OCR A-LEVEL BIOLOGY A

BIOLOGY



EXAM QUESTION PACK

UNIT F214 OLD SPECIFICATION PAPERS

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner reports in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports free of charge. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

OCR
Oxford Cambridge and RSA

Thursday 16 June 2016 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

5878157751

F 2 1 4 0 1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

© OCR 2016 [A/500/8553]
DC (KN/FD) 119784/4

OCR is an exempt Charity

STEMUP.CO.UK

BLANK PAGE

© OCR 2016

Answer **all** the questions.

1 **(a)** Fig. 1.1 is a diagram representing the mammalian pancreas and associated structures.

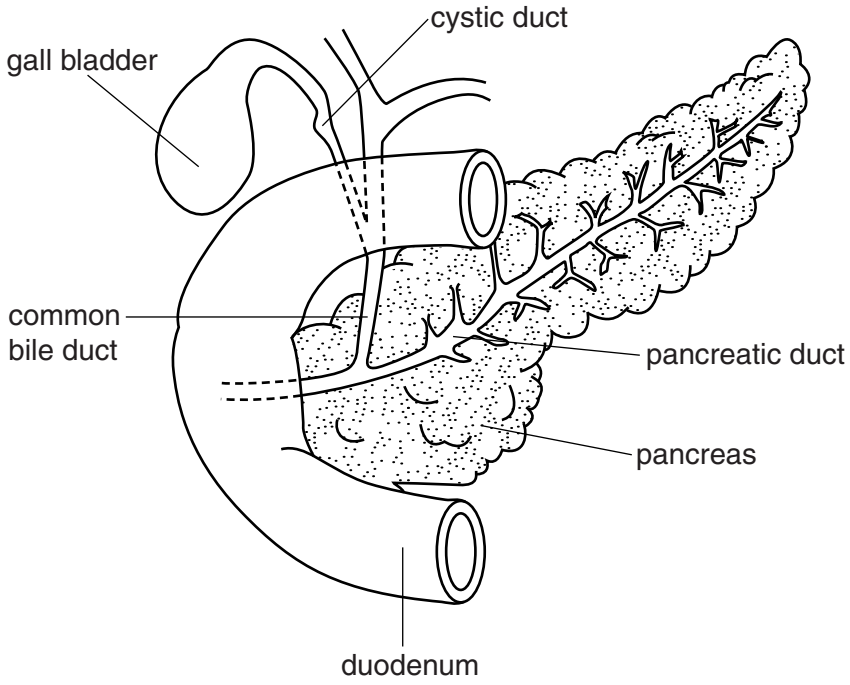


Fig. 1.1

The pancreas is an exocrine and an endocrine gland.

How does Fig. 1.1 indicate that the pancreas has an **exocrine** function?

.....

.....

.....

.....

..... **[2]**

© OCR 2016

STEMUP.CO.UK

(b) Fig. 1.2 represents a cross-section of part of the pancreas.

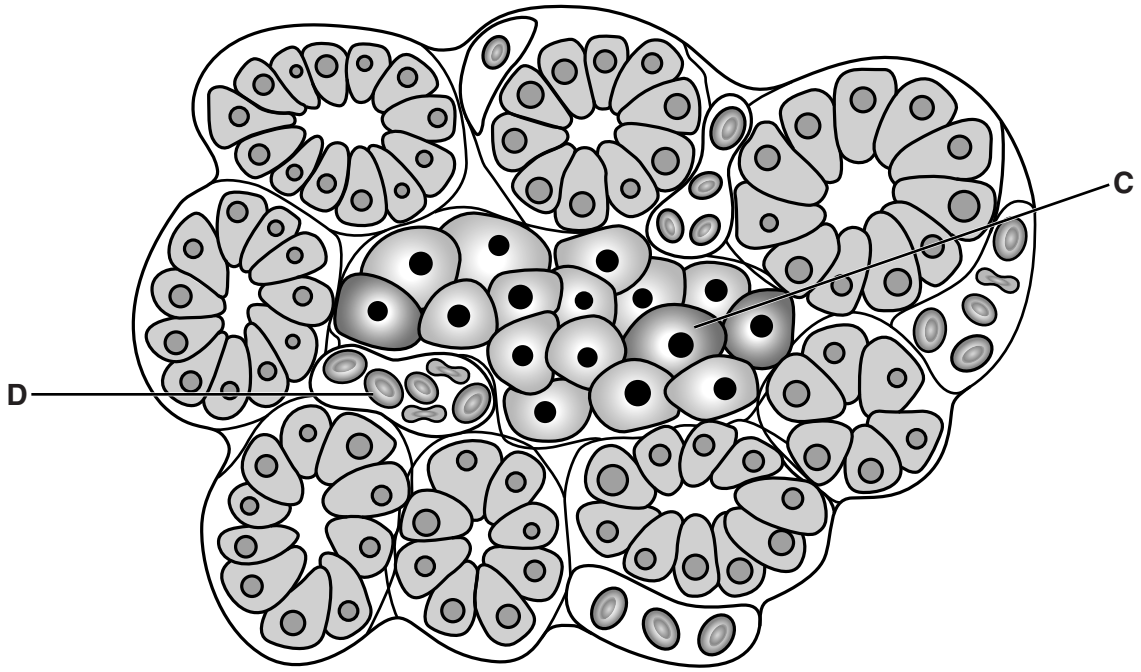


Fig. 1.2

(i) Name the **group** of cells that include the cell labelled **C**.

..... **[1]**

(ii) Identify the structure labelled **D**.

..... **[1]**

(c) Fig. 1.3 shows the concentrations of glucose and insulin in the blood of an individual before and after a meal.

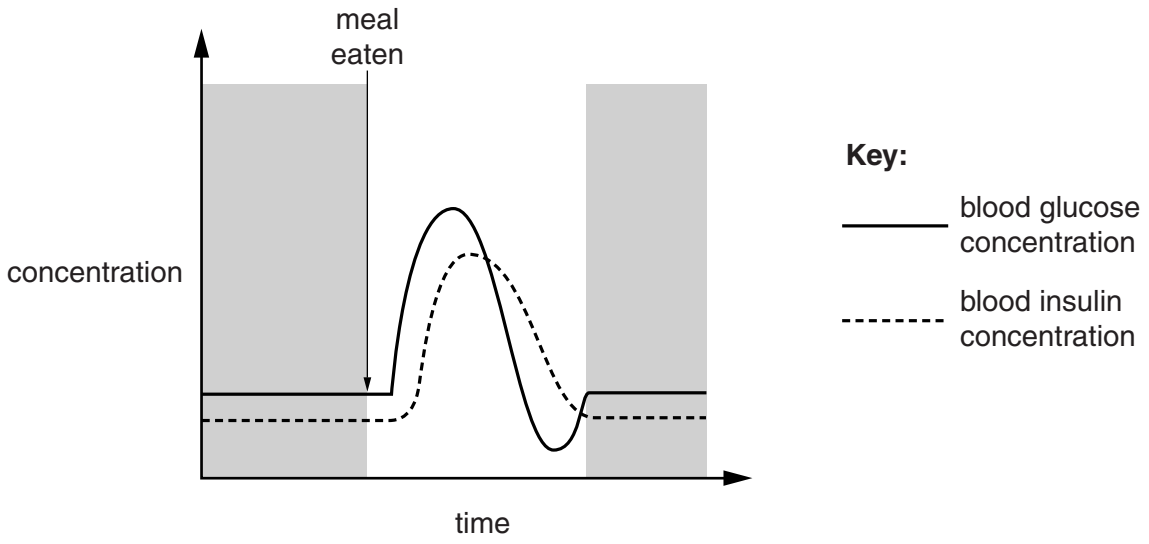


Fig. 1.3

© OCR 2016

STEMUP.CO.UK

(i) After the meal, the concentrations of glucose and insulin in the blood increase.

Explain why there is a delay in the increase of insulin concentration following the increase in blood glucose concentration.

.....

.....

.....

.....

.....

..... **[2]**

(ii) The shaded parts of the graph in Fig. 1.3 are over-simplified representations of the blood glucose and insulin concentrations.

Describe **and** explain how these concentrations should be represented on the graph accurately.

In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

© OCR 2016

STEMUP.CO.UK

(d) The published Glycaemic Index value (GI) of a carbohydrate-containing food, rates the food on a scale from 0 to 100 according to how much it raises blood glucose concentration after it is eaten.

To determine the GI value of a test food:

- 10 healthy people fast overnight
- the test food containing 50 g of carbohydrate is eaten
- blood samples are taken every 15 minutes for the next two hours and blood glucose concentrations are measured
- a value known as the iAUC is obtained from these measurements
- the GI value is calculated by dividing the iAUC for the test food by the iAUC for glucose and multiplying by 100
- the mean of the GI values from all 10 people is the published GI value for that food

(i) Why is it necessary for the people to fast overnight before the start of the test?

.....

.....

..... **[1]**

(ii) The **iAUC for glucose** is used to calculate the GI value of the test food. For this calculation to be valid, a number of variables must be controlled when determining the iAUC for glucose.

Suggest **two** variables and **how** they may be controlled.

1 .....

.....

.....

2 .....

.....

..... **[2]**

© OCR 2016

STEMUP.CO.UK

(iii) Why does the procedure use the mean of the GI values to obtain the published GI value for the food?

.....

.....

..... **[1]**

[Total : 14]

© OCR 2016

STEMUP.CO.UK

2 Much biological knowledge is obtained and verified through observation.

(a) A biologist has a small pond containing goldfish in her garden.

On a sunny day, more pondweed is at the surface of the water but on a cloudy day, less pondweed is at the surface.

Suggest an explanation for this observation.

.....

.....

.....

.....

.....

..... **[2]**

(b) A pump stands in the pond to circulate the water. In cold weather, the fish gather around the pump.

Suggest an explanation as to why the fish gather around the pump in cold weather.

.....

.....

.....

.....

.....

..... **[2]**

[Total : 4]

© OCR 2016

STEMUP.CO.UK

3 **(a)** ATP is described as the 'universal energy currency'.

Describe how the structure of ATP is similar to **and** differs from the structure of a DNA nucleotide.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

© OCR 2016

STEMUP.CO.UK

(b) ATP is produced in cells by the process of respiration. Some of the reactions involved in the process of respiration are outlined in Fig. 3.1.

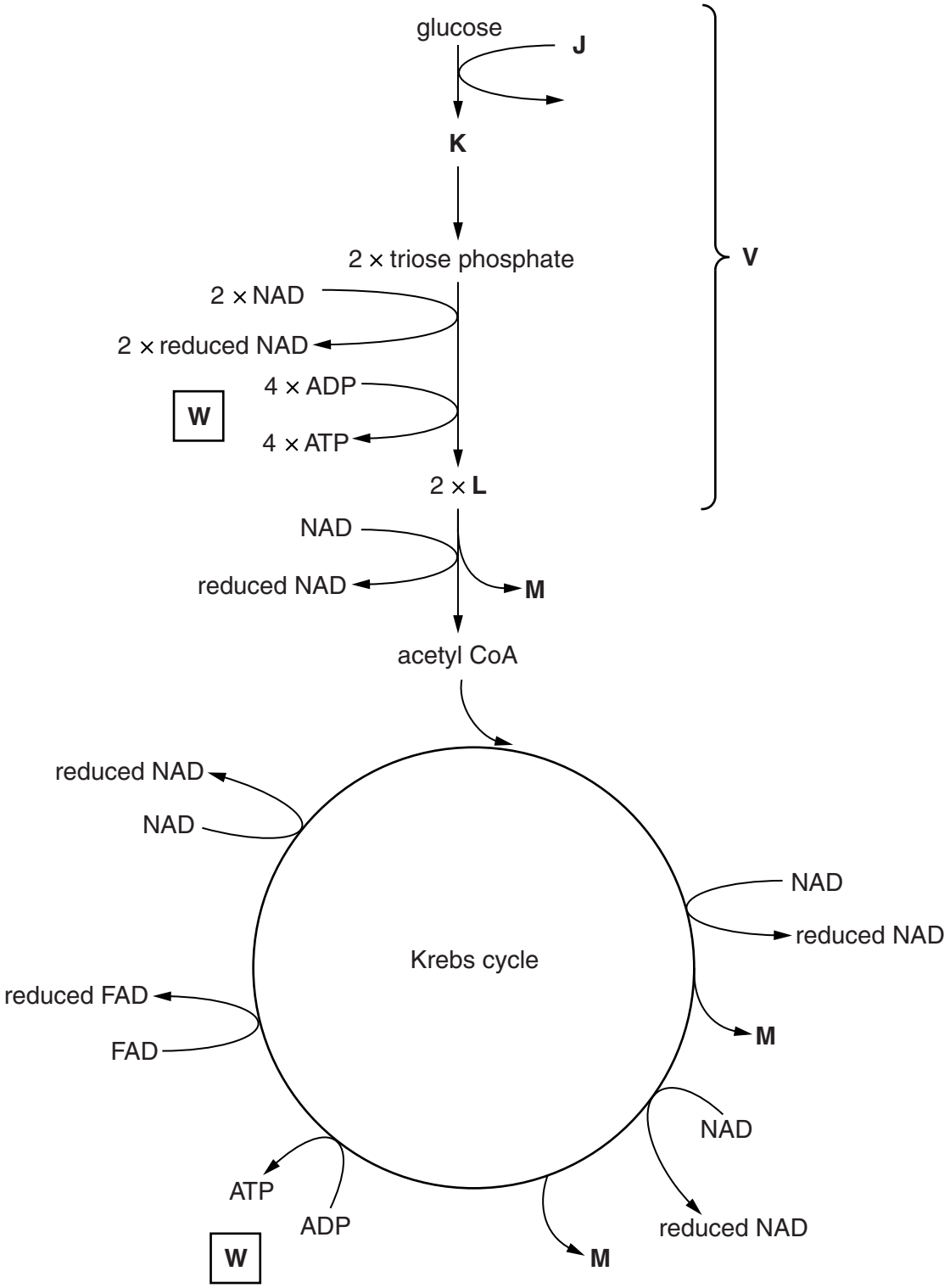


Fig. 3.1

© OCR 2016

(i) Compound **J** is required for the reaction pathway to start.

Identify compound **J**.

..... **[1]**

(ii) Identify compounds **K** to **M**.

K .....

L .....

M .....

[3]

(iii) Name the pathway labelled **V**.

..... **[1]**

(iv) ATP is produced in two different ways during respiration.

- Some ATP is produced at the points labelled **W** on Fig. 3.1.
- ATP is also produced using reduced NAD and reduced FAD on the inner mitochondrial membrane.

Outline the differences in the two ways by which ATP is produced in respiration.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total : 13]

© OCR 2016

STEMUP.CO.UK

4 **(a)** The rate of photosynthesis is affected by different factors.

An experiment was carried out to investigate the effect of temperature and carbon dioxide concentration on the rate of photosynthesis.

- Plants were supplied with air (0.04% CO_2) and with air enriched with carbon dioxide (0.19% CO_2).
- The rate of photosynthesis was measured at different leaf temperatures.

The results are shown in Table 4.1.

Leaf temperature (°C)	**Rate of photosynthesis (a.u)**	
	in air with 0.04% CO_2	**in air with 0.19% CO_2**
10	8.0	8.0
15	12.3	16.8
20	15.0	24.4
25	16.2	30.0
30	14.3	34.7
35	8.3	38.2
40	—	29.3
45	—	13.2

Table 4.1

(i) Describe the effect on the rate of photosynthesis of increasing leaf temperature.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

© OCR 2016

STEMUP.CO.UK

(ii) Calculate the percentage increase in the rate of photosynthesis at **30 °C** as the carbon dioxide concentration is increased from 0.04% to 0.19%.

Show your working and give your answer to **3 significant figures**.

Answer = ... % **[2]**

(iii) Use the information in Table 4.1 to state **one other** effect of an increased concentration of carbon dioxide on the rate of photosynthesis.

.....

.....

..... **[1]**

(iv) Suggest why there are no results for 0.04% CO_2 at 40 °C and 45 °C.

.....

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2016

STEMUP.CO.UK

(b) As a leaf ages, the ribulose bisphosphate carboxylase (rubisco) content of the leaf changes.

Fig. 4.1 represents the amount of rubisco present, the synthesis of rubisco and the breakdown of rubisco as the leaf ages.

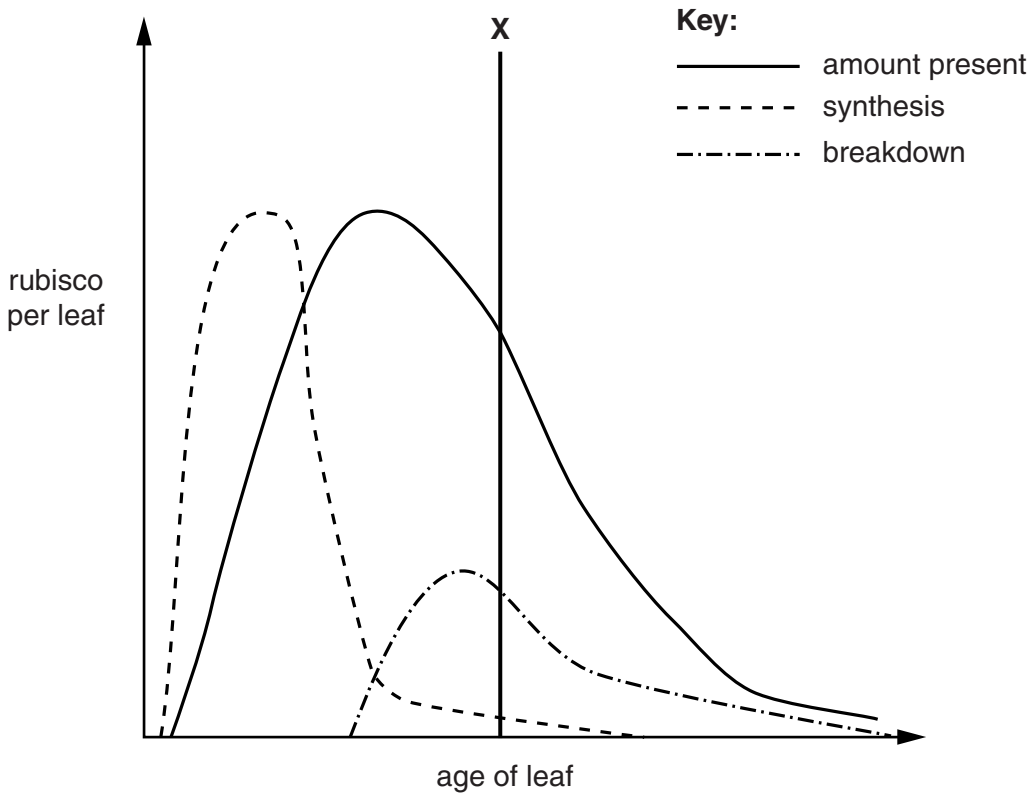


Fig. 4.1

Explain the effect that the levels of rubisco would have **on the rate of photosynthesis** as the age of the leaf increases beyond the line labelled **X**.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total : 11]

© OCR 2016

STEMUP.CO.UK

5 **(a)** Fig. 5.1 represents the voltage across the membrane of an axon and the changes that take place during the generation and transmission of an action potential.

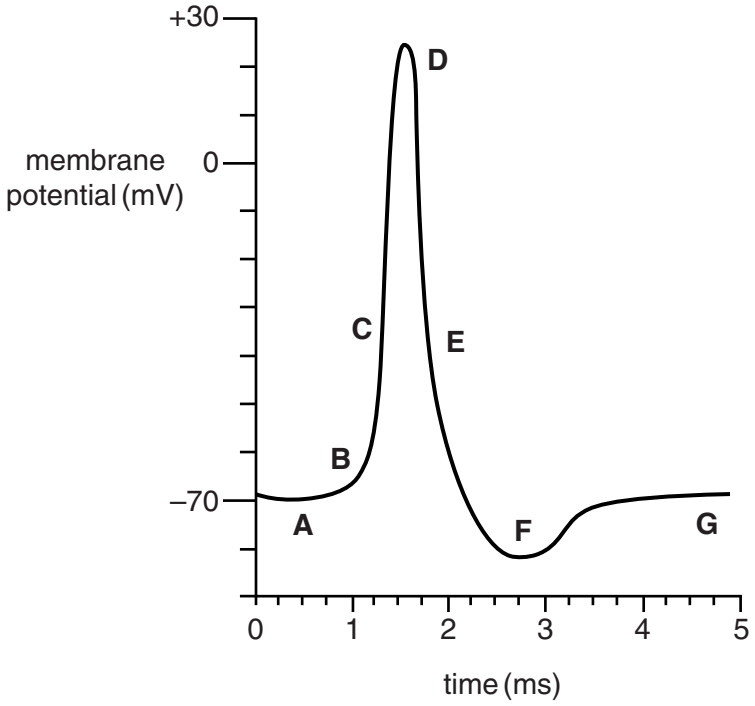


Fig. 5.1

Using Fig. 5.1, indicate the **letters**, **A** to **G**, when each of the following occurs.

A letter may be used once, more than once or not at all.

(i) Voltage-gated sodium ion channels are open.

..... **[1]**

(ii) Repolarisation.

..... **[1]**

(iii) Sodium ions are actively pumped out of the neurone.

..... **[1]**

© OCR 2016

STEMUP.CO.UK

(b) Heart rate is controlled by nervous and hormonal mechanisms.

(i) For each of the following statements, indicate whether the statement is true or false.

Statement	True or False
Heart rate is accelerated by stimulation from the vagus nerve.	
Stimulation by the sympathetic and parasympathetic nerves have opposite effects on the heart rate.	
The vagus nerve releases acetylcholine.	

[2]

(ii) Hormonal control of heart rate is achieved by hormones acting on the sino-atrial node (SAN).

Using your knowledge of the way in which heart action is coordinated, suggest why it can be deduced that hormones act on the SAN rather than on individual cardiac muscle cells.

.....

.....

.....

.....

.....

.....

..... **[2]**

(iii) Suggest how adrenaline brings about a response inside the cells of the SAN.

.....

.....

.....

.....

.....

.....

..... **[2]**

[Total : 9]

© OCR 2016

STEMUP.CO.UK

6 Most excess amino acids are metabolised in the liver, resulting in products that are relatively harmless to the body.

(a) Fig. 6.1 outlines the first step in the metabolism of amino acids in the liver.

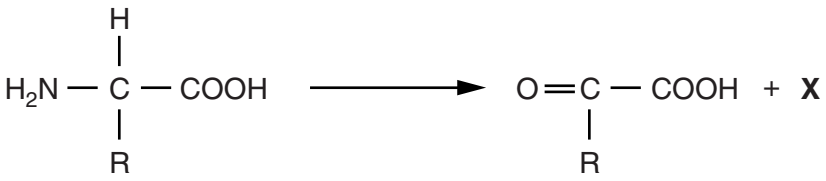


Fig. 6.1

(i) State the name given to this reaction.

..... **[1]**

(ii) Identify the toxic product of the reaction.

..... **[1]**

(b) Complete the following passage by inserting the **most suitable** word or term.

Fig. 6.1 shows the first step in the metabolism of amino acids in the liver. The next step involves a series of reactions known as the ..... cycle. The toxic product **X** enters the cycle together with ..... , resulting in the formation of the final nitrogenous product ..... The nitrogenous product is transported to the ..... and then via the ureter to the ..... where it is stored as ..... before leaving the body. **[6]**

(c) In addition to the reaction shown in Fig. 6.1, liver cells also use amino acids for protein synthesis.

Suggest **one** other use of amino acids in liver cell metabolism.

..... **[1]**

[Total : 9]

END OF QUESTION PAPER

© OCR 2016

STEMUP.CO.UK

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

© OCR 2016

© OCR 2016

OCR
Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2016

OCR
Oxford Cambridge and RSA

GCE

Biology

Unit **F214:** Communication, Homeostasis & Energy

Advanced GCE

Mark Scheme for June 2016

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2016

These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line
I	Ignore
	Large dot (Key point attempted)
NBOD	Benefit of the doubt not given
QWC+	additional QWC credit given
	Tick
	Tick 1
	Tick 2
^	Omission Mark

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(a)		1 (pancreas has) pancreatic duct ; 2 (ducts) carry / transport / take , secretions / enzymes / pancreatic juice (to duodenum) ; 3 (enzyme) not , released / secreted , directly into the blood ;	2 max	**DO NOT CREDIT** 'excretion' for 'secretion' on first occasion then apply ecf 1 **IGNORE** ref to the other ducts 2 **CREDIT** enzymes secreted into duct **ACCEPT** substances / molecules for 'secretions' **DO NOT CREDIT** incorrect ref to hormones **DO NOT CREDIT** ref to *ducts* secreting enzymes 3 **DO NOT CREDIT** incorrect ref to hormones **IGNORE** 'not transported in the blood' **Note** 'it releases enzymes into the pancreatic duct' **= 2 marks (mps 1 and 2)**
1	(b)	(i)	islet(s) of Langerhan(s) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** α and β / alpha and beta , cells **DO NOT CREDIT** a / b / A / B , cells **DO NOT CREDIT** acinar cells
1	(b)	(ii)	erythrocyte / red blood cell ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** RBC **IGNORE** ref to blood vessel

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(c)	(i)	1 increase (in blood sugar) is detected (by β cells) ; 2 *idea that takes time for* depolarisation (in β cells) ; 3 *time needed for* β cells to , produce / release , insulin ;	2 max	**DO NOT CREDIT** 'B' or 'b' cell on first occasion then apply ecf A description of a *sequence* of events provides a timeline 2 *time for* making sure that there is enough ATP / ion channels open / to pump out K^+ / for Ca^{2+} to enter 3 **DO NOT CREDIT** ref to α cell(s)
1	(c)	(ii)	1 there should be no straight line(s) (on the graph) **or** line(s) (should) , rise and fall / fluctuate ; 2 glucose and insulin levels fluctuate ; 3 insulin levels (should) rise (and fall) after those of glucose ; 4 (glucose) level , maintained around / returned to , the **norm**(al) / a **set** point / a **set** value ; 5 ref to **negative feedback** / **homeosta**sis ;	3 max	**DO NOT CREDIT** in the context of eating a meal 2 Must be a statement that implies both levels change 4 **CREDIT** 'within narrow limits' / 'relatively constant' **IGNORE** optimum **CREDIT** maintained at , 80 – 120 mg $100cm^{-3}$ / 4 – 6 mmol dm^{-3} for the glucose value
			QWC ;	1	Award if **3** of the following terms have been used in a correct context with correct spelling: **set** (point / value) **norm**(al) **negative feedback** **homeosta**sis

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(d)	(i)	to ensure that the (blood) glucose **,** is at its **,** base (level) / low (level) / normal (level) **;**	**1**	**ACCEPT** 'sugar' instead of 'glucose' **ACCEPT** to make sure that the glucose (level) is not **,** raised / high **ACCEPT** to make sure that the rise in blood glucose is only due to the (tested) food eaten **DO NOT CREDIT** ref to ***no*** , sugar / carbohydrate
1	(d)	(ii)	1 50 g of <u>glucose</u> must be used **;** 2 the data for glucose should be obtained for the same (ten) people (to eliminate differences between individuals) **;** 3 same age / same age range (as people in original test) **;** 4 same gender balance (as in original test) **;** 5 have the same level of activity (during the test) **;** 6 be at the same temperature **;** 7 don't eat or drink anything else (during the test) **;** 8 same **,** body mass / BMI **;**	**2 max**	**IGNORE** ref to volume of blood taken or where in the body it is taken from **IGNORE** same number of people 1 **CREDIT** ref to same mass as test carbohydrate **IGNORE** amount 7 **CREDIT** 'only drinks water' (during the test) 8 **ACCEPT** same weight **IGNORE** same build

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(d)	(iii)	1 (absorption / effect on blood glucose) , variable from person to person ; 2 it reduces the effect of , outliers / anomalous values ;	1 max	**IGNORE** ref to accuracy / precision / reliability / validity
			Total	14	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(a)		1 greater light intensity on a sunny day / less light intensity on a cloudy day ; 2 oxygen produced during , photosynthesis / photolysis / light dependent stage ; 3 (more) oxygen trapped within weed increases buoyancy ;	2 max	**IGNORE** all ref to growth and tropisms 3 **ACCEPT** 'oxygen helps the weed to float' 'oxygen bubbles makes the weed rise' 'trapped oxygen lowers the density'
2	(b)		1 fish are , ectotherms / ectothermic **or** body temperature will be similar to surrounding water ; 2 *idea that* pump will be generating heat / water around pump is warmer ; 3 AVP ;	2 max	All marks to be applied in the context of warmth rather than oxygen (as the pump circulates water and does not oxygenate) 1 **CREDIT** cannot control body temperature (by physiological means) **DO NOT CREDIT** ref to , regulating / maintaining , body temperature 3 they are adapted for warmer conditions ref to (named) metabolic function (e.g. metabolic reactions occur at a faster rate / enzymes can work more efficiently)
			Total	**4**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(a)		*similarities* S1 (both) have **,** **pentose** / 5C **,** sugar **;** S2 (both) have **phosphate ;** S3 (both) have **,** **adenine** / (nitrogenous) base **;** *differences* D1 DNA (nucleotide) has **deoxyribose** ***and*** ATP has **ribose ;** D2 DNA (nucleotide) has 1 phosphate ***and*** ATP has 3 phosphates **;** D3 DNA (nucleotide) **,** has (4 possible) different bases / can have **thymine** / can have **cytosine** / can have **guanine** ***and*** ATP has **,** only 1 (possible) base / adenine **;**	**4 max**	**Accept all mark points from diagrams that are clearly labelled** **IGNORE** letters for bases **IGNORE** bonds S2 **ACCEPT** P_i / $PO_4^{(3-)}$ / (P) **DO NOT CREDIT** phosphate heads / phosphoric acid / phosphorus / P S3 **DO NOT CREDIT** adenosine D2 **ACCEPT** P_i / $PO_4^{(3-)}$ / (P) / 'a phosphate group' for DNA **DO NOT CREDIT** phosphate heads / phosphoric acid / phosphorus / P D3 **DO NOT CREDIT** thiamine / cysteine / adenosine **Note:** 'ATP has adenine but DNA has adenine or thymine' **= 2 marks (S3 and D3)**
			QWC **;**	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **adenine** **thymine / cytosine / guanine** **deoxyribose** **ribose** **pentose** **phosphate**

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(b)	(i)	(2 molecules of) ATP / adenosine triphosphate **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
3	(b)	(ii)	**K** hexose (1,6) (bis)phosphate **;** **L** pyruvate **;** **M** carbon dioxide / CO_2 **;**	3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** K **CREDIT** glucose (6) phosphate / fructose (1) phosphate / fructose (1,6) diphosphate / hexose diphosphate **DO NOT CREDIT** glucose (1,6) bisphosphate L **ACCEPT** pyruvic acid M if used, formula must be correct
3	(b)	(iii)	glycolysis / glycolytic **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(b)	(iv)	by substrate level phosphorylation ; detail ; by , chemiosmosis / oxidative phosphorylation ; detail ;	3 max	e.g. • by removing phosphate from a compound (in the reaction pathway) e.g. • hydrogen lost from , redNAD / redFAD • electrons pass down , ETC / electron transport chain • ref to proton gradient / electrochemical gradient • ref to ATP synth(et)ase
			Total	**13**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(a)	(i)	1 rate of photosynthesis increases (reaches peak) **and** then decreases; 2 peak / optimum , for 0.04% CO_2 , between 20°C and 30°C / at 25°C ; 3 peak / optimum , for 0.19% CO_2 , between 30°C and 40°C / at 35°C ; 4 ref to zero rate / no result / no photosynthesis , at 40°C and 45°C / from 40°C / above 35°C , with 0.04% CO_2 ;	3 max	'it' = rate of photosynthesis Units must be used once (% and °C) for mps 2 to 4 2 either states 25°C **or** states the range 20°C to 30°C 3 either states 35°C **or** states the range 30°C to 40°C 4 **ACCEPT** photosynthesis stops at 40°C
4	(a)	(ii)	143 (%) ; ;	2	**Correct answer = 2 marks** **[please place 2 ticks on script]** **If answer is incorrect, then ALLOW 1 mark for** unrounded or incorrectly rounded answer (e.g. 142.657 or 142) **or** (34.7 - 14.3) ÷ 14.3 **or** 20.4 ÷ 14.3 **or** 100 x (34.7 ÷ 14.3) - 100 **or** 243

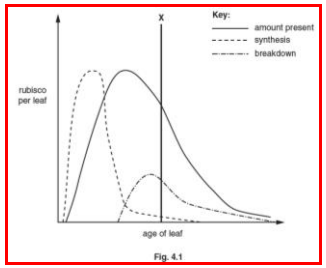
STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(a)	(iii)	*idea that* increases the optimum temperature (for photosynthesis) **or** maximum rate of photosynthesis at higher temperature **or** can photosynthesise at higher temperatures **or** maximum rate of photosynthesis is higher **or** rate of photosynthesis starts to decrease at a higher temperature **or** the rate of photosynthesis increased **,** at a higher rate / faster **;**	1	**ACCEPT** moves peak upwards

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(a)	(iv)	1 no , photosynthesis / Calvin cycle / carbon fixation **or** rate too low to be recorded ; 2 CO_2 is <u>limiting</u> **or** *idea that* the level of CO_2 is too low to compensate for the high temperature ; 3 rubisco is binding to O_2 (instead) ; 4 decreased enzyme activity ; 5 (high temperature has) distorted rubisco active site ; 6 AVP ;	**2 max**	2 (as activity had been observed at these temperatures with 0.19% CO_2) 3 look for a clear statement **CREDIT** switches to , photorespiration / oxygenase activity 4 **DO NOT CREDIT** (fully) denatured 5 **DO NOT CREDIT** (fully) denatured (as there is activity at these higher temperatures) 6 e.g. stomatal closure to conserve water reduces CO_2 **Note:** 'the rubisco active site is distorted so it binds to O_2 instead' **= 2 marks (mps 3 and 5)**

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(b)		 Fig. 4.1 1 rate of photosynthesis would decrease ; 2 little rubisco being synthesised **and** the rubisco present being broken down **or** more rubisco is being broken down than being synthesised ; 3 less / no , enzyme / rubisco , available to fix , carbon dioxide / CO_2 ; 4 less / no , Calvin cycle / light independent stage , can take place ; 5 rubisco becomes limiting (factor) ;	**3 max**	'it' = rate of photosynthesis 1 **IGNORE** no photosynthesis 3 **CREDIT** less rubisco to catalyse the reaction between CO_2 and RuBP 4 **CREDIT** build up of red NADP less , triose phosphate / TP / etc , made less glucose made light independent stage takes place at a slower rate **Note:** 'less photosynthesis because there is less rubisco which is needed to fix CO_2 in the Calvin cycle' **= 3 marks (mps 1, 3 and 4)**
			Total	**11**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(a)	(i)	(B and) C ;	1	**Mark the first answer(s).** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(a)	(ii)	D **and** E ;	1	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** F
5	(a)	(iii)	**all** individual letters A to G / A to G / A - G ;	1	as the pump runs continuously **CREDIT** F **and/or** A **and** G as these are the places where the pump has greatest effect **IGNORE** B if given as an additional answer to an otherwise correct answer
5	(b)	(i)	False / F True / T True / T ; ;	2	**All 3 answers correct = 2 marks** **Any 2 answers correct = 1 mark** **1 or 0 answers correct = 0 marks** **Mark incorrect cells first** **1 ✗ = 1 max** **2 ✗ = 0 marks**

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(b)	(ii)	1 *idea that* (hormonal) stimulation of individual muscle cells would result in uncoordinated response **or** (hormonal) stimulation of SAN results in coordinated action of the cardiac muscle **;** 2 *idea that* (hormonal) stimulation of individual muscle cells will not result in a change in heart rate **or** (hormonal) stimulation of SAN results in a change in heart rate **;** 3 (as) (hormone) receptors only present on the SAN / individual cells do not have (hormone) receptors **;**	**2 max**	hormone binds to / hormone acts on = stimulation e.g. coordinated action = both atria contract together
5	(b)	(iii)	1 adrenaline / first messenger / it **,** binds to receptor(s) on cell **surface** membrane (of SAN cell(s)) **;** 2 activates adenyl(yl) cyclase **;** 3 ATP converted to **,** cyclic AMP / cAMP **or** cyclic AMP / cAMP / second messenger **,** synthesised **;** 4 results in depolarisation (of SAN cell membrane) **;**	**2 max**	**IGNORE** ref to synthesis of glucose 1 **CREDIT** 'plasma membrane' or 'plasmalemma' for 'cell surface membrane' 2 **CREDIT** ref to adenylate cyclase 3 **DO NOT CREDIT** in context of 'wave of depolarisation'
			Total	**9**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
6	(a)	(i)	deamination ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** deanimation
6	(a)	(ii)	ammonia / NH_3 ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** ammonium / NH_4^+
6	(b)		ornithine ; carbon dioxide / CO_2 ; urea / $CO(NH_2)_2$; kidney / nephron / renal tubule / glomerulus ; bladder ; urine ;	6	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** If formula used, must be correct **IGNORE** water / H_2O / ATP **IGNORE** other named part of the nephron e.g. Bowmans capsule / loop of Henle / etc **DO NOT CREDIT** gall bladder

STEMUP.CO.UK

Question			Answer	Mark	Guidance
6	(c)				**IGNORE** ref to protein synthesis (as in Q) used in the regeneration / repair of liver cells
			1 in respiration / in Krebs cycle / as a respiratory substrate ;		1 **DO NOT CREDIT** for anaerobic respiration / glycolysis
			2 gluconeogenesis ;		2 **CREDIT** conversion to glucose
			3 conversion to , lipid / fatty acid ;		3 **ACCEPT** conversion to , steroid / bile salts **IGNORE** glycerol
			4 transamination ;	1 max	
			Total	**9**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2016

PART OF THE CAMBRIDGE ASSESSMENT GROUP

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS MANAGEMENT SYSTEMS 001

STEMUP.CO.UK

OCR
Oxford Cambridge and RSA

Monday 8 June 2015 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

* 4 8 3 7 0 1 0 3 4 6 *

* F 2 1 4 0 1 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

© OCR 2015 [A/500/8553]
DC (RW/FD) 102587/6

OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** Fig. 1.1 is a diagram representing a three-dimensional view of a chloroplast.

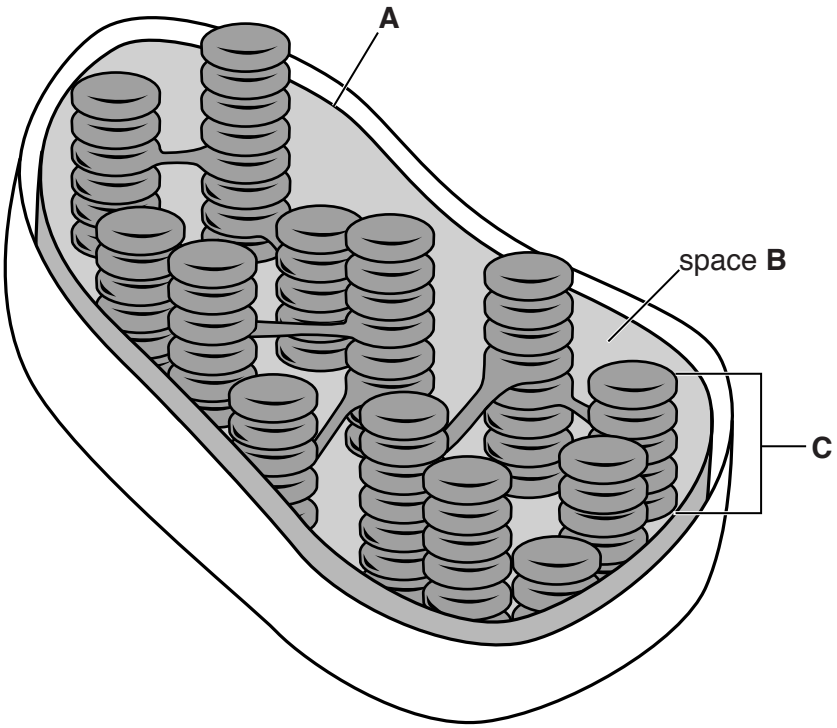


Fig. 1.1

(i) Name parts **A** to **C** in Fig. 1.1.

A .....

B .....

C ..... **[3]**

(ii) Describe **two** ways in which the structure of part **C** is adapted to its function.

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2015

STEMUP.CO.UK

(iii) A key aspect of photosynthesis is the metabolic pathway involving carbon dioxide.

Place a tick (✓) in the appropriate box to indicate the part of the chloroplast (**A**, **B** or **C**) in which the metabolic pathway involving carbon dioxide is located.

A	
B	
C	

[1]

(b) Fig. 1.2 shows the theoretical and actual relationship between light intensity and the rate of photosynthesis.

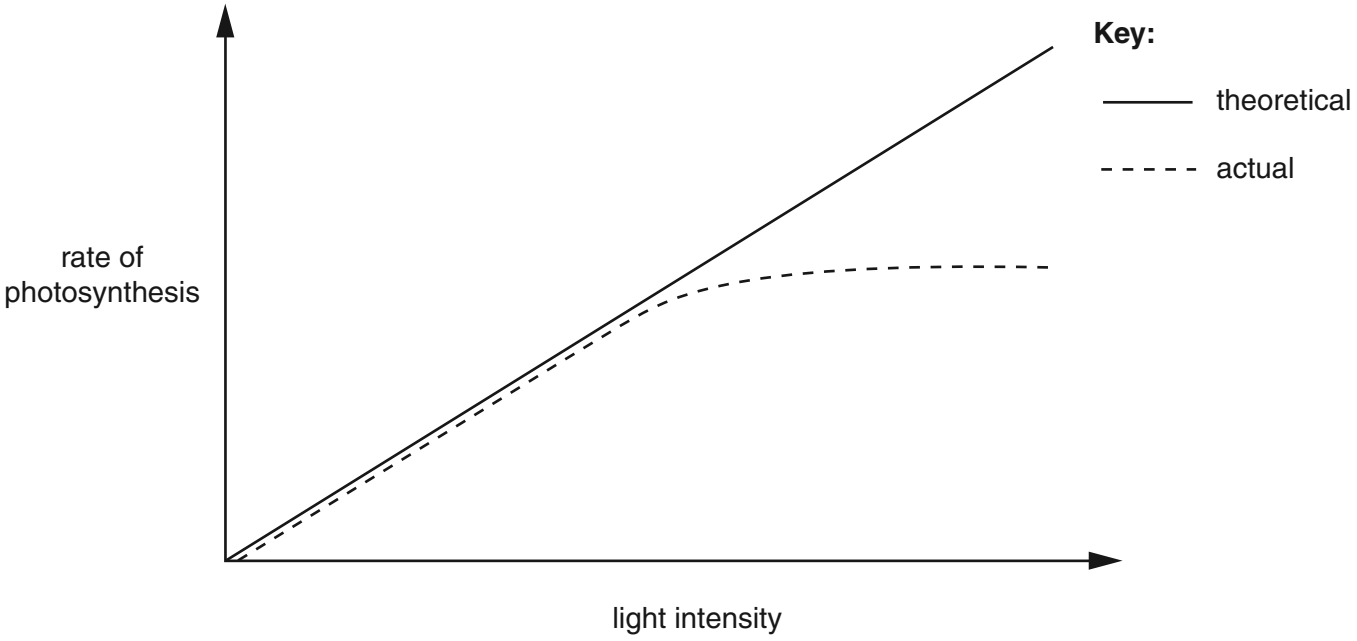


Fig. 1.2

With reference to the biochemistry of photosynthesis, explain why the theoretical rate of photosynthesis is **not** achieved at higher light intensities.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2015

STEMUP.CO.UK

(c) Plants are usually adapted to living in conditions of different light intensities.

The rate of photosynthesis at different light intensities for two different species of plant was investigated. The results are shown in Fig. 1.3.

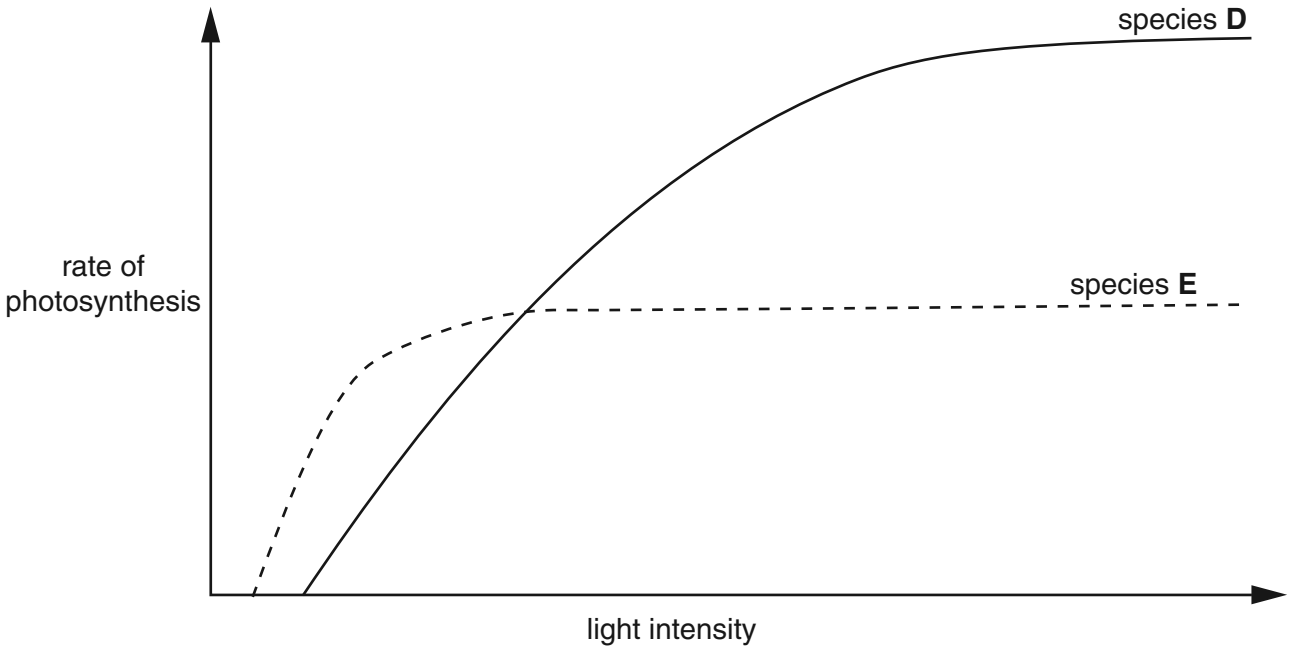


Fig. 1.3

(i) Using the information in Fig. 1.3, explain which of the two species, **D** or **E**, is better adapted to living in **shady** conditions.

.....

.....

.....

.....

.....

.....

..... **[2]**

(ii) The leaf of a plant that is adapted to living in shade will differ from the leaf of a plant that is adapted to living in sunlight.

Suggest **one** way in which the **structure** of these leaves will differ.

.....

.....

..... **[1]**

© OCR 2015

(d) Plants are autotrophs. Most other organisms are heterotrophs.

Outline the ways in which heterotrophic organisms are dependent on plants.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total : 14]

© OCR 2015

STEMUP.CO.UK

2 Within the mammalian body, different systems of communication are used to coordinate and control activities.

(a) Complete the following passage by using the **most suitable** term in each case.

The pancreas and the adrenal glands are both examples of ..... glands. Adrenaline is a ..... that is secreted by the adrenal glands. These glands also secrete steroids such as corticosteroids from cells in the ..... region. The chemicals secreted by these glands are transported by the blood to their ..... cells and tissues. **[4]**

(b) Insulin is secreted from the beta cells of the pancreas in response to increased blood glucose concentration.

Fig. 2.1 is a diagram representing the sequence of events leading to the secretion of insulin from the beta cell.

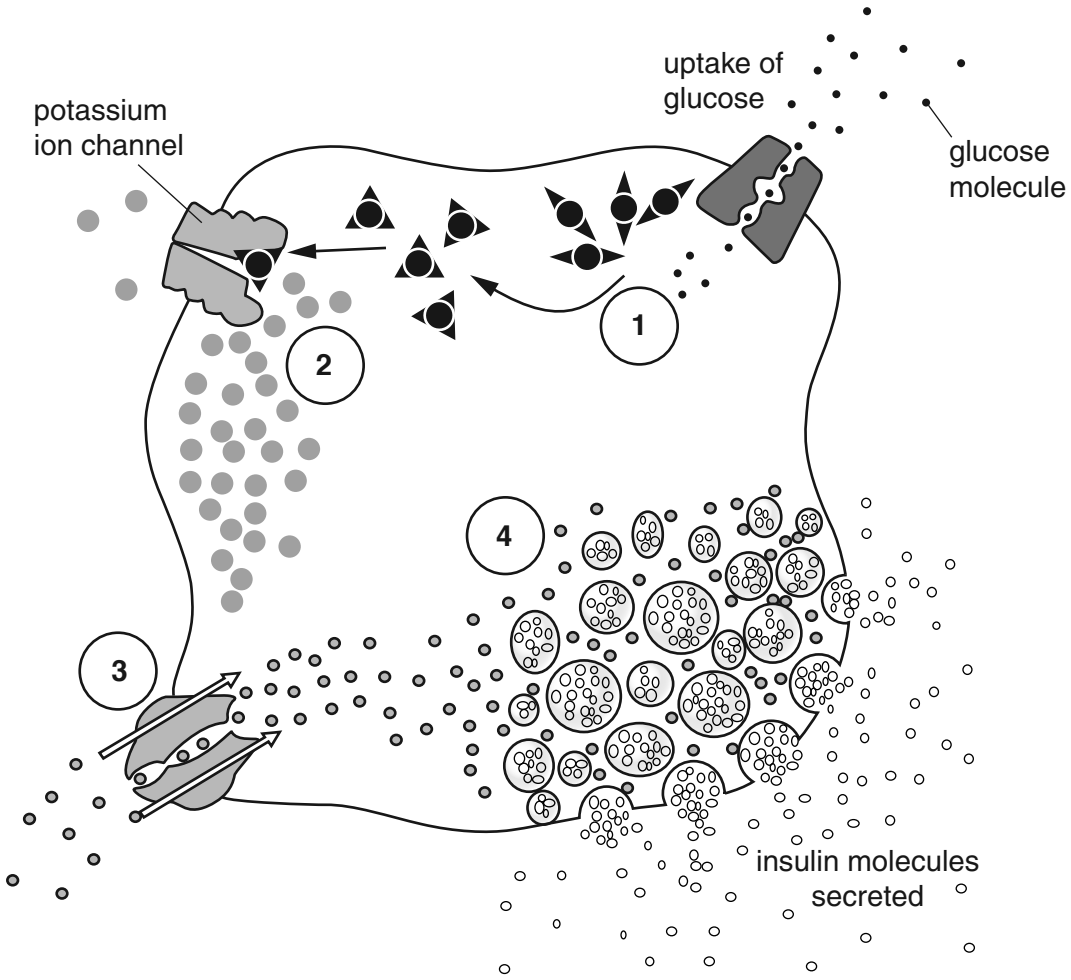


Fig. 2.1

© OCR 2015

STEMUP.CO.UK

(i) With reference to Fig. 2.1, describe the events occurring at the stages labelled **1** to **4**.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

4 .....

.....

..... **[4]**

(ii) After the initial release of insulin from the beta cell, insulin secretion continues even when there is no further glucose intake.

Suggest and explain why the cell continues to secrete insulin.

.....

.....

.....

.....

.....

.....

..... **[2]**

[Total : 10]

© OCR 2015

STEMUP.CO.UK

3 **(a)** Fig. 3.1 is a diagram representing a mitochondrion located in the cytoplasm of an animal cell.

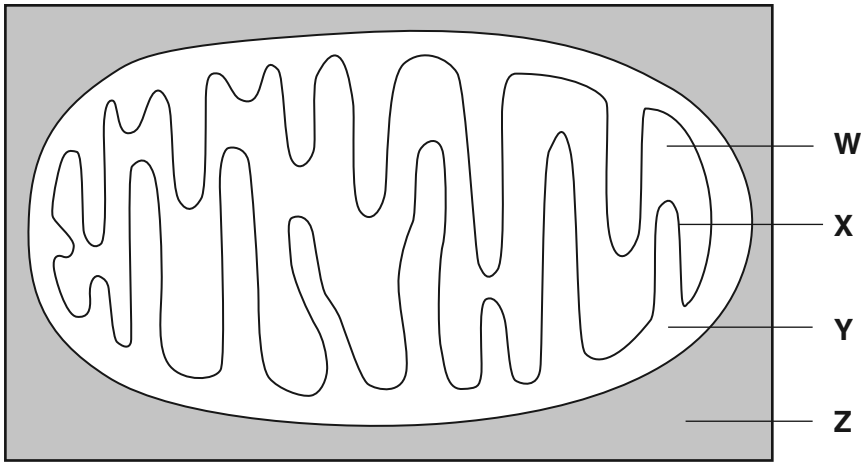


Fig. 3.1

(i) Use the letters **W** to **Z** to identify the region in Fig. 3.1 where each of the following occurs.

You may use each letter once, more than once or not at all.

link reaction .....

glycolysis .....

electron transport chain .....

Krebs cycle ..... **[4]**

(ii) Why does aerobic respiration yield fewer molecules of ATP than the theoretical maximum?

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2015

STEMUP.CO.UK

(b) Explain why the incomplete breakdown of glucose in **anaerobic** respiration produces less ATP than aerobic respiration.

In your answer, you should use appropriate technical terms, spelled correctly.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

.... **[5]**

[Total : 11]

© OCR 2015

STEMUP.CO.UK

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2015

4 Kidney failure is a serious condition. Many kidney patients receive some form of renal replacement therapy (RRT) such as dialysis.

The UK Renal Registry collects national data about the causes and treatment of kidney failure.

(a) Table 4.1 shows the number of adult patients who started RRT in the UK in 2011. The table also shows the estimated population of each country in the UK and the incidence rate of RRT in each country.

The incidence rate is the number of adult patients starting RRT in 2011 per million people.

Country	**Number of adults starting RRT in 2011**	**Estimated population in 2011 (millions)**	**Incidence rate (per million people)**
England	5774	53.0	109
Northern Ireland	203	1.8	113
Scotland	495	5.3	
Wales	363	3.1	117
UK	6835	63.2	108

Table 4.1

Using the data in Table 4.1, calculate the missing value for the incidence rate of adult patients starting RRT in **Scotland** in 2011.

incidence rate = ... **[2]**

© OCR 2015

STEMUP.CO.UK

(b) Fig. 4.1 shows the mean percentage of adult patients in the UK starting renal replacement therapy (RRT) in 2011 who were male and the age groups to which they belonged.

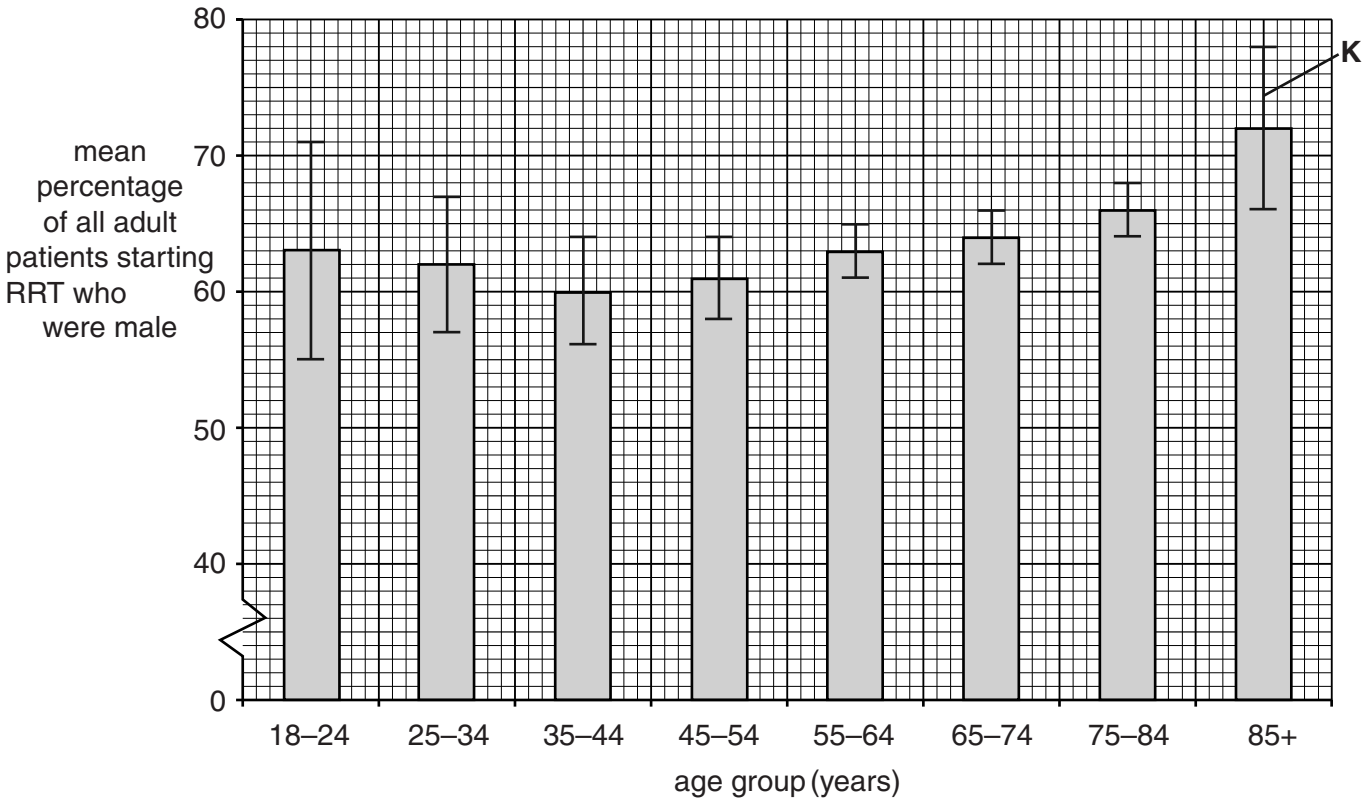


Fig. 4.1

(i) State the name given to the feature indicated by the letter **K** on Fig. 4.1.

..... **[1]**

(ii) What information can be deduced from the data in Fig. 4.1 about the gender of adult patients starting RRT in 2011?

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2015

STEMUP.CO.UK

(c) Many causes of kidney failure can be diagnosed.

Table 4.2 shows the percentage of patients starting RRT in 2011 who were diagnosed with different causes of kidney failure. The percentages are given for patients belonging to two different age groups, and for patients of all age groups.

Cause of kidney failure	Patients with kidney failure (%)		
	Aged below 65 years	Aged 65 + years	All age groups
Diabetes	27.2	22.4	24.80
Glomerulonephritis	17.4	9.2	13.30
Pyelonephritis	7.8	6.5	7.15
Hypertension	6.7	7.4	7.05
Polycystic kidney	10.6	3.8	7.20
Renal vascular disease	2.3	11.5	6.90
Other causes	16.0	16.6	16.30
Uncertain diagnosis	12.0	22.6	17.30

Table 4.2

(i) Suggest why 'uncertain diagnosis' occurs more often in the group of patients aged 65+ years compared with the group below 65 years of age.

.....

.....

..... **[1]**

(ii) Identify the cause of kidney failure with the **most significant** increase in the group of patients aged 65+ years compared with the group below 65 years of age.

Justify your answer.

.....

.....

..... **[1]**

© OCR 2015

STEMUP.CO.UK

(d) The main forms of RRT use dialysis. Most patients receiving dialysis have haemodialysis using a dialysis machine. However, the number of people receiving another form of dialysis, peritoneal dialysis, is increasing.

Fig. 4.2 represents the procedure of peritoneal dialysis. Some of the key points of this procedure are listed below.

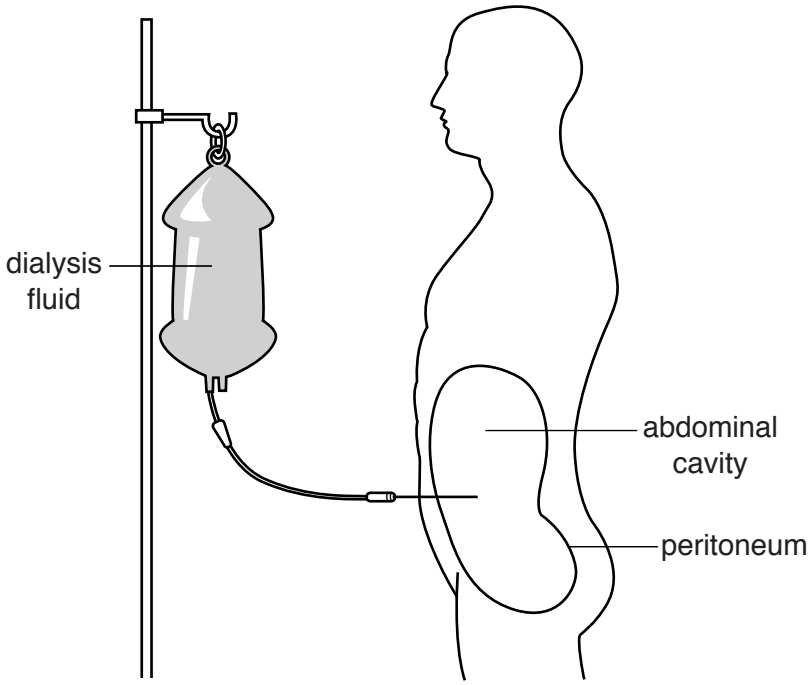


Fig. 4.2

- The peritoneum is a membrane that lines the abdominal cavity and is well supplied with blood capillaries.
- The peritoneum acts as a surface across which waste can be removed.
- The dialysis fluid, containing the sugar dextrose, fills the abdominal cavity.
- The fluid remains in the abdominal cavity for 4 to 6 hours.
- The fluid is then drained from the abdominal cavity and thrown away.
- The procedure usually needs to be done four times each day.

(i) How might the peritoneum differ in its **function** from the artificial membrane in a dialysis machine used in haemodialysis?

.....

.....

..... **[1]**

© OCR 2015

STEMUP.CO.UK

(ii) Why does the dialysis fluid used in peritoneal dialysis contain dextrose solution rather than water alone?

.....

.....

.....

.....

.....

.....

..... **[2]**

(iii) Suggest why patients receiving peritoneal dialysis usually need to have the peritoneal dialysis fluid replaced four times a day, but those receiving haemodialysis only need treatment three times a week.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

(e) One function of healthy kidneys is to make the hormone erythropoietin (EPO), which stimulates the production of red blood cells. Patients with kidney failure may need to be given supplements of EPO.

State the type of cell from which red blood cells are formed **and** where this type of cell is located.

type of cell .....

location ..... **[1]**

[Total : 13]

© OCR 2015

STEMUP.CO.UK

5 **(a)** Outline the ways in which the **structures** of a sensory neurone and a motor neurone are **similar**.

In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

(b) The table below lists a number of statements about the functions of neurones. Indicate whether each statement refers to:

- sensory neurones only (**S**)
- motor neurones only (**M**)
- sensory **and** motor neurones (**B**).

Statement	**S** or **M** or **B**
Have a resting potential of approximately –70 mV	**B**
Transmit nerve impulses from the CNS	
Connect to other neurones via synapses	
Connect to effectors	

[3]

© OCR 2015

STEMUP.CO.UK

(c) The presence of a pathogen in the body can cause a fever. During a fever, the body's thermoregulatory set-point (normal body temperature) rises.

(i) Fever is accompanied by sweating.

Explain the effect that this sweating will have on the body.

.....

.....

.....

.....

.....

..... **[2]**

(ii) Another feature of fever may be uncontrollable shivering.

Suggest why shivering occurs during fever.

.....

.....

.....

..... **[1]**

(d) Hypothermia is a condition in which the body's core temperature is lowered. Hypothermia can affect people who take part in outdoor activities in winter without wearing suitable clothing.

Some people think that alcohol should be given to those who have hypothermia, as it makes them feel warmer. Alcohol causes vasodilation.

Explain why it is **not** a good idea to give alcohol to someone with hypothermia.

.....

.....

.....

.....

.....

..... **[2]**

[Total : 12]

END OF QUESTION PAPER

© OCR 2015

STEMUP.CO.UK

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

© OCR 2015

© OCR 2015

OCR
Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2015

OCR
Oxford Cambridge and RSA

GCE

Biology

Unit **F214:** Communication, Homeostasis & Energy

Advanced GCE

Mark Scheme for June 2015

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2015

These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line
I	Ignore
	Large dot (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
QWC+	additional QWC credit given
	Tick
	Tick 1
	Tick 2
	Omission Mark
BP	Blank Page

STEMUP.CO.UK

Here are the subject specific instructions for this question paper

Unless otherwise stated, accept phonetic spelling throughout unless there is clear ambiguity with another term.
For each correct mark point awarded the tick annotation should be used.
Ensure that the answers to all part questions are acknowledged with a suitable annotation – e.g.

- an omission mark or NBOD if the answer is incomplete or not good enough
- a wavy line if some information is inaccurate
- CON if a potential mark point is contradicted
- a cross if the answer is completely wrong.

Use BOD with care and only if you are certain that the answer is close enough to the required information for the mark.

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(a)	(i)	**A** inner membrane (of , double membrane / envelope , surrounding organelle) ; **B** stroma ; **C** granum / grana / granal stack / thylakoid stack ;	3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **A** **DO NOT CREDIT** inter membrane **DO NOT CREDIT** inner envelope membrane **DO NOT CREDIT** ref to cell / surface / plasma / membrane **B** correct spelling only **C** **IGNORE** thylakoid unqualified / lamellae
1	(a)	(ii)	**1** contain , (named) pigment (molecules) / photosystems ; **2** contain , (named) electron carriers / ETC / ATP synth(et)ase ; **3** *idea that* has a large surface area (in a small volume) for , light absorption / light dependent reaction(s) / light dependent stage / electron transport ;	2 max	**1** **IGNORE** 'accessory' **2** **IGNORE** enzymes unqualified **3** **IGNORE** ref to different wavelengths **Note:** 'the membranes containing the pigments have a large surface area for absorbing light' **= 2 marks** (mps 1 & 3) **Note:** 'there is a large surface area for electron transport chain' **= 2 marks** (mps 2 & 3)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(a)	(iii)	A ; B ✓ ; C	1	**DO NOT CREDIT** if more than one tick entered
1	(b)		**1** *at high light intensity* other (named) factor becomes a limiting factor ; **2** *idea that* temperature becomes limiting as , Calvin cycle / light independent reaction , involves enzymes / relies on kinetic energy of molecules ; **3** *idea that* CO_2 (concentration) becomes limiting as it is required for , Calvin cycle / light independent reaction / formation of (named) Calvin cycle compound / reaction with RuBP / fixation by Rubisco ;	2 max	**IGNORE** ref to photorespiration (as Q specifies photosynthesis) **1** **ACCEPT** light is no longer the limiting factor e.g. of named factor = temperature / CO_2 concentration **DO NOT CREDIT** if light is given as a limiting factor **DO NOT CREDIT** ref to the rate slowing down **IGNORE** water or other suggestions **2** **ACCEPT** ref to Rubisco being limited by temp (as a named enzyme being in the Calvin cycle) **3** e.g. of named compound = GP / TP / RuBP

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(c)	(i)	**No ora** *species **E** because* **1** **E** starts photosynthesising at low(er) light intensity **;** **2** **E** reaches its maximum rate at low(er) light intensity **;** **3** **E** steep(er) increase in rate of photosynthesis (with small increase in light intensity) **;** **4** **E** has a **,** higher / greater / faster **,** rate of photosynthesis (than **D**) at low light intensities **;**	**2 max**	**Only credit answers stating that species E is the shade plant.** **Please indicate this with the green dot annotation.** **IGNORE** ref to time / earlier / later / etc. **2** **IGNORE** plateau (as this is a description of the curve) **IGNORE** ref to optimum rate **3** Needs to relate to the ***increase***, not just rate i.e. referring to the gradient part of the graph **4** i.e. referring to any point at low light intensity when E is photosynthesising at a higher rate than D **Note –** 'E has a faster increase in the rate of photosynthesis at low light intensities' **= 2 marks** (mps 3 & 4)
1	(c)	(ii)	*shade leaf will have* **1** large(r) / more **,** chloroplast(s) / (palisade) mesophyll **;** **2** more **,** grana / thylakoids (in chloroplast) **;** **3** large(r) surface area (of leaves) **;**	**1 max**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** *Assume shade leaf unless otherwise stated* **CREDIT** ora for sun leaf **IGNORE** adaptations related to temperature **1** **ACCEPT** more **,** chlorophyll / photosystems **IGNORE** ref to colour / accessory pigments

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(d)				**IGNORE** ref to providing habitat / shelter **DO NOT CREDIT** ref to creating (etc.) energy
			1 animals / heterotrophs (need to) **,** eat / obtain organic material from / AW **,** plants / autotrophs **;**		**1** **CREDIT** (plants / autotrophs) are the start of food chain(s)
			2 (plants / autotrophs) produce (named) organic molecules during **,** photosynthesis / Calvin cycle / light independent stage **;**		
			3 (plants / autotrophs) produce oxygen during **,** photosynthesis / photolysis / light dependent stage**;**		**3** **IGNORE** photophosphorylation
			4 glucose / carbohydrate / oxygen **,** (produced in photosynthesis) are used in respiration by **,** animals / heterotrophs **;**	**3 max**	**4** **ALLOW** ref to other respiratory substrate
			Total	**14**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(a)		endocrine ; hormone ; cortex / cortical ; target / effector ;	4	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
2	(b)	(i)	**1** glucose , respired / phosphorylated / metabolised , to produce ATP ; **2** ATP , blocks / closes , potassium ion channel(s) **and** potassium ions / K^+ , build up (inside cell) / cannot leave ; **3** (voltage-gated) calcium ion / Ca^{2+} , channels open **and** calcium ions / Ca^{2+} , enter (cell by diffusion) ; **4** (more) calcium ions / Ca^{2+} , resulting in , movement of vesicles to membrane / exocytosis / described ;	4	**IGNORE** the numbered prompt lines, but the events **must** be in the correct sequence. 1 **IGNORE** 'glucose is broken down to form ATP' **2** ion must be indicated at least once If symbol used, must have correct charge **IGNORE** ref to 'depolarisation' (as not indicated on fig.) **3** ion must be indicated at least once If symbol used, must have correct charge **IGNORE** ref to polarisation **4** if ion had been mentioned in stage 3, then allow 'calcium' alone for this mp **ACCEPT** ecf ***for this mp*** if mp 3 not awarded because Na^+ stated instead of Ca^{2+} **IGNORE** 'secretion' as given in question

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(b)	(ii)	**1** (continues to be secreted) as long as blood / plasma , glucose (concentration) , remains high / is higher than normal ; **2** (sufficient) ATP is still present and so K^+ channels remain closed ; **3** (exocytosis) still being triggered by , calcium ions / Ca^{2+};	**2 max**	**IGNORE** ref to what happens once the glucose level returns to normal and secretion stops (as Q asks about the continued secretion of insulin) **3** **CREDIT** Ca^{2+} , still present / remain high **CREDIT** exocytosis continues until Ca^{2+} can be removed from cell
			Total	**10**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(a)	(i)	**W ;** **Z ;** **X ;** **W ;**	**4**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
3	(a)	(ii)	**1** some ATP used to (actively) transport pyruvate (into the mitochondrion) **;** **2** some ATP used to (actively) transport $H^{(+)}$ from (reduced) NAD **,** formed in glycolysis / into the mitochondrion **;** **3** some energy released in ETC **,** is not used to transport H^+ (across inner membrane) / is released as heat **;** **4** not all the H^+ movement (back across membrane) **,** is used to generate ATP / is through ATP synth(et)ase **;** **5** not all the, reduced NAD / red NAD / NADH , is used to feed into the ETC **;**	**2 max**	**IGNORE** ref to phosphorylation of glucose as this is taken into account in estimate. **2** **DO NOT CREDIT** transport of (reduced) NAD **3** **ACCEPT** in context of oxidative phosphorylation **4** **ACCEPT** ref to H^+ leaking (back into matrix or out into cytoplasm) resulting in less ATP generated **5** **CREDIT** use of (some of) the red NAD for other purpose

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(b)		*in anaerobic respiration* **1** **glycolysis** / conversion of glucose into **pyruvate** , occurs ; **2** produces 2 molecules of ATP (net) ; **3** (only) substrate level phosphorylation (occurs) ; **4** **oxygen** not available as final **electron acceptor** ; **5** pyruvate / ethanal , used to regenerate NAD for glycolysis (to continue) ; **6** (Krebs cycle and) electron transport chain / **chemiosmosis** / **oxidative phosphorylation** , do not occur ;	**4 max**	**2** **IGNORE** little / less / not much **4** **CREDIT** oxygen is available as the final electron acceptor in aerobic **IGNORE** ref to hydrogen acceptor **5** pyruvate refers to lactate pathway, ethanal refers to fermentation **6** ETC (etc.) ***only*** occur(s) in aerobic
			QWC ;	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **glycolysis** **pyruvate** **substrate level phosphorylation** **oxygen** **electron acceptor** **chemiosmosis / chemiosmotic** **oxidative phosphorylation** ***Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (✗) if QWC has not been awarded.*** ***You should use the green dot to identify the QWC terms that you are crediting.***
			Total	**11**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(a)		93 (to nearest whole number) / 93.4 (to 3 sig figs) ; per million (people) / million $^{-1}$;	2	**Correct answer with correct units = 2 marks** **Correct answer with no/incorrect units = 1 mark** **If answer incorrect or no numerical answer given then allow 1 mark for using correct units.**
4	(b)	(i)	error bar(s) ;	1	**CREDIT** standard deviation / variance / standard error **DO NOT CREDIT** range bars (as they would not all be equidistant from the mean)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(b)	(ii)	*In the context of starting RRT* **1** more males **ora** **or** higher percentage are males / lower percentage are females **;** **2** the lowest percentage of males is 60% / the highest percentage of females is 40% **;** **3** percentage of males increases with age from age group 35-44 **or** ratio / proportion **,** of male to female increases with age from age group 35-44 **or** percentage of males decreases with age until age group 35-44 **or** ratio / proportion **,** of male to female decreases with age until age group 35-44 **;** **4** *idea that* (as bars overlap) any differences (in proportions of the genders) between age groups are not (statistically) significant **;**	**2 max**	**IGNORE** ref to likelihood of / risk of / more likely to **,** start / have **,** RRT **1** **ACCEPT** 'more than 50% are males' or 'over half are males' or 'less than 50% are females' or 'less than half are females' **IGNORE** refs to data relating to single age groups **2** Needs to emphasise that this is the ***least*** **CREDIT** 55% instead of 60% 45% instead of 40% **3** **IGNORE** ref to number of males **CREDIT ora** for female to male ratio / proportion **IGNORE** ref to number of males **CREDIT ora** for female to male ratio / proportion **4** Illustrates why the conclusions in mp 3 may not be secure

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(c)	(i)	*uncertain diagnosis because* *idea that* older people may have more complex medical problems ;	1	e.g. 'older people may have more than one thing wrong with them' 'more likely to have more than one cause of kidney failure'
4	(c)	(ii)	renal vascular disease **and** x 5 increase / (percentage) increase of 400% ;	1	**IGNORE** ref to 9.2%
4	(d)	(i)	it can perform , active transport / facilitated diffusion ;	1	**IGNORE** ref to structural features e.g. channel proteins
4	(d)	(ii)	**1** *idea that* (dialysis is replicating function of kidney and) part of kidney's function is to remove (excess) water from blood ; **2** (dextrose / sugar) reduces , water potential / Ψ (of dialysis fluid) **or** (dextrose / sugar , solution) has a lower , water potential / Ψ (than water) ; **3** water moves from blood (into dialysis fluid) by osmosis **or** prevents water moving into the blood (from dialysis fluid) by osmosis ; **4** (if it was water alone) cells would , swell / burst ;	2 max	**IGNORE** ref to the use of dextrose rather than glucose **IGNORE** ref to ions

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(d)	(iii)	**1** peritoneal dialysis can remove less (named) waste (than haemodialysis) **;** **2** *idea that* in haemodialysis dialysis fluid is constantly **,** refreshed / changed (but not in peritoneal dialysis) **;** **3** haemodialysis uses counter-current flow **;** **4** *idea that* haemodialysis maintains concentration gradient **or** in peritoneal dialysis the concentration gradient **,** reduces / is lower **;** **5** (in peritoneal dialysis) the fluid reaches equilibrium with the blood **;**	**2 max**	**IGNORE** ref to 'cleaning' blood **1** **ora** e.g. haemodialysis is more **,** efficient / effective **,** at removing (named) waste
4	(e)		stem / erythropoietic **,** cell(s) **and** bone marrow **;**	**1**	
			Total	**13**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(a)		*both have* **1** **dendrite**(s) **;** **2** an **axon ;** **3** a **cell body** with a **,** nucleus / named organelle **;** **4** **myelin** sheath / myelinated / (covered with) **Schwann** cell / nodes of Ranvier **;** **5** voltage-gated channels / sodium-potassium (ion) pump **;**	**3 max**	**1** **DO NOT CREDIT** if states that motor neurone has dendrites and a dendron **3** e.g. mitochondria / Golgi / SER / RER **4** **CREDIT** may have / can have
			QWC ;	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **dendrite(s)** **axon(s)** **cell body(ies)** **myelin** (or derived term) **schwann** ***Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (✗) if QWC has not been awarded.*** ***You should use the green dot to identify the QWC terms that you are crediting.***
5	(b)		**M ;** **B ;** **M ;**	**3**	**Mark the first answer in each box.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(c)	(i)	**1** evaporation will **,** have a cooling effect / reduce (body) temperature **;** **2** heat **,** taken from / supplied by **,** the body / blood / skin , is **,** needed / used for **,** evaporation **;** **3** *idea that* water has a high latent heat of **,** vaporisation / evaporation **;**	**2 max**	**2** **ACCEPT** evaporation uses latent heat Look for a clear statement that body heat is being ***used*** for evaporation **3** e.g. evaporation of water needs a lot of , energy / heat
5	(c)	(ii)	*idea that* to increase body temperature as it is lower than the 'new' set-point (even though body is hot) **;**	**1**	e.g. as the new 'normal' body temperature is higher, the body is using shivering to raise the temperature of the internal environment.
5	(d)		**1** vasodilation results in more blood nearer to the skin surface **;** **2** *idea that* will lose (even) more heat / further heat loss (from body) / body temperature decreases further **;** **3** (named) organ(s) will not be able to maintain **,** function / metabolism **;**	**2 max**	**1** Vasodilation must be in correct context (arterioles). **DO NOT CREDIT** (large) arteries / capillaries / veins , relaxing / dilating / expanding **DO NOT CREDIT** blood vessels moving closer to the surface **2** just 'the body loses heat' is not enough **3** **ACCEPT** ref to lack of kinetic energy for enzymes **ACCEPT** ref to lack of enzyme activity
			Total	**12**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2015

PART OF THE CAMBRIDGE ASSESSMENT GROUP

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS MANAGEMENT SYSTEMS 001

STEMUP.CO.UK

OCR

Friday 13 June 2014 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

* F 2 1 4 0 1 *

* 1 2 1 3 7 1 6 9 8 6 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

© OCR 2014 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2014

Answer **all** the questions.

1 Photosynthesis involves two main stages:

- the light-dependent stage, which involves photosystems
- the light-independent stage, which involves the Calvin cycle.

(a) Photosynthetic pigments are arranged in groups known as photosystems I and II.

(i) Name the primary photosynthetic pigment in these photosystems.

..... **[1]**

(ii) Name an accessory pigment.

..... **[1]**

(iii) State the advantage to the plant of having a range of accessory pigments in photosystems.

.....

.....

..... **[1]**

(iv) Name the compound that is synthesised in the light-dependent stage as a result of the generation of an electrical and pH gradient across the thylakoid membrane.

..... **[1]**

(b) The Calvin cycle takes place in the stroma of the chloroplast.

(i) Identify the enzyme that catalyses the fixation of carbon dioxide.

..... **[1]**

(ii) Identify the first stable product of carbon dioxide fixation.

..... **[1]**

(iii) Identify the compound that is regenerated in the Calvin cycle so that more carbon dioxide can be fixed.

..... **[1]**

(iv) Name **two different polysaccharides** that can be synthesised from the end products of the light-independent stage of photosynthesis.

.... **[1]**

[Total: 8]

© OCR 2014

STEMUP.CO.UK

2 The skin is important in enabling the body to detect changes in the environment. This allows the body to respond to these changes.

(a) Various types of sensory receptor are located in the skin.

Fig. 2.1 is a photomicrograph of a **transverse section** through a pressure receptor known as a Pacinian corpuscle.

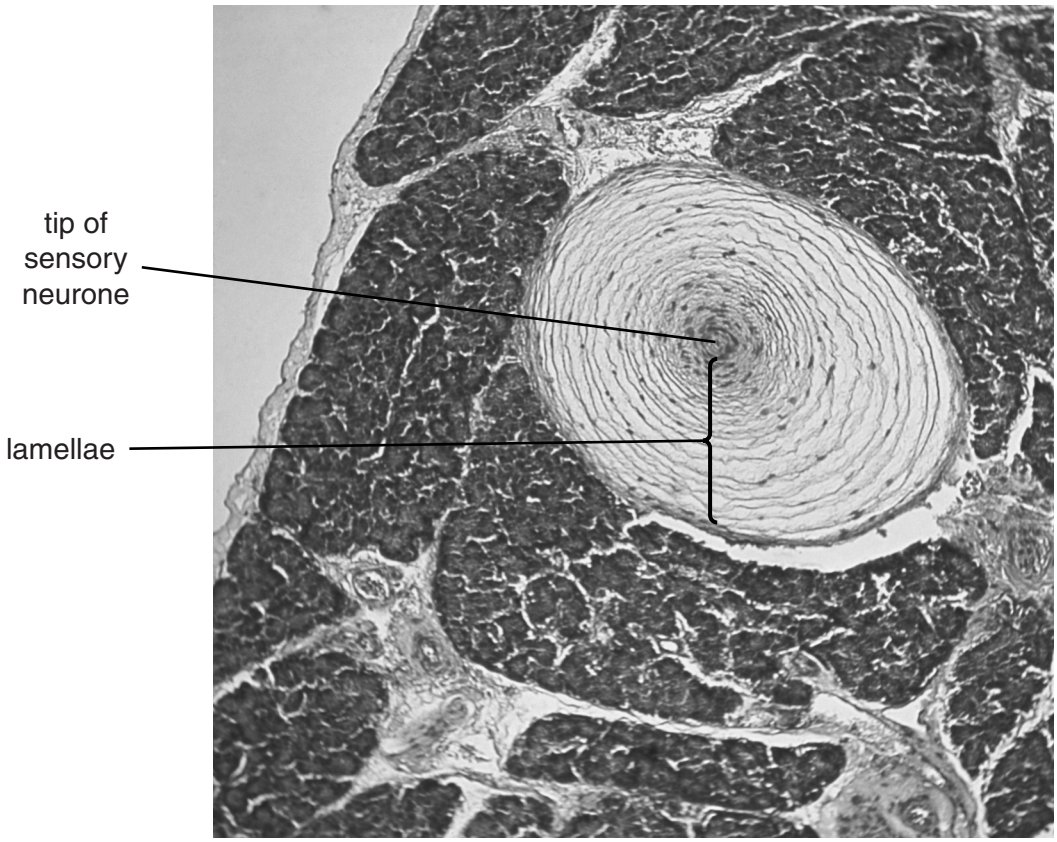


Fig. 2.1

Fig. 2.2 is a diagram of a **longitudinal section** through a Pacinian corpuscle. The tip of the sensory neurone is not covered by the myelin sheath.

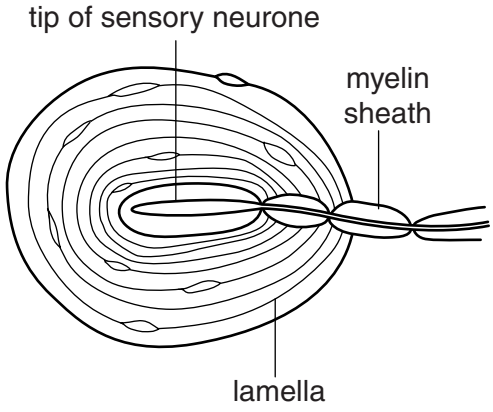


Fig. 2.2

© OCR 2014

STEMUP.CO.UK

The Pacinian corpuscle is a type of biological transducer.

- As a pressure stimulus is exerted on the corpuscle, the lamellae are compressed and exert pressure on the tip of the sensory neurone.
- The plasma (cell surface) membrane of the tip of the neurone becomes deformed and more permeable to sodium ions (Na^+).
- This region of the neurone becomes depolarised, reaching the threshold potential, and an action potential is generated.

(i) Why is the Pacinian corpuscle described as a transducer?

.....

.....

..... **[1]**

(ii) Deformation of the plasma membrane of the tip of the neurone causes the membrane to become more permeable to Na^+.

Suggest why.

.....

.....

..... **[1]**

(iii) The generation of an action potential follows the 'All-or-Nothing' law.

Explain what this means.

.....

.....

.....

..... **[1]**

(iv) Describe how information about the strength and intensity of a stimulus is communicated to the brain.

.....

.....

.....

.....

..... **[2]**

© OCR 2014

STEMUP.CO.UK

(b) When clothes are first put on the body, a constant gentle pressure is applied to the pressure receptors in the skin. After a short time, action potentials are no longer generated unless there is a change in pressure as the clothes move over the surface of the skin.

Suggest an explanation for the fact that action potentials are not generated constantly whilst wearing clothes.

.....

.....

..... **[1]**

(c) Synapses are an integral part of the nervous system.

Outline the roles of synapses in the nervous system.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 9]

© OCR 2014

STEMUP.CO.UK

3 **(a)** A doctor arranged for a 59-year-old patient to have a series of blood tests. One of these tests was to determine the patient's 'fasting blood glucose' concentration.

- The result of this test indicates whether or not the patient's blood glucose concentration is being regulated within the normal range.
- The validity of the result relies on the patient not having eaten for at least eight hours before the test.
- The patient confirmed to the doctor that he had not eaten since the previous evening.

(i) What condition was being tested for in this 59-year-old patient?

..... **[1]**

(ii) Why was it important that the patient had not eaten for at least eight hours before the test?

.....

.....

..... **[1]**

(iii) The result of the patient's fasting blood glucose test was 7.0 mmol dm^{-3}.

The upper limit for 'normal' blood glucose concentration is considered to be 5.9 mmol dm^{-3}.

Calculate the percentage by which this patient's blood glucose concentration is higher than the upper limit for normal concentration.

Show your working. **Give your answer to one decimal place.**

Answer = ... % **[2]**

© OCR 2014

STEMUP.CO.UK

(b) The patient was sent for a further blood test, known as the haemoglobin A1C (HbA1C) test.

- Glucose combines with haemoglobin in the bloodstream to form a 'glycosylated haemoglobin' molecule, HbA1C.
- The concentration of HbA1C is directly proportional to the mean concentration of glucose in the blood over an eight to twelve week period.

Suggest why a single HbA1C test cannot indicate accurately the mean blood glucose concentration for a period longer than twelve weeks.

.....

.....

.....

.....

.....

..... **[2]**

(c) The result of the patient's fasting blood glucose test showed a blood glucose concentration higher than the normal range even though the patient had not eaten food for at least eight hours before providing a blood sample.

The result of the patient's HbA1C test indicated that his mean blood glucose concentration had been within the normal range for the previous eight to twelve weeks.

Suggest an explanation for the patient's high value for the **fasting blood glucose test**.

.....

.....

..... **[1]**

© OCR 2014

STEMUP.CO.UK

(d) Another patient shows severe symptoms of unregulated blood glucose concentration. Under certain circumstances this condition may need to be treated with glucagon injections.

(i) Under what circumstances might this patient need to be given a glucagon injection?

.....

.....

..... **[1]**

(ii) Describe how glucagon is involved in the regulation of blood glucose concentration in a person who is able to regulate their blood glucose concentration correctly.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

[Total: 13]

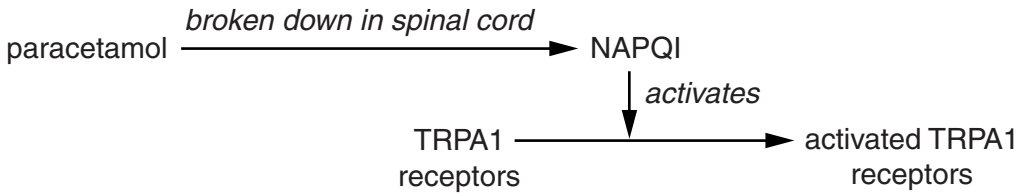
© OCR 2014

STEMUP.CO.UK

4 **(a)** Paracetamol is a drug that is commonly used as a painkiller. For many years, scientists have been uncertain about the way in which paracetamol works.

A recent study has shown that:

- paracetamol is broken down in the spinal cord into a compound called NAPQI
- NAPQI activates a receptor protein called TRPA1
- TRPA1 is found on the plasma (cell surface) membranes of neurones
- the activated receptor protein, TRPA1, interferes with the transmission of the nerve impulses from one neurone to the next.



(i) Name **one** chemical that transfers a nerve impulse from one neurone to another.

..... **[1]**

(ii) Suggest the part of the neurone where the plasma membrane has TRPA1 receptors.

Explain your answer.

part of neurone .....

explanation .....

.....

.....

.....

[2]

© OCR 2014

(b) One role of the liver is detoxification. Detoxification includes the breakdown of drugs such as paracetamol.

(i) Fig. 4.1 is a diagram that represents the structure of part of a liver lobule.

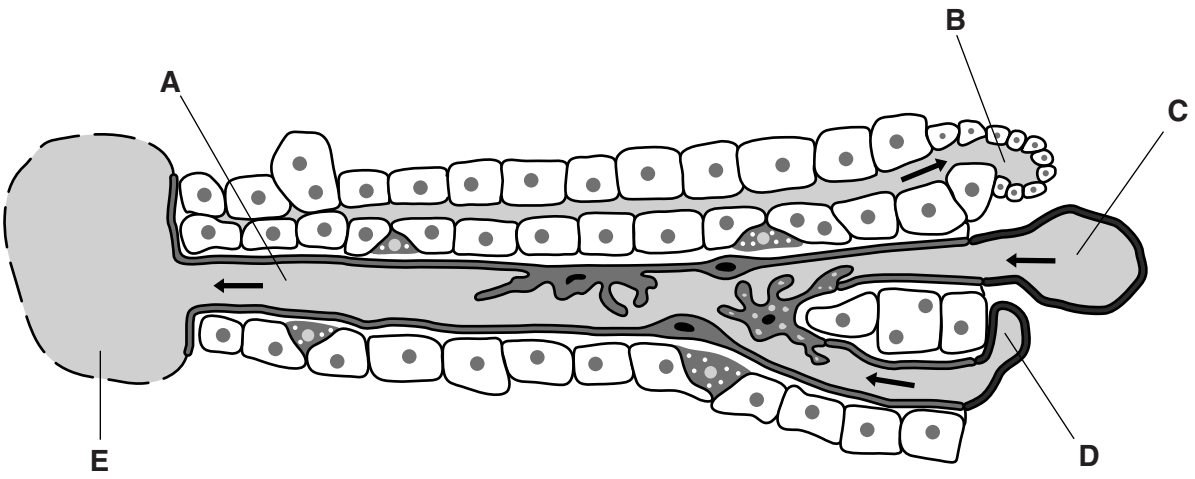


Fig. 4.1

Identify the parts labelled **A** to **E**.

A .....

B .....

C .....

D .....

E .....

[5]

© OCR 2014

STEMUP.CO.UK

(ii) During detoxification, paracetamol is metabolised in the liver cells as follows:

- approximately 90% is combined with two chemicals, sulfate and glucuronide, and excreted
- approximately 5% is oxidised by the P450 enzyme system, which produces NAPQI
- the NAPQI is then metabolised using another compound called glutathione.

Once the sulfate and glucuronide reserves in the liver are used up, the P450 system takes over completely. However, continued metabolism of paracetamol will result in high concentrations of NAPQI accumulating in the liver cells, causing cell death.

Suggest a reason for the accumulation of high concentrations of NAPQI in the liver cells.

.....

.....

.....

..... **[1]**

(iii) The liver has considerable powers of regeneration, even if a high proportion of its cells are damaged.

Name the liver cells that can lead to this regeneration **and** the type of cell division that they carry out.

name of liver cells .....

type of cell division ..... **[1]**

[Total: 10]

© OCR 2014

BLANK PAGE

Question 5 starts on page 14.

© OCR 2014

STEMUP.CO.UK

5 **(a)** Humans harvest a wide range of fruits and vegetables as food. Cellular respiration supplies energy and forms part of the natural ripening process in fruits and vegetables. This ripening process may continue after the fruits and vegetables are harvested, as the cells continue to respire.

The rate of cellular respiration after harvesting affects the shelf-life of fruits and vegetables as it can lead to changes in food quality. After harvesting, some fruits and vegetables enter a dormant (inactive) state while others remain active during storage.

Table 5.1 contains data that show the respiration rate of a selection of fruits and vegetables stored at different temperatures after harvesting. The respiration rate is measured by the rate of carbon dioxide produced.

Fruits and vegetables	**Respiration rate (mg CO_2 kg^{-1} h^{-1})**				
	at 0 °C	**at 5 °C**	**at 10 °C**	**at 15 °C**	**at 20 °C**
Apple	3	6	9	15	20
Asparagus	60	105	215	235	270
Blackberry	19	36	62	75	115
Cauliflower	17	21	34	44	69
Onion	3	5	7	7	8
Orange	4	6	8	18	28
Parsnip	12	13	22	37	n/a*
Potato	n/a*	12	16	17	22
Turnip	8	10	16	23	25

* no data were collected at these temperatures

Table 5.1

(i) Describe the pattern of respiration shown by cauliflower at increasing storage temperatures of 0 °C to 20 °C.

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2014

(ii) Discuss what the data in Table 5.1 indicate about the best conditions for storage of fruits and vegetables.

.....

.....

.....

.....

.....

.....

..... **[2]**

(iii) Identify, with reasons, which fruit or vegetable listed in Table 5.1 is **least** likely to spoil during storage.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(iv) Which fruit or vegetable listed in Table 5.1 is likely to be the most difficult to keep fresh during storage? Give a reason for your answer.

.....

.....

.....

..... **[1]**

© OCR 2014

STEMUP.CO.UK

(b) Respiration can be aerobic or anaerobic.

(i) Certain parasites live in the blood of mammals.

Suggest why, even though blood carries oxygen, these parasites are adapted to respire anaerobically.

.....

.....

.....

.....

.....

..... **[2]**

(ii) The anaerobic respiration pathway in animal cells can be reversed, but the anaerobic respiration pathway in yeast cells cannot be reversed.

Explain why, using your knowledge of the differences between the two pathways.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

[Total: 14]

© OCR 2014

STEMUP.CO.UK

BLANK PAGE

Question 6 starts on page 18.

© OCR 2014

STEMUP.CO.UK

6 Fig. 6.1 is a diagram that represents the nephron in a mammalian kidney.

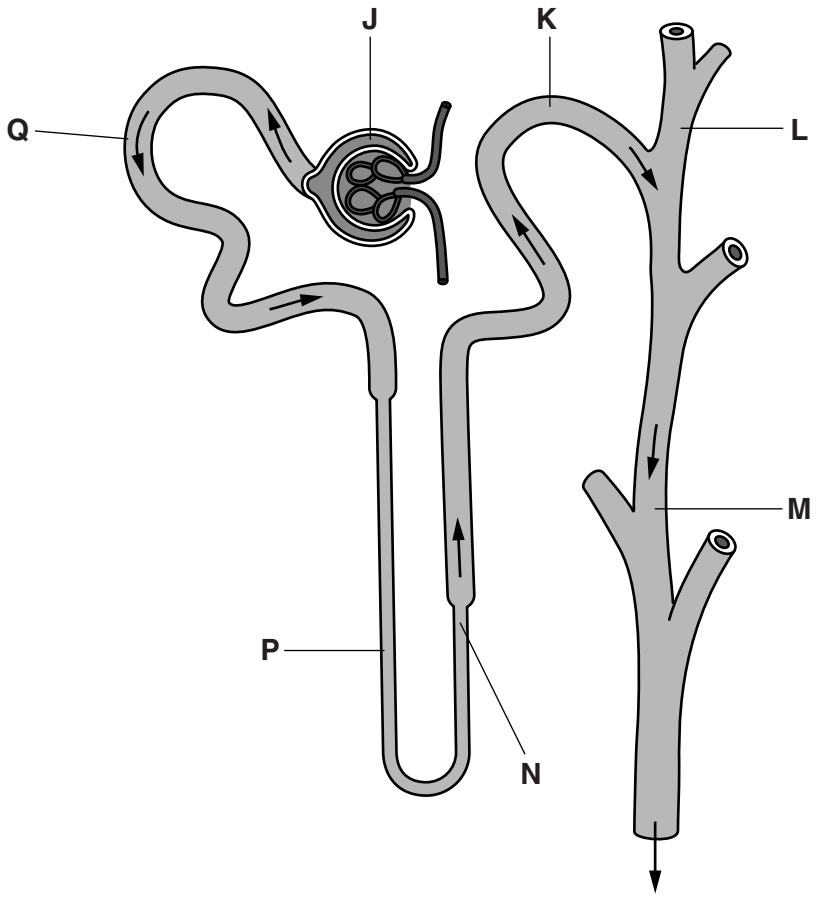


Fig. 6.1

(a) Use the letter or letters from Fig. 6.1 to identify:

(i) the region or regions where glucose is selectively reabsorbed into the blood capillaries

..... **[1]**

(ii) the region or regions present in the cortex

..... **[1]**

(iii) the region or regions where podocytes are located.

..... **[1]**

© OCR 2014

STEMUP.CO.UK

(b) The desert kangaroo rat, *Dipodomys deserti*, lives in dry and hot conditions. It excretes a very small volume of urine relative to its size.

The loops of Henle in the kidneys of these mammals are longer than those found in mammals of a similar size that do not live in desert conditions.

Explain how the longer loop of Henle is able to assist the desert kangaroo rat in preventing excessive water loss.

.....

.....

.....

.....

.....

.....

..... **[2]**

(c) Urine can be tested to detect a person's misuse of certain drugs in body-building.

State the **type** of drug that can be misused in this way.

..... **[1]**

[Total: 6]

END OF QUESTION PAPER

© OCR 2014

STEMUP.CO.UK

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

OCR

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2014

STEMUP.CO.UK

OCR
Oxford Cambridge and RSA

GCE

Biology

Unit **F214:** Communication, Homeostasis & Energy

Advanced GCE

Mark Scheme for June 2014

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2014

Annotations

Annotation	Meaning
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	Correct answer
	Incorrect response
BOD	Benefit of Doubt
NBOD	Not Benefit of Doubt
ECF	Error Carried Forward
GM	Given mark
	Underline (for ambiguous/contradictory wording)
^	Omission mark
I	Ignore
	Correct response (for a QWC question)
QWC+	QWC* mark awarded
V	Verbal Construction

**Quality of Written Communication*

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(a)	(i)	chlorophyll **,** a / A **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** chlorophyll 680 **and** chlorophyll 700 (**Note** that both are required for this option) **IGNORE** P680 / P700 **DO NOT CREDIT** chlorophyll α
1	(a)	(ii)	chlorophyll b / xanthophyll(s) / carotenoid(s) / (β / beta-) carotene **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** karatine (as could be confused with keratin)
1	(a)	(iii)	able to **,** absorb / use **,** a range of / different / more / other **,** (light) wavelengths / λ **;**	1	e.g. absorb wavelength(s) not absorbed by primary pigment **IGNORE** frequency **IGNORE** absorb all wavelengths **IGNORE** ref to chlorophyll b **DO NOT CREDIT** ref to reflection where ***a*** pigment absorbs and reflects the ***same*** wavelength
1	(a)	(iv)	ATP **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** O_2 / oxygen / red NADP / NADPH **DO NOT CREDIT** inaccurate name for ATP e.g. 'ATP (adenine triphosphate)' = 0 marks

STEMUP.CO.UK

Question			Answer	Mark	Guidance
1	(b)	(i)	rubisco / RuBP carboxylase / ribulose bisphosphate carboxylase ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** ribulose biphosphate carboxylase **IGNORE** oxygenase
1	(b)	(ii)	GP / glycerate(3-)phosphate ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ALLOW** PGA / phosphoglyceric acid / phosphoglycerate **DO NOT CREDIT** PGAL / GALP / phosphoglyceraldehyde **DO NOT CREDIT** inaccurate name for GP e.g. 'GP (glycerol phosphate)' = 0 marks
1	(b)	(iii)	RuBP / ribulose bisphosphate ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** ribulose biphosphate
1	(b)	(iv)	starch / amylose / amylopectin **and** cellulose ;	1	**Mark the first two answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			Total	**8**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(a)	(i)	it converts energy (mechanical) into **,** another / different **,** form of energy (electrical) **;**	1	If type of energy is specified, it must be as indicated in the brackets **ACCEPT** 'converts one form of energy into another' **IGNORE** pressure
2	(a)	(ii)	*idea that deformation of membrane will allow more Na^+ through because* **1** (the increased pressure) causes sodium (ion) channels to open **;** **2** (temporary) gaps / holes / spaces **,** appear **,** between the <u>phospholipids</u> / in the <u>bilayer</u> **;**	1 max	**1** **CREDIT** Na^+ channels **DO NOT CREDIT** Na channels **DO NOT CREDIT** ref to voltage(-gated) channels **2** **IGNORE** weakened **DO NOT CREDIT** '*breaks* in the bilayer' **DO NOT CREDIT** 'pores' for 'gaps' **DO NOT CREDIT** idea of additional **,** channels / carriers **,** inserted
2	(a)	(iii)	if the **,** stimulus is not strong enough / threshold (value) is not reached / depolarisation (of membrane) is insufficient **,** then **,** it / an action potential **,** is not **,** generated / AW **;** **ora**	1	**ACCEPT** 'impulses' for 'action potentials' **DO NOT CREDIT** ref to 'strength' of an action potential **IGNORE** ref to numerical value for threshold potential **IGNORE** ref to 'it' or 'action potential' reaching threshold **DO NOT CREDIT** ref to action potentials of different sizes/values

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(a)	(iv)	**1** *idea that* it is represented by the frequency of the action potentials ; **2** high , frequency / rate (of generation) , of action potentials shows , a strong / an intense , stimulus ; **ora**	2	**Note: max 1 if term 'frequent' or derived term NOT used in answer** **ACCEPT** 'impulses' for 'action potentials' **1** **CREDIT** represented by how , frequently / often, the action potentials are , transmitted / generated **2** **DO NOT CREDIT** ref to speed of , action potentials / impulses **Note:** e.g. 'a higher frequency of impulses represents a strong stimulus' **= 2 marks**
2	(b)		*action potentials not generated because* **1** sodium (ion) channels (remain) open / resting potential not re-established ; **2** *idea of* ions being in the wrong place for correct ion movement (across membrane) ;	1 max	**IGNORE** lack of (named) neurotransmitter as the Q refers to generation of the action potential in the receptor and not its onward transmission **1** **CREDIT** Na^+ channels **IGNORE** 'voltage-gated' **DO NOT CREDIT** Na channels

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(c)			3 max	**ACCEPT** 'action potentials' for 'impulses' **IGNORE** 'messages' and 'signals' throughout
			1 allows **,** neurones to communicate / cell signalling **;**		**1** e.g. ● passes impulse on to next neurone ● passes neurotransmitter on to next neurone
			2 ensure transmission (between neurones) in one direction (only) **;**		**2** **Must be transmission *between* neurones** **IGNORE** description unless for clarification
			3 allows **,** convergence / impulses from more than one neurone to be passed to a single neurone **;**		**3** **IGNORE** 'summation' **ACCEPT** 'neurotranmsitter' instead of 'impulse'
			4 allows **,** divergence / impulses from a single neurone to be passed to more than one neurone **;**		**4** **ACCEPT** 'neurotranmsitter' instead of 'impulse'
			5 idea that filters (out) **,** 'background' / low level **,** stimuli **or** ensures that only stimulation that is strong enough will be passed on **;**		
			6 prevents fatigue / prevents over-stimulation **;**		
			7 allows many low level stimuli to be amplified **;**		**7** **IGNORE** 'summation'
			8 *idea that* presence of inhibitory and stimulatory synapses allows impulses to follow specific path **;**		
			9 permits **,** memory / learning / decision making **;**		
					Note: **'**impulses from more than one neurone can pass to a single neurone' **= 2 marks** (mps 1 & 3) **Note:** **'**impulses from a single neurone can pass to many neurones' **= 2 marks** (mps 1 & 4)
			Total	**9**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(a)	(i)	diabetes (mellitus) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** hyperglycaemia **IGNORE** Type 1 or Type 2 **DO NOT CREDIT** hypoglycaemia
3	(a)	(ii)	*idea that* time needed , to restore normal (blood) glucose concentration / for insulin to act (fully) ;	1	
3	(a)	(iii)	18.6 ; ;	2	**Correct answer = 2 marks**, even if no working shown. **If answer is incorrect**, then **ALLOW** 1 mark for seeing: 1.1 ÷ 5.9 **or** (7.0 – 5.9) ÷ 5.9 **or** 118.6 **or** 118.64 **If the answer is not correctly rounded to 1dp**, then **ALLOW** 1 mark for seeing a correct unrounded answer e.g. 18.64
3	(b)		**1** HbA1C / glycosylated Hb , contained within , red blood cell(s) / erythrocyte(s) ; **2** red blood cells / erythrocyte(s) , have limited life span / live for 8 to 12 weeks **or** red blood cells / erythrocyte(s) , break down after , 12 weeks / 3 months ; **3** HbA1C / glycosylated Hb , broken down , in liver / by hepatocytes / by Kupffer cells ;	2 max	**CREDIT** RBC / rbc for 'red blood cell' throughout **3** **IGNORE** ref to recycling

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(c)		patient might have had a drink containing sugar ; AVP ;	1 max	**DO NOT CREDIT** ref to having eaten (as patient had confirmed that he had not eaten) **CREDIT** ref to a specific sugar-containing drink e.g. ● patient was nervous and secreted adrenaline ● other medication interferes with glucose levels ● patient's haemoglobin does not bind effectively with glucose (e.g. anaemia / sickle cell)
3	(d)	(i)	**1** if blood glucose falls , extremely / dangerously / too / very , low ; **2** if patient , cannot produce (enough) glucagon / produces little glucagon ; **3** *idea that* glucose source cannot be taken by mouth ;	1 max	**1** **CREDIT** hypoglycaemic / hypoglycaemia **IGNORE** 'below normal' alone **2** **CREDIT** ref to dysfunctional , α cells / glucagon receptors **3** **CREDIT** a suitable reason (e.g. fitting or in a coma)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
3	(d)	(ii)	*when blood glucose concentration decreases* **1** (glucagon) released by the **,** **alpha** / α **,** cells in **,** **islet**s of Langerhans / **pancreas** **;** **2** promotes / AW **,** conversion of **glycogen** to glucose / **glycogenolysis** **,** in **,** liver / muscle / **effector** **,** cells **;** **3** ref **gluconeogenesis** / described **;** **4** ref conversion of triglycerides to (free) fatty acids / lipolysis / increased use of fatty acids in respiration **;** **5** **negative feedback** **,** reduces / inhibits **,** the secretion of glucagon **;** **6** glucagon **,** reduces / inhibits **,** insulin secretion **;**	4 max	**IGNORE** ref to insulin or events following an increase in blood glucose concentration **1** **DO NOT CREDIT** 'alpha cells are produced' **2** **Any description must** correspond correctly to term **DO NOT CREDIT** if glucagon *converts* glycogen directly **3** **Any description must** correspond correctly to term **IGNORE** imprecise ref to glucagon *doing the conversion* **4** **Any description must** correspond correctly to term **IGNORE** imprecise ref to glucagon *doing the conversion* **5** **DO NOT CREDIT** stopping glucagon secretion **6** **DO NOT CREDIT** stopping insulin secretion
			QWC – technical terms used appropriately and spelled correctly **;**	1	Use of **three** terms from: **alpha**, **islet**, **pancreas** , **glycogen**, **glycogenolysis**, **effector**, **gluconeogenesis**, **negative feedback** **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
			Total	**13**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(a)	(i)	acetylcholine ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **CREDIT** other correct examples e.g. dopamine / noradrenaline / norepinephrine **ACCEPT** ACh
4	(a)	(ii)	***either*** post-synaptic membrane ; (TRPA1) prevents attachment of (named) neurotransmitter to its receptor ; ***or*** pre-synaptic membrane / (pre)synaptic knob / axon terminal / bouton / synaptic bulb ; (TRPA1) prevents , release of (named) neurotransmitter / influx of calcium ions ;	2	**Explanation must match correct location for 2 marks.** **If no location stated then explanation can be awarded independently for 1 mark.** **Incorrect location = 0 marks.** **IGNORE** 'interferes' (as in Q) **IGNORE** ref to dendrites / cell bodies /neurone(s) / synapse(s) **CREDIT** causes hyperpolarisation **DO NOT CREDIT** idea that TRPA1 is a free protein that will enter the ACh receptor and block it (rather like a competitive inhibitor occupying the active site of an enzyme) **ACCEPT** Ca^{2+}

STEMUP.CO.UK

Question			Answer	Mark	Guidance
4	(b)	(i)	**A** sinusoid ; **B** (branch of) bile duct ; **C** (branch of) hepatic portal <u>vein</u> ; **D** (branch of) hepatic artery / arteriole ; **E** (branch of) hepatic / central , <u>vein</u> ;	5	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **B** **DO NOT CREDIT** canaliculus **C** **IGNORE** inter lobular **but** **DO NOT CREDIT** intra lobular **D** **IGNORE** inter lobular **but** **DO NOT CREDIT** intra lobular **E** **IGNORE** intra lobular **but** **DO NOT CREDIT** inter lobular
4	(b)	(ii)	**1** because there is not enough <u>glutathione</u> / <u>glutathione</u> has run out ; **2** enzyme catalysing glutathione reaction is , working at V_{max} / inhibited / in short supply ; **3** the NAPQI cannot , cross the cell (surface) membrane / leave the cell / leave (named) organelle ;	1 max	**2** **DO NOT CREDIT** in context of P450 system **3** **IGNORE** ref to excretion
4	(b)	(iii)	hepatocytes **<u>and</u>** <u>mitosis</u> / <u>mitotic</u> (division) ;	1	**CREDIT** (liver) stem cells / hepatic cells **IGNORE** liver cells unqualified **DO NOT CREDIT** Kupffer cells **ONLY CREDIT** correct spelling for mitosis / mitotic
			Total	**10**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(a)	(i)	**1** (as the temperature increases) the respiration rate increases **;** **2** respiration rate doubles with a $10^{o}C$ temperature increase **;** **3** **comparative** figures with **correct units** (units once for respiration and once for temperature) in the context of either mp **;**	2 max	**Only credit answers that refer to an increase in temperature – no ora** **1** **Clear statement required – cannot be inferred from figures quoted.** **ACCEPT** positive correlation between temperature and respiration rate **IGNORE** ref to directly proportional **2** **Clear statement required – cannot be inferred from figures quoted.** **CREDIT** $Q_{10} = 2$ **3** e.g. ● between 0 and $20^{o}C$ the respiration goes from 17 to 69 mg CO_2 kg^{-1} h^{-1} ● between 5 and $10^{o}C$ the rate changes by 13 mg CO_2 kg^{-1} h^{-1} e.g. ● between 0 and $10^{o}C$ the rate goes from 17 to 34 mg CO_2 kg^{-1} h^{-1} ● between 10 and $20^{o}C$ the respiration goes from 34 to 69 mg CO_2 kg^{-1} h^{-1} **Note:** 'between 0 and $20^{o}C$ the respiration rate increased from 17 to 69 mg CO_2 kg^{-1} h^{-1}' = **2 marks** (mps 1 & 3) **But** 'at 0 ^{o}C the respiration is 17 mg CO_2 kg^{-1} h^{-1}' and at $20^{o}C$ it is 69' = **1 mark** (mp 3)

0 °C	5 °C	10 °C	15 °C	20 °C
17	21	34	44	69

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(a)	(ii)	**1** *best conditions are* low(er) temperatures because respiration rate low ; **2** 0 °C / freezing , could be / is , best ; **3** *idea that* 0 °C might be too low as (the food cells) might be damaged at 0 °C ; **4** *idea that* for some (named) food(s) (storage) temperature doesn't seem to matter ; **5** *idea that* data is incomplete for , potato / parsnip , so , only limited / no , conclusions can be made ; **6** *idea that* if product needs to ripen during storage then a higher temperature (not above 20 °C) will be ideal ;	2 max	**1** 5 °C or below **IGNORE** statements that simply describe a trend **3** **ACCEPT** ref to freezing instead of 0 °C **4** **NOT** asparagus, blackberry or cauliflower **6** **IGNORE** ref to ethene **Note:** '0 °C is best as the respiration rate is low' = **2 marks** (mps 1 & 2)
5	(a)	(iii)	**1** onion ; **2** has low(est) respiration rate ; **3** across all temperatures (in the investigation / up to 20 °C) **or** temperature has , the least / little , effect on respiration rate ; **4** can be , stored / kept , at , higher temperatures / room temperature / at 20 °C ;	3	**1** **DO NOT CREDIT** if an additional suggestion is made **3** **DO NOT CREDIT** 'temperature has **no** effect on respiration rate' **4** **CREDIT** *idea that* no need to store in fridge

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(a)	(iv)	asparagus **and** has a high respiration rate across all temperatures / has the highest respiration rate (of the foods) **;**	1	**Both parts of the mark point required for the mark to be awarded** **DO NOT CREDIT** 'asparagus' without a supporting reason **ACCEPT** 'has a high respiration rate even at low temperature(s)'
5	(b)	(i)	**1** *idea that* parasites have little access to oxygen **;** **2** (inaccessible because) little oxygen dissolved in plasma / oxygen not very soluble (in plasma) **;** **3** (inaccessible because) *idea that* oxygen is **,** combined with haemoglobin / contained in red blood cells **;** 4 *idea that* haemoglobin has greater affinity for oxygen than parasite (pigment) **;**	2 max	**1** **DO NOT CREDIT 'no** oxygen accessible' clearly stated **DO NOT CREDIT** in the context of **,** the mammal respiring anaerobically / deoxygenated blood / temporary lack of oxygen **3** **ACCEPT** in context of saturation **Note:** 'because the oxygen is bound to haemoglobin, the parasite is unable to use it' = **2 marks** (mps 3 & 1)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
5	(b)	(ii)	*in animals* **A1** **pyruvate** is **,** converted / reduced , to **,** **lactate** / lactic acid **;** **A2** can be reversed as no **,** atoms lost / other product formed **;** **A3** **lactate dehydrogenase** available to reverse the reaction **;** *in yeast* **Y1** pyruvate converted to **ethanol** (in 2 steps) **and** **carbon dioxide** / CO_2 **;** **Y2** cannot be reversed as **,** carbon dioxide is / atoms are **,** lost **;** **Y3** (de)**carboxylase** enzyme cannot reverse the reaction **;**	3 max	**Only award 3 content marks if A mark(s) plus Y mark(s) awarded** **A1** **Cannot be inferred** from awarding of **A2 or A3** **A2** e.g. pyruvate and lactate are both 3C compounds so reaction can be reversed **Y1** **CREDIT** pyruvate decarboxylated to ethanol **Y2** e.g. pyruvate is 3C and **,** ethanol / ethanal **,** is 2C so reaction cannot be reversed
			QWC – technical terms used appropriately and spelled correctly **;**	1	Use of **three** terms from: **pyruvate**, **lactate**, **lactate dehydrogenase** **carbon dioxide**, **ethanol** **(de)carboxylase / (de)carboxylation** (or derived term) **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
			Total	**14**	

STEMUP.CO.UK

Question			Answer	Mark	Guidance
6	(a)	(i)	**Q ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram.
6	(a)	(ii)	**Q and J and K and L ;**	1	**All 4 letters required for the mark.** **If additional letters given, = 0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram.
6	(a)	(iii)	**J ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram.
6	(b)		**1** more (sodium and chloride) ions pumped **,** out of ascending limb / into medulla **;** **2** builds up greater water potential gradient **;** **3** allows **,** reabsorption / removal **,** of *more* water from **,** collecting duct / M **;**	2	**1** **CREDIT** active transport / AW **,** for 'pumped' **IGNORE** salts / diffusion **2** **ACCEPT** ***even more*** negative water potential in medulla (than other mammals)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
6	(c)		anabolic steroids ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** androgenic steroids **IGNORE** named steroids as *type* of drug asked for
			Total	**6**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2014

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

Monday 17 June 2013 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

F2140061 3

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

F 2 1 4 0 1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

© OCR 2013 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** Fig. 1.1 represents a cross section through a myelinated neurone.

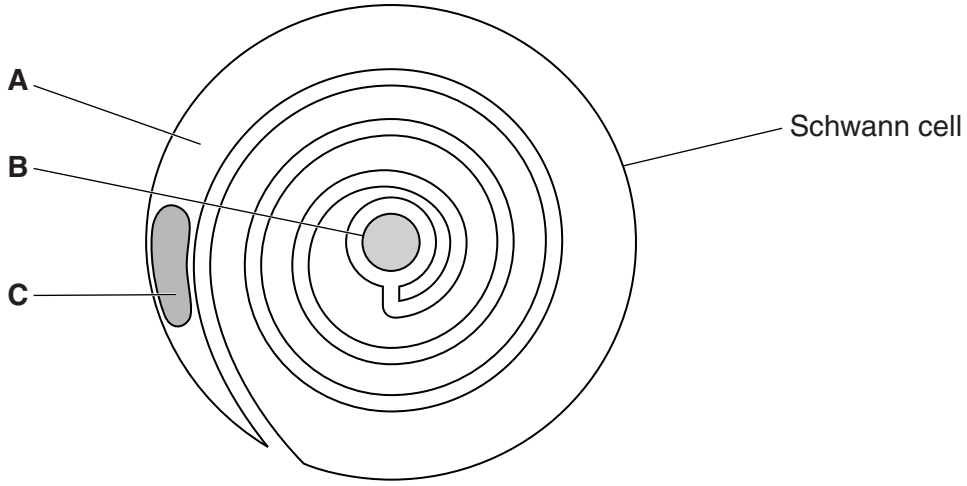


Fig. 1.1

(i) Identify **A** to **C**.

A .....

B .....

C .....

[3]

(ii) Name the gap between two adjacent Schwann cells along the length of the neurone.

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(b) There are a number of differences between myelinated and non-myelinated neurones. One difference is the distribution of voltage-gated sodium ion channels in the membrane.

myelinated neurone

- voltage-gated sodium ion channels only occur at gaps between Schwann cells
- each gap is approximately 2 μm long
- gaps occur at approximately 1000 μm intervals

non-myelinated neurone

- voltage-gated sodium ion channels occur along the total length of the neurone

Use the information above to explain the difference in the speed of conduction of an action potential along the length of a myelinated neurone and a non-myelinated neurone.

.....

.....

.....

.....

.....

.....

.....

.....

.....

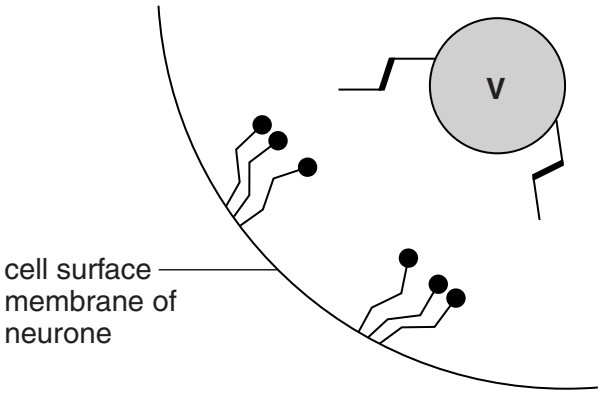
..... **[4]**

© OCR 2013

STEMUP.CO.UK

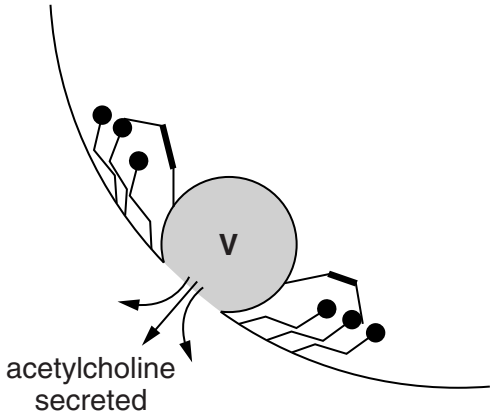
(c) A family of membrane proteins known as SNARE proteins are attached to vesicle membranes and cell surface membranes.

Fig. 1.2 summarises the mechanism by which vesicles secrete acetylcholine from a neurone.



Vesicle (**V**) has a type of SNARE protein attached to its membrane. This protein is known as vesicle associated membrane protein (VAMP).

The cell surface membrane of the neurone has a complex of SNARE proteins attached to it.



When the VAMP protein locks onto the SNARE complex, it enables the vesicle membrane to fuse with the cell surface membrane. This allows secretion of acetylcholine from the neurone.

Fig. 1.2

(i) Name the process by which the acetylcholine is secreted.

..... **[1]**

(ii) Name the part of a neurone from which acetylcholine is secreted.

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(iii) Botulinum toxin is a protease that is produced by the bacterium, *Clostridium botulinum.*

If this toxin is present in the body, for example as a result of eating contaminated food, the toxin enters neurones.

With reference to Fig. 1.2, suggest, with reasons, the effects that botulinum toxin may have once it has entered a neurone.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 12]

© OCR 2013

STEMUP.CO.UK

2 The maintenance of a stable body temperature is an important aspect of homeostasis in endotherms. This is known as thermoregulation.

(a) (i) State where the **core** body temperature is monitored.

..... **[1]**

(ii) Name the type of sensory cell in the skin that detects changes in environmental temperature.

..... **[1]**

(iii) Name the corrective homeostatic mechanism that works to restore any changes in body temperature to the normal range.

..... **[1]**

(b) Endotherms respond in different ways to changes in environmental temperature. Some of these responses are listed below:

J	secretion of adrenaline
K	sweating
L	shivering
M	contraction of erector pili muscles (attached to base of hairs)
N	curling up
O	finding shade
P	vasoconstriction of arterioles near to skin surface

Use the letters, **J** to **P**, to identify:

(i) the responses that conserve heat.

..... **[1]**

(ii) the responses that cool the body.

..... **[1]**

(iii) a physiological response that generates heat.

..... **[1]**

(iv) a behavioural (not physiological) response to a decrease in environmental temperature.

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(c) Different endotherms have evolved different physiological and behavioural adaptations to assist with temperature control.

Explain how each of the following adaptations help the animal to control its body temperature.

(i) Elephants have large, thin ears that they move backwards and forwards when hot.

.....

.....

.....

.....

.....

..... **[2]**

(ii) Penguins living in cold climates have 'shunt' blood vessels. These shunt vessels link arterioles carrying blood towards their feet with small veins that carry blood away from their feet.

.....

.....

.....

..... **[1]**

[Total: 10]

© OCR 2013

STEMUP.CO.UK

3 As blood passes through the kidney it is filtered and the urine formed in the nephron leaves the kidney through the ureter.

Table 3.1 below shows the concentration of some of the components of blood, glomerular filtrate and urine.

Component	Blood ($g\,100\,cm^{-3}$)	Glomerular filtrate ($g\,100\,cm^{-3}$)	Urine ($g\,100\,cm^{-3}$)
Glucose	0.10	0.10	0.00
Urea	0.03	0.03	1.80
Amino acids	0.05	0.05	0.00
Large proteins	8.00	0.00	0.00
Inorganic ions (total)	0.90	0.90	variable, up to 3.60

Table 3.1

Table 3.2 below shows the presence or absence of erythrocytes in blood, glomerular filtrate and urine.

Component	Blood	Glomerular filtrate	Urine
Erythrocytes	present	absent	absent

Table 3.2

© OCR 2013

(a) Explain the changes in fluid composition shown in Table 3.1 and Table 3.2.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

© OCR 2013

STEMUP.CO.UK

(b) Kidney function can be assessed by measuring the Glomerular Filtration Rate (GFR). GFR is a measure of the rate at which blood is filtered by the kidneys.

The GFR is estimated using the concentration of creatinine in the blood plasma. This compound is produced naturally by the body and is normally filtered from the blood by the kidneys and excreted.

(i) Suggest what a high concentration of creatinine in the blood plasma indicates about kidney function. Give a reason for your answer.

.....

.....

..... **[1]**

(ii) A formula is used to obtain a value for GFR that takes into account the various factors that contribute to concentration of creatinine in the blood.

GFR is expressed as $cm^3\,min^{-1}$.

A typical person is assumed to have a body surface area of $1.73\,m^2$.

In order to obtain an estimate of GFR (eGFR) for individuals who are smaller or larger than a typical person, the following calculation is performed:

$$eGFR = GFR \times \frac{1.73}{\text{individual's body surface area}}$$

A man has a GFR of $82\,cm^3\,min^{-1}$ and a body surface area of $2.56\,m^2$.

Calculate the eGFR for this man.

Show your working and give your answer to the nearest **whole number**.

eGFR = ... $cm^3\,min^{-1}$ **[2]**

© OCR 2013

STEMUP.CO.UK

(iii) Chronic Kidney Disease (CKD) is divided into five stages according to the eGFR value.

These stages are listed in Table 3.3 below.

CKD stage	eGFR ($cm^3 min^{-1}$)	Effect on kidney
1	greater than 90	little or no damage
2	60 – 90	some or no damage
3	30 – 59	moderate reduction in function
4	15 – 29	severe reduction in function
5	less than 15	kidney failure

Table 3.3

Use the information in Table 3.3 to:

- identify the CKD stage indicated by the eGFR that you calculated in **(b)(ii)**
- determine the effect on the kidney of this man.

stage .....

effect on kidney .....

[1]

Question 3(c) begins on page 12

© OCR 2013

STEMUP.CO.UK

(c) The following are some of the pieces of information relating to kidney transplantation that have appeared in some news items during the last 15 years.

November 2002

The trade in human organs is growing. One woman sold her kidney for £400 (two year's worth of her wages) to an agent. The agent then sold it for an estimated £20 000 to a man who was in desperate need of a transplant.

November 2010

A private medical group has admitted to the charge of carrying out illegal kidney transplants at one of its hospitals. The people from whom the kidneys were taken were poor and some were below the legal age of consent. They were paid for the kidneys, which were sold to wealthy people who needed transplants.

April 2011

The number of people donating one of their kidneys for transplant is increasing year by year. The donor receives no payment, undergoes months of medical and psychiatric tests, and cannot specify who receives their kidney. While the numbers of donors are still small compared to the numbers needing a kidney transplant, each kidney donated is making the difference between life and death for someone.

© OCR 2013

STEMUP.CO.UK

Discuss, with reference to the information given on page 12, whether it is ethical for live donors to be used as a source of kidneys for transplantation.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 12]

© OCR 2013

STEMUP.CO.UK

4 Organisms respond to changes in their internal environment. These responses are controlled by nervous and hormonal mechanisms.

(a) The concentration of blood glucose is regulated by hormones.

Complete the passage below, using the **most suitable** term in each case.

The pancreas releases hormones directly into the blood and these regulate the concentration of blood glucose. The pancreas, therefore, acts as an ..... gland.

When the blood glucose concentration increases, insulin is released from the beta cells in the regions of the pancreas known as the ..... .

A different hormone, glucagon, is released from the alpha cells of the pancreas and this hormone causes ..... to be broken down into glucose, in a process known as ..... . **[4]**

(b) The heart rate is controlled by both nervous and hormonal mechanisms.

(i) Name **one** hormone which will **increase** the heart rate.

..... **[1]**

(ii) State **one** way in which the nervous system **decreases** the heart rate.

.....

..... **[1]**

[Total: 6]

© OCR 2013

5 **(a)** Glycolysis is the initial stage of cellular respiration.

(i) State **precisely** where in the cell glycolysis occurs.

..... **[1]**

(ii) Outline the process of glycolysis.

In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

(b) Yeast cells can carry out **anaerobic** respiration.

Fig. 5.1 outlines the process of anaerobic respiration in yeast.

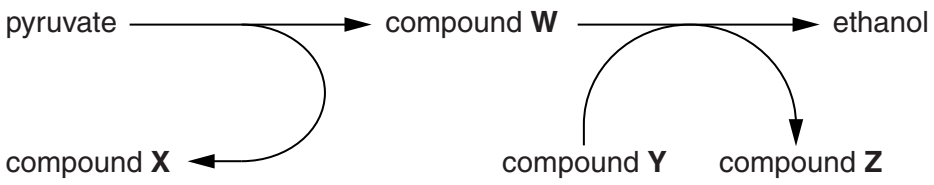


Fig. 5.1

Identify the compounds **W** to **Z**.

W .....

X .....

Y .....

Z .....

[4]

© OCR 2013

STEMUP.CO.UK

(c) In South-East Asia the main source of commercial sugar is the palm, *Borassus flabellifer*. Sap of this species has a high sugar content. Yeasts and bacteria, however, can contaminate the sap as it is collected and ferment the sugar, producing ethanol. This contamination makes it less suitable as a source of sugar.

A study was carried out to investigate the effect of three treatments traditionally used to reduce fermentation during the collection of the sap. The sap is treated in one of the following ways:

- with a weak alkaline solution (treatment **A**)
- with bark from the tree *Vateria copallifera* (treatment **V**)
- with bark from the tree *Careya arborea* (treatment **C**)

The sap was collected from the palm trees over a 60-hour period. Samples of the collected sap were taken at 15 hour intervals. In each sample, the concentration of alcohol and the number of bacteria were recorded.

The results are shown in Table 5.1.

Treatment	Sample time (hours)	Alcohol concentration (%)	Number of bacteria ($10^6\,cm^{-3}$)
Control (no treatment)	15	0.2	19
	30	3.5	800
	45	5.2	2200
	60	2.6	3400
A	15	0.0	3
	30	0.1	4
	45	0.2	5
	60	0.3	7
V	15	0.2	110
	30	1.1	2900
	45	1.2	2400
	60	1.8	2000
C	15	0.4	230
	30	1.1	160
	45	1.3	3
	60	3.6	40

Table 5.1

© OCR 2013

STEMUP.CO.UK

(i) With reference to Table 5.1, describe the effect of the different treatments on the alcohol concentration of the treated samples compared with the control samples.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

(ii) Suggest a reason for the difference in alcohol concentration **at 60 hours** between the two bark treatments **V** and **C**.

.....

.....

.....

..... **[1]**

(iii) To be used as a source of commercial sugar, the sap needs to be as uncontaminated as possible.

Suggest, with a reason, which of the treatments shown in Table 5.1 would be the best for use with sap so that it is suitable as a source of commercial sugar.

.....

.....

.....

.....

.....

.....

..... **[2]**

[Total: 14]

© OCR 2013

STEMUP.CO.UK

6 The molecules listed below are all associated with photosynthesis.

amino acid	**reduced NADP**
ATP	**ribulose bisphosphate (RuBP)**
carbon dioxide	**rubisco**
glycerate-3-phosphate (GP)	**triose phosphate (TP)**
oxygen	**water**

From these molecules, identify:

(a) the enzyme.

..... **[1]**

(b) a product of the light-dependent reaction that is **used** in the light-independent reaction.

..... **[1]**

(c) a 3-carbon compound.

..... **[1]**

(d) a compound that can be made from TP but is **not** part of the Calvin cycle.

..... **[1]**

(e) a 5-carbon compound.

..... **[1]**

(f) a product of the light-dependent reaction that **is not** used in the light-independent reaction.

..... **[1]**

[Total: 6]

END OF QUESTION PAPER

© OCR 2013

STEMUP.CO.UK

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

© OCR 2013

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2013

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2013

1. **Annotations**

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of doubt
	No benefit of doubt
	Error carried forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded

2. **Subject-specific Marking Instructions**

ALLOW alternative wording throughout, as long as the essence of the mark point remains.

In some questions (especially **Q1(b), Q3(a), Q3(c) and Q5(c)(i)**) candidates have been given information or data that they have to explain or discuss. In such questions they cannot score marks by simply lifting text or figures from the information given in the question.

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(a)	(i)	**A** cytoplasm ; **B** cell surface (plasma) membrane / neurone / neurilemma / axon / dendron ; **C** nucleus (of Schwann cell) ;	3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **A** **ACCEPT** cytosol **IGNORE** myelin **B** **IGNORE** nerve **DO NOT CREDIT** cell body
1	(a)	(ii)	node(s) of Ranvier ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
1	(b)		*in myelinated neurones* **1** conduction faster in myelinated neurone ; **ora** **2** depolarisation / action potential , can **only** occur where (voltage-gated / $Na^{(+)}$) channels present ; **3** *idea that* myelinated neurones have long(er) sections with no, (voltage-gated / $Na^{(+)}$) channels present ; **4** ion , movement / transfer , can **only** take place at the gaps / nodes ; **ora** **5** longer local circuits / fewer local circuits ; **6** saltatory conduction / action potential jumps from node to node ; **ora**	4	**1** must be a comparative statement and not from figs alone **2** **IGNORE** ref to nodes of Ranvier (as they should be using information in Q) **3** e.g. (only) 0.2% of the myelinated neurone has voltage-gated Na channels **ACCEPT** channels are further apart in myelinated **4** This is a general mark for Na+ or K^+ movement, regardless of direction **5** **ACCEPT** 'currents' for 'circuits' **6** **ACCEPT** 'gap' for 'node' **ACCEPT** jumping *between* nodes

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(c)	(i)	exocytosis ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** secretion
1	(c)	(ii)	synaptic knob / synaptic bulb / presynaptic membrane ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** bouton **ACCEPT** presynaptic knob **IGNORE** vesicle **DO NOT CREDIT** synapse
1	(c)	(iii)	**1** vesicle cannot fuse with cell membrane **and** acetylcholine not secreted ; **2** protease / enzyme / toxin / it , hydrolyses , VAMP / SNARE / protein / peptide bonds ; **3** (because of hydrolysis) VAMP (protein) cannot bind to SNARE (complex) ; **4** microtubules broken down **so** vesicle cannot move towards membrane ;	2 max	**1** **ACCEPT** bind / attach , for fuse (see diagram) **2** **ACCEPT** acts on / digests / breaks down , for 'hydrolyses' **3** **ACCEPT** attach / join / lock , for 'bind' **IGNORE** fuse **DO NOT CREDIT** in context of , inhibition / denaturation
			Total	12	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(a)	(i)	(thermoregulatory centre in) hypothalamus **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** hyperthalamus
2	(a)	(ii)	thermoreceptor / peripheral temperature receptor **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** 'heat' / 'sensory cell'
2	(a)	(iii)	negative feedback / thermoregulation **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** homeostasis
2	(b)	(i)	**M and N and P ;**	1	If the answer is correct and an additional letter is given that is incorrect then = **0 marks** **All 3** correct letters required for one mark **IGNORE J**
2	(b)	(ii)	**K and O ;**	1	If the answer is correct and an additional letter is given then = **0 marks** **Both** correct letters required for one mark
2	(b)	(iii)	**L ;**	1	**Mark the first answer.** If the answer is correct and an additional letter is given that is incorrect then = **0 marks** **ACCEPT J**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(b)	(iv)	**N ;**	1	**Mark the first answer.** If the answer is correct and an additional letter is given then = **0 marks**
2	(c)	(i)	**Look for ref to , heat loss / cooling , at any point in the answer before awarding any marks** large surface area (to lose heat) **;** (thin) so **,** blood flows / (named) blood vessel are **,** close to the (skin) surface (to lose heat) **;** (movement) increases air movement over **,** skin / surface (to lose heat) **;**	2 max	**DO NOT CREDIT** evaporation of heat **IGNORE** ref to sweating **ACCEPT** SA**:**Vol
2	(c)	(ii)	**Needs to be in the context of reducing heat loss from the blood** blood loses less heat because **,** less <u>blood</u> flows to feet / warm <u>blood</u> diverted from arterioles to veins **or** less <u>blood</u> flows to feet so core body temperature maintained **;**	1	**DO NOT CREDIT** prevents / stops **,** blood flowing to feet **ACCEPT** 'extremities' for 'feet' **IGNORE** ref to vasoconstriction of peripheral arterioles **DO NOT CREDIT** vasoconstriction of shunt vessels **IGNORE** ref to countercurrent (as not answering Q)
			Total	10	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(a)		**1** large molecules / proteins / blood cells **,** cannot **,** leave blood / enter the filtrate **or** (named) small molecules can **,** leave blood / enter filtrate**;**	**4 max**	**1** Needs more than a figs ref **DO NOT CREDIT** through **,** cells / membranes **DO NOT CREDIT** ref to erythrocytes being large molecules or proteins **ACCEPT** capillary / glomerulus **,** for 'blood'
			2 **endotheli**um **/ fenestration**s / **basement membrane** **,** prevents **,** large molecules / erythrocytes **,** reaching **,** renal / **Bowmans capsule** **;**		**2** Needs ref to entering Bowmans capsule to explain data in table **DO NOT CREDIT** basal membrane
			3 <u>all</u> glucose / glucose completely **,** **reabsor**bed at the **,** **proximal convoluted tubule** / PCT **;**		**3** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT
			4 <u>all</u> amino acids / amino acids completely **,** reabsorbed at the **,** proximal convoluted tubule / PCT **;**		**4** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT
			5 (some / not all) ions **,** reabsorbed / move into blood (at any part of **,** nephron / tubule) **;**		**5** **ACCEPT** ref to named ions **IGNORE** salts **DO NOT CREDIT** if stated that **all** ions are reabsorbed
			6 urea / ion **,** <u>concentration</u> increases (between filtrate and urine) because **,** movement (of urea / ion) into tubule / water removed **;**		**6** Must be a clear specific statement and not part of a list Reason must refer **only** to water removal
			QWC – technical terms used appropriately **<u>and</u>** spelled correctly **;**	**1**	Use of **three** terms from: **endothelium / endothelial** **fenestration**(s) **basement membrane** **Bowmans capsule** **reabsorb** (or derived term) **proximal convoluted tubule** **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(b)	(i)	*idea that* (high creatinine concentration indicates) reduced function because **,** less filtration / low GFR **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **Answer must include statement about lack of 'working' or 'functioning' of kidney <u>as well as</u> some reference to reduced filtration** **IGNORE** ref to creatinine or creatine **ACCEPT** ref to no filtration **DO NOT CREDIT** ref to creatinine ***causing*** kidney damage
3	(b)	(ii)	55 **; ;**	2	**Correct answer = 2 marks** If the answer is incorrect, **award 1 mark** for working: $82 \times \frac{1.73}{2.56}$ If the answer is unrounded, incorrectly rounded or not given to the nearest whole number, **award 1 mark** for seeing an unrounded answer (e.g. 55**.**4140625)
3	(b)	(iii)	stage 3 **<u>and</u>** moderate reduction (in kidney function) **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **Needs to quote the effect on the kidney stated in the table.** **If the answer is incorrect, then look at the candidate's answer to Q3(b)(ii) (scroll down – it's situated below this answer) and CREDIT** a stage that correctly follows on from candidate's answer to **(ii)** as **ecf**.

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(c)		*general* **1** *idea that* people **should** have a **right** to choose (freely) what to do with their kidney **;** *perceived donor advantages* **2** *idea that* donors / donors' families **,** can benefit from money raised (by selling a kidney) **;** **3** people can donate a kidney to family member **;** **4** *idea that* people can donate without payment **;** *perceived donor disadvantages* **5** *idea of* exploiting people's poverty **;** **6** *idea of* exploitation of **,** children / minors **;** *recipient issues* **7** *idea that* people should receive transplants irrespective of wealth **;** **8** *idea that* it is wrong that recipients are being charged excessively **;** **9** AVP **;**	**3 max**	**IGNORE** 'yes' or 'no' **IGNORE** religious / cultural **,** considerations **IGNORE** ref to kidneys sourced from animals Answers need not be a balanced account. **4** **ACCEPT** choosing to donate for **,** free / the good of it **IGNORE** ref to giving to charity **5** **ora** ethical if not doing it just for money they receive **6** **ACCEPT** ref to illegality of child donors **IGNORE** **'**young' unqualified **ora** ethical as long as (donor) of legal age **9** e.g. family member may feel pressured into donating e.g. can survive with only one healthy kidney e.g. potential for complications if donor has subsequent kidney failure e.g. people should have access to kidneys if needed e.g. danger of operating on **,** healthy person / donor e.g. *idea that* wrong for large profits to be made
			Total	**12**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(a)		endocrine ; islets of Langerhans ; glycogen ; glycogenolysis ;	4	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** 'isles' / 'eyelets' (as phonetic) **DO NOT CREDIT** 'islands' spelling **must be correct** spelling must be **unambiguous** **IGNORE** hydrolysis
	(b)	(i)	adrenaline / epinephrine / noradrenaline / norepinephrine ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** thyroxine / (named) corticosteroid
		(ii)	impulses along parasympathetic nerve / impulses along vagus nerve / nerve endings releasing acetycholine ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** Ref to structure alone is not good enough **CREDIT** 'stimulation' / 'action potentials' **,** for 'impulses along' **ACCEPT** 'activates' / 'uses' **,** parasympathetic / vagus **,** nerve **DO NOT CREDIT** 'messages' / 'signals' / 'information'
			Total	6	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(a)	(i)	cytoplasm (of cell) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** cytosol
5	(a)	(ii)	**1** **phosphorylation** of **glucose** ; **2** so forming **hexose** (1,6) **bisphosphate** ; **3** (then) splitting into / formation of **,** two / 2 **, triose phosphate**(s) / TP ; **4** (for formation of pyruvate) **dehydrogenation** / **oxidation** / formation of reduced NAD ; **5** **pyruvate** produced (from **,** TP / (3C) intermediate) ; **6** total production 4 ATP / net production of 2 ATP ;	3 max	**Marks can be awarded from a diagram** **1** **DO NOT CREDIT** substrate level phosphorylation **2** **IGNORE** glucose-6-phosphate / fructose-6-phosphate **CREDIT** fructose(-1,6-)bisphosphate **ACCEPT** hexose biphosphate **DO NOT CREDIT** hexose diphosphate **3** **IGNORE** hydrolysis **DO NOT CREDIT** if ATP or NAD or red NAD involved in conversion of hexose bisphosphate to TP **4** **ACCEPT** formation of **,** $NADH_2$ / NADH ($+H^+$) / red NAD **DO NOT CREDIT** $NADPH_2$ / NADPH ($+H^+$) **DO NOT CREDIT** hydrogen ion without electron / H_2 **6** Needs to be a clear statement
			QWC – technical terms used appropriately **and** spelled correctly ;	1	Use of **three** terms (including from a flow chart) from: **phosphorylation** (or derived term) **glucose** **hexose** (1,6) **bisphosphate** **triose phosphate** **dehydrogenation OR oxidation** (or derived terms) **pyruvate** **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(b)		**W** ethanal ; **X** carbon dioxide / CO_2 ; **Y** reduced NAD ; **Z** $NAD^{(+)}$;	4	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **W** Correct spelling only **DO NOT CREDIT** ethanol **X** **DO NOT CREDIT** CO^2 / CO **Y** **ACCEPT** $NADH_2$ / $NADH^{(+)}$ $(+H^+)$ / red NAD **DO NOT CREDIT** $NADPH_2$ / $NADPH^{(+)}$ $(+H^+)$ / red NADP **Z** **DO NOT CREDIT** NADP
5	(c)	(i)	**1** **A** / alkaline , produced less alcohol (than the control) at all times ; **2** **V** / *Vateria* , produced less alcohol (than the control) , at 30 **and** 45 **and** 60 hours / from 30 hours / after 15 hours **or** **V** / *Vateria* had the same alcohol as the control at 15 hours ; **3** **C** / *Careya* , produced less alcohol (than the control) at 30 **and** 45 hours **or** **C** / *Careya* , produced more alcohol (than the control) at 15 **and** 60 hours ;	2	**CREDIT** **ora** for all mark points **ora** e.g. control always produced more alcohol than **A**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(c)	(ii)	*at 60 hours* **V** has fewer yeast cells (which would ferment the sugar) **or** **C** has more yeast cells **;** only a small number of bacteria in **V** are **,** fermenting the sugar / producing alcohol **or** the **,** type / species **,** of bacteria in **V** are not **,** fermenting the sugar / producing alcohol **or** most / all / type of **,** bacteria in **C** are **,** fermenting the sugar / producing alcohol **;**	**1**	**IGNORE** ref to a compound inhibiting production of alcohol in **V** **Must be clear statements, not implied by the use of figs** **IGNORE** '**V** has fewer bacteria' without ref to fermentation **IGNORE** '**C** has more bacteria' without ref to fermentation
5	(c)	(iii)	**A** / (weak) alkaline (solution) **;** (**A** has the least contamination as) it has very few bacteria **and** little alcohol **;**	**2**	 **ONLY CREDIT** in context of treatment **A**
			Total	**14**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(a)		rubisco ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
6	(b)		ATP / reduced NADP ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** oxygen (as it is not used in the light independent reaction)
6	(c)		glycerate-3-phosphate / GP / triose phosphate / TP ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
6	(d)		amino acid ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
6	(e)		ribulose bisphosphate / RuBP ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** ribulose biphosphate
6	(f)		oxygen ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** ATP / reduced NADP (as they are used in the light independent reaction)
			Total	6	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2013

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

Friday 11 January 2013 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

F21O4O113

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

F 2 1 4 0 1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2013 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** Fig. 1.1 represents a sensory neurone connected to its associated receptor cells.

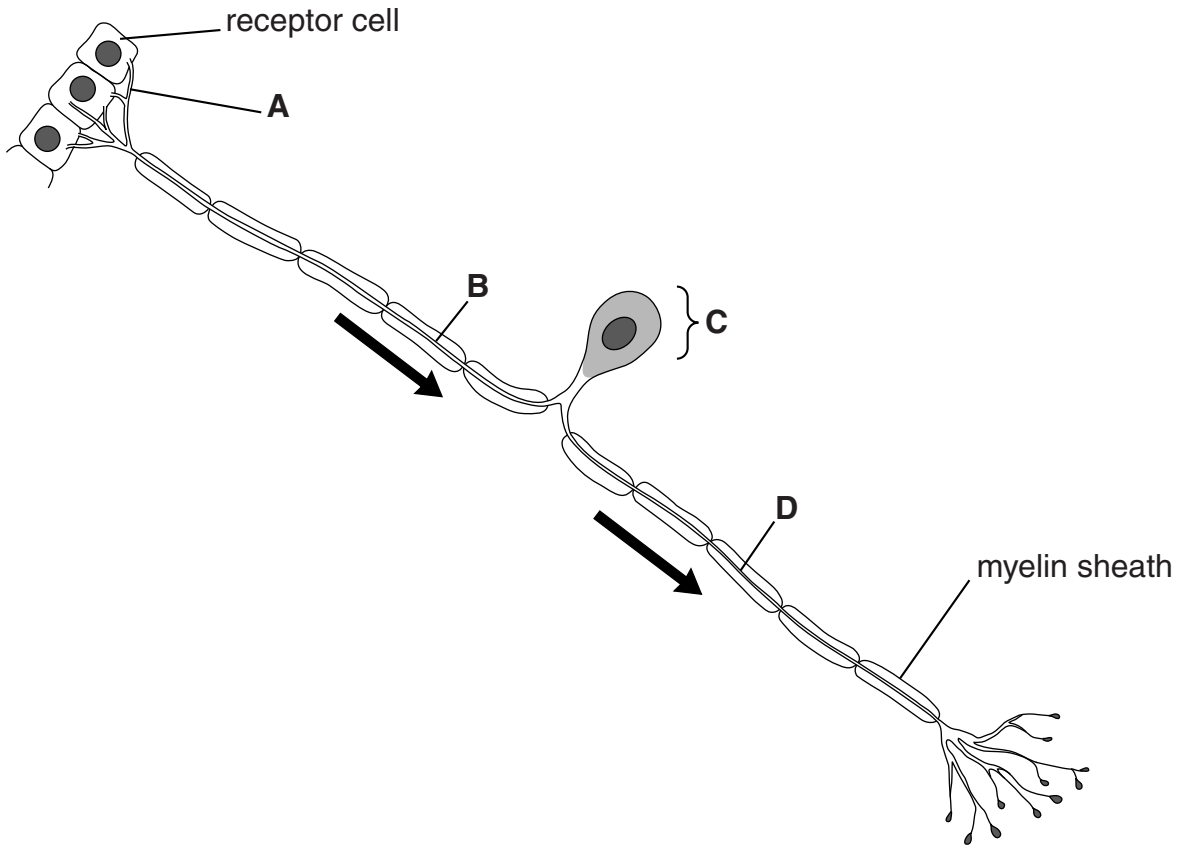


Fig. 1.1

(i) Identify the parts of the neurone labelled **A** to **D**.

A .....

B .....

C .....

D .....

[4]

(ii) What is represented by the arrows on Fig. 1.1?

.....

..... **[1]**

© OCR 2013

(b) Describe and explain how the **resting potential** is established **and** how it is maintained in a sensory neurone.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

© OCR 2013

STEMUP.CO.UK

(c) Fig. 1.2 shows the changes in the membrane potential of a sensory neurone when the receptor cells are stimulated.

Fig. 1.3 indicates the strength of the stimuli that results in the corresponding changes in membrane potential.

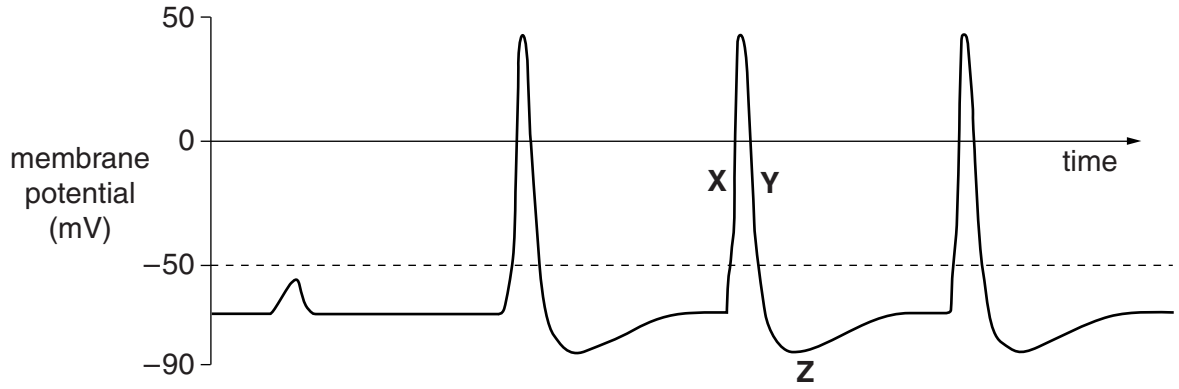


Fig. 1.2

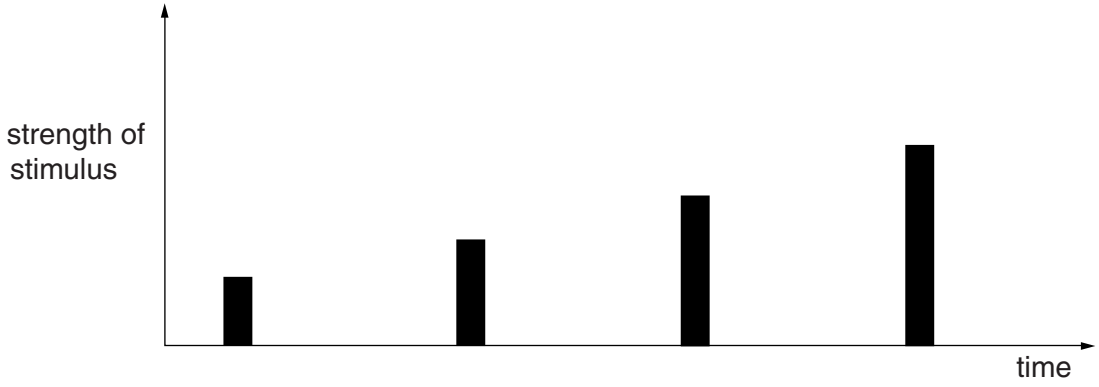


Fig. 1.3

(i) State the term used to describe what is happening at each of the points **X**, **Y** and **Z** on Fig. 1.2.

X .....

Y .....

Z .....

[3]

(ii) What term is used to refer to the value of –50 mV on Fig. 1.2?

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(iii) Comment on the relationship between the strength of a stimulus, as shown in Fig. 1.3, and the resulting action potential, as shown in Fig 1.2.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 15]

© OCR 2013

STEMUP.CO.UK

2 The liver is an organ that is metabolically very active, carrying out over 500 different functions. Some of its important functions include converting chemicals including toxins, into other compounds.

Fig. 2.1 outlines some of the reaction pathways that take place in the liver cells.

The ***underlined words*** represent toxic compounds.

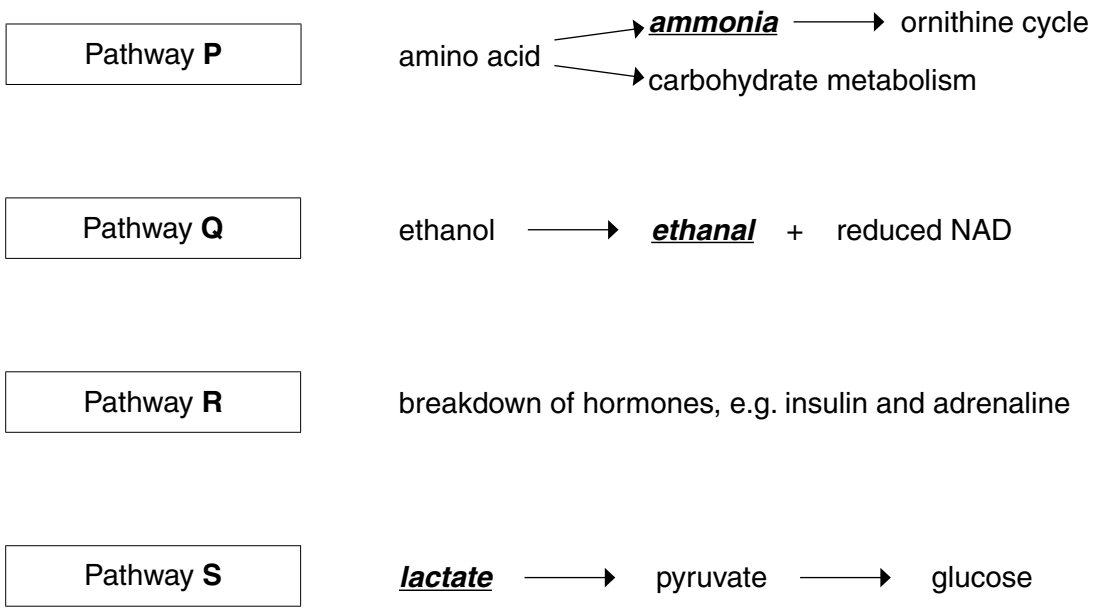


Fig. 2.1

(a) (i) State the product of the ornithine cycle in Pathway **P** and the organ to which this product is transported for removal from the body.

product .....

organ the product is transported to .....
[2]

(ii) The lactate that enters pathway **S** is produced by cells, such as muscle cells, undergoing anaerobic respiration.

Suggest why this lactate is converted into pyruvate by the hepatocytes (liver cells) rather than by the respiring cells in which it is produced.

.....

.....

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(b) Insulin only remains in the bloodstream for a relatively short time. Pathway **R** breaks down insulin in the liver.

Explain what might happen to a person if the liver did not break down insulin.

.....

.....

.....

.....

.....

..... **[2]**

(c) Alcohol (ethanol) is oxidised in the liver by Pathway **Q**. If a person has a high alcohol intake, it will result in the production of excess reduced NAD.

(i) Excess reduced NAD in the liver cells will influence some metabolic pathways by:

- inhibiting the conversion of lactate to pyruvate
- inhibiting fatty acid oxidation
- promoting fatty acid synthesis.

Using this information **and** the information in Fig. 2.1, suggest the consequences for **liver metabolism** if a person has a regular high alcohol intake.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

(ii) State **precisely** where in the liver cell the excess reduced NAD can be re-oxidised.

..... **[1]**

[Total: 8]

© OCR 2013

STEMUP.CO.UK

3 **(a)** Explain what is meant by the terms *autotroph* and *heterotroph*.

autotroph .....

.....

.....

heterotroph .....

.....

.....

[2]

(b) Fig. 3.1 is a transmission electron micrograph showing part of a chloroplast, including some of the internal membranes.

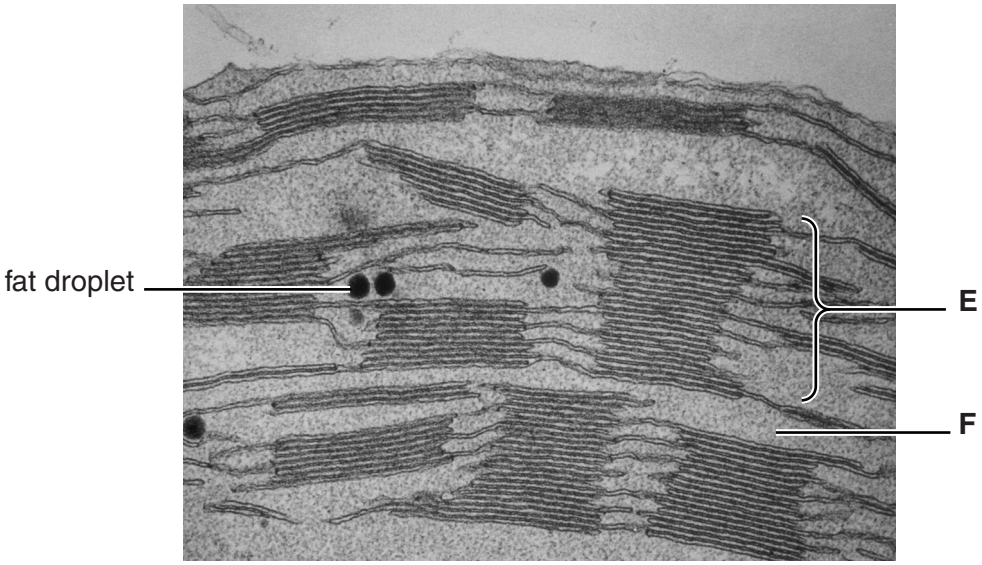


Fig. 3.1

(i) Identify **E** and **F** in Fig. 3.1.

E .....

F .....

[2]

(ii) The chloroplast contains fat droplets, as shown in Fig. 3.1. These act as a reserve of raw material **for the chloroplast**.

Suggest what this raw material might be used for in the chloroplast.

.....

.....

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(c) Fig. 3.2 represents the light harvesting system found on the surface of the internal membranes of the chloroplast.

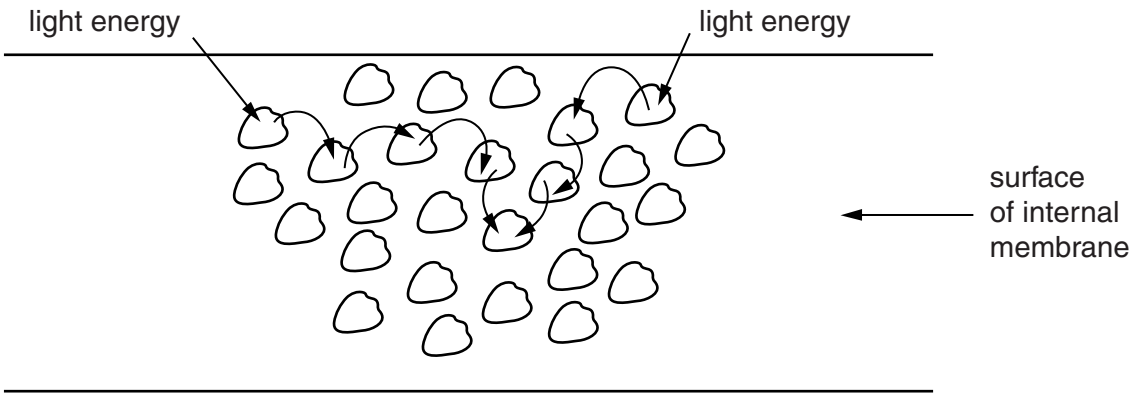


Fig. 3.2

Use the information in Fig. 3.2 to describe how light is harvested in the chloroplast membranes.

In your answer, you should use appropriate technical terms, spelled correctly.

..... **[5]**

© OCR 2013

STEMUP.CO.UK

(d) Many herbicides act by inhibiting photosynthesis in weeds. A series of research studies were carried out to evaluate the effectiveness of a triazine herbicide on the yield of a crop of corn, *Zea mays*. Some of the data obtained is shown in Table 3.1.

Study	Plots not treated with herbicide		Plots treated with herbicide		Yield difference with herbicide	
	Number of plots	Mean yield ($kg\,ha^{-1}$)	Number of plots	Mean yield ($kg\,ha^{-1}$)	($kg\,ha^{-1}$)	(%)
A	90	8321.4	51	8756.9	+435.5	+5.2
B	21	10344.8	3	11457.0	+1112.2	+10.8
C	30	10411.8	14	10954.5	+542.7	+5.2
D	20	13982.9	7	13607.7	–375.2	–2.7
E	2	6532.5	8	11041.6	+4509.1	+69.0
F	66	8750.2	63	8971.3	+221.1	+2.5
G	17	11671.4	7	10807.1		

Table 3.1

(i) Calculate the yield difference caused by the application of herbicide in study **G**.

Show your working.

Answer = ... $kg\,ha^{-1}$

..... % **[2]**

(ii) Suggest why the researchers concluded that the data obtained from Study **E** was not useful in evaluating the effectiveness of the herbicide.

.....

..... **[1]**

(iii) Triazine herbicide acts on the weeds by binding to a specific protein associated with photosystem II, blocking the movement of electrons between electron carriers.

Explain the effect that the herbicide binding to this protein will have on photosynthesis.

.....

.....

.....

..... **[2]**

© OCR 2013

STEMUP.CO.UK

(iv) Plants treated with triazine herbicide can, when illuminated under experimental conditions, be seen to fluoresce (emit light) and give off small quantities of heat.

Suggest how this experimental finding could be explained.

.....

.....

..... **[1]**

[Total: 16]

4 Biological terms are often used incorrectly. This may be because they have similar spelling or refer to similar structures.

glucagon	*glycogenolysis*
gluconeogenesis	*glycolysis*
glycogen	*insulin*
glycogenesis	*negative feedback*

Select from the list above, the term(s) that refer to:

(a) a stage in respiration

..... **[1]**

(b) hormone(s)

..... **[1]**

(c) process(es) that produce glucose

..... **[1]**

(d) process(es) that have glucose as a starting point

..... **[1]**

[Total: 4]

© OCR 2013

STEMUP.CO.UK

5 **(a)** Adenosine tri-phosphate (ATP) is an important product of respiration. The ATP molecule is made up of five sub-units, as shown in Fig. 5.1.

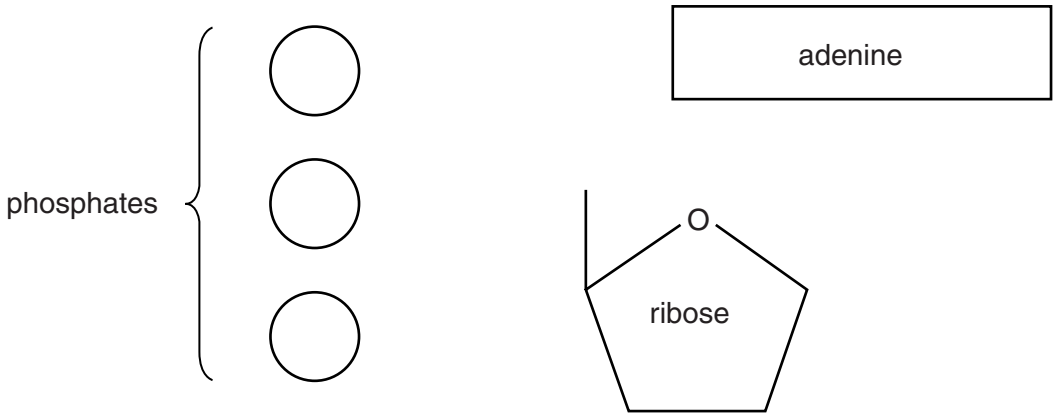


Fig. 5.1

(i) In the space below, indicate how these sub-units are joined in a molecule of ATP.

[2]

(ii) Suggest the type of reaction that removes a phosphate group from an ATP molecule.

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(b) The formation of ATP is now widely accepted as being achieved by the process of **chemiosmosis**.

Various pieces of evidence have been documented to support this theory. Three of these are described below.

1 In isolated mitochondria that have had their outer membranes removed, electron transfer takes place but the mitochondria are unable to produce ATP.

2 The pH of the inter-membrane space is lower than the pH inside the rest of the mitochondrion.

3 The outer mitochondrial membrane is permeable to protons.
If isolated mitochondria are supplied with ADP and inorganic phosphate and placed in a solution of pH 8, no ATP is produced. If, however, these mitochondria are placed in an acidic solution, ATP is produced.

Identify the pieces of evidence above, **1**, **2** or **3**, that supports each of the following statements about the theory of chemiosmosis.

Write '**none**' if a statement is not supported by any of the pieces of evidence above.

(i) Electron transfer occurs on the inner membrane of the mitochondrion. ..... **[1]**

(ii) Protons are actively pumped across the inner mitochondrial membrane into the inter-membrane space. ..... **[1]**

(iii) Protons accumulate in the inter-membrane space. ..... **[1]**

[Total: 6]

© OCR 2013

STEMUP.CO.UK

6 The kidney is a vital organ in the body and is responsible for excretion. It also plays an important role in homeostasis.

(a) Complete the passage, using the **most suitable** term in each case.

The blood in the glomerulus has a high ..... pressure, which forces small molecules, such as glucose and ....., out of the glomerulus and into the lumen of the Bowman's capsule. This process is known as ..... .

In the proximal convoluted tubule, the glucose, most of the ..... and some of the salts are reabsorbed into blood ..... that surround the nephron at this point. **[5]**

(b) One aspect of the kidney's homeostatic role is the ability of anti-diuretic hormone (ADH) to increase the number of aquaporins in the plasma membranes of the cells lining the collecting duct. This increases the amount of water reabsorbed.

ADH is released in response to a decrease in the water potential of the blood plasma.

(i) State precisely where the cells that detect a decrease in the water potential of the blood plasma are found.

..... **[1]**

(ii) Name the cells that detect this decrease.

..... **[1]**

© OCR 2013

STEMUP.CO.UK

(c) Fig. 6.1 outlines some of the events that take place if the blood volume decreases, for example, due to a significant loss of blood.

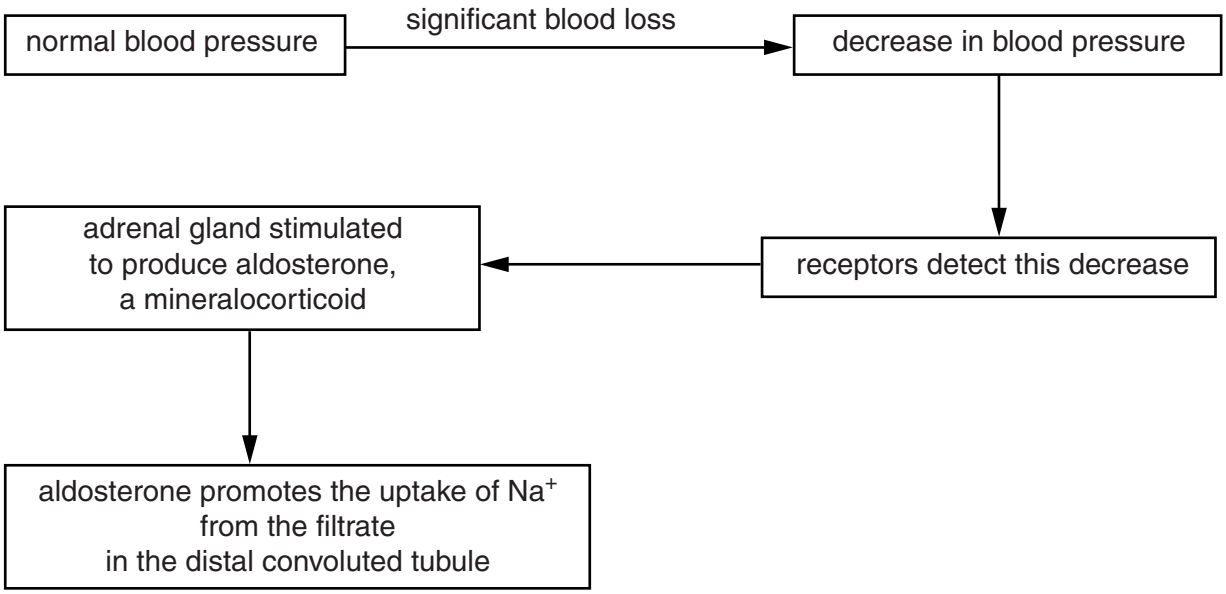


Fig. 6.1

(i) Name the part of the adrenal gland that releases aldosterone.

..... **[1]**

(ii) Suggest **and** explain what effect the action of aldosterone will have on the secretion of ADH.

.....

.....

.....

.....

.....

..... **[2]**

(iii) As the action of aldosterone takes effect, this is detected by receptors in the body and secretion of aldosterone decreases.

State the name of the mechanism that results in this decrease in aldosterone secretion.

..... **[1]**

[Total: 11]

END OF QUESTION PAPER

© OCR 2013

STEMUP.CO.UK

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page. The question number(s) must be clearly shown in the margin.

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2013

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for January 2013

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2013

Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded

**Quality of Written Communication*

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(a)	(i)	**A** dendrite(s) **;** **B** dendron (membrane) **;** **C** cell body (of neurone) **;** **D** axon (membrane) **;**	4	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **A DO NOT CREDIT** sensory receptor **B DO NOT CREDIT** dendrion (as inclusion of the 'i' means that it can be confused with dendrite)
1	(a)	(ii)	direction of (conduction / travel / transmission) **,** impulse / action potential **;**	1	**DO NOT CREDIT** signal / message **DO NOT CREDIT** 'action potential' alone

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(b)		*pumping / active* **1** **sodium-potassium pump** , uses ATP / uses energy / by active transport / (pumps) actively ; **2** pumps / actively moves , sodium **ions** / Na^+ , out of , cell / axon / neurone , and , potassium ions / K^+ , in ; *passive / diffusing* **3** K^+ , **diffuse** / move / flow / leak , (freely) back out (of cell) ; **4** membrane less **permeable** to Na^+ / fewer Na^+ channels open , so fewer Na^+ , diffuse / move / flow / leak , back in ; **ora** **5** **voltage-gate**d (Na^+) , channels closed ; **6** AVP ; **QWC** – technical terms used appropriately and spelled correctly ;	3 max 1	**If symbol for ion not used, must refer to <u>ion</u>** **IGNORE** ref to value of resting potential **1** **DO NOT CREDIT** if referring to 2 separate pumps **2** **IGNORE** numbers / ratio for this mark **DO NOT CREDIT** in context of (diffusion) channels **4** Looking for a comparative statement referring to permeability **<u>and</u>** its consequence **ACCEPT** 'K^+ move out (20x) faster than Na^+ move in' for idea of more K^+ moving out **IGNORE** ref to impermeable to Na^+ / all Na^+ channels closed **5** **IGNORE** ref. ligand-gated channels **6** e.g. • 3 Na^+ out and 2 K^+ in • build up of +ve ions outside • large (numbers of) , anions / -ve ions , inside • ref to negatively charged proteins **Note** 'pumps 3 Na^+ out and 2 K^+ into cell' = **2 marks** (mp 2 and mp 6) 'the Na/K pump actively moves 3 Na^+ out of and 2 K^+ into axon' **= 3 marks** (mps 1, 2 and 6) Use of **three** terms from: **sodium-potassium pump**, **ion**(s), **diffuse** (or derived term), **permeable**, **voltage-gate**d **Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded. You should use the green dot to identify the QWC terms that you are crediting.**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(c)	(i)	**X** depolarisation **;** **Y** repolarisation **;** **Z** hyperpolarisation **;**	3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** As the term is asked for, **IGNORE** descriptions **X** **ACCEPT** depolarise(d) / depolarising **Y** **ACCEPT** repolarise(d) / repolarising **Z** **ACCEPT** hyperpolarise(d) / hyperpolarising **IGNORE** refractory period
1	(c)	(ii)	threshold (potential / value / voltage) **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** threshold frequency
1	(c)	(iii)	**1** *idea that* only stimuli **,** that reach / are greater than **,** threshold value / -50mV **,** produce an action potential **;** **ora** **2** (when stimulated) action potential either occurs or does not / all-or-nothing (law) **;** **3** *idea that* the action potential is the same (magnitude / size) **,** no matter how strong the stimulus / even if strength of stimulus increases **;** **4** *idea that* a strong stimulus produces many action potentials (in rapid succession) **;**	2 max	**IGNORE** ref to refractory period as Figs do not indicate this **Note** 'strong stimulus increases frequency but not magnitude of action potential' = **2 marks** (mps 3 & 4)
			Total	15	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(a)	(i)	*product* urea ; *organ transported to* kidney ;	2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** bladder
2	(a)	(ii)	**1** hepatocytes can tolerate , lactate / low pH (which would otherwise be toxic) ; **2** hepatocytes have / (other) cells do not have , enzymes to , metabolise lactate / catalyse this reaction ; **3** (conversion of lactate) requires oxygen and , muscle cells do not have enough oxygen / O_2 is not available during anaerobic respiration / O_2 is sufficient in hepatocytes ;	1 max	**2** **ACCEPT** ref to hepatocytes having the , correct / necessary , enzyme(s)

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(b)		**1** blood glucose (concentration) would fall **,** too low / below normal level **;** **2** *idea that* glucose would continue to be taken up by **,** cells / liver / muscle (results in low blood glucose) **or** *idea that* glucose is continually converted into glycogen / would store too much glucose as glycogen **;** **3** (mitochondria eventually) cannot **,** release enough energy / generate enough ATP (as less available glucose in blood) **;** **4** coma / death **;** **5** AVP **;**	**2 max**	**1** **CREDIT** causes <u>hypoglyc</u>aemia **2** Needs to convey the idea of ***continued / too much*** uptake rather than 'more'. **IGNORE** 'glucose taken up by cells' / 'glucose converted to glycogen' unless suitably qualified **ACCEPT** 'too much glucose is taken up by cells' **3** **CREDIT** ref to use of alternative respiratory substrate **4** **IGNORE** fatigue / tiredness / fainting **5** e.g. ● receptor (on hepatocyte) becomes desensitised ● triggering of glucagon release

STEMUP.CO.UK

Question			Answer	Mark	Guidance
2	(c)	(i)	**1** build-up of lactate / prevention of pathway S , poisons / kills , (liver) cells ; **2** disruption of enzymes as a result of low pH ; **3** *idea that* lack of substrate / fatty acids not available , for respiration ; **4** lack of (oxidised) NAD for (metabolic) reactions ; **5** (some) deamination / ornithine cycle / pathway P / breakdown of (named) hormones / pathway R , cannot occur ; **6** build-up of fatty acids / more fatty acids present , resulting in , fat deposits in (liver) cells / fatty liver / cirrhosis ;	**2 max**	**1** **IGNORE** ref to ethanal **2** **IGNORE** 'affects enzymes' without qualification **4** e.g. ● 'less NAD is available for oxidation of fatty acids' ● 'lack of NAD for respiration' when referring to conversion of lactate to pyruvate the emphasis must be on the lack of available NAD to accept hydrogen from the lactate (and so inhibiting the conversion of lactate to pyruvate) **6** **IGNORE** 'fatty acids build up in liver' without qualification **IGNORE** repetition of bulleted statements without ref to build up **IGNORE** ref to fat deposited around the liver
2	(c)	(ii)	crista(e) / inner mitochondrial membrane ;	**1**	**Mark the first answer.** if the answer if correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** (at) electron transport chain **DO NOT CREDIT** inter mitochondrial membrane
			Total	**8**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(a)		*autotroph* can make **,** organic molecule(s) / named organic molecule(s) **,** from **,** inorganic molecule(s) / carbon dioxide **;** *heterotroph* relies on / needs to use / has to obtain / feeds on and digests **,** (named) organic molecules (that have been made by another organism) **;**	**2**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** ref to biological molecules **ACCEPT** fixes carbon dioxide to produce (named) carbohydrates / protein / lipid idea of ***need*** or ***taking in and breaking down*** is important 'gets its organic molecules from another organism' = **0 marks** 'has to get its organic molecules from another organism' = **1 mark**
3	(b)	(i)	**E** granum / grana **;** **F** stroma **;**	**2**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **E** **IGNORE** ref to stacks of **,** lamellae / thylakoids **F** **DO NOT CREDIT** stoma / storma
3	(b)	(ii)	for membrane formation **or** phospholipid / cholesterol / glycolipid **,** for membrane **;** fatty acid / (named) pigment **,** synthesis **;**	**1 max**	**IGNORE** ref to ATP production (as primarily generated by photophosphorylation in a chloroplast) **ACCEPT** ref to repair of membrane **ACCEPT** ref to (chloroplast) envelope instead of membrane **DO NOT CREDIT** ref to cell surface membrane (as this is not in the chloroplast)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(c)			4 max	**IGNORE** ref to photophosphorylation, as irrelevant to Q
			1 (primary & accessory) **pigment**s **,** are in / form a(n) **,** photosystem / complex / **antenna complex ;**		**1** if pigments are named, state that chlorophyll a **and** at least 1 named accessory pigment are **in a photosystem**
			2 **photon** / light energy **,** absorbed by pigment (molecule(s)) **;**		**2** *idea of* absorption required in the context of this Q **IGNORE** falls on / hits / strikes
			3 electron **,** excited / moves to higher energy level / delocalised **,** and returned to pigment **;**		**3** **DO NOT CREDIT** if ***this*** electron is passed to **,** electron acceptor / ETC **DO NOT CREDIT** in context of chlorophyll a
			4 (energy / photon) passed from one pigment to another **;**		**4** **DO NOT CREDIT** ref to electron being passed
			5 (energy / photon) passed to **,** **reaction centre / chlorophyll a** / P680 / P700 / PSI / PSII / **primary** pigment **;**		**5** **DO NOT CREDIT** ref to electron being passed **But** apply ecf from mp 4
			6 range of / **accessory ,** pigments allow range of **wavelengths** to be absorbed **;**		**6** **CREDIT** 'photon energy' for 'wavelengths' **IGNORE** in context of P680 and P700
			QWC – technical terms used appropriately and spelt correctly **;**	**1**	Use of **three** terms from: **pigment** **antenna complex** **photon** **reaction centre** **chlorophyll** , **a / A** **primary** **accessory** **wavelength**(s) **Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded You should use the green dot to identify the QWC terms that you are crediting.**

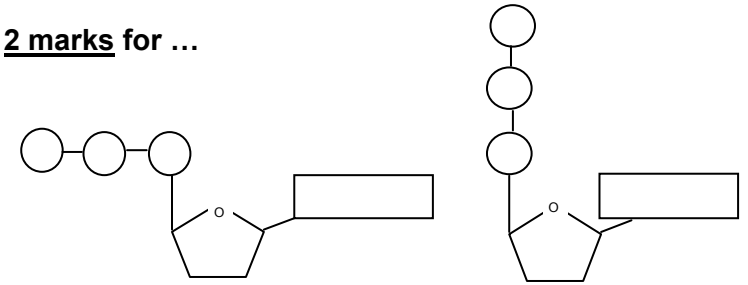
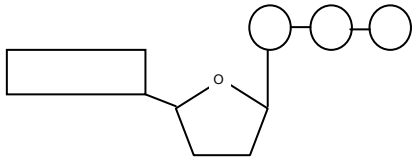
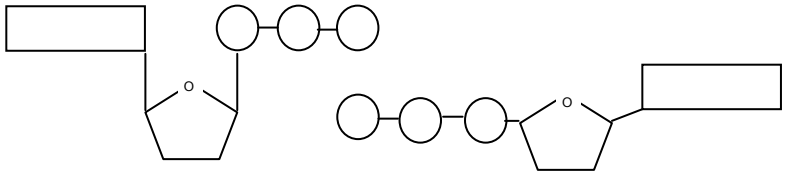
STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(d)	(i)	- 864.3 (kg ha^{-1}) ; - 7.4 (%) ;	2	**DO NOT CREDIT** answer that is not given to 1 dp **DO NOT CREDIT** correct numerical answer without minus sign If no answers on the answer lines, then look in the appropriate boxes in the table for the answers. **ALLOW** ecf from candidate's value for kg ha^{-1}
3	(d)	(ii)	*idea that* the number of , plots / samples , was , too / very , small ;	1	Just ref to a smaller number of plots is not quite enough **CREDIT** *idea that* the number of plots was not large enough **IGNORE** ref to the idea that the difference is very large
3	(d)	(iii)	**1** prevents non-cyclic photophosphorylation ; **2** no electron(s) available to form reduced NADP ; **3** *idea that* ATP production by cyclic photophosphorylation is not prevented ; **4** no / less , ATP and no reduced NADP available for , Calvin cycle / light independent reaction / conversion of GP to TP ;	2 max	**1** **IGNORE** ref to cyclic photophosphorylation **2** **CREDIT** red NADP / NADPH / NADPH + H^+ / $NADPH_2$ for 'reduced NADP'
3	(d)	(iv)	*idea that* energy given off from , high energy / excited , electron (emitted by , chlorophyll / reaction centre) ;	1	
			Total	16	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4					**The spelling must be unambiguous and there must be no implication that another or 'hybrid' term is being given as the answer. In particular, look for** **'gly….' 'glu…'** **'…agon' '…ogen'** **'…genes…' '…genoly…'** **If a candidate has labelled each term with a number or letter and has then answered using these labels, credit appropriately.** **Also credit as appropriate if candidate has used arrows back to the original list.**
4	**(a)**		glycolysis **;**	**1**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
4	**(b)**		glucagon **and** insulin **;**	**1**	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
4	**(c)**		gluconeogenesis **and** glycogenolysis **;**	**1**	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
4	**(d)**		glycolysis **and** glycogenesis **;**	**1**	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
			Total	**4**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(a)	(i)	row of 3 phosphates joined to ribose **and** ribose joined to adenine **;** phosphates and adenine shown joined to correct place on ribose **or** stated that phosphate(s) joined to carbon 5 **and** adenine joined to carbon 1 **;**	2	**CREDIT** a written description that meets the requirements of the mark point **IGNORE** ribose drawn without an 'O' Phosphates must be attached to a vertical line from ribose Adenine must not be attached to a vertical line from ribose **2 marks for …**  **ALLOW 2** for reverse of above (as long as C atoms not numbered incorrectly) eg  **1 mark for …** (as implies that adenine is attached to carbon 5)  (as implies that phosphates are attached to carbon 4)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(a)	(ii)	hydrolysis ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** dephosphorylation **IGNORE** ref to phosphorylation in glycolysis (as, even if addition of phosphate to glucose is explained, this is not the type of reaction)
5	(b)	(i)	1 ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(b)	(ii)	none ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(b)	(iii)	2 / 3 ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			Total	6	

Addendum to F214 January 2013 Question Paper

Chemiosmotic theory is a learning outcome of Module 4 of the F214 specification.

The chemiosmotic theory, as presented in the examination paper for F214, January 2013, and the OCR endorsed A2 Heinemann textbook, has been the subject of debate by a group of Academics working in the area of bioenergetics. This group of scientists has stated that the outer mitochondrial membrane does not play a role in oxidative phosphorylation and, hence, in ATP synthesis.

An account of the chemiosmotic theory has been produced by this group to assist with the teaching and learning of this important topic and has been placed on the OCR website http://www.ocr.org.uk/qualifications/as-a-level-gce-biology-h021-h421/

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(a)		hydrostatic ; water / urea / amino acids / vitamins / small proteins ; ultrafiltration ; water ; capillaries / vessels ;	5	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** blood **DO NOT CREDIT** osmotic / hydrostolic **ALLOW** ADH / hCG / LH **DO NOT CREDIT** ions / salts / minerals (because sentence refers to molecules) **CREDIT** urea **IGNORE** ref to vitamins **DO NOT CREDIT** amino acids (as these are completely reabsorbed) **DO NOT CREDIT** plasma / arteries / arterioles / tissue fluid
6	(b)	(i)	((walls of) blood vessels in) hypothalamus ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** brain
6	(b)	(ii)	osmoreceptor(s) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** neurosecretory (cell body) **DO NOT CREDIT** osmoregulatory

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(c)	(i)	cortex ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
6	(c)	(ii)	water potential of , plasma / blood , will , decrease / become more negative ; (ADH secretion) will increase ;	2	**CREDIT** concentration of Na^+ in , plasma / blood , will increase **IGNORE** ref to increased uptake of Na^+ into blood **DO NOT CREDIT** ADH starts to be released / produced
6	(c)	(iii)	negative feedback ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** cell signaling

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2013

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

Friday 22 June 2012 – Morning

A2 GCE BIOLOGY

F214 Communication, Homeostasis and Energy

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

F21040061 1

F 2 1 4

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2012 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** The cells of the body need to communicate with one another.

State the name given to this process of communication.

..... **[1]**

(b) Fig. 1.1 is an electron micrograph of the junction between two neurones.

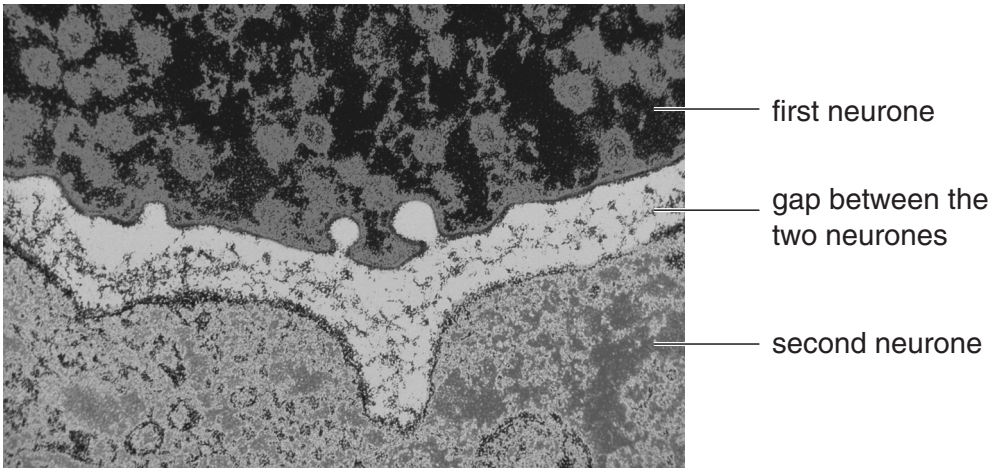


Fig. 1.1

(i) State the name given to the gap between the two neurones at this junction.

..... **[1]**

(ii) Outline how the first neurone communicates with the second neurone across the gap.

In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

© OCR 2012

(iii) Outline the importance of the junctions between neurones in the functioning of the nervous system.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

The nervous system and the hormonal system are involved in the maintenance of core body temperature.

(c) Give the **most suitable** word or term that has the same meaning as each of the following descriptions:

(i) animals that are able to regulate and maintain their core body temperature within narrow limits;

..... **[1]**

(ii) the increase in the diameter of the lumen of an arteriole to allow more blood to flow through.

..... **[1]**

(d) **(i)** Name a hormone that increases the metabolic rate and so generates heat.

..... **[1]**

(ii) Name the part of the brain where the thermoregulatory centre is located.

..... **[1]**

[Total: 12]

© OCR 2012

STEMUP.CO.UK

2 The kidney is composed of many nephrons.

Fig. 2.1 is a diagrammatic representation of a nephron. The numbers represent the relative concentrations of solutes in the tubule and the tissue fluid surrounding the tubule.

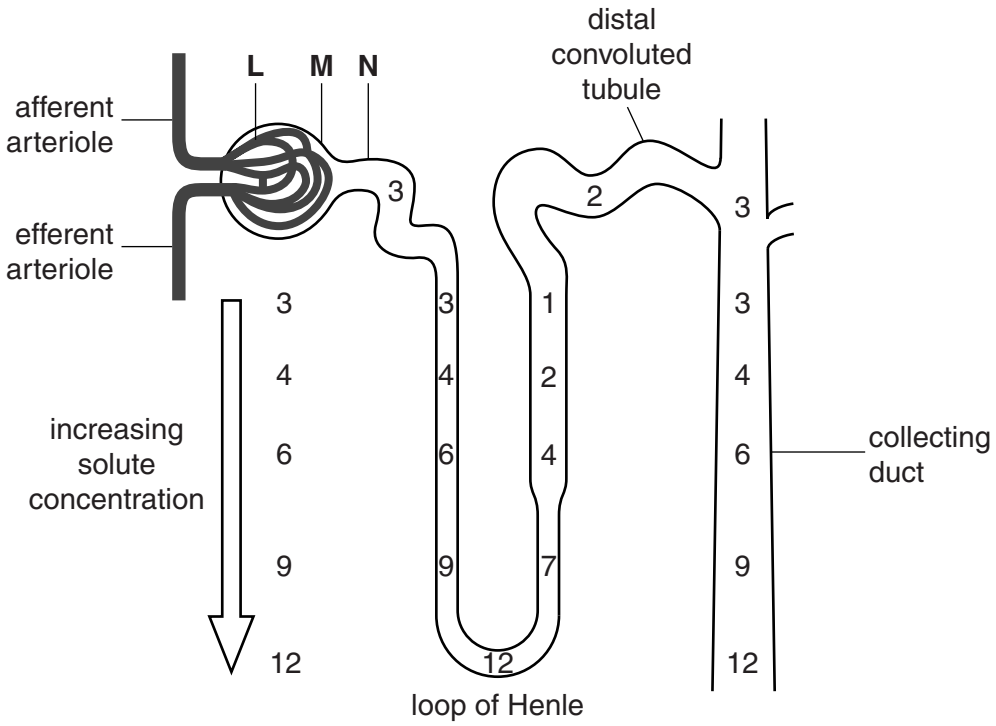


Fig. 2.1

(a) **Name** the parts of the nephron labelled **L**, **M** and **N**.

L .....

M .....

N ..... **[3]**

© OCR 2012

STEMUP.CO.UK

(b) Which part(s) of the nephron corresponds to each of the statements in the table below?

statement	part(s) of the nephron
walls are impermeable to water	
glucose is reabsorbed into the blood	
ADH acts on the walls	
contains podocytes	
most of the water is reabsorbed into the blood	

[5]

(c) With reference to Fig. 2.1, explain the role of the loop of Henle in the production of urine.



In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

[Total: 13]

© OCR 2012

STEMUP.CO.UK

3 The compound 2,3,5-triphenyl-tetrazolium chloride (TTC) is an electron acceptor. TTC will diffuse into actively respiring cells and accept electrons from the electron transport chain.

When TTC accepts electrons and becomes reduced, it changes from colourless to pink. The tissues in which this reaction takes place will be stained a pink colour.

(a) State the **precise** location of the electron transport chain in the cell.

..... **[1]**

(b) A student carried out an investigation into the respiratory activity of plant tissue. She used three groups of germinating broad bean seeds. These were first treated as shown in Table 3.1.

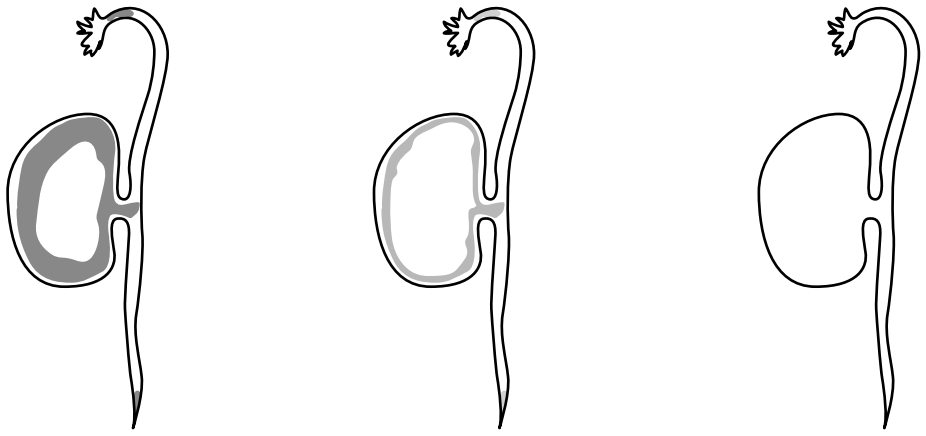
Table 3.1

seed	treatment
group **A**	kept at 22 °C for 24 hours before the investigation
group **B**	kept at 6 °C for 24 hours before the investigation
group **C**	kept at 22 °C for 24 hours and then placed in water at 90 °C for 5 minutes before the investigation

The groups of seeds were then sliced longitudinally and placed, cut surface down, in a shallow dish containing a small volume of TTC solution. The cut surfaces remained in contact with the solution for 10 minutes.

The seeds were then removed from the dish. The excess TTC solution was wiped off and the cut surfaces of the seeds in each group were observed.

The appearance of the seeds in each group is shown in Fig. 3.1. The shaded areas are the regions where the tissues have stained a pink colour.



seeds in group A **seeds in group B** **seeds in group C**

Fig. 3.1

© OCR 2012

(i) Describe the differences observed in the seeds in groups **A**, **B** and **C**.

.....

.....

.....

..... **[1]**

(ii) Suggest reasons for the results observed in the seeds in group **A**.

.....

.....

.....

.....

.....

..... **[2]**

(iii) Suggest reasons for the difference in the amount of staining observed in the seeds in groups **B** and **C** when compared to those in group **A**.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2012

STEMUP.CO.UK

(c) If oxygen is not present or is in short supply, respiration can take an anaerobic pathway **after glycolysis**. In plant cells, this pathway is the same as the one used in yeast cells.

(i) Name the hydrogen acceptor in this pathway.

..... **[1]**

(ii) Name the intermediate compound in this pathway.

..... **[1]**

(iii) Name the products of this pathway.

..... **[1]**

(iv) Explain why this pathway is important for the plant cell.

.....

.....

.....

.....

.....

.....

.....

..... **[2]**

[Total: 11]

© OCR 2012

STEMUP.CO.UK

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

QUESTION 4 STARTS ON PAGE 10

© OCR 2012

STEMUP.CO.UK

4 One way to determine the rate of photosynthesis is to measure the uptake of carbon dioxide.

(a) Discuss why measuring carbon dioxide uptake may or may not give a better indication of photosynthetic activity than measuring oxygen production.

.....

.....

.....

.....

.....

..... **[2]**

(b) Fig. 4.1 shows the relationship between light intensity and the relative carbon dioxide uptake and production in a plant.

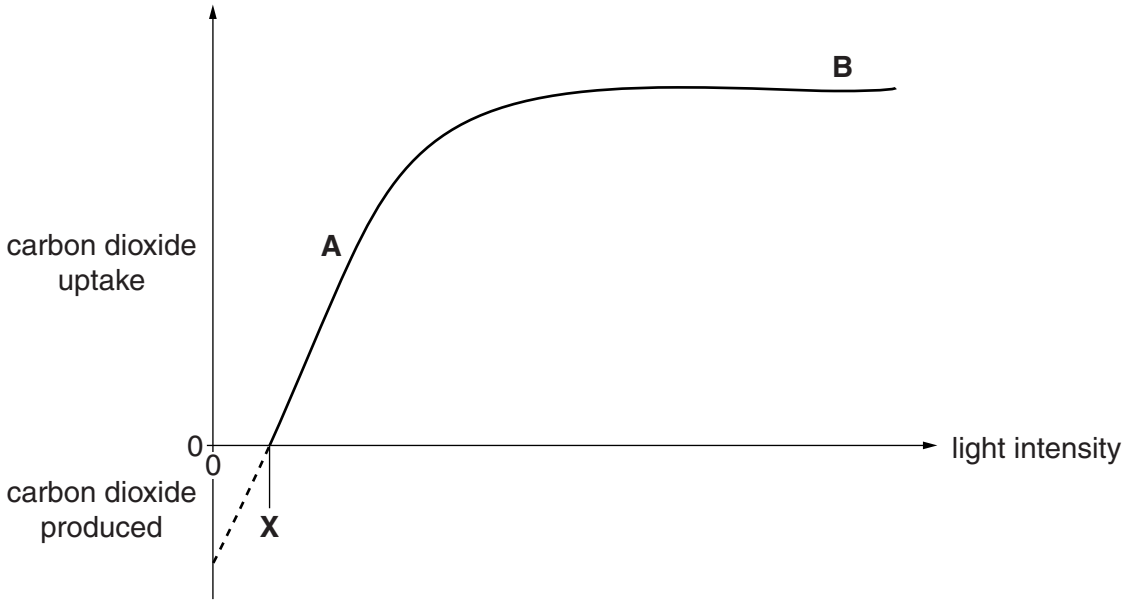


Fig. 4.1

(i) State the factor that is limiting the rate of photosynthesis at **A** on the graph.

..... **[1]**

(ii) Suggest **one** factor that may limit the rate of photosynthesis at **B**.

..... **[1]**

(iii) Carbon dioxide is given off by the plant when the light intensity is lower than **X**.

Name the process that **produces** carbon dioxide in the plant.

..... **[1]**

© OCR 2012

STEMUP.CO.UK

(iv) With reference to Fig. 4.1, explain the biochemical processes that are occurring in the plant:

- as light intensity increases from 0 (zero) to **X**.
- at light intensity **X**.
- at light intensities greater than **X**.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(c) (i) Name the products of the light-dependent stage of photosynthesis.

.....

.....

..... **[3]**

(ii) Paraquat is a weedkiller. It binds with electrons in photosystem I.

Suggest how paraquat results in the death of a plant.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 13]

QUESTION 5 STARTS ON PAGE 12

© OCR 2012

STEMUP.CO.UK

5 The regulation of blood glucose concentration is important for homeostasis and involves hormonal control.

(a) **(i)** Name the endocrine tissue in the pancreas that is responsible for secretion of hormones.

..... **[1]**

(ii) Identify the **specific** cell type in pancreatic tissue that secretes the hormone insulin.

..... **[1]**

(b) The incomplete flowchart below outlines the way in which the secretion of insulin from a pancreatic cell is controlled.

Complete the flowchart by inserting the most appropriate word(s) in the spaces provided.

Insulin secretion is stimulated when the blood glucose concentration

.....

↓

Glucose enters the pancreatic cell through channel proteins. The glucose enters the..... pathway and ATP is produced.

↓

The increase in ATP causes ATP-controlled potassium ion channels to close and the cell membrane becomes .....

↓

This results in the opening of voltage-gated ..... ion channels and the concentration of this ion inside the cell increases.

↓

The increased concentration of these ions causes the secretion of insulin from the cell by the process of .....

[5]

© OCR 2012

STEMUP.CO.UK

(c) (i) Insulin is a polypeptide molecule.

State where in a pancreatic **cell** insulin molecules are synthesised.

..... **[1]**

(ii) Outline the events that occur after the synthesis of an insulin molecule until it is ready to be secreted from the pancreatic cell.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 11]

END OF QUESTION PAPER

© OCR 2012

STEMUP.CO.UK

ADDITIONAL PAGE

If additional space is required, you should use the lined pages below. The question number(s) must be clearly shown.

© OCR 2012

ADDITIONAL PAGE

© OCR 2012

ADDITIONAL PAGE

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2012

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for June 2012

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Annotations used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded

*Quality of Written Communication

Subject Specific Information

SPELLING
Accept phonetic spelling throughout unless otherwise specified.
Underlined terms must be used to gain the mark, but can be spelt phonetically unless otherwise stated.
Correct spelling is required if being credited as a QWC term.

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(a)		cell signalling ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
1	(b)	(i)	synaptic (cleft / space / gap) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ALLOW** synapse **DO NOT CREDIT** synoptic / synopse / synapsis

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(b)	(ii)	**1** (named) **neurotransmitter** / **acetylcholine** **,** released from **pre-synaptic** / first **,** cell / membrane **;** **2** **diffus**es across **,** gap / cleft / **synaptic cleft** ***or*** reaches second **,** neurone / cell / membrane **,** by diffusion **;** **3** attaches to **, receptors** / binding sites of sodium channels **,** on **post-synaptic** membrane / membrane of second cell **;** **4** neurotransmitter / acetylcholine **,** broken down (in cleft) **;**	2 max	**DO NOT CREDIT a mark point** if stated that complete *vesicles* (even if containing neurotransmitter) are involved ***1*** *release of neurotransmitter* must be clearly stated ***2*** **IGNORE** synapse ***3*** **DO NOT CREDIT** post-synaptic knob / bulb ***Note*** *that a statement reading:* *'Diffuses across and attaches to receptors on the post-synaptic membrane'* **= 2 marks** (mps 2 & 3) ***4*** **CREDIT** ref to action of cholinesterase
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **neurotransmitter**, **acetylcholine**, **pre-synaptic / presynaptic**, **diffus**e / **diffus**ion, **synaptic cleft**, **receptor**, **post-synaptic / postsynaptic** Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded You should use the green dot to identify the QWC terms that you are crediting.

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(b)	(iii)	**1** ensures movement of **,** impulse / action potential **,** in one direction (only) **;** **2** integration **or** one neurone can **,** connect to / receive impulses from / transmit impulses to **,** many neurones **;** **3** allows summation **;** **4** *idea* that filters out **,** 'background' / low level **,** stimuli **or** ensures that only stimulation that is strong enough will be passed on**;** **5** AVP **;**	3 max	**IGNORE** ref to 'signals' / 'messages' / coordination ***1*** **ACCEPT** description eg ACh only released from presynaptic and receptors only on postsynaptic ***3*** **ACCEPT** description eg enough action potentials arrive to trigger depolarisation in next neurone ***5*** eg • permits **,** memory / learning • acclimatisation (or described) • prevents continuous stimulation of neurones • synapses are of two types – excitatory and inhibitory
1	(c)	(i)	endotherm(s) **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **CREDIT** homoiothermic

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(c)	(ii)	(vaso)dilation ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** 'arteriole' **DO NOT CREDIT** 'arterial dilation'
1	(d)	(i)	thyroxine / adrenaline;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** adrenalin / thyroxin **/** epinephrin(e)
1	(d)	(ii)	hypothalamus ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			Total	**12**	

STEMUP.CO.UK

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>L glomerulus ;

M Bowman’s / renal , capsule ;

N proximal convoluted tubule ;</td><td>3</td><td>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

L ACCEPT ‘capillary knot’
IGNORE ‘capillary unqualified’

N IGNORE ‘first’
IGNORE PCT / pct (as Q asks for ‘name’)</td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>
<table>
<tr><th>statement</th><th>part(s) of the nephron</th><th></th></tr>
<tr><td>walls are impermeable to water</td><td>ascending (limb of loop of Henle)</td><td>;</td></tr>
<tr><td>glucose is reabsorbed into the blood</td><td>proximal convoluted tubule / N</td><td>;</td></tr>
<tr><td>ADH acts on the walls</td><td>collecting duct / distal convoluted tubule</td><td>;</td></tr>
<tr><td>contains podocytes</td><td>Bowman’s capsule / renal capsule / M</td><td>;</td></tr>
<tr><td>most of the water is reabsorbed into the blood</td><td>proximal convoluted tubule / N</td><td>;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

ACCEPT rising limb

ACCEPT pct / first convoluted tubule

ACCEPT DCT / dct / second convoluted tubule

ACCEPT pct / first convoluted tubule</td></tr>
</table>

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(c)		**1** *role of loop of Henle is to* cause a decrease in **water potential** in / establish water potential gradient going down **,** **<u>medulla</u>** **;** **2** (as) in **ascending** limb **active transport** outwards of **,** solutes / (sodium and chloride) **ions** **;** **3** (walls of) **descending** limb permeable to water **;** **4** water removed from descending limb **;** **5** water potential of tissues surrounding collecting duct is low(er) than fluid inside it **;** **6** water removed from **,** filtrate / urine (in collecting duct) **;** **7** AVP **;**	4 max	***1*** **Do not award** for a simple statement that 'there is a lower water potential in the medulla' ***2*** **ACCEPT** 'pumped' for active transport ***3*** **IGNORE** ref to permeability to ions ***5*** **ACCEPT** 'contents of collecting duct' ***7*** eg • acts as a countercurrent **,** system / multiplier • the drier the habitat the longer the loop • *idea that* urea contributes to low water potential in medulla • (facilitated) diffusion of ions out of the loop at the bottom
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **water potential**, **medulla**, **ascending**, **active transport** (or derived term), **ion**(s), **descending** **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
			Total	**13**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(a)		crista(e) / inner mitochondrial membrane ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** thylakoid membrane / lamella(e) (of chloroplast)
3	(b)	(i)	**A** has more stain than **B** **and** **C** has none ;	1	All 3 seeds must be mentioned Staining ref. could relate to area or intensity of stain. **DO NOT CREDIT** implication that C has any staining **ACCEPT** 'shading' instead of 'staining' **IGNORE** ref to presence or absence of TTC (as it is present in all regions of all seedlings and it is the *staining* that is important)
3	(b)	(ii)	**1** *idea that* shaded areas in **A** are respiring ; **2** *idea that* 22°C is suitable temperature for respiration ; **3** reduced , NAD / FAD / coenzymes , produced in , glycolysis / link reaction / Krebs cycle ; **4** lots of / more , electron transfer (to TTC) / (oxidative) phosphorylation / chemiosmosis ;	2 max	***1*** **ACCEPT** a description of the respiring area(s) eg the outer regions of the seed are respiring ***3*** **ACCEPT** NADH / $NADH^+$ / $NADH + H^+$ / $NADH_2$ / FADH / $FADH^+$ / $FADH + H^+$ / $FADH_2$

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(b)	(iii)	(named stage of) respiration uses **,** enzymes / proteins in ETC / electron carriers **;** *group B* not enough kinetic energy for **,** ESC formation / substrates and enzymes to collide (successfully) **;** *group C* enzymes / proteins in ETC / electron carriers **,** denatured by **,** high temperature / (almost) boiling water **;**	2 max	**IGNORE** coenzymes ***Note** that a statement reading:* 'the respiratory enzymes are denatured by 90°C in C' **= 2 marks** (mps 1 and 3)
3	(c)	(i)	ethanal **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** acetaldehyde **IGNORE** formulae (as name asked for in Q)
3	(c)	(ii)	ethanal **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** acetaldehyde **IGNORE** formulae (as name asked for in Q)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(c)	(iii)	ethanol **and** carbon dioxide **;**	1	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** formulae **IGNORE** alcohol unless specified as 'ethyl alcohol' **IGNORE** (oxidised) NAD **DO NOT CREDIT** NADP / reduced NAD / ATP
3	(c)	(iv)	**1** releases NAD **,** to accept more H / to be reduced again / so glycolysis can continue **or** allows (some) ATP to be generated (in glycolysis) **;** **2** (some ATP available) for named cellular process **;** **3** AVP **;**	2 max	***1*** the idea that cells can still respire is not quite enough ***2*** eg • active transport • endocytosis / exocytosis / pinocytosis • mitosis / meiosis • protein synthesis • DNA replication • Calvin cycle / light-independent stage of photosynthesis ***3*** eg • stated situation where oxygen is in short supply (e.g. waterlogging / compacted soil / roots situated very deep in soil) **IGNORE** can respire in low oxygen conditions (as stated in Q)
			Total	**11**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(a)		*oxygen* **1** oxygen ***only*** produced in one (named) stage of photosynthesis **;** **2** oxygen ***produced*** might be used for respiration **;** *carbon dioxide* **3** CO_2 ***only*** used in one (named) stage of photosynthesis **;** **4** CO_2 ***produced*** during respiration might be used for **,** photosynthesis / light independent reaction / Calvin cycle **;** **5** O_2 / CO_2 / both **,** could be an underestimate **or** represents net production (O_2) **or** represents net use (CO_2) **;**	2 max	***1*** **CREDIT** for O_2 'only measures the rate of the light dependent stage / photolysis' ***3*** **CREDIT** for CO_2 'only measures the rate of the Calvin cycle' ***5*** **ACCEPT** a description e.g. 'measurement is less than expected because not all the oxygen produced can be measured' (but not if expressed in terms of terms of experimental error – e.g. dissolves in the water) **IGNORE** refs to reliability / accuracy
4	(b)	(i)	light <u>intensity</u> **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(b)	(ii)	carbon dioxide <u>concentration</u> / partial pressure of CO_2 / temperature **;** AVP **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** 'high' or 'low', as these indicate situations rather than factors eg • stomatal density • stomatal size • chlorophyll concentration • number of chloroplasts • enzyme turnover rate **IGNORE** (temporary) changes in stomatal **,** opening / closing **IGNORE** ref to water availability
	(b)	(iii)	(aerobic / anaerobic) respiration **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** Krebs cycle / link reaction / decarboxylation **DO NOT CREDIT** photorespiration (as light intensity stated as being low)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(b)	(iv)	**1** at 0 **,** respiration only / no photosynthesis **;** *between 0 and X* **2** *idea that* (rate of) respiration is greater than (rate of) photosynthesis **;** *at X* **3** *idea that* (rate of) respiration equals (rate of) photosynthesis / at compensation point **;** *after X* **4** *idea that* (rate of) photosynthesis is greater than (rate of) respiration **;**	3 max	Assume that candidate is answering in the same order as the bullet points, unless otherwise indicated. **IGNORE** photorespiration throughout **CREDIT** **'**Calvin cycle' for 'photosynthesis' throughout For **mps 2, 3 & 4** must include clear ref. to both respiration and photosynthesis ***2*** **DO NOT CREDIT** no photosynthesis
4	(c)	(i)	reduced NADP / NADPH / $NADPH_2$ / $NADPH^+$ **;** ATP **;** oxygen **;**	3	**Mark the first 3 answers.** **IGNORE** numbers of molecules **ACCEPT** O_2 (to be consistent with the other answers to this question)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(c)	(ii)	**1** prevents <u>photophosphorylation</u> **;** **2** cyclic **<u>and</u>** non-cyclic **;** **3** no / less **,** ATP / reduced NADP **,** for **,** light-independent stage / Calvin cycle / GP to TP **;** **4** no (named) substrate made for <u>respiration</u> **;**	2 max	***3*** 'no ATP for photosynthesis' is not quite enough **DO NOT CREDIT** (oxidised) NADP ***4*** substrate eg glucose / starch / carbohydrate / sucrose / sugars **IGNORE** triose phosphate / food / nutrients
			Total	**13**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(a)	(i)	islet(s) of Langerhans ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** α and β cells
5	(a)	(ii)	beta / β ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** b **IGNORE** islets (of Langerhans) **DO NOT CREDIT** B (confusion with immune system)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(b)		*in gap order* **1** increases **;** **2** glycolytic / glycolysis **;** **3** depolarised **;** **4** calcium **;** **5** exocytosis **;**	5	**Mark the first answer on each prompt line.** If the answer is correct and an answer is given that is incorrect or contradicts the correct answer then **= 0 marks** ***1*** **CREDIT** rises / gets higher **ACCEPT** 'is high' ***2*** **IGNORE** metabolic / respiratory ***3*** **ACCEPT** **'**less negative / more positive **,** on the inside (than previously)' **or** 'less positive / more negative **,** on the outside (than previously)' **IGNORE** figures (as Q has asked for words) **DO NOT CREDIT** ionised / polarised ***4*** **IGNORE** Ca or Ca^{2+} (as Q has asked for words) **DO NOT CREDIT** if incorrect symbols given (e.g. Ca^{+} , CA^{2+})
5	(c)	(i)	ribosome / <u>rough</u> endoplasmic reticulum / <u>R</u>ER **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** rRNA (as this is not *where* proteins are made)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(c)	(ii)	**1** transported to Golgi **;** **2** modified / processed **,** in Golgi **;** **3** packaged into / stored in **,** (Golgi) vesicle(s) **;** **4** vesicles transported towards **,** plasma / cell surface **,** membrane **;** **5** AVP **;**	3 max	**IGNORE** ref. to mechanism of insulin secretion **IGNORE** ref. to negative feedback control of insulin secretion ***2*** **DO NOT CREDIT** if ref. to carbohydrate ***4*** **IGNORE** 'fuses with membrane' ***5*** eg • detail of modification (splitting / recombining, polypeptide) • role of cytoskeleton • use of ATP (in context of, modification / movement)
			Total	**11**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2012

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

Wednesday 25 January 2012 – Morning

A2 GCE BIOLOGY

F214 Communication, Homeostasis and Energy

F21O4O111

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

F214

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

© OCR 2012 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** The control of blood glucose is a very important aspect of homeostasis.

(i) Explain what is meant by the term *homeostasis*.

.....

.....

.....

.....

..... **[2]**

(ii) Describe how negative feedback is used to control blood glucose concentration.



In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

© OCR 2012

(b) A 55 year old man visited the doctor and was newly diagnosed with diabetes.

- The doctor initially recommended to the man that he should change his diet to cut out excess carbohydrate, including sugars such as glucose and make a further appointment to check on his progress.
- At this second appointment, however, it was discovered that the dietary changes had not been effective, which was unexpected.
- It turned out that the man had a form of diabetes that required daily hormone injections to control his blood sugar concentration.

Using **only the information given above**, state how **this** man's form of diabetes is **similar** to:

(i) Type 1 diabetes

.....

.....

..... **[1]**

(ii) Type 2 diabetes.

.....

.....

..... **[1]**

[Total: 10]

© OCR 2012

STEMUP.CO.UK

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2012

2 Urine is a liquid that is composed of a number of different substances.

(a) Urea is one compound that is excreted from the mammalian body in urine.

(i) Name the organ that **produces** urea.

..... **[1]**

(ii) It has been observed that the urea content of urine is relatively high when a person eats an excessive amount of protein in their diet.

Suggest why a high intake of protein in the diet will be likely to result in a high concentration of urea in urine.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(b) Suggest what condition is indicated by the presence of glucose in a person's urine.

..... **[1]**

(c) **(i)** Pregnancy may be detected by testing a woman's urine.

State the substance that is being tested for in urine when a pregnancy test is carried out.

..... **[1]**

© OCR 2012

STEMUP.CO.UK

(ii) Ovulation is the release of an egg cell from the ovary. In order for pregnancy to occur, the egg cell must be fertilised within 24 hours of its release from the ovary.

Immediately before ovulation, the body produces a large amount of luteinising hormone (LH). This is known as the LH surge and triggers ovulation. It is during this time that fertilisation is most likely to occur.

- If a woman is trying to get pregnant, it can be useful to know when ovulation has occurred.
- It is possible to identify the LH surge by using a test stick to detect LH in urine.
- The test stick for LH works in a similar way to the test stick used for detecting pregnancy.

Fig. 2.1 shows the features of a test stick that can be used to test for LH in urine.

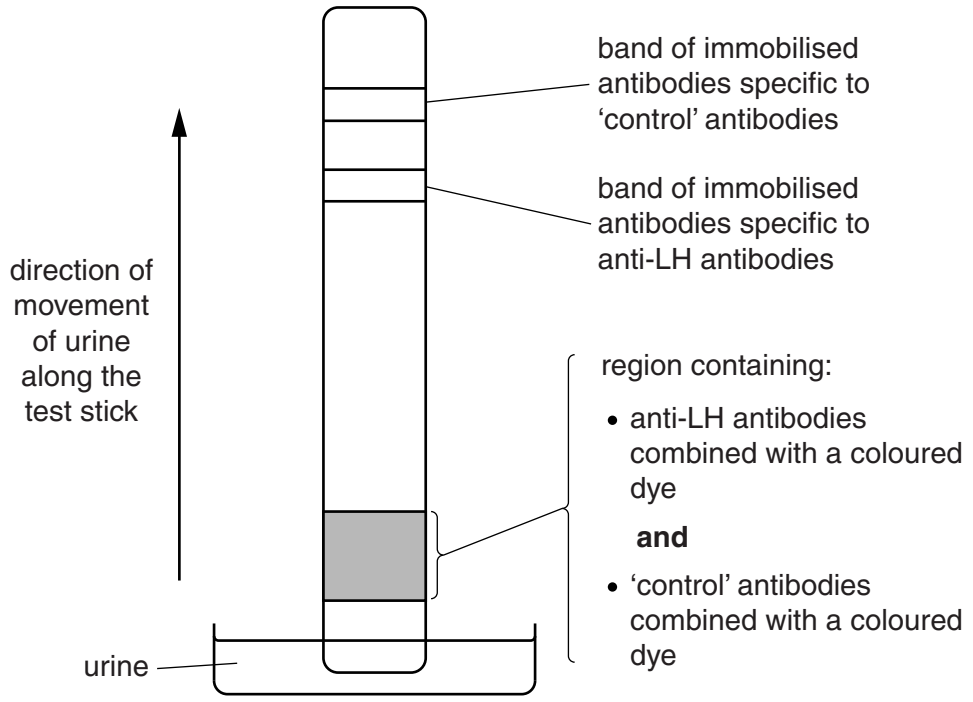


Fig. 2.1

© OCR 2012

7

Using your knowledge of how a test stick works, suggest how the test stick in Fig. 2.1 can be used to indicate a positive result for LH in urine.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 9]

© OCR 2012

STEMUP.CO.UK

3 **(a)** Fig. 3.1 is an electron micrograph of a chloroplast from a tobacco leaf.

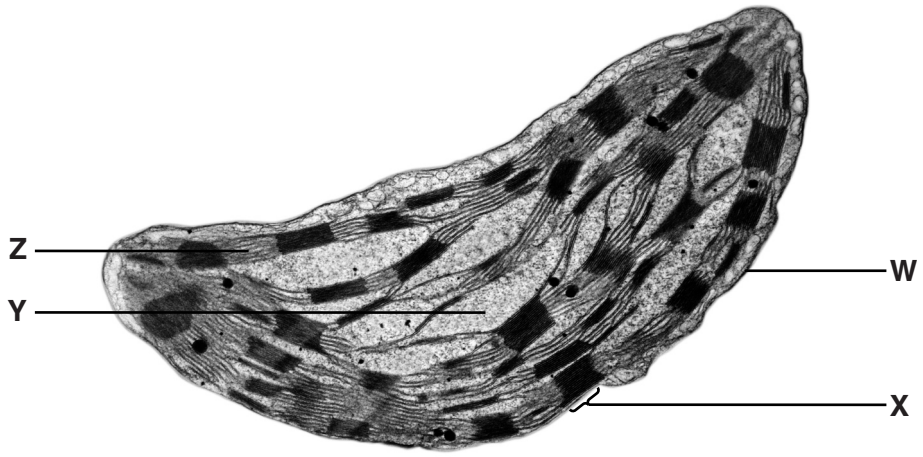


Fig. 3.1

(i) Identify the structures labelled **W** to **Z**.

W .....

X .....

Y .....

Z ..... **[4]**

(ii) In addition to the structures seen in Fig. 3.1, a chloroplast also contains DNA and ribosomes.

Suggest the role of DNA and ribosomes **in this organelle**.

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2012

STEMUP.CO.UK

(b) The table below contains statements that refer to the light-dependent stage of photosynthesis.

Complete the table, indicating with the letters **C**, **N** or **B**, whether each statement applies to:

- cyclic photophosphorylation only (**C**)

  or

- non-cyclic photophosphorylation only (**N**)

  or

- both cyclic and non-cyclic photophosphorylation (**B**)

The first one has been completed for you.

statement	letter
ATP is produced	**B**
an electron leaves photosystem I	
electrons are passed along an electron carrier chain	
electrons leave both photosystem I and photosystem II	
an electron from a water molecule replaces the electron lost from the photosystem	
the same electron returns to the photosystem	

[5]

[Total: 11]

© OCR 2012

STEMUP.CO.UK

4 One way of calculating the rate of respiration is to measure the volume of oxygen taken up over a period of time.

A student carried out an experiment to investigate the effect of temperature on the rate of respiration in soaked (germinating) pea seeds and dry (dormant) pea seeds.

A simple piece of apparatus called a respirometer was used, as shown in Fig. 4.1.

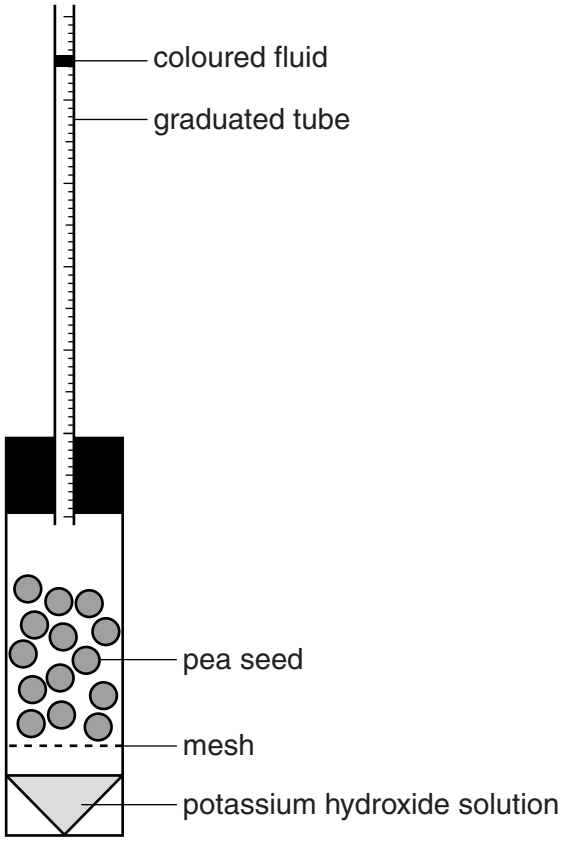


Fig. 4.1

The potassium hydroxide solution in this apparatus absorbs carbon dioxide. If the apparatus is kept at a constant temperature, any changes in the volume of air in the respirometer will be due to oxygen uptake.

(a) State the stage or stages of aerobic respiration during which:

(i) carbon dioxide is produced

.....

..... **[1]**

(ii) oxygen is used.

.....

..... **[1]**

© OCR 2012

STEMUP.CO.UK

(b) The student set up three respirometers, **A**, **B** and **C**, in water baths at two different temperatures. The respirometers were left for 10 minutes in order to equilibrate.

The contents of each respirometer are shown in Table 4.1.

Table 4.1

temperature (°C)	respirometer	contents
15	**A**	30 soaked pea seeds
	B	glass beads + 30 dry pea seeds
	C	glass beads
25	**A**	30 soaked pea seeds
	B	glass beads + 30 dry pea seeds
	C	glass beads

At each temperature, respirometer **C,** which contained only glass beads, was a control.

Respirometer **B**, at each temperature, also contained some glass beads.

(i) Suggest why, at each temperature, respirometer **B** contained **some** glass beads.

.....

.....

.....

.....

.....

..... **[2]**

(ii) Suggest how the student determined the quantity of glass beads to place in respirometer **B** at each temperature.

.....

.....

.....

.....

.....

..... **[2]**

QUESTION 4(c) STARTS ON PAGE 12

© OCR 2012

STEMUP.CO.UK

(c) After the student had left each respirometer to equilibrate, a small volume of coloured fluid was introduced into each graduated tube.

The respirometers were then left in the appropriate water baths for 20 minutes and maintained at the correct temperature. During this time, the coloured fluid in the graduated tube moved.

The level of the coloured fluid in each respirometer was recorded at the start of the experiment and after 20 minutes.

The results are summarised in Table 4.2.

Table 4.2

temperature (°C)	respirometer	reading at start (cm^3)	reading after 20 minutes (cm^3)	difference (cm^3)	corrected difference (cm^3)	rate of oxygen uptake ($cm^3\,min^{-1}$)
15	**A**	0.93	0.74	0.19	0.16	0.008
	B	0.93	0.86	0.07	0.04	0.002
	C	0.91	0.88	0.03		
25	**A**	0.94	0.63	0.31	0.27	
	B	0.93	0.84	0.09	0.05	0.003
	C	0.95	0.91	0.04		

(i) Table 4.2 is incomplete.

Calculate the missing value for the rate of oxygen uptake for soaked pea seeds (**A**) at **25 °C**.

Show your working.

Answer = ... $cm^3\,min^{-1}$ **[2]**

© OCR 2012

STEMUP.CO.UK

(ii) Explain why there is an increased rate of respiration in soaked seeds at 25 °C compared with soaked seeds at 15 °C.

.....

.....

.....

.....

.....

..... **[2]**

(iii) Suggest a reason for the difference in the rate of respiration between soaked and dry pea seeds.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 12]

QUESTION 5 STARTS ON PAGE 14

© OCR 2012

STEMUP.CO.UK

5 Fig. 5.1 is a photomicrograph of a horizontal section through the cortex of a mammalian kidney.

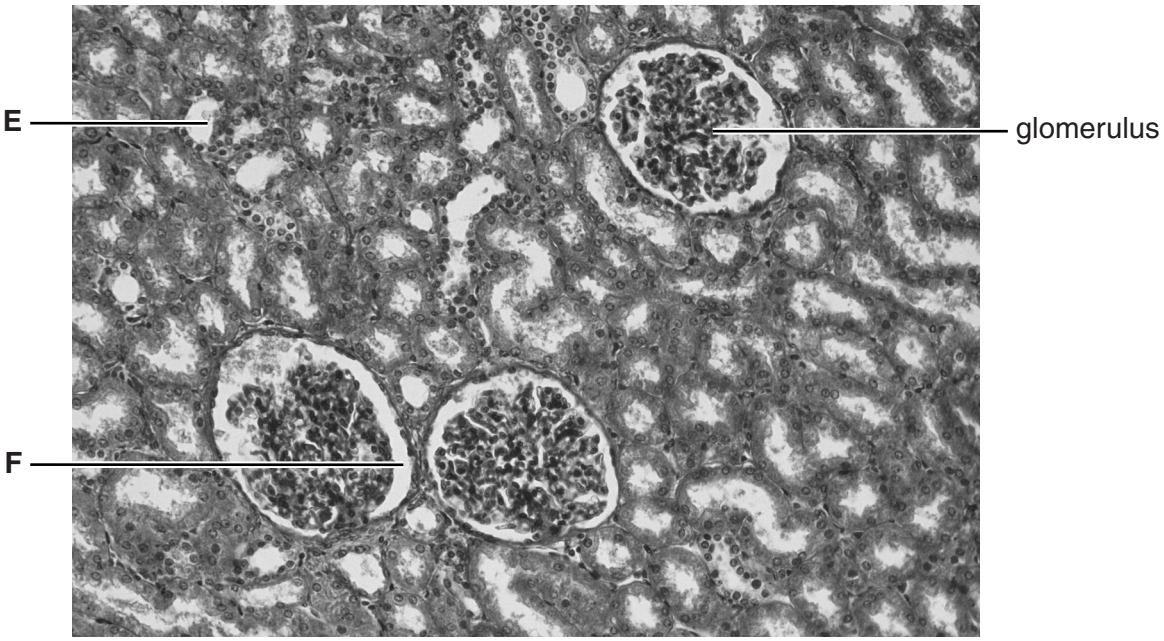


Fig. 5.1

(a) Identify the structures labelled **E** and **F** in Fig. 5.1.

E .....

F ..... **[2]**

(b) **(i)** Explain how the glomerulus is able to perform its function.

In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

© OCR 2012

(ii) **Name** the specialised cells present in structure **F** that assist in the function you described in **(b)(i)**.

..... **[1]**

(c) Kidney failure has serious consequences for the individual.

(i) Suggest the effects of complete kidney failure on the **composition of the blood**.

.....

.....

.....

.....

.....

..... **[2]**

(ii) One way of treating a person with kidney failure is by giving them a kidney transplant.

Explain the need for close matching of the donated kidney to the recipient.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 11]

QUESTION 6 STARTS ON PAGE 16

© OCR 2012

STEMUP.CO.UK

6 In order to survive, animals need to be able to respond to changes in the internal and external environment.

(a) Complete the following passage by using the most appropriate word(s) or term(s).

Specialised cells that are able to detect stimuli can be found both within and at the surface of an animal's body. These specialised cells can be found singly or in groups and are known as sensory ..... .

Each cell is specialised to respond to a particular type of stimulus. Some specialised cells in the retina of the eye respond to the ..... and wavelength of light. Groups of specialised cells in the nose and on the tongue detect ..... stimuli and this results in the ability to smell and taste.

When specialised cells receive an appropriate stimulus which is above the threshold ..... , the cells are able to convert this energy into a nerve ..... . **[5]**

(b) Following the detection of a stimulus, sensory and motor neurones co-ordinate the body's response to this stimulus.

State **one** way in which:

(i) the **structure** of a motor neurone differs from that of a sensory neurone

.....

.....

..... **[1]**

(ii) the **function** of a motor neurone differs from that of a sensory neurone.

.....

.....

..... **[1]**

[Total: 7]

END OF QUESTION PAPER

© OCR 2012

STEMUP.CO.UK

ADDITIONAL PAGES

If additional space is required, you should use the lined pages below. The question number(s) must be clearly shown.

© OCR 2012

ADDITIONAL PAGE

© OCR 2012

ADDITIONAL PAGE

© OCR 2012

ADDITIONAL PAGE

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2012

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for January 2012

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded

**Quality of Written Communication*

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(a)	(i)	**1** *idea of* maintaining (relatively) stable internal **,** environment / state **;** **2** within (narrow) limits / within (narrow) range / about a set point **;** **3** even though environment is changing **;**	**2 max**	**1** Need the idea of 'constant' or 'steady' **and** 'regulation' or 'keeping' **and** in the body **2 ACCEPT** about the 'norm' **IGNORE** ref to negative feedback (as mechanism rather than definition) / optimum conditions **CREDIT** mps 2 & 3 (only) if response is in terms of example(s) e.g. temperature / blood glucose ***Note*** 'maintaining a stable body temperature' = 0 'keeping your body temperature at 37°C' = 1 (mp 2) 'even though it is getting cold' = 1 (mp 3)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(a)	(ii)	**1** β cells / α cells / **receptor**s , detect , change / increased / decreased , in blood glucose (concentration) ; **2** if high(er) glucose (concentration) , **beta** / β , cells (in pancreas) release **insulin** ; **3** (increased) uptake / absorption , of glucose by , liver / muscle / **effector** , cells ; **4** enters through glucose transport proteins (in cell surface membrane) ; **5** glucose converted to **glycogen** / **glycogenesis** ; **6** increased (use of glucose in) , respiration / ATP production ; **7** if low(er) glucose (concentration) , **alpha** / α , (in pancreas) cells release **glucagon** ; **8** (increased) conversion of glycogen to glucose / **glycogenolysis** ; **9** (increased) conversion of other compounds (amino acids / lipids) to glucose / **gluconeogenesis** ; **10** glucose leaves cells , by **facilitated diffusion** / through glucose channels ; **11** AVP ;	**5 max**	**1** β cells / α cells / **receptor**s , detect , change / increased / decreased , in blood glucose (concentration) ; **CREDIT** correct ref to detection by α/a (low) or β/b (high) **IGNORE** monitor / stimulate / figures quoted **2** if high(er) glucose (concentration) , **beta** / β , cells (in pancreas) release **insulin** ; **ACCEPT** 'produce' rather than release **DO NOT CREDIT** B cells **3** (increased) uptake / absorption , of glucose by , liver / muscle / **effector** , cells ; **CREDIT** increased permeability of named cell to glucose **IGNORE** 'use' / target cell **4** enters through glucose transport proteins (in cell surface membrane) ; **CREDIT** GLUT channels **5** glucose converted to **glycogen** / **glycogenesis** ; unambiguous spelling only of glycogen and glycogenesis **6** increased (use of glucose in) , respiration / ATP production ; **DO NOT CREDIT** in context of α and β cells **ACCEPT** 'increased respiration by body' **7** if low(er) glucose (concentration) , **alpha** / α , (in pancreas) cells release **glucagon** ; unambiguous spelling only of glucagon **ACCEPT** 'produce' rather than release **8** (increased) conversion of glycogen to glucose / **glycogenolysis** ; unambiguous spelling only of glycogen and glycogenolysis **9** (increased) conversion of other compounds (amino acids / lipids) to glucose / **gluconeogenesis** ; unambiguous spelling only of gluconeogenesis **11** AVP ; e.g. correct cellular detail for insulin release or in effector cells … ● insulin binds to receptor on plasma membrane of hepatocytes ● correct ref to secondary messenger (cAMP) e.g. ref to inhibitory effect(s) of hormone … ● conversion in cells / secretion of antagonist
			QWC – technical terms used appropriately and spelt correctly ;	**1**	Use of **three** terms from: **receptor**, **effector**, **alpha**, **gluconeogenesis**, **beta**, **glycogen**, **glucagon**, **facilitated diffusion**, **insulin**, **glycogenesis**, **glycogenolysis**, **Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
1	(b)	(i)	requires (daily) **,** insulin / hormone **,** injections **;** is not affected by dietary changes **;**	**1 max**	**ACCEPT** insulin is not being produced in sufficient quantities
1	(b)	(ii)	*idea that* has developed in **,** an old(er) person / middle age / a 55 year old **;**	**1**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** references to diet, as this was ineffective **but use NBOD icon to indicate this**
			Total	**10**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(a)	(i)	liver ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
2	(a)	(ii)	**1** (high intake of protein) leads to a large amount of amino acids ; **2** (excess) amino acids cannot be stored ; **3** amino acids deaminated **or** amine group / NH_2 , removed / converted to ammonia ; **4** (large amount of) ammonia enters ornithine cycle (for conversion to urea) ; **5** increased , blood / plasma , concentration of urea (leads to more urea in , filtrate / urine) ; **6** high concentration of , amino acids / urea , in blood increases water absorption from urine ;	3 max	**1** Must emphasise the idea of *leading to* , more / too many / lots of , amino acids **3 DO NOT CREDIT** deamination of protein **IGNORE** amino group **4 ACCEPT** ref to urea cycle instead of ornithine cycle correct diagram of the cycle
2	(b)		diabetes (mellitus) ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** kidney disease / nephritis / kidney failure / pregnancy **IGNORE** type 1 or 2

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(c)	(i)	(human) chorionic gonadotrop(h)in / hCG**;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spelling (a vowel between the ch and r) **DO NOT CREDIT** chronic **ACCEPT** combinations of lower and upper case letters **DO NOT CREDIT** letters in the incorrect order (eg hGC)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
2	(c)	(ii)			**ACCEPT** joins / attaches **,** for 'bind' throughout **IGNORE** **'**reacts with' **DO NOT CREDIT** active site / enzyme references instead of antibodies **If a candidate's <u>whole</u> answer is in terms of pregnancy testing, DO NOT CREDIT mps 1, 2 & 3**
			1 LH binds to **,** anti-LH / its complementary (free / mobile / with dye) **,** antibodies **;**		**1** **ACCEPT** hormone for LH 'specific' for 'complementary'
			2 this (LH-anti-LH) antibody complex moves along (test stick together with urine) **;**		**2** **IGNORE** urine moving along the stick on its own
			3 this (LH-anti-LH) antibody complex binds (only) with **,** immobilised antibodies specific to them / lower band of immobilised antibodies **;**		
			4 (only) control antibodies bind with **,** immobilised antibodies specific to them / upper band of immobilised antibodies **;**		
			5 *idea that* binding of antibody (with dye to its immobilised anti-antibody) produces coloured line **;**		**5** **Award** in context of either LH or control line
			6 2 lines indicates **,** positive result / presence of LH **or** darker line = more LH **or** 'control' / top **,** line indicates the strip is working (correctly) **or** 'control' / top **,** line alone indicates no LH **;**	**3 max**	**6** **DO NOT CREDIT** this alternative in context of positive pregnancy result
			Total	**9**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(a)	(i)	**W** (chloroplast outer) membrane / envelope ; **X** granum / grana ; **Y** <u>stroma</u> ; **Z** thylakoid(s) / (intergranal) lamella(e) ;	**4**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **W** **DO NOT CREDIT** cell / plasma , membrane **DO NOT CREDIT** inner membrane alone but **IGNORE** if stated together with outer **X** **ACCEPT** granal stack / thylakoid stack **Y** **DO NOT CREDIT** stoma / matrix / cytoplasm
3	(a)	(ii)	**1** (DNA) coding for , gene(s) / protein / enzyme **or** (ribosome) protein / enzyme , synthesis ; **2** (enzymes for production of / proteins for) chlorophyll synthesis / pigment synthesis / photosystem ; **3** (protein for) electron , acceptor(s) / carrier(s) ; **4** ATP synth(et)ase ; **5** (enzyme / PSII) for , photolysis / splitting of water ; **6** (enzymes for) Calvin cycle / light independent reaction ;	**2 max**	**DO NOT CREDIT any** mps in context of respiration **1** **IGNORE** 'information' **/** ref to replication **DO NOT CREDIT** making amino acids **3** **CREDIT** named acceptor / carrier (e.g. NADP / cytochrome) **6** **CREDIT** Rubisco

STEMUP.CO.UK

Question			Answer	Marks	Guidance
3	(b)		<table><tr><th>statement</th><th>letter</th></tr><tr><td>ATP is produced</td><td>B</td></tr><tr><td>an electron leaves photosystem I</td><td>B ;</td></tr><tr><td>electrons are passed along an electron carrier chain</td><td>B ;</td></tr><tr><td>electrons leave both photosystem I and photosystem II</td><td>N ;</td></tr><tr><td>an electron from a water molecule replaces the electron lost from the photosystem</td><td>N ;</td></tr><tr><td>the same electron returns to the photosystem</td><td>C ;</td></tr></table>	5	**Mark the first answer in each box.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks **ACCEPT** lower case letters **DO NOT CREDIT** 'N and C' *instead of* B, as they have been asked to use B **IGNORE** 'N and C' if stated *in addition to B* in rows 1 and 2 **ACCEPT B** for this row
			Total	**11**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(a)	(i)	link reaction **and** Krebs cycle **;**	1	**Mark the first 2 answers.** If they are correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
4	(a)	(ii)	oxidative phosphorylation **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** electron transport chain / electron transport system / electron carrier chain **IGNORE** chemiosmosis **DO NOT CREDIT** photorespiration
4	(b)	(i)	**1** to make the volume of **,** contents / 'peas' **,** the same (in the respirometers) **;** **2** *idea that because* the volume of peas in **A** is greater than the volume of peas in **B** **or** the peas in **A ,** are bigger / take up more space **or** the peas in **A** have absorbed water **or** the peas in **B ,** are smaller / take up less space **;** **3** as without the beads there would be more **,** air / gas / oxygen **,** in **B** than in **A ;**	2 max	**1 IGNORE** ref to mass / weight **2 IGNORE** ref to mass / weight must refer to A / soaked / germinating **and/or** B / dry / dormant **3 CREDIT** idea that with the presence of beads the volume of gas would be the same

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(b)	(ii)	**1** (determined by) finding difference in volume between (30) soaked **,** seeds / peas and (30) dry **,** seeds / peas **;** **2** the difference represents the volume of glass beads required **or** add the quantity of glass beads necessary to make the volumes (of respirometer contents) equal **;** **3** calculate / knowing **,** volume of 1 bead to determine number of beads equivalent to volume required **;**	**2 max**	**ACCEPT** ref to mass/weight instead of volume throughout **(ii)** as an error carried forward (ecf) **3** **CREDIT** any suitable *method* of determining the volume of beads required e.g. • displacement • put soaked peas in tube and measure volume; mark; then put dry peas in and add glass beads into tube and top up to mark
4	(c)	(i)	0.014 **; ;**	**2**	Correct answer = 2 marks, even if no working If answer incorrect **,** not rounded correctly or given to more than 3 dp then **ALLOW** 1 mark for seeing • $\frac{0.27}{20}$ **or** • 0.0135 Only if there is no answer on the dotted answer line, should you look for the answer in the working or in the appropriate place in the table.

STEMUP.CO.UK

Question			Answer	Marks	Guidance
4	(c)	(ii)	*at, higher temperature / 25^{0}C* increased <u>kinetic</u> energy **;** (named respiratory) enzymes / decarboxylases / dehydrogenases **,** involved **;**	**2**	**CREDIT** ora for lower temperature **IGNORE** more collisions / ESCs Needs a clear statement that they are involved in <u>respiration</u> **IGNORE** (named) co-enzymes
4	(c)	(iii)	**1** reactions require aqueous medium / reactions need to take place in water / reactions need to take place in solution **;** **2** enzymes and substrates can move (to collide) in soaked seeds **or** movement (of reactants) **,** prevented / limited **,** in dry seeds **;** **3** soaked seeds need more **,** ATP / energy **or** dry seeds need less **,** ATP / energy **;** **4** for **,** protein synthesis / mitosis / other (named) metabolic reaction **;**	**2 max**	**ACCEPT** **'**germinating' for 'soaked', 'peas' for 'seeds', 'dormant' for 'dry' throughout **1** **IGNORE** ref to reactants dissolving **2** **IGNORE** ref to ESC as the mp is for the idea of mobility **3** **DO NOT CREDIT** 'no' ATP / energy **4** **CREDIT** soaked peas have increased metabolism **IGNORE** growth / respiration **DO NOT CREDIT** ref to photosynthesis
			Total	**12**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(a)		**E** (proximal / first / distal / second) convoluted tubule / PCT / DCT **;** **F** (lumen of) Bowman's / renal **,** capsule **;**	**2**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **E ACCEPT** collecting duct **DO NOT CREDIT** loop of Henle (as not in cortex) **DO NOT CREDIT** 'cells of …' / tube **IGNORE** 'nephron tubule' / nephron

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(b)	(i)	**1** **afferent** arteriole **,** has diameter greater than that of / is wider than **,** **efferent arteriole ;** **2** build up of / high **, hydrostatic** / blood **,** pressure **;** **3** **endothelium** / wall **,** of **,** capillary / glomerulus **,** has **,** (small) pores / **fenestrations ;** **4** (these allow) **ultrafiltration ;**	**2 max**	**1** **IGNORE** different / larger / smaller**,** without suitable qualification **IGNORE** thicker / thinner **3** **ACCEPT** holes / gaps instead of pores **IGNORE** epithelium **DO NOT CREDIT** cell wall **DO NOT CREDIT** podocytes / basement membrane if linked to capillary structure **IGNORE** podocytes / basement membrane if linked to the Bowmans capsule
			QWC – technical terms used appropriately and spelt correctly **;**	**1**	Use of **three** terms from: **afferent**, **efferent**, **arteriole**, **hydrostatic**, **endothelium**, **fenestrations**, **ultrafiltration** (or derived term) **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
5	(b)	(ii)	podocyte(s) **;**	**1**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(c)	(i)	*if kidney cannot filter so substances remain in blood* **1** increase / high **,** in urea **;** **2** increase / high **,** in **,** (named) ions / (named) salts **;** **3** increase / high **,** in water **;** **4** AVP **;** **OR** *if problems cause substances to be lost indiscriminately* **5** decrease / low **,** in **,** protein / blood cells **;** **6** decrease / low **,** in **,** (named) ions / (named) salts **;** **7** decrease / low **,** in **,** glucose / amino acids / vitamins **;** **8** decrease / low **,** in water **;**	**2 max**	**Candidate's answer can only come from one section of the mark scheme if type of failure not specified. However, all marks are available if clearly linked to the type of failure.** **3 IGNORE** ref to water potential **4** e.g. • high(er) levels of **,** creatinine / (named) hormone • high(er) levels of **,** metabolite / toxin **,** breakdown **for mps 5-8 DO NOT CREDIT** 'no' / 'none' / 'zero' **7 IGNORE** sugar **8 IGNORE** ref to water potential ***Note*** 'increase in urea' = 1 (mp 1) 'increase in salt and water' = 2 (mps 2 & 3) 'low in protein but high in urea' = 1 (mp 5, but not mp 1 as different type of failure and has not been specified)

STEMUP.CO.UK

Question			Answer	Marks	Guidance
5	(c)	(ii)	*if not closely matched* **1** donated kidney will be recognised as , foreign / non-self ; **2** antigens / glycoproteins , (on donated kidney) will be different ; **3** causing rejection ; **4** (response) by immune system ; **5** use of immuno-suppressant drugs ; **6** ref to need for suitable size in specific case (e.g. if recipient is a small child) ;	**3 max**	**CREDIT** ora **for all mark points** **1** Needs the idea of the body *recognising* the foreign nature **4** **CREDIT** a description of immune response **DO NOT CREDIT** ref to <u>auto</u>immunity
			Total	**11**	

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(a)		**1** receptors **;** **2** intensity **;** **3** chemical **;** **4** potential / value **;** **5** impulse **;**	**5**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **1 ACCEPT** receptor cells **DO NOT CREDIT** neurones / organs **2 IGNORE** brightness **DO NOT CREDIT** frequency **3 IGNORE** volatile / soluble **4 ACCEPT** 'level' / '(needed) for depolarisation' **IGNORE** numerical value quoted / 'receptor' **DO NOT CREDIT** action potential **5 ACCEPT** action potential **DO NOT CREDIT** message / signal / information / stimulus

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(b)	(i)	*the motor neurone - structure* the cell body is at (one) end of the , neurone / cell **or** the cell body is in , brain / spinal cord / CNS **or** dendrites connected (directly) to cell body **or** long(er) axon **or** no dendron **or** axon , connects to / ends at , effector / motor end plate ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** ref to cell size / myelin(ation) **DO NOT CREDIT** at end of axon / nerve **IGNORE** reference to dendrite length **CREDIT ora for sensory** i.e. cell body is at centre of cell **or** cell body is in PNS **or** dendrites at the end(s) of , axon / dendron **or** short(er) axon **or** dendron present **or** connects to / starts at , receptor

STEMUP.CO.UK

Question			Answer	Marks	Guidance
6	(b)	(ii)	*the motor* neurone - *function* carries , impulse(s) / action potential(s) , from , brain / spinal cord / CNS / relay neurone **or** carries , impulse(s) / action potential(s) , to , effector / muscle / gland ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** refs to 'connects …' **DO NOT CREDIT** message / signal / information / stimulus **DO NOT CREDIT** message / signal / information / stimulus **CREDIT ora for sensory** i.e. carries , impulse(s) / action potential(s) , to , brain / spinal cord / CNS / relay neurone **or** carries , impulse(s) / action potential(s) , from receptor
			Total	**7**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2012

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

Communication, Homeostasis and Energy

F214

Candidates answer on the question paper.

OCR supplied materials:
- Insert (inserted)

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Wednesday 22 June 2011
Morning

Duration: 1 hour

F2156901111

F 2 1 4

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2011 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** The nervous system is made up of a number of different types of neurone, which transmit electrical impulses.

Complete the table below by stating **three** differences in the structure of motor and sensory neurones.

motor neurone	sensory neurone

[3]

© OCR 2011

(b) Complete the following passage, using the most appropriate term(s) in each case.

When an impulse is not passing along a neurone, a resting potential of .....mV is established. When the neurone is stimulated, it causes ..... of the cell surface membrane. This will not generate an action potential unless it is large enough to exceed the ....

A neurone will either conduct an action potential or not; this is described as the ..... - ..... - ..... law.

Action potentials all have the same ..... . The only way in which the intensity of a stimulus can be interpreted is by the ..... of the action potential. **[6]**

[Total: 9]

© OCR 2011

STEMUP.CO.UK

2 A student carried out an experiment to investigate the effect of light intensity on the rate of photosynthesis in an aquatic plant, using the apparatus shown in Fig. 2.1.

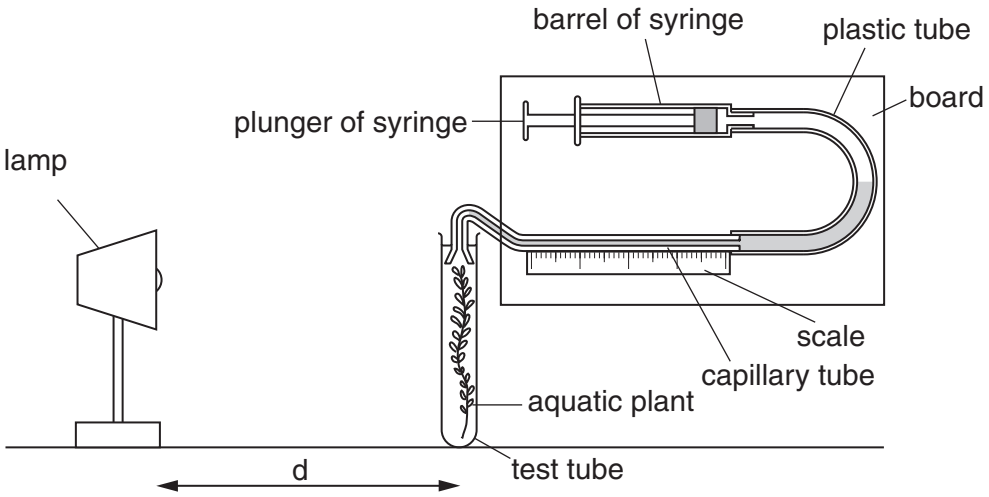


Fig. 2.1

The student decided to measure the rate of photosynthesis by measuring the gas produced over a five minute period. The gas collected in the capillary tube.

After five minutes, the length of the bubble was measured along the scale.

The light intensity was varied by altering the distance (d) between the lamp and the photosynthesising plant.

The student prepared Table 2.1 to calculate the light intensity.

Table 2.1

distance (d) from lamp to plant (cm)	light intensity $\left(\frac{1}{d^2}\right)$
4	0.0625
8	0.0156
12	0.0069
16	0.0039
20	0.0025
24	
60	0.0003

© OCR 2011

STEMUP.CO.UK

(a) (i) Calculate the light intensity when the lamp was 24 cm from the plant.

Show your working.

Answer = ... **[2]**

(ii) The length of the gas bubble was measured (in mm).

State what additional information would be required to calculate the **volume** of gas produced.

.....

.....

..... **[1]**

(iii) Suggest how the student supplied the aquatic plant with a source of carbon dioxide.

.....

.....

..... **[1]**

(b) Certain assumptions are made when using the apparatus shown in Fig. 2.1 to measure the rate of photosynthesis.

(i) One of these assumptions is that all of the oxygen produced by the plant during photosynthesis is collected.

Suggest why not all of the oxygen produced by the plant is collected.

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2011

STEMUP.CO.UK

(ii) Another assumption is that all of the gas collected is oxygen.

Analysis of the gas collected reveals that it has the following composition:

- oxygen 50%
- nitrogen 44%
- carbon dioxide 6%

Suggest a reason for the presence of nitrogen in the gas collected.

.....

.....

..... **[1]**

(iii) Comment on the percentage of carbon dioxide present in the gas collected and give reasons for this figure.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(c) Some aquatic photosynthetic organisms, for example seaweeds, contain pigments such as fucoxanthin and phycoerythrin, in addition to chlorophyll. These pigments give seaweeds a brown or red colour and are produced in larger quantities in those seaweeds that live in deeper water.

Suggest why the presence of these pigments is an advantage to seaweeds that live in deeper water.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 12]

© OCR 2011

BLANK PAGE

QUESTION 3 STARTS ON PAGE 8

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2011

STEMUP.CO.UK

3 Fatigue is a symptom of some medical conditions. One feature of fatigue is extreme tiredness, due to a lack of energy.

Medical conditions that have fatigue as a characteristic symptom include Type 2 diabetes, certain heart conditions, chronic fatigue syndrome (CFS) and emphysema.

(a) Explain how emphysema could result in fatigue.

.....

.....

.....

.....

.....

..... **[2]**

(b) In Type 2 diabetes, the target cells do not respond correctly to the insulin produced when there is an increase in blood glucose concentration.

Suggest why fatigue may occur in a person with Type 2 diabetes who is **not** taking medication.

.....

.....

.....

.....

.....

..... **[2]**

(c) Certain heart conditions result in a weak and irregular heart beat.

Suggest how a weak and irregular heart beat could result in fatigue.

.....

.....

.....

.....

.....

..... **[2]**

© OCR 2011

STEMUP.CO.UK

(d) Chronic fatigue syndrome (CFS) is a condition in which symptoms vary from individual to individual.

It is thought that a number of different malfunctioning processes can contribute to this condition in an individual.

CFS can affect every system in the body and is identified by symptoms that include fatigue, muscle weakness and aching muscles.

(i) It has been suggested that, in the cells of people with CFS, pyruvate may not be transferred into the mitochondria efficiently.

Outline the consequences of an inefficient transfer of pyruvate into mitochondria and link this to the symptoms of CFS stated above.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(ii) Some people with CFS overproduce T lymphocytes and associated cytokines. Despite this, the specific immune response is poor in these people, resulting in an increased susceptibility to infection.

Suggest a reason for the poor specific immune response in people with CFS.

.....

.....

..... **[1]**

[Total: 10]

© OCR 2011

STEMUP.CO.UK

4 **(a)** The pancreas is an unusual gland as it is both an endocrine and an exocrine gland.

Fig. 4.1, **on the insert**, shows a group of cells in the pancreas.

(i) State the name given to the group of cells labelled **X**.

..... **[1]**

(ii) Describe the different ways in which the pancreas acts as both an endocrine and an exocrine gland.



In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

© OCR 2011

STEMUP.CO.UK

(b) One particular type of cell in the pancreas is responsible for secreting insulin. The various events involved in the secretion of insulin are listed below.

A	Glucose is phosphorylated and metabolised to produce ATP
B	Potassium channels open, allowing potassium ions to diffuse out of the cell
C	The change in voltage across the membrane causes calcium channels to open
D	Glucose enters the cell
E	The movement of ions results in a potential difference across the cell surface membrane of –70 mV
F	Calcium ions diffuse into the cell
G	The presence of extra ATP causes the potassium channels to close
H	The membrane potential changes to –30 mV
J	The calcium ions cause the vesicles to fuse with the membrane and release insulin

Complete the following list by placing the events in the correct order.

B **E** .... **J** **[4]**

(c) **(i)** State **two** advantages of treating **Type 1** diabetes by using insulin that has been produced by genetically modified bacteria rather than insulin that has been extracted from pigs.

.....

.....

.....

..... **[2]**

(ii) A potential treatment for Type 1 diabetes is the use of stem cells.

State an advantage of this form of treatment compared to treatment using insulin.

.....

..... **[1]**

[Total: 13]

© OCR 2011

STEMUP.CO.UK

5 **(a)** Fig. 5.1 is a drawing representing a vertical section through a mammalian kidney.

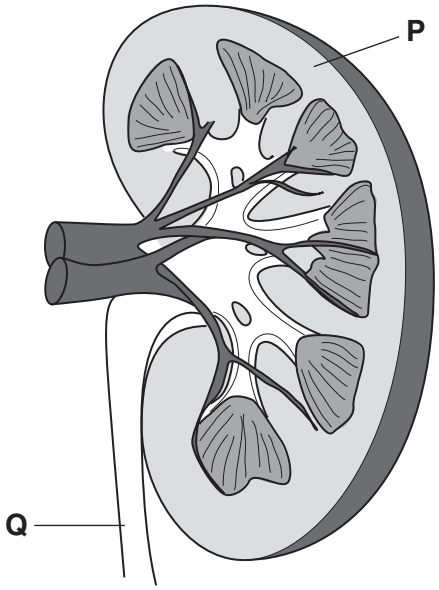


Fig. 5.1

Name the region **P** and the structure **Q**.

P .....

Q ..... **[2]**

© OCR 2011

STEMUP.CO.UK

(b) (i) Each kidney contains approximately one million nephrons. Each section of a kidney nephron is adapted to perform its function effectively.

Describe the features of the **glomerulus** and **Bowman's capsule** that allow them to perform their function effectively.



In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

(ii) Nephritis is a condition in which the tissue of the glomerulus and proximal convoluted tubule becomes inflamed and damaged.

Suggest **two** differences in the composition of the urine of a person with nephritis when compared to the urine of a person with healthy kidneys.

.....

.....

.....

..... **[2]**

QUESTION 5(c) STARTS ON PAGE 14

© OCR 2011

STEMUP.CO.UK

(c) Caffeine is a mild diuretic. Caffeine prevents the introduction of additional aquaporins into the wall of the collecting duct of the nephron and therefore additional water is not removed from the urine.

Aquaporins are channels in the cell surface membrane that allow water molecules to pass through.

Fig. 5.2 represents an aquaporin.

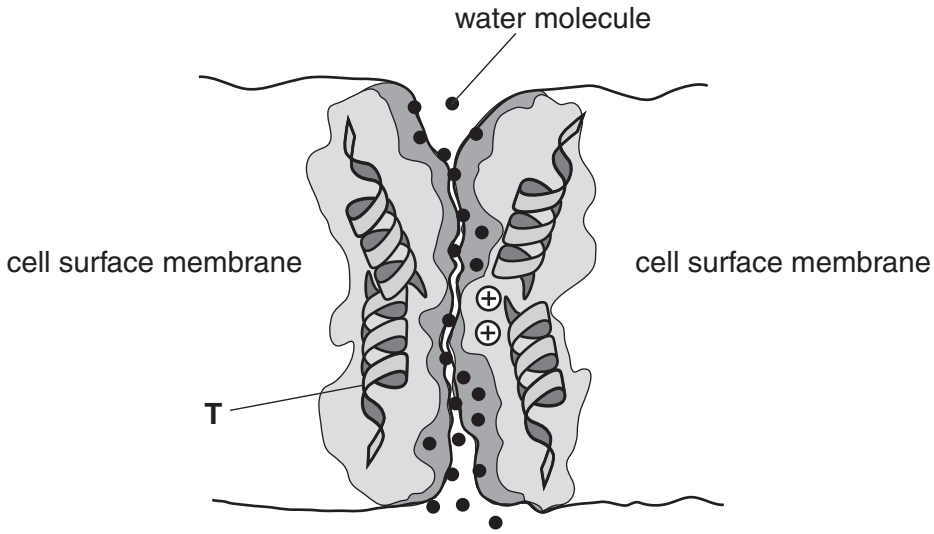


Fig. 5.2

(i) Identify the type of molecule labelled **T**.

..... **[1]**

(ii) The aquaporin allows water to travel from the collecting duct into the surrounding tissues but prevents the passage of ions such as sodium ions and potassium ions.

With reference to Fig.5.2, suggest **two** ways in which the structure of this aquaporin prevents the passage of ions.

.....

.....

.....

.....

.....

..... **[2]**

[Total: 11]

© OCR 2011

STEMUP.CO.UK

6 **(a)** State the **precise** location where each of the following biochemical processes take place:

(i) the production of glucocorticoids in the body

..... **[1]**

(ii) chemiosmosis within an animal cell.

..... **[1]**

(b) Name the mechanism or process that is being described in each of the following statements.

(i) *A person breathes in air that is high in carbon dioxide. This produces a high concentration of carbon dioxide in the blood. This increased concentration is detected by receptors, resulting in the person breathing more rapidly. In turn, more carbon dioxide enters the blood causing the breathing to be even more rapid.*

The mechanism being described is:

..... **[1]**

(ii) *Light strikes a molecule of chlorophyll a in photosystem I, providing it with enough energy so that it loses an electron. This electron is passed along a series of electron carriers and then returns to a molecule of chlorophyll a in photosystem I. As the electron loses energy, ATP is formed.*

The process being described is:

..... **[1]**

(iii) *As an animal needs to respond to changes in the external and internal environment, communication between cells takes place within the body to coordinate the activities of different organs.*

The mechanism being described is:

..... **[1]**

[Total: 5]

END OF QUESTION PAPER

© OCR 2011

STEMUP.CO.UK

ADDITIONAL PAGE

If additional space is required, you should use the lined page below. The question number(s) must be clearly shown.

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2011

STEMUP.CO.UK

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2011

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question	Expected Answer	Mark	Additional Guidance
In ALL questions	**CREDIT AW throughout** i.e. credit any alternatively worded statement that conveys the same sense as the whole mark point. If a particular word is essential and no other will do it is <u>underlined</u>. **ACCEPT** incorrect spellings if they are recognisable and sound the same when pronounced, even for underlined terms. If correct spelling is essential, this will be indicated in the Additional Guidance. For QWC marks, correct spelling **and** context are necessary. **IGNORE** wrong or vague statements unless Additional Guidance states **DO NOT CREDIT**, in which case the mark point is not awarded.		

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
1	(a)			3	**Award 1 mark for each correct side by side comparison.** Comparative statements **must** be made on the same row. **ALLOW two valid comparisons in the same pair of boxes, e.g** Cell body at end of neurone in the CNS | Cell body in middle and in the PNS **= 2 marks** mps 2, 3 and 4 can be taken from a labelled diagram All mps can be taken from annotated diagrams

	motor neurone	*sensory neurone*	
1	cell body in CNS	cell body **,** not in CNS / in PNS	;
2	cell body at end (of neurone)	cell body **,** not at end / in middle (of neurone)	;
3	dendrites connect directly to cell body	dendrites do not connect directly to cell body **or** dendrites at the end(s) of **,** dendron / axon	;
4	long(er) axon	short(er) axon	;
5	dendron absent / no dendron	dendron present	;
6	ends at motor end plate	starts at / connects to **,** (sensory) receptor	;

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
1	(b)				**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
			1 **-** 60 to **-**70 **;**		***1*** **ACCEPT** any single figure or range (within this range) Must be a negative number
			2 depolarisation **;**		
			3 threshold potential / threshold value **;**		
			4 all or nothing **;**		***4*** **ALLOW** all or none
			5 size / magnitude **;**		***5*** **ALLOW** amplitude **DO NOT CREDIT** intensity / strength / value / potential difference / voltage
			6 frequency **;**	**6**	
			Total	**9**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	0.0017 ; ;	2	• Correct answer, given to 4 dp = 2 marks • If answer **not** shown on answer line, **CREDIT** correct answer written in the appropriate space in the table. • If answer is incorrectly rounded **or** rounded to the wrong number of dp **or** written in standard form (1.7×10^{-3}) then award 1 working mark • If answer is incorrect then award 1 working mark for seeing $1 \div 576$ **or** $1 \div 24^2$
2	(a)	(ii)	**1** (internal) radius / diameter **,** of capillary tube ; **2** cross-sectional area (of capillary tube) ; **3** (use) $\pi r^2 h$;	**1 max**	***1*** **ACCEPT** radius / diameter **,** of bubble **ACCEPT** width of tube ***2*** **ACCEPT** cross-sectional area of bubble
2	(a)	(iii)	**1** (sodium) hydrogen carbonate ; **2** bubble in **,** CO_2 / exhaled air ; **3** dry ice ;	**1 max**	***1*** **ACCEPT** bicarbonate **DO NOT CREDIT** carbonate

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
2	(b)	(i)	*idea that some of the oxygen* **1** would dissolve in the water **;** **2** used in **,** respiration / oxidative phosphorylation **;** **3** may escape the collection apparatus **;** **4** trapped in **,** a bubble attached to / air spaces in **,** the leaf **;**	**2 max**	***1*** **IGNORE** 'oxygen is in the water' **2** **IGNORE** produces energy
2	(b)	(ii)	**1** (nitrogen) was present in the air (spaces) in the **,** leaf / plant **;** **2** (nitrogen) leaves the plant with the oxygen **;** **3** *idea that* (nitrogen) comes out of solution / 'undissolved' (as less soluble in warm water) **;**	**1 max**	
2	(b)	(iii)	**1** higher than **,** expected / normal / in atmosphere **;** **2** (plant is) respiring / produces CO_2 during respiration **;** **3** CO_2 **,** has been added to water / is present in excess **;** **4** (CO_2) comes out of solution / 'undissolved' (as less soluble in warm water) **;** **5** less / low(er) **,** as some CO_2 will dissolve in **,** water / solution **;** **6** less / low(er) **,** as CO_2 used in photosynthesis **;**	**3 max**	***2*** **IGNORE** produces energy ***5*** **DO NOT CREDIT** if in context of lower than O_2 and N_2 ***6*** **DO NOT CREDIT** if in context of lower than O_2 and N_2

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
2	(c)		*intensity* **1** in deeper water there is , less / lower **,** light <u>intensity</u> **;** **2** (these pigments) can absorb what (little) light there is **;** *wavelength* **3** not all wavelengths of light can penetrate **or** mainly shorter wavelengths can penetrate **or** (mostly) blue light (450 – 520 nm) penetrates **;** **4** (these pigments) can absorb wavelengths of light that can penetrate (deeper water) **;**	**2 max**	**IGNORE** ref to photosynthesis (as 'photosynthetic' stated in Q) ***2*** **ACCEPT** trap / harvest / capture **IGNORE** use / collect ***3*** idea of restricted range of wavelengths able to penetrate (rather than wavelengths are different) **ACCEPT** '**higher** frequency' instead of '**shorter** wavelength' ***4*** **ACCEPT** trap / harvest / capture **IGNORE** use / collect
			Total	**12**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
3	(a)		**1** less ventilation / *Idea of* difficulty in exhaling due to less recoil / small surface area for gaseous exchange / less oxygen entering capillaries / less oxygen entering blood ; **2** less oxygen (reaching cells) for , (aerobic) respiration / oxidative phosphorylation ; **3** (so) less ATP produced ; **4** *idea of* increased acidity (as CO_2 / lactate builds up) interfering with / affects , enzymes / respiratory metabolism ;	**2 max**	**IGNORE** 'produces' energy in any mark point ***1*** **DO NOT CREDIT** **no** oxygen ***2*** **DO NOT CREDIT** **no** respiration ***3*** **DO NOT CREDIT** **no** ATP
3	(b)		**1** not enough / less , glucose uptake into <u>cells</u> ; **2** not enough / less , glucose / substrate , for , respiration / ATP production ; **3** glucose not , stored as / converted to , glycogen ;	**2 max**	**ACCEPT** 'sugar' for glucose **IGNORE** (excess) glucose lost in urine (as does not answer the Q) **Only CREDIT ora** if candidate clearly states that the sequence of events does **not** happen in this case ***1*** **DO NOT CREDIT** **no** glucose uptake ***2*** **IGNORE** produces energy **DO NOT CREDIT** **no** respiration / **no** ATP / **no** glucose

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
3	(c)				**IGNORE** 'produces' energy in any mark point
			1 *idea of* slow rate of / sluggish **,** blood flow **or** low(er) blood pressure **;**		***1*** **IGNORE** 'heart doesn't beat strongly enough' or 'heart beat is inefficient' **IGNORE** ref to volume of blood without time/rate
			2 less / irregular amount of **,** oxygen (reaching cells) for **,** (aerobic) respiration / oxidative phosphorylation **;**		***2*** **DO NOT CREDIT** **no** oxygen / **no** respiration
			3 less glucose (reaching cells) for respiration **;**		***3*** **IGNORE** sugar **DO NOT CREDIT** **no** glucose / **no** respiration
			4 (so) less ATP produced **;**		***4*** **DO NOT CREDIT** **no** ATP
			5 *idea of* increased acidity (as CO_2 / lactate builds up) interfering with / affects **,** enzymes / respiratory metabolism **;**	**2 max**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
3	(d)	(i)	**1** less pyruvate for **,** link reaction / Krebs cycle **or** link reaction / Krebs cycle **,** cannot take place / reduced **or** only / mainly **,** glycolysis takes place **;** **2** no / little **,** oxidative phosphorylation **;** **3** less **,** energy / ATP **,** for muscle contraction / resulting in muscle weakness / for mental processes **;** **4** <u>anaerobic</u> respiration takes place **;** **5** lactate / decrease in pH **,** causing aching muscles **;** **3 max**	*2* **IGNORE** produces energy *3* **DO NOT CREDIT no** ATP **IGNORE** produces energy **IGNORE** muscle fatigue *5* **CREDIT** 'lactic acid' instead of 'lactate' **ACCEPT** muscle cramps
3	(d)	(ii)	**1** *idea that* B lymphocytes do not respond to cytokines (that have been produced) **;** **2** little **,** energy / ATP **,** for B cell **,** mitosis / clonal expansion **;** **3** little **,** energy / ATP **,** for **,** production / release **,** of antibodies **;** **1 max**	
			Total	**10**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(i)	islet(s) of Langerhans ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **ACCEPT** α and β cells in islets of Langerhans **DO NOT CREDIT** α cells in islets of Langerhans **DO NOT CREDIT** β cells in islets of Langerhans

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(ii)	use ✓1 *endocrine* **H1** **hormone**(s) released directly into blood ; **H2** **beta** / β , cells , secrete / produce / release , insulin ; **H3** **alpha** / α , cells , secrete / produce / release , **glucagon** ; **H4** **islet /** α and β , cells , detect / monitor , blood glucose concentration ; **3 max** use ✓2 *exocrine* **E1** fluid / juice / secretion / enzymes , released into duct ; **E2** (release triggered by) nervous / hormonal , stimulation ; **E3** **pancreatic** secretions into , gut / small intestine / **duodenum** ; **E4** alkaline / pH 8 / (sodium) hydrogen carbonate ; **E5** containing **2** named **enzyme**(s) ; **3 max**	**4 max**	**If endocrine and exocrine terms are muddled, then ignore endocrine and exocrine refs but only award max 2 for both sections and do not award the QWC mark.** ***H1*** **DO NOT CREDIT** carried / transported , in ***H2*** **ACCEPT** b cells ***H3*** **ACCEPT** a cells **DO NOT CREDIT** incorrect spelling of glucagon ***H4*** **ACCEPT** a and b cells α cells and β cells secrete glucagon and insulin = **2 marks** α cells and β cells secrete insulin and glucagon = **0 marks** ***E1*** **IGNORE** substances **DO NOT CREDIT** carried / transported , in ***E5*** **CREDIT** 2 enzymes but no more than 1 enzyme from each bullet point • lipase • **amylase** / carbohydrase • **trypsin** / **chymotrypsin** / protease / trypsinogen / chymotrypsinogen
			QWC – technical terms used appropriately with correct spelling ;	**1**	**Do not award if endocrine & exocrine are muddled.** Use of **3** terms from: **hormone**(s), **beta**, **alpha**, **glucagon**, **islet**(s), **pancreatic**, **duodenum**, **enzyme**(s), **amylase**, **trypsin**(ogen) / **chymotrypsin**(ogen) **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
4	(b)		**D A G H C F ; ; ; ;**	4	All letters in correct sequence = 4 marks If letters are **not all** in the correct sequence, then mark as follows: **D** at the beginning and **F** at the end = 1 mark **A** somewhere before **G** = 1 mark **G** somewhere before **H** = 1 mark **H** somewhere before **C** = 1 mark
4	(c)	(i)	**1** *idea of* plentiful / dependable **,** supply **;** **2** cheap **;** **3** not cruel to pigs / more ethical **;** **4** no religious objections / can be used by vegetarians **;** **5** reliable **,** quality / standard **;** **6** (exact match to) human insulin / no allergic reaction **;**	2	**Mark the first <u>two</u> advantages** ***1*** e.g. can meet demand / can be mass produced **IGNORE** ref to speed ***6*** **ACCEPT** ref to not spreading prions **IGNORE** spread of disease from pigs / no rejection **DO NOT CREDIT** genetically identical insulin
4	(c)	(ii)	**1** (has the potential to) cure / do more than manage **,** the condition **;** **2** long term effect / permanent / no need for repeated treatments **;**	1 max	***1*** e.g. no need to restrict diet ***2*** e.g. no need to inject insulin (regularly)
			Total	13	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
5	(a)		**P** cortex **;** **Q** ureter **;**		**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** ***Q*** **Correct spelling only** **DO NOT CREDIT** incorrect spelling of ureter

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(i)	**1** **ultrafiltration ;** **2** **afferent** arteriole is wider than **efferent** arteriole **;** **3** high **blood pressure** in glomerulus / high(er) **hydrostatic pressure** in glomerulus (than in Bowman's capsule) **;** **4** *idea that* **endothelium** / wall of capillary **,** has gaps to **,** allow / prevent **,** passage (of substances / cells) **;** **5** *idea that* **basement membrane** stops removal of **,** large molecules / cells **;** **6** **podocytes** / **epithelial** cells of Bowman's capsule **,** have (finger-like) projections / processes **;** **7** (projections) ensure gaps to allow passage (of substances) **;**	**3 max**	***4*** e.g. fenestrations in capillary wall don't allow red blood cells to leave **DO NOT CREDIT** cell walls of capillaries ***5*** e.g. basement membrane (only) allows small molecules to pass through
			QWC – technical terms used appropriately and spelt correctly **;**	**1**	Use of **3** terms in the correct context from: **afferent**, **efferent**, **blood pressure** / **hydrostatic pressure**, **endothelium** / **endothelial**, **basement membrane**, **podocyte(s)**, **epithelial** / **epithelium**, **ultrafiltration** **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(ii)	**1** (large) protein / amino acids **,** present **;** **2** blood (cells) present **;** **3** glucose present **;** **4** more water present / more dilute **;** **5** more **,** ions / salts / electrolytes **,** present **;** **6** (more) vitamins present **;**	**2 max**	**Mark as prose - award marks wherever they occur** ***1*** **ACCEPT** more **,** protein / amino acids **ACCEPT** appropriately named protein e.g. albumin / antibodies / immunoglobulins ***3*** **DO NOT CREDIT** more glucose
5	(c)	(i)	protein / polypeptide **;**	**1**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** alpha helix / intrinsic / transmembrane **DO NOT CREDIT** glycoprotein
5	(c)	(ii)	**1** the ions (in solution) are too large to pass through the channel **or** the channel is too narrow for the ions (in solution) to pass through **;** **2** shapes not compatible **;** **3** *idea that* positive charge (in the channel) repels the (positively charged) ions **;**	**2 max**	**Mark the first <u>two</u> suggestions** ***1*** **ACCEPT** gap / hole for channel ***3*** **DO NOT CREDIT** repels and/or attracts
			Total	**11**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	adrenal cortex ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** endocrine gland(s)
6	(a)	(ii)	inner mitochondrial membrane / crista / location described ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** e.g. between the inter-membrane space and the matrix **IGNORE** stalked particles / ATP synthetase
6	(b)	(i)	positive feedback ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** respiratory acidosis / hyperventilation
6	(b)	(ii)	cyclic photophosphorylation ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **DO NOT CREDIT** cyclic phosphorylation
6	(b)	(iii)	cell signalling ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** homeostasis
			Total	**5**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2011

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

F214

Communication, Homeostasis and Energy

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Monday 24 January 2011
Afternoon

Duration: 1 hour

OCE/25763

F 2 1 4

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2011 [A/500/8553]
OCR is an exempt Charity

STEMUP.CO.UK

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2011

Answer **all** the questions.

1 Organisms require energy in order to carry out essential metabolism. Organisms are able to release energy by carrying out both aerobic and anaerobic respiration.

(a) Complete the table to compare **anaerobic** respiration in mammals and yeast.

	mammal	yeast
name of hydrogen acceptor after glycolysis		
is CO_2 produced?		
name of final product		

[3]

(b) Suggest **one** benefit of anaerobic respiration to an organism.

.....

..... **[1]**

[Total: 4]

© OCR 2011

STEMUP.CO.UK

2 **(a)** Fig. 2.1 represents the end region of a neurone at a cholinergic synapse.

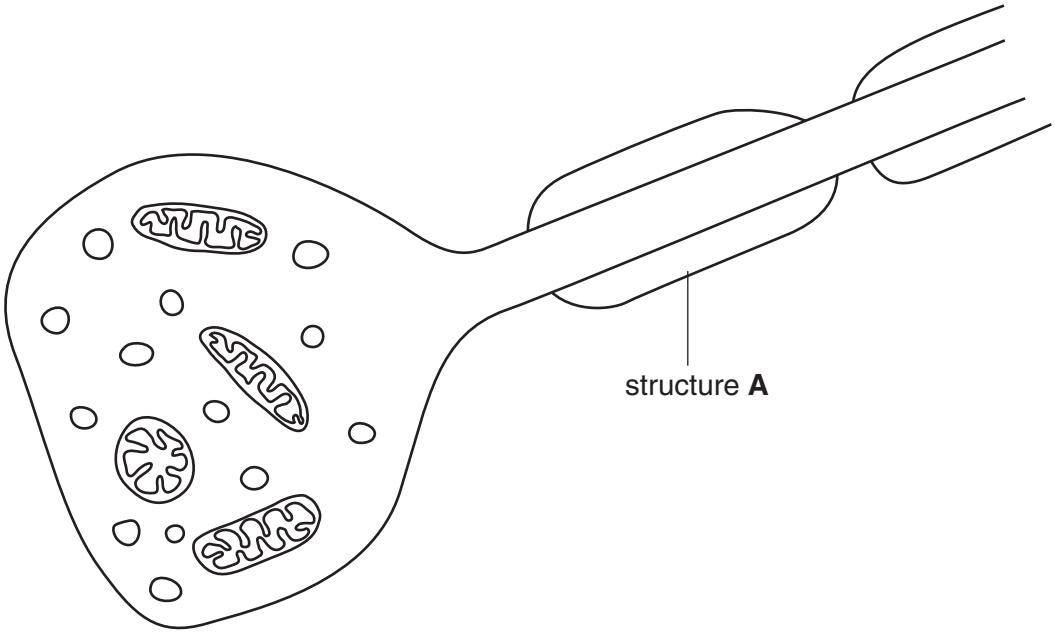


Fig. 2.1

(i) Describe the function of **structure A**.

In your answer, you should use the appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

(ii) Name the process by which acetylcholine leaves the neurone shown in Fig. 2.1.

..... **[1]**

(iii) Name the process by which acetylcholine travels across the synaptic cleft.

..... **[1]**

© OCR 2011

STEMUP.CO.UK

(iv) A feature of synapses is that they allow transmission in only one direction.

State how this is achieved.

.....

.....

..... **[1]**

(b) The chemical nature of synaptic transmission makes it susceptible to disruption by toxins.

(i) Atropine is a toxin produced by the deadly nightshade plant, *Atropa belladonna*.

Atropine is a similar shape to acetylcholine. The presence of atropine prevents the initiation of an action potential in the post-synaptic neurone.

Explain how the presence of atropine in the synapse will prevent the initiation of an action potential.

.....

.....

.....

.....

.....

.....

..... **[3]**

(ii) Nerve gases have been used as chemical weapons. Some nerve gases act by inhibiting acetylcholinesterase, prolonging the effect of acetylcholine.

Suggest how atropine could act as an antidote to nerve gas.

.....

.....

.....

.....

..... **[2]**

[Total: 12]

© OCR 2011

STEMUP.CO.UK

3 Fig. 3.1 represents some of the reactions that take place in a leaf cell of a flowering plant.

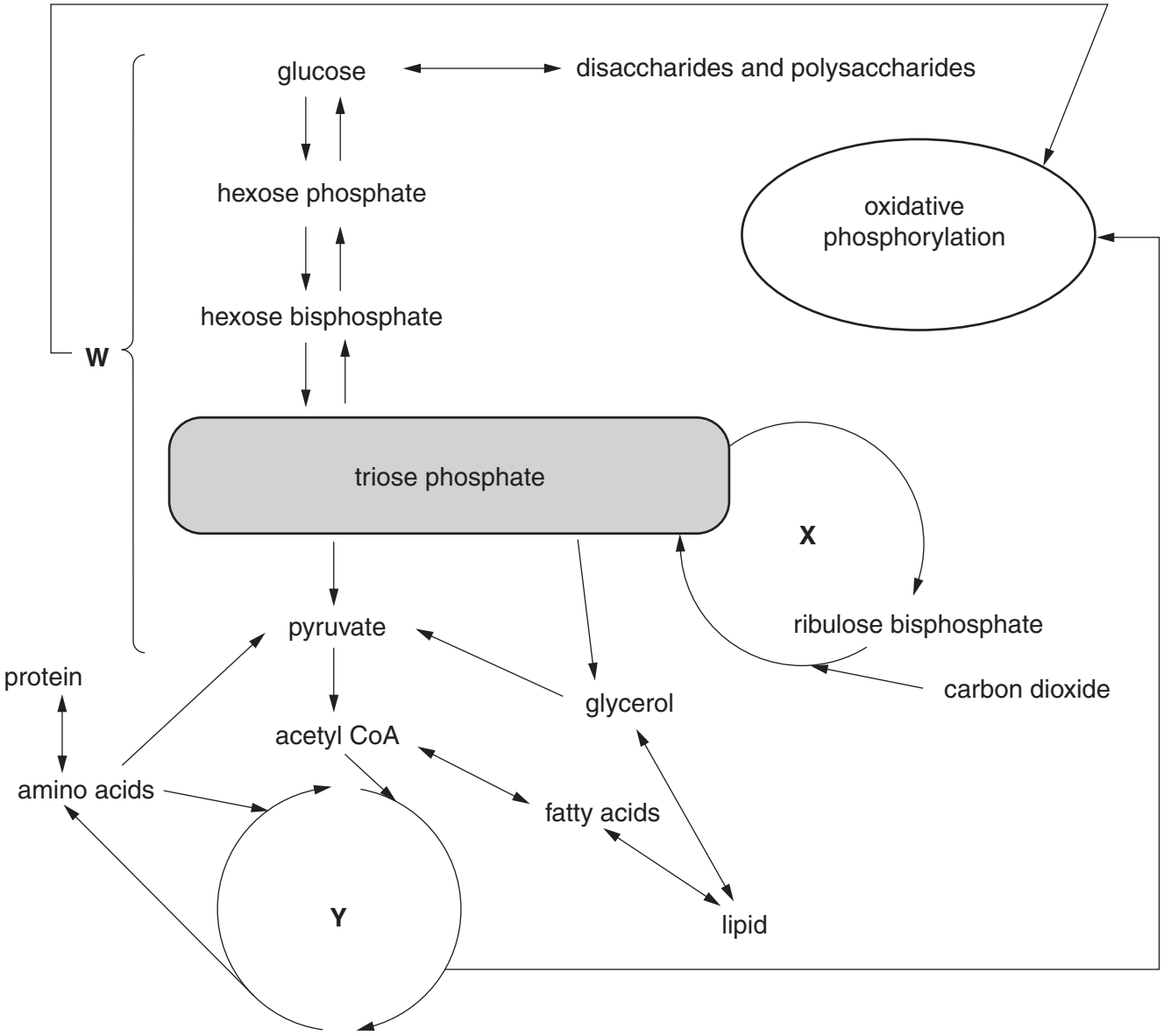


Fig. 3.1

(a) (i) Name the reaction pathways indicated by the letters **W**, **X** and **Y**.

W .....

X .....

Y ..... **[3]**

© OCR 2011

STEMUP.CO.UK

(ii) Triose phosphate is a compound that is central to the metabolism of this cell.

Explain how **the three** reaction pathways (**W**, **X** and **Y**) are able to work independently of each other in the same leaf cell.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(iii) Identify which of **these three** reaction pathways (**W**, **X** and **Y**) are associated with:

photosynthesis .....

aerobic respiration..... **[2]**

(iv) Fig. 3.1 shows that compounds from two of the three pathways are used in oxidative phosphorylation.

State the products of oxidative phosphorylation.

.....

..... **[2]**

(b) Explain the role of coenzymes in this leaf cell, with respect to the metabolic reactions outlined in Fig. 3.1.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 13]

© OCR 2011

STEMUP.CO.UK

4 Osmoregulation is a key feature of homeostasis and maintains the water potential of the blood within certain limits. This is achieved by the action of anti-diuretic hormone (ADH).

(a) Explain the likely effect on the blood cells if the water potential of the plasma was allowed to increase significantly.

.....

.....

.....

.....

..... **[2]**

Fig. 4.1 is a simplified diagram of the structure of ADH.

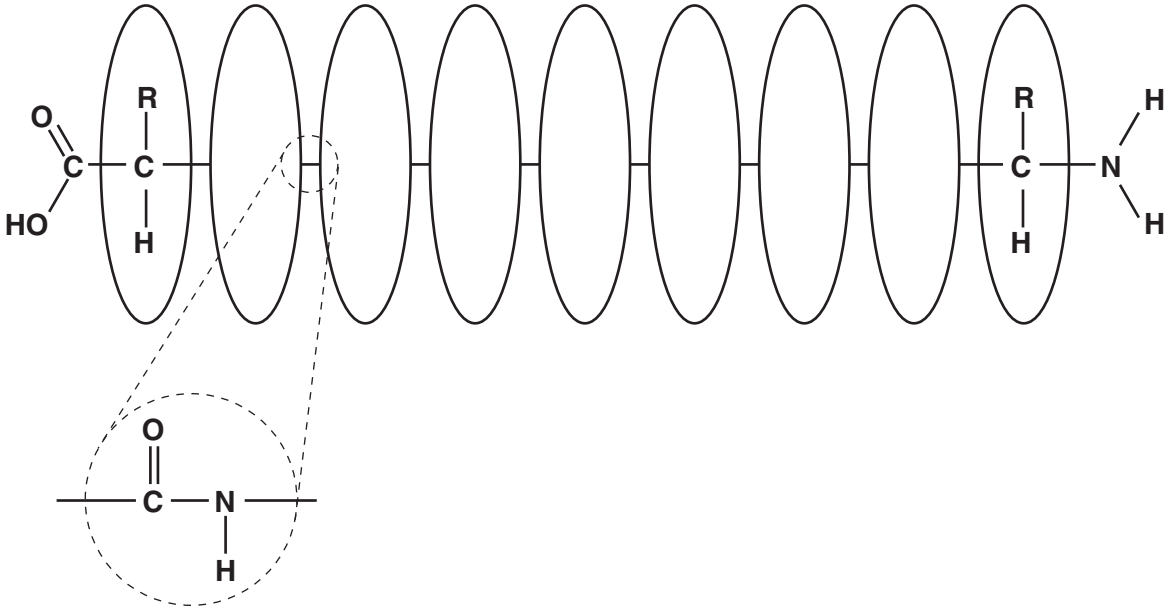


Fig. 4.1

(b) Name the type of monomer that makes up a molecule of ADH and the bond that joins the monomers together.

type of monomer.....

name of bond..... **[2]**

© OCR 2011

STEMUP.CO.UK

(c) Complete the following passage, using the **most suitable** term in each case:

ADH is a hormone that is produced by specialised nerve cells known as

..... cells. These cells detect changes in the water

potential of the blood flowing through the ..... . If the water

potential of the blood is too low then ADH is released.

ADH is not secreted immediately into the blood but passes along the

..... of the specialised nerve cells to the

.... gland, from where it is

released into the blood.

ADH acts on the cells of the ....

The ADH molecule attaches to receptors on the ..... of these

cells and causes protein channels known as ..... to insert

themselves into the membrane. Water passes through these channels by

..... and a smaller volume of more concentrated urine is produced.

[8]

(d) ADH does not stay in the blood indefinitely.

Suggest where ADH is removed from the blood **and** describe what then happens to the ADH molecule.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 15]

© OCR 2011

STEMUP.CO.UK

5 **(a)** Fig. 5.1 represents the sequence of events that takes place when adrenaline reaches a liver cell.

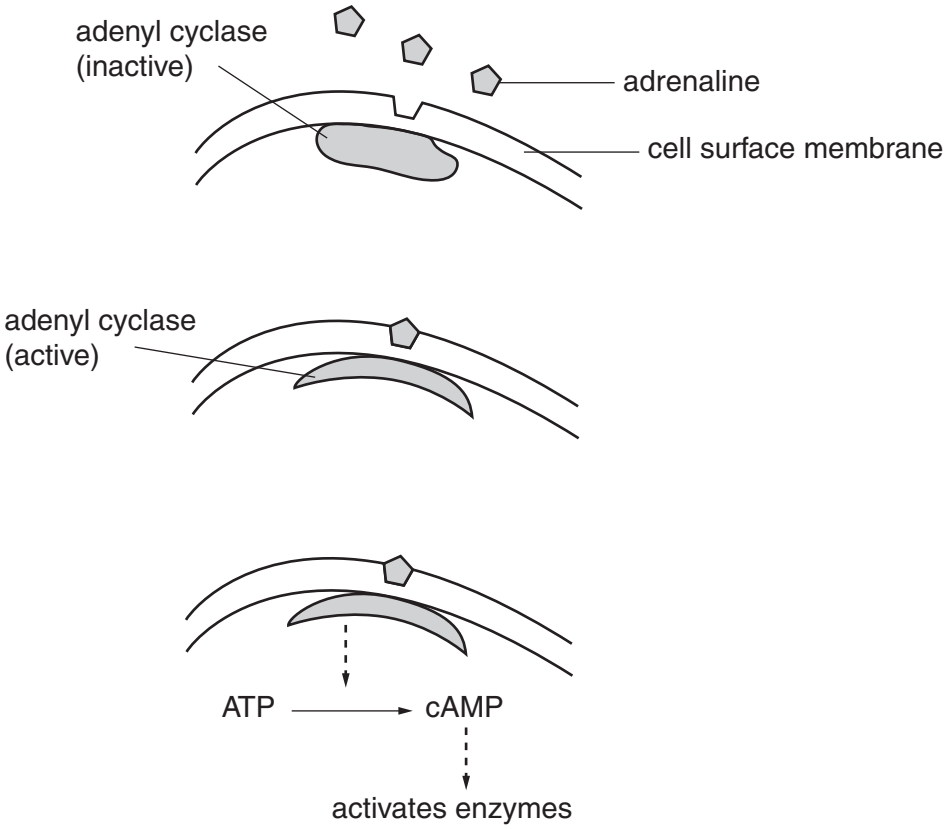


Fig. 5.1

(i) In terms of cell signalling, name the compound in Fig. 5.1 that is acting as:

the second messenger.....

the first messenger..... **[2]**

(ii) Suggest what happens to polysaccharides in the liver cell as a result of the events shown in Fig. 5.1.

.....

.....

..... **[1]**

© OCR 2011

STEMUP.CO.UK

(iii) Adrenaline affects a range of target tissues in the body.

Suggest how the adrenaline molecule can cause different effects in different target tissues.

.....

.....

.....

.....

.....

..... **[2]**

(b) Outline the **hormonal** and **nervous** mechanisms involved in the control of heart rate.



In your answer, you should use the appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

[Total: 10]

© OCR 2011

STEMUP.CO.UK

6 The leaves of flowering plants have the ability to develop differently, depending on environmental conditions such as the amount of sun or shade a leaf receives.

A student carried out an investigation into sun and shade leaves from different parts of the same plant. Her observations and results are shown in Table 6.1.

Table 6.1

type of leaf	number of leaves studied	mean no. of stomata per mm^2 on lower surface	mean thickness of leaf (μm)	cuticle
sun	55	170	208	thick
shade	8	92	93	thin

(a) Calculate the percentage difference in the **mean thickness** of the sun leaves compared to the shade leaves.

Show your working.

Answer = ... **[2]**

(b) Suggest **and** explain one benefit of the greater **mean number** of stomata per mm^2 on the lower surfaces of the sun leaves.

.....

.....

.....

.....

..... **[2]**

(c) Describe **two** ways in which the student could improve her investigation.

.....

.....

.....

.....

..... **[2]**

[Total: 6]

END OF QUESTION PAPER

© OCR 2011

STEMUP.CO.UK

ADDITIONAL PAGES

If additional space is required, you should use the lined pages below. The question number(s) must be clearly shown.

© OCR 2011

© OCR 2011

© OCR 2011

PLEASE DO NOT WRITE ON THIS PAGE

RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2011

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for January 2011

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2011

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question	Expected Answers	Marks	Additional Guidance
1 (a)	***Award 1 mark per correct row***	3	**Mark the first answer in each box.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spelling **except for** ethanal and ethanol

	mammal	*yeast*	
name of hydrogen acceptor after glycolysis	pyruvate	ethanal	;
is CO_2 produced?	no / ✗ / none / no molecules	yes / ✓ / some / one molecule	;
name of final product	lactate	ethanol	;

ACCEPT pyruvic acid (instead of pyruvate)
ACCEPT acetaldehyde (instead of ethanal)
IGNORE formulae
The spelling of ethanal must be unambiguous

ACCEPT 2 molecules for yeast (from 1 glucose molecule)

ACCEPT lactic acid (instead of lactate)
ACCEPT ethyl alcohol (instead of ethanol)
IGNORE alcohol
IGNORE formulae
The spelling of ethanol must be unambiguous

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
1	(b)					**IGNORE** ref to specific metabolic reactions other than glycolysis (mp 3) **IGNORE** ref to respiration without oxygen
			1	*idea that* ATP produced / energy released **;**		***1*** **DO NOT CREDIT** this mark point with any ref to energy , generated / produced / made [eg energy made in the form of ATP = 0 ATP (energy) is produced = 0]
			2	*idea that* recycles NAD / NAD can be used again **;**		***2*** **ACCEPT** 'reoxidises red NAD' (as implies recycling) **CREDIT** NADH / $NADH^+$ / $NADH_2$ for red NAD **DO NOT CREDIT** 'oxidises red NAD' without further qualification
			3	allows **, glyco**lysis / description of glycolysis **,** to take place / to continue **;**	**1 max**	***3*** If glycolysis used as a term, the spelling of 'glyco' must be correct.
				TOTAL	**4**	

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
2	(a)	(i)	1	structure A / Schwann cell / it , produces **myelin** ;		*1*	Needs the idea of production rather than simply stating 'it is a myelin sheath'
			2	(electrical) insulation / insulates ;		*2*	**CREDIT** insulate or derived term. **IGNORE** impermeable **DO NOT CREDIT** *idea of* thermal insulation
			3	prevents movement of ions , into / out of , neurone / axon ***or*** prevents **depolaris**ation ;		*3*	**CREDIT** 'across membrane' instead of , in / out, of axon **IGNORE** ion exchange **IGNORE** impermeable **DO NOT CREDIT** ions moving , into / out of , membrane **DO NOT CREDIT** movement of ions without qualification
			4	speeds up , **conduct**ion / transmission / passage , of , **impulse** / action potential ;		*4*	Statement must be comparative eg faster **DO NOT CREDIT** message / signal / wave of depolarisation
			5	**action potential**s / **local circuit**s / depolarisation / only occur at , gaps / **node**s (of Ranvier) ;		*5*	**ACCEPT** longer local circuits **ACCEPT** 'local currents' instead of local circuits
			6	**saltatory** conduction / described ;	3 max	*6*	eg • impulse jumps from , node to node / gap to gap **Note:** 'saltatory conduction' = 2 QWC terms
			QWC – technical terms used appropriately with correct spelling ;		1	Correct use and spelling of 3 terms from: **myelin, depolarisation (or other derived term),** **impulse, conduct (or other derived term),** **action potential, local circuit,** **node, saltatory** **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**	

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(ii)	<u>exocytosis</u> ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** bulk transport
2	(a)	(iii)	<u>diffusion</u> ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** facilitated diffusion
2	(a)	(iv)	**1** *idea that only* the <u>presynaptic</u> neurone , produces / releases / contains , acetylcholine / ACh / (neuro)transmitter ; **2** only the <u>presynaptic</u> membrane has , $Ca^{(2+)}$ / calcium (ion) , channels ; **3** *idea that only* the <u>postsynaptic</u> , membrane / neurone , has (ACh) receptors ; **4** ACh broken down at <u>postsynaptic</u> membrane ;	1 max	**IGNORE** ref to refractory period (as not a feature of synapse) **ACCEPT** ACH / ach throughout ***1*** **CREDIT** knob / terminal bouton / bulb (instead of neurone) ***2*** ***3*** **DO NOT CREDIT** ref to bouton / bulb / etc ***4*** **IGNORE** ref to (acetyl)cholinesterase without ref to action at postsynaptic membrane

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
2	(b)	(i)				**IGNORE** ref to atropine and ACh having similar shapes (as given in Q) **ACCEPT** ACH / ach throughout **Only credit ORA for the mark points if candidate clearly states that these events do <u>NOT</u> take place with atropine.**	
			1	*idea that* atropine **,** binds to / occupies / competes for **,** (ACh) <u>receptor</u> on postsynaptic **,** membrane / neurone **;**		***1***	**IGNORE** ref inhibition **DO NOT CREDIT** active site **DO NOT CREDIT** ref to bouton / bulb / etc
			2	*idea that* prevents ACh binding / blocks binding site / blocks receptor **;**		***2***	
			3	ion gates / ion channels / sodium channels / protein channels **,** do not open / remain closed **;**		***3***	**CREDIT** fewer ion channels open
			4	Na^+ cannot enter / K^+ cannot leave **,** neurone / (nerve) cell **;**		***4***	**CREDIT** sodium ions / potassium ions **DO NOT CREDIT** Na / K **DO NOT CREDIT** ions entering the membrane
			5	no / insufficient **,** depolarisation / postsynaptic potential / excitatory postsynaptic potential / epsp / generator potential **;**		***5***	**IGNORE** action potential (as given in Q)
			6	(so) does not reach threshold (value / potential) **;**	**3 max**	***6***	

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
2	(b)	(ii)				**ACCEPT** ACH / ach throughout	
			1	*idea that* will **,** bind to / occupy / compete for / block **,** (some of ACh) receptors **;**		***1***	**DO NOT CREDIT** ref to active site
			2	*so* acetylcholine / ACh **,** cannot bind / less likely to bind (to receptor / to postsynaptic membrane) **;**		***2***	**ACCEPT** *idea that* ACh remains in synaptic cleft
			3	prevents / reduces **,** constant stimulation / overstimulation / constant depolarisation **,** of postsynaptic neurone **or** prevents / reduces **,** constant firing of action potentials / tetanus / (muscle) spasm **;**		***3***	
			4	AVP **;**		***4***	eg • effective if administered soon after exposure • cannot counteract inhibition of acetylcholinesterase
					2 max		
				TOTAL	**12**		

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
3	(a)	(i)				**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**	
			W	**glycol**ysis ;		***W***	**CREDIT** glycolytic pathway **ACCEPT** phonetic spelling but must have 'glycol' **IGNORE** respiration
			X	Calvin cycle / light-independent stage (of photosynthesis) ;		***X***	**IGNORE** dark reaction / photosynthesis **ACCEPT** phonetic spelling
			Y	Krebs cycle ;		***Y***	**ACCEPT** citric acid cycle / TCA cycle / (tri)carboxylic acid cycle **ACCEPT** phonetic spelling **IGNORE** respiration / link reaction
					3		
3	(a)	(ii)	**1**	take place in different , parts / organelles , of the cell **or** compartmentalisation / reactions separated by membranes ;		***1***	Must be a clear statement and not implied from others. **DO NOT CREDIT** different parts of the leaf **DO NOT CREDIT** no interference between pathways (as rephrasing the Q)
			2	W / glycolysis , in cytoplasm ;		***2***	
			3	X / Calvin cycle , in , chloroplast / stroma (of chloroplast) ;		***3***	**DO NOT CREDIT** if thylakoid / membranes stated or implied
			4	Y / Krebs cycle , in , mitochondrion / matrix (of mitochondrion) ;		***4***	**DO NOT CREDIT** if cristae / membranes stated or implied
			5	AVP ;		***5***	eg • different enzymes for each pathway • different conditions for each pathway
					3 max		

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(iii)	X ; W **and** Y ;	**2**	**IGNORE** names. The question has asked for letters. *photosynthesis* **Mark the first answer.** If the answer is correct and an additional letter is given then = **0 marks** *aerobic respiration* **Mark the first two answers.** If these answers are correct and an additional letter (ie 3rd etc) is given then = **0 marks** **Both letters required for this mark, in any order.**
3	(a)	(iv)	ATP / adenosine triphosphate ; water / H_2O ; (oxidised) NAD / FAD ;	**2**	**If any answer(s) incorrect then Max 1** **IGNORE** energy / heat **IGNORE** numbers eg oxygen (×) and ATP (✓) and water = max 1 oxygen (×) and energy (*ignore*) = 0 ATP (✓) and energy (*ignore*) and H_2O (✓) = 2 reduced NAD (×) and ATP (✓) and energy (*ignore*) and H_2O = max 1

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
3	(b)		1	NAD / FAD / NADP , can , accept hydrogen / accept H / be reduced ;		*1*	**DO NOT CREDIT** hydrogen ions / protons , unless there is an electron as well **DO NOT CREDIT** accepts hydrogen molecules / H_2 **CREDIT** equation showing the reduction **ACCEPT** eg NAD converted to NADH **IGNORE** 'carries hydrogen'
			2	reduced , NAD / FAD , supplies / carries , electrons , to the electron transport chain / for oxidative phosphorylation ;		*2*	Must refer to *reduced* NAD **or** *reduced* FAD **or** NADH / $NADH^+$ / $NADH_2$ / FADH / $FADH^+$ / $FADH_2$
			3	reduced , NAD / FAD , supplies / carries , hydrogen ions for , chemiosmosis / oxidative phosphorylation ;		*3*	Must refer to *reduced* NAD **or** *reduced* FAD **or** NADH / $NADH^+$ / $NADH_2$ / FADH / $FADH^+$ / $FADH_2$
			4	reduced NADP , supplies / carries , hydrogen to , light independent stage / Calvin cycle / X ;		*4*	Must refer to *reduced* NADP **or** NADPH / $NADPH^+$ / $NADPH_2$
			5	coenzyme A / CoA , carries , acetate / ethanoate / acetyl group , to , Krebs cycle / Y ;		*5*	**DO NOT CREDIT** acetyl CoA carries acetate
			6	AVP ;		*6*	eg • co-enzyme(s) / cytochrome(s) , transfer / accept and release , electrons along the electron transport chain • can be , recycled / oxidised **and** reduced
					3 max		
				TOTAL	**13**		

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
4	(a)		1	water potential / Ψ , of plasma / outside cells , would be higher than that of the (blood) cells ;	2 max	*1* Must be a clear comparative statement relating to outside and inside cells **CREDIT** ora **IGNORE** water concentration
			2	water would enter (blood) cells ;		*2* **IGNORE** osmosis / down water potential gradient
			3	blood cells , swell / (might) burst / lyse ;		*3* **CREDIT** haemolysis / haemolysed **DO NOT CREDIT** plasmolysis / turgid ***Note:*** 'cells become turgid and burst' = 0 'cells swell and become turgid' = 0
4	(b)		*type of monomer* amino acid ; *name of bond* peptide / amide ;		2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** amine **IGNORE** covalent **DO NOT CREDIT** dipeptide / polypeptide

STEMUP.CO.UK

Question				Expected Answers	Marks	Additional Guidance
4	(c)					**Mark the first answer on each prompt line in the passage.** If the answer is correct and an additional answer is given for that 'gap' that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spelling throughout
			1	osmoreceptor / neurosecretory ;		***1*** **ACCEPT** osmotic receptor
			2	hypothalamus ;		***2***
			3	axon(s) ;		***3***
			4	posterior pituitary ;		***4*** **DO NOT CREDIT** 'pituitary' without correct qualification
			5	collecting duct ;		***5*** **ACCEPT** distal (convoluted) tubule / second convoluted tubule
			6	(plasma / cell) membrane(s) ;		***6***
			7	aquaporins(s) ;		***7*** **DO NOT CREDIT** aqua pores
			8	osmosis ;		***8***
					8	

STEMUP.CO.UK

Question			Expected Answers		Marks		Additional Guidance
4	(d)			*how ADH is dealt with as a protein*			
			1	in **,** liver / hepatocytes **;**		***1***	**DO NOT CREDIT** if linked directly to excretion eg 'excreted by the liver'
			2	hydrolysis / acted on by protease **;**		***2***	'broken down' is not quite enough
			3	deamination / amine group removed / formation of ammonia / formation of NH_3 **;**		***3***	**DO NOT CREDIT** 'amine group deaminated'
			4	ornithine cycle / formation of urea / formation of $CO(NH_2)_2$ **;**		***4***	**DO NOT CREDIT** 'amino acid enters ornithine cycle'
			5	amino acids / keto acids **,** used in (named) metabolic pathway **;**		***5***	eg • amino acids used for protein synthesis • keto acids used in **,** Krebs cycle / respiration • used in gluconeogenesis
				how ADH or urea is dealt with as a small molecule			
			6	in kidney **;**		***6***	
			7	(ultra)filtered from blood / moves from blood into nephron **;**		***7***	
			8	(because) small molecule **;**		***8***	
			9	urea not (all) reabsorbed / ADH not reabsorbed / (ADH or urea) present in urine **;**		***9***	**DO NOT CREDIT** 'removed **as** urine'
			10	excreted **;**		***10***	**DO NOT CREDIT** if linked directly to the liver eg 'excreted by the liver'
					3 max		
				TOTAL	**15**		

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
5	(a)	(i)	*2nd messenger* cAMP / cyclic AMP / cyclic adenosine monophosphate ; *1st messenger* adrenaline / adrenalin ;		2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** CAMP / camp **DO NOT CREDIT** adenine monophosphate **IGNORE** chemicals not named in Fig. 5.1	
5	(a)	(ii)	**1**	glycogen → glucose / glycogenolysis ;	1 max	*1*	**DO NOT CREDIT** gluconeogenesis / glycogenesis
			2	by hydrolysis ;		*2*	This term must be used, or a derived term.
			3	*correct ref to* protein kinase / glycogen phosphorylase kinase (activates glycogen phosphorylase) ***or*** glycogen phosphorylase (stimulates conversion of glycogen) ***or*** inhibition of glycogen synthase (preventing glucose conversion to glycogen) ;	*3*	

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
5	(a)	(iii)				**IGNORE** reasons not related to adrenaline (as Q specifies 'how the adrenaline molecule can cause ...') **IGNORE** descriptions of stated effects in different tissues as Q asks *how* adrenaline causes these different effects
			1	different tissues have different (types of adrenaline) receptors **;**		***1***
			2	(causing) cAMP concentration to increase or decrease **;**		***2*** **ACCEPT** adenyl cyclase / cAMP **,** inhibited
			3	second messenger (may be) different **;**		***3***
			4	cAMP / second messenger **,** activates **,** different / other **,** enzymes / enzyme reactions (in different target cells) **;**	**2 max**	***4***

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
5	(b)		1	**adrenalin**(**e**) increases **,** heart rate / stroke volume / cardiac output **;**		*1*	
			2	**cardiovascular centre** in **medulla oblongata ;**		*2*	**ACCEPT** 'cardiac' instead of cardiovascular but not for QWC
			3	*idea of* nervous connection to **,** SAN / **sino-atrial node ;**		*3*	**ACCEPT** SAN for mp 3 but not for QWC
			4	(which) controls frequency of waves of **,** excitation / depolarisation **;**		*4*	**CREDIT** in relation to mp 2 or mp 3
			5	**vagus** / **parasympathetic ,** nerve decreases heart rate **;**		*5*	**ONLY CREDIT** vagus ***or*** parasympathetic for QWC
			6	**accelerator** / **sympathetic ,** nerve increases heart rate **;**		*6*	**ONLY CREDIT** accelerator ***or*** sympathetic for QWC **ACCEPT** phrenic nerve
			7	high blood pressure detected by **,** stretch receptors / baroreceptors **;**		*7*	**DO NOT CREDIT** proprioreceptor
			8	low blood pH / increased levels of blood CO_2 **,** detected by **chemoreceptor**s **;**		*8*	
			9	(receptors) in **,** aorta / **carotid** sinus / carotid arteries **;**	**4 max**	*9*	
			QWC – technical terms used appropriately with correct spelling **;**		**1**	Correct use of **adrenalin**(**e**) (**Identify using the tick 1** ✓**1** AND MUST BE INCLUDED FOR QWC TO BE AWARDED) **plus** use of **2** terms from: **cardiovascular centre, medulla oblongata, sino-atrial node, vagus** or **parasympathetic, carotid, accelerator** or **sympathetic, chemoreceptor** **You should use the GREEN DOT to identify the remaining QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded**	
				TOTAL	**10**		

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
6	(a)		124 (%) / 123.7 (%) ; ;	2	• Correct answer = 2 marks (208 – 93) ÷ 93 x 100 • **ACCEPT** 55 (%) / 55.3 (%) for 2 marks (208 – 93) ÷ 208 x 100 • Correct numerical answer but inappropriate units (eg 124 μm) = 1 mark • If answer not rounded correctly (to nearest whole number or to 1 dp) or if answer incorrect, then allow 1 mark for seeing **either** 115 **or** (208 – 93)

STEMUP.CO.UK

Question	Expected Answers	Marks	Additional Guidance
6 (b)	**Read through complete answer.** **Award 2 marks if a benefit and explanation <u>are</u> correctly linked.** **If benefit and explanation <u>are not</u> correctly linked:** **Award Max 1 for <u>either</u> a benefit <u>or</u> an explanation.**		
	benefit		
	1a allows entry of **more** CO_2 **;**		***1a*** Must indicate the idea of ***more*** *and* ***imply going in*** eg 'allows more gas exchange so that there is more CO_2 for photosynthesis' the mention of gas exchange implies that the CO_2 must be going in
	explanation		
	2a (CO_2) for **,** light-independent reaction / Calvin cycle		***2a*** **DO NOT CREDIT** 'CO_2 fixed' without further qualification (eg ref to Rubisco / GP formation)
	or		
	2b light-dependent reaction is taking place quickly / reduced NADP building up / ATP building up		***2b***
	or		
	2c CO_2 not as limiting (than when there are fewer stomata)		***2c*** **CREDIT** with fewer stomata CO_2 is limiting
	or		
	2d *idea that* increases access to air spaces for distribution of CO_2 **;**		***2d***
	OR		
	benefit		
	1b reduces transpiration **;**		***1b*** **DO NOT CREDIT** description of transpiration **ACCEPT** 'plant less likely to wilt'
	explanation		
	2e *idea of* stomata sheltered from **,** air currents / heat (when on lower surface)		***2e***
	or		
	2f *idea that* diffusion shells maintained **;**	**2**	***2f***

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
6	(c)					**DO NOT CREDIT** refs to controlling temperature **or** light **or** wind **or** time
			1	equal sample size for sun and shade leaves / increase sample size of shade leaves / greater numbers of sun and shade leaves ;		***1***
			2	measure thickness of cuticle / make cuticle observations quantitative ;		***2***
			3	record range / calculate SD / calculate SE / (named) statistical analysis ;		***3***
			4	record data on leaf, length / width / area / colour / chlorophyll content ;		***4***
			5	record data on , size of stomata / stomatal count on upper surface ;		***5***
			6	define what is a sun or shade leaf / measure light levels to classify type of leaf ;		***6***
			7	repeat / replicate , the (whole) experiment / using other plants of the same species ;		***7*** **IGNORE** ref to other species **DO NOT CREDIT** 'repeats' unqualified or implying the same individual plant
					2 max	
				TOTAL	**6**	

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2011

THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE
BIOLOGY
Communication, Homeostasis and Energy

F214

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Electronic Calculator
- Ruler (cm/mm)

Friday 25 June 2010
Afternoon

Duration: 1 hour

* F 2 1 4 *

* O C E / 1 3 7 1 0 *

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2010 [A/500/8553]
SHW 00434 3/09 13710/2

OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** Fig. 1.1 represents a molecule of ATP.

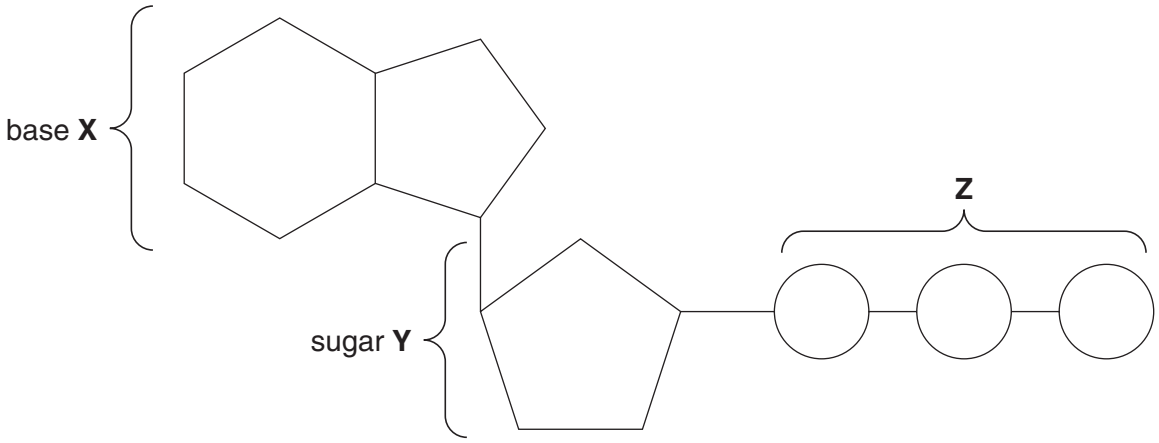


Fig. 1.1

(i) Name the parts of the ATP molecule labelled **X**, **Y** and **Z**.

X .....

Y .....

Z ..... **[3]**

(ii) With reference to Fig. 1.1, describe and explain the role of ATP in the cell.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

© OCR 2010

STEMUP.CO.UK

(b) Fig. 1.2 is an electron micrograph of a mitochondrion from an animal cell.

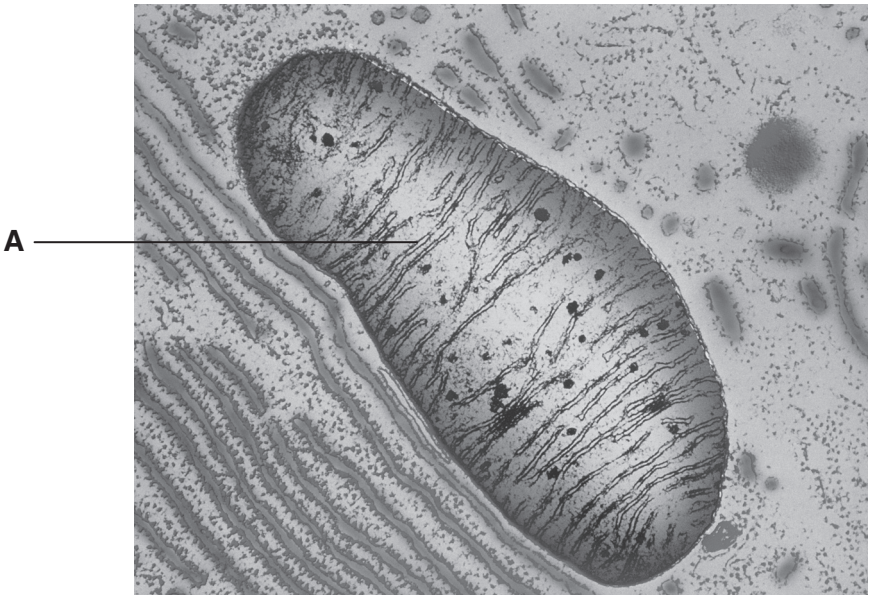


Fig. 1.2

(i) Name the structure labelled **A**.

..... **[1]**

(ii) Name the specific process that is carried out by structure **A** in the mitochondrion.

..... **[1]**

© OCR 2010

STEMUP.CO.UK

(c) Some animals conserve energy by entering a state of torpor (a short period of dormancy), in which they allow their body temperature to fall below normal for a number of hours.

In an investigation into torpor in the Siberian hamster, *Phodopus sungorus*, the animal's respiratory quotient (RQ) was measured before and during the period of torpor.

The respiratory quotient is determined by the following equation:

$$RQ = \frac{\text{volume of carbon dioxide produced}}{\text{volume of oxygen consumed in the same time}}$$

RQ values for different respiratory substrates have been determined and are shown in Table 1.1.

Table 1.1

substrate	RQ
carbohydrate	1.0
lipid	0.7
protein	0.9

(i) Initially, the RQ value determined for the hamster was 0.95, but as the period of torpor progressed, its RQ value decreased to 0.75.

What do these values suggest about the substrates being respired by the hamster during the period of the investigation?

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

© OCR 2010

STEMUP.CO.UK

(ii) Describe the way in which an endothermic animal, such as a mammal, normally prevents its body temperature from decreasing when the external temperature decreases.



In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

[Total: 16]

© OCR 2010

STEMUP.CO.UK

2 **(a)** Fig. 2.1 is a photomicrograph through the centre of a lobule of a mammalian liver.

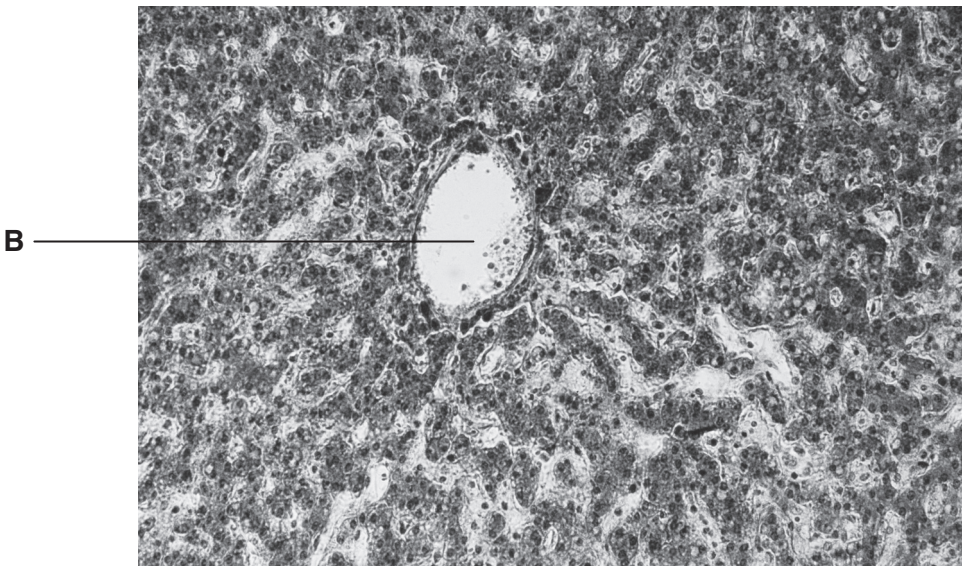


Fig. 2.1

(i) Name the type of vessel labelled **B**.

..... **[1]**

(ii) Name the cells that make up the lobule.

..... **[1]**

© OCR 2010

STEMUP.CO.UK

(b) Fig. 2.2 outlines the formation of urea in the liver.

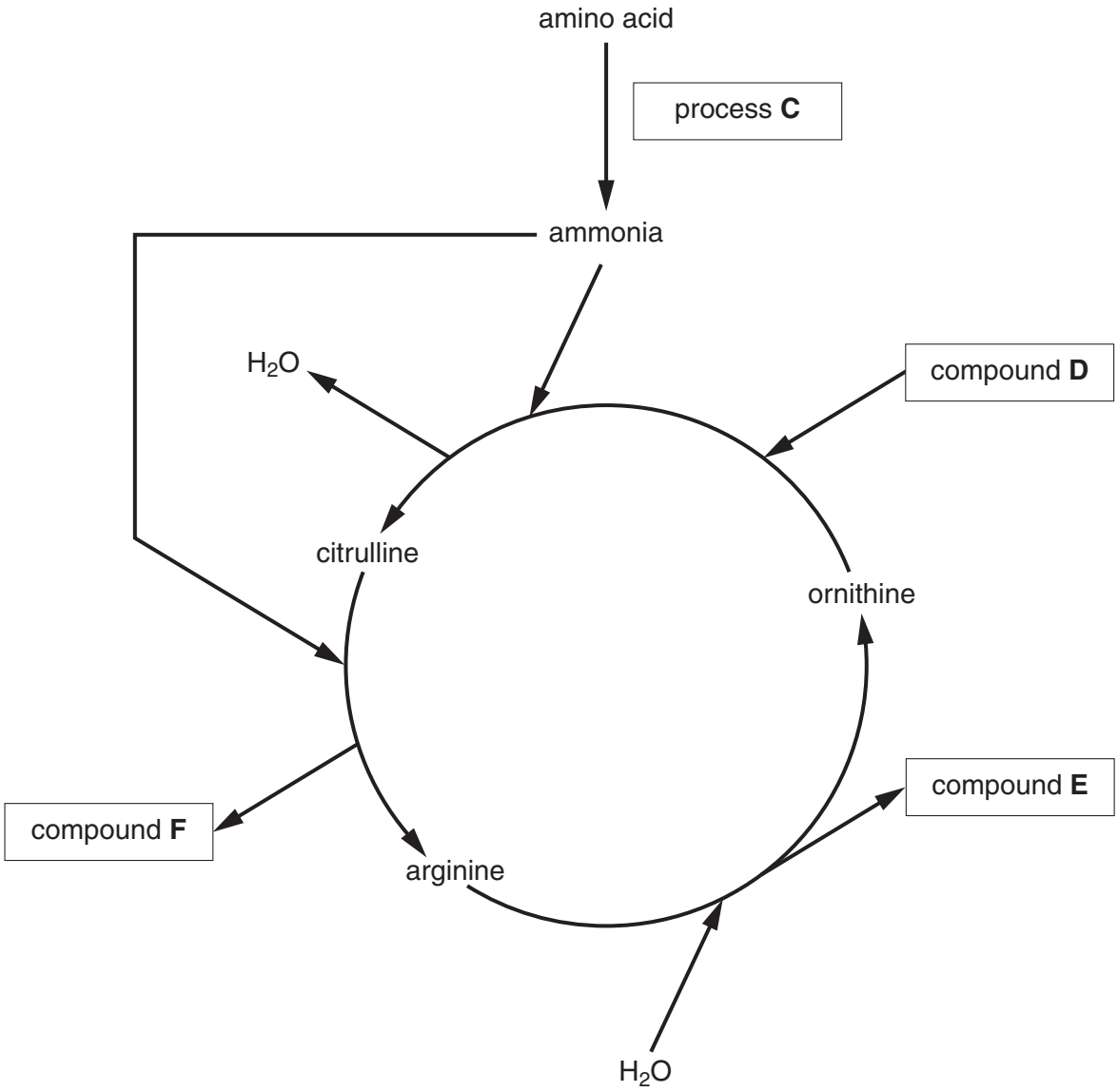


Fig. 2.2

Using Fig. 2.2, identify:

process **C** .....

compound **D** .....

compound **E** .....

compound **F** ..... **[4]**

© OCR 2010

STEMUP.CO.UK

(c) The urea formed in the ornithine cycle will be excreted from the body in urine. Urine also contains other chemicals.

Procedures have been developed to test for the presence of some of these chemicals, such as hormones.

(i) A pregnancy testing kit contains a testing 'stick' to detect a hormone in the urine.

Explain how the stick detects this pregnancy hormone.

In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

© OCR 2010

(ii) The urine of some high profile athletes has been tested and found to contain abnormally high levels of banned steroids or their metabolites.

The pressure on elite athletes to succeed in their sport leads some of them to resort to the use of these performance-enhancing steroids.

Comment on whether the use of steroids should be permitted in sport.

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 13]

© OCR 2010

STEMUP.CO.UK

3 **(a)** The Calvin cycle is the stage of photosynthesis during which carbon dioxide is fixed. The Calvin cycle uses the products of the light dependent stage.

(i) Name the products of the light dependent stage that are used in the Calvin cycle.

.....

..... **[2]**

(ii) Discuss the fate of triose phosphate (TP) in the Calvin cycle.

.....

.....

.....

.....

.....

.....

..... **[3]**

(b) A process known as **photorespiration** also takes place in photosynthetic cells. In this process, oxygen competes with carbon dioxide for the active site of the enzyme RuBP carboxylase (Rubisco).

Fig. 3.1 (a) and Fig. 3.1 (b) outline the processes of photosynthesis and photorespiration.

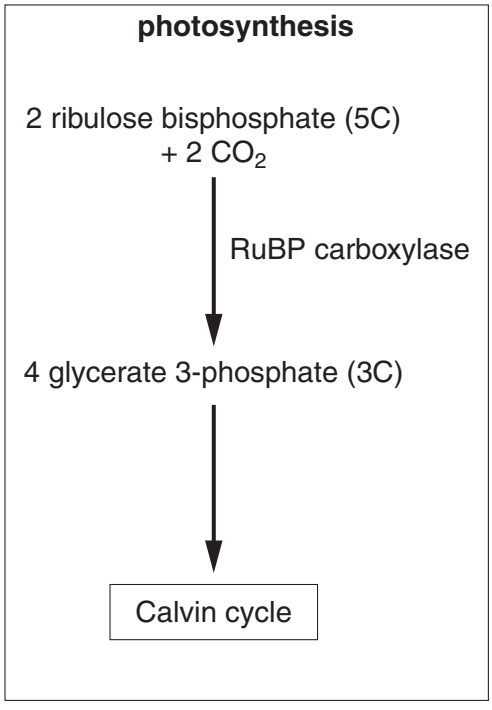


Fig. 3.1 (a)

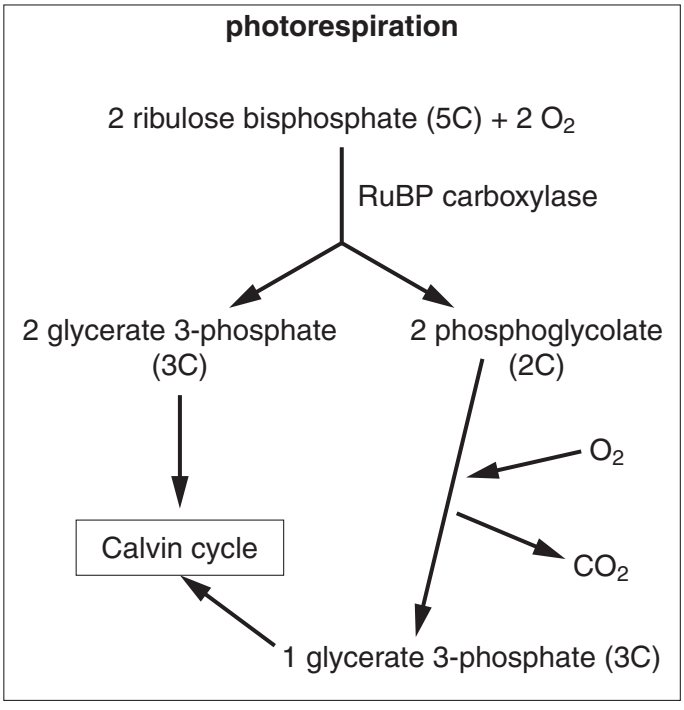


Fig. 3.1 (b)

© OCR 2010

STEMUP.CO.UK

(i) Suggest why the process outlined in Fig. 3.1 (b) is known as photorespiration.

.....

.....

.....

..... **[2]**

(ii) Using Fig. 3.1 (a) and Fig. 3.1 (b), describe and explain the likely effect on photosynthesis of an increase in the oxygen concentration.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(iii) Some plants, known as C_4 plants, use an enzyme called PEP carboxylase, instead of Rubisco, to fix carbon dioxide.

Suggest why these plants do **not** show photorespiration.

.....

.....

..... **[1]**

[Total: 11]

© OCR 2010

STEMUP.CO.UK

4 As part of a study to control Type 2 diabetes by modification of the diet, an investigation was carried out into the effects of different food compounds on the blood glucose and blood insulin concentrations of patients with this type of diabetes.

The food compounds, their components and their effect on blood glucose and blood insulin concentrations are summarised in Table 4.1.

Table 4.1

food compound	component(s)	effect on blood glucose concentration	effect on blood insulin concentration
sucrose	glucose and fructose	moderate increase	moderate increase
lactose	glucose and galactose	moderate increase	moderate increase
starch	glucose	substantial increase	substantial increase
cellulose	glucose	no effect	no effect
protein	amino acid	no effect	moderate increase
fat	fatty acid and glycerol	no effect	moderate increase

(a) Suggest an explanation for the differences observed in **blood glucose concentration**:

(i) between starch and sucrose,

.....

.....

.....

..... **[2]**

(ii) between starch and cellulose.

.....

.....

.....

..... **[2]**

© OCR 2010

STEMUP.CO.UK

(b) With reference to the food compounds in Table 4.1, explain how a person with Type 2 diabetes could control the condition by modifying their diet.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

(c) Glycogen and glucagon are compounds that are involved in the control of blood glucose concentration.

Complete the table below to distinguish between these two compounds.

	glycogen	glucagon
type of compound		
role of compound		
site of production		

[3]

[Total: 10]

© OCR 2010

STEMUP.CO.UK

5 Fig. 5.1 is a trace that shows the changes that occur in the membrane potential of a neurone during the generation of an action potential.

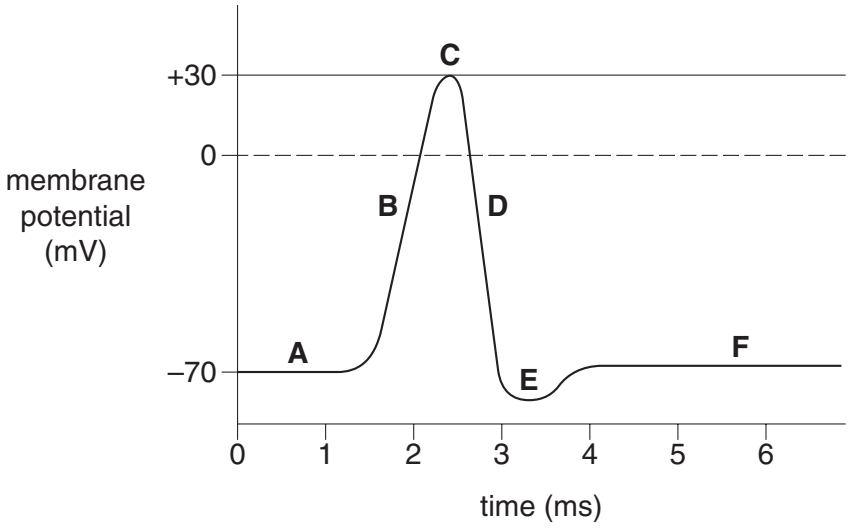


Fig. 5.1

(a) Using the letters **A** to **F**, indicate the point or points on the trace which correspond to the following:

(i) hyperpolarisation,

..... **[1]**

(ii) resting potential,

..... **[1]**

(iii) the membrane is most permeable to potassium ions,

..... **[1]**

(iv) depolarisation.

..... **[1]**

© OCR 2010

STEMUP.CO.UK

(b) Puffer fish, *Fugu spp.*, produce a powerful poison, tetradotoxin, and some species store it in high concentrations in their body tissues. Unless these fish are correctly prepared, eating them can be fatal.

Tetradotoxin is poisonous to humans because it blocks **gated** sodium channels in cell membranes, preventing action potentials. This does not happen in the fish themselves.

(i) With reference to Fig. 5.1, identify, using the appropriate letter, the part of the action potential trace that will be affected by tetradotoxin.

..... **[1]**

(ii) Suggest why tetradotoxin is **not** toxic to the puffer fish.

.....

.....

..... **[1]**

QUESTION 5(c) STARTS ON PAGE 16

© OCR 2010

STEMUP.CO.UK

(c) Multiple sclerosis (MS) is an auto-immune condition in which the nervous system is damaged. This damage leads to loss of sensation. One form of damage is shown in Fig. 5.2.

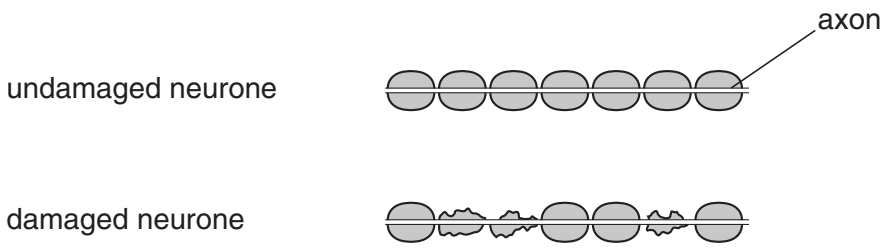


Fig. 5.2

(i) Suggest why MS is described as an auto-immune condition.

.....

.....

.....

.....

..... **[2]**

(ii) Explain why this damage leads to a loss of sensation.

.....

.....

.....

.....

..... **[2]**

[Total: 10]

END OF QUESTION PAPER

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2010

OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **F214**

Communication, Homeostasis & Energy

Mark Scheme for June 2010

Oxford Cambridge and RSA Examinations

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2010

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)			**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			X adenine ;		***X*** **IGNORE** nitrogenous base / base / A **DO NOT CREDIT** adenosine
			Y ribose ;		***Y*** **IGNORE** pentose / sugar **DO NOT CREDIT** ribulose / hexose
			Z (tri / 3) phosphate(s) ;		***Z*** **IGNORE** chemical formulae (as Q asks for name) **DO NOT CREDIT** phosphorus / phosphoryl (PO)
				3	

STEMUP.CO.UK

Question				Expected Answer	Mark	Additional Guidance
1	(a)	(ii)	1	transfers energy / energy 'currency' / releases energy / universal energy molecule / energy intermediate / (immediate) source of energy ;		*1* **IGNORE** contains energy **DO NOT CREDIT** produce energy
			2	phosphate(s) can be removed by hydrolysis ;		*2* $ATP \rightarrow ADP + P_{(i)}$ by hydrolysis **or** $ATP + H_2O \rightarrow ADP + P_{(i)}$ (must include water)
			3	to , release / provide , 30kJ (mol^{-1}) energy ;		*3* **ACCEPT** 28 – 32 kJ **DO NOT CREDIT** produce energy
			4	(energy released for) metabolism / appropriate named reaction / appropriate reaction described ;		*4* e.g. • muscle contraction • active transport • phosphorylation • glycolysis • during movement binding to proteins to change their shape **IGNORE** respiration / photosynthesis unqualified
			5	ADP can attach a phosphate (forming ATP) during , respiration / photosynthesis ;		*5* **CREDIT** during, oxidative phosphorylation / chemiosmosis / substrate level phosphorylation / photophosphorylation
			6	energy released in , small 'packets' (to prevent cell damage) / suitable quantity ;		**NOTE** 'it releases 30kJ of energy when a phosphate is removed by hydrolysis' = 3 marks (mps 3, 1 and 2)
					3 max	

STEMUP.CO.UK

Question			Expected Answer		Mark	Additional Guidance
1	(b)	(i)	crista ;		1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** 'cristae' / **'**inner mitochondrial membrane' **IGNORE** 'stalked particles'
1	(b)	(ii)	chemiosmosis / oxidative phosphorylation ;		1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** description of chemiosmosis [e.g. • 'ATP synthesis' • 'electron flow along electron carriers'] **IGNORE** **'**aerobic respiration' **IGNORE** 'electron transport chain' alone (as this is not a process)
1	(c)	(i)	**1**	<u>substrate</u> respired changes over time ;	3 max	***1*** Needs to be a clear statement and not just names and not inferred from candidate's complete answer
			2	initially respires (mostly) **,** glucose / carbohydrate ;		***2*** **IGNORE** respiring protein
			3	lower / decrease in / 0.75 **,** RQ indicates (more) **,** fat / lipid **,** as substrate ***or*** as time goes by (more) lipid is respired ;		***3*** **IGNORE** respiring protein
			4	glucose / carbohydrate **,** used up / decreases (over time) ;		
			5	protein not likely to be used as substrate / protein only used as a last resort ;		***5*** 'Less protein respired' isn't quite enough for this mp

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
1	(c)	(ii)	***This is a QWC question***		**Only CREDIT** answers that refer to **preventing a decrease** in body temperature – no **ora** **IGNORE** negative feedback (Q only about preventing decrease)
			1 **peripheral** / skin , **thermoreceptor**s / (heat) receptors , stimulated (by decrease in external temp) ; **2** (impulses sent to / blood temperature monitored in) **hypothalamus** / sensory **cortex** ; **3** **vasoconstrict**ion of , arterioles / small arteries , to reduce heat loss ; **4** (prevents heat loss by) **radiat**ion / **conduct**ion / **convect**ion ; **5** increased , **metabolic rate** / **metaboli**sm / respiration , to generate heat (energy) ; **6** (release of) **adrenaline** / **thyroxine** ; **7** shivering / (involuntary) muscle spasms , to generate heat (energy) ; **8** **erector** / hair , muscles raise , (skin) hair / fur , to trap , air / heat ; **9** AVP ;	**4 max**	***3*** **ACCEPT** '<u>pre</u>-capillary sphincter' instead of 'arterioles' **DO NOT CREDIT** other blood vessels **but allow QWC** ***5*** Emphasis needs to be on increase / higher rate / more ***7*** Needs the idea of generating heat not just 'to keep warm ' ***9*** e.g. • specific behavioural response (such as huddling / increased exercise / move to find sun) • involvement of sympathetic nervous system • reduce sweating / reduce panting / stop panting **DO NOT CREDIT** 'stop sweating'
			QWC - technical terms used appropriately and spelt correctly ;	**1**	Use of **three** terms from: **peripheral,** **thermoreceptor(s),** **hypothalamus,** **cortex,** **vasoconstrict**ion, **metabolic rate / metaboli**sm, **adrenaline,** **thyroxine,** **erector** **radiat**ion **/ conduct**ion **/ convect**ion **Please insert a QWC symbol next to the mark total bracket, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
			Total	**[16]**	

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	vein / venule ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** further qualification (e.g. central / hepatic) **but** **DO NOT CREDIT** inappropriate name (e.g. renal vein / hepatic portal vein)
2	(a)	(ii)	hepatocyte(s) / hepatic cells ;	1	**IGNORE** 'liver cells' (as given in Q) and 'sinusoid cells' A list must include 'hepatocytes' or 'hepatic cells' and not include an incorrect cell e.g. hepatocytes and Kupffer cells = 1 hepatocytes and α cells = 0 liver cells and Kupffer cells = 0
2	(b)		<u>deamination</u> ; carbon dioxide / CO_2 ; urea / $CO(NH_2)_2$; water / H_2O ;	4	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** If a formula is given for compounds D, E and F then the formula given must be correct in order to be awarded the mark e.g. **E** 'urea ($CONH_2$)' = 0 as the formula is incorrect

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
2	(c)	(i)	***This is a QWC question***		**Max 2 (instead of 3) for content if use the term , receptor / antigen / enzyme , *throughout* instead of antibody**
			1 (testing for) **human chorionic gonadotrophin** / hCG **;**		***1*** **ACCEPT** HCG This mark can be awarded for hCG but the name must be given in full for QWC
			2 hormone small so can pass from blood into **filtrate** (at Bowman's capsule) **;**		
			3 **monoclonal** / **immobilised , antibodies** / immunoglobulin **,** on stick **;**		***3*** **ALLOW** 'strip' instead of stick
			4 antibodies attached to **,** marker / dye **;**		
			5 hormone **,** binds / **complementary ,** to antibody **;**		***5*** **IGNORE** specificity
			6 (triggers) appearance of colour / line becomes visible **;**		
			7 AVP **;**	**3 max**	***7*** e.g. • reference to the second line to validate test • different antibody for second line • 2 coloured lines = pregnant
			QWC - technical terms used appropriately and spelt correctly **;**	**1**	Use of **three** terms from: **human chorionic gonadotrophin, filtrate, monoclonal, immobilised, antibody(ies), complementary**

STEMUP.CO.UK

Question				Expected Answer	Mark	Additional Guidance
2	(c)	(ii)				**IGNORE** enhances performance (as given in Q)
			1	fairness / giving unfair advantage / does not give an 'even playing field' ;		***1*** **ACCEPT** comment about cheating **IGNORE** idea of should be available to all
			2	*idea of* health risks / dangerous / unhealthy / fatal / side effects ;		***2*** **IGNORE** 'has an effect on health' as must imply negative effect
			3	specified health risk ;		***3*** e.g. • depression • aggression • liver , damage / failure • heart attack • masculinisation of female athletes • feminisation of male athletes • infertility
			4	*idea of* distrust of 'outstanding' performances / does not reflect athlete's natural talent / sport should reflect athlete's natural talent ;		
			5	*idea of* pressure to keep up with rival competitors ;		
			6	*idea that* can train for longer (without tiring) / can respire longer (without tiring) / can recover from injury quicker / can build up muscle mass ;		
			7	AVP ;	**3 max**	***7*** e.g. • up to the individual to decide • idea that athletes should be role models
				Total	**[13]**	

STEMUP.CO.UK

Question			Expected Answer		Mark	Additional Guidance
3	(a)	(i)	**Credit in either order** ATP ; reduced NADP / NADPH / NADPH$_2$ / NADPH + H$^+$;		2	**Mark the first two answers.** If either of the answers is correct and an additional answer (i.e. 3rd etc) is given that is incorrect or contradicts the correct answer then -1 for each additional incorrect answer **DO NOT CREDIT** reduced NAD / NADH / NADH$_2$ / NADH + H$^+$ **DO NOT CREDIT** oxygen / O_2 (as not used in Calvin cycle) e.g. ATP (✓) and NADPH (✓) and GP (-1) = 1 NADH (×) and ATP (✓) and oxygen (-1) = 0 GP (×) and H_2O (×) and ATP and NADPH = 0 ATP (✓) and NADPH (✓) and GP (-1) and H_2O (-1) = 0
3	(a)	(ii)	**1** regenerates / produces , ribulose bisphosphate / RuBP ; **2** so cycle can continue / for (further) CO_2 fixation / to combine with CO_2 ; **3** formation of (named) , sugar / glucose / hexose / sucrose / starch / cellulose ; **4** formation of (named) , fat / triglyceride / lipid / fatty acids / glycerol / amino acids / protein / nucleic acids / nucleotides ; **5** 10x TP for RuBP and 2x TP for production **or** most TP used to produce RuBP and the rest for production ;		3 max	***3*** **IGNORE** carbohydrate without qualification **but CREDIT** suitably named carbohydrate ***5*** Needs to refer to both **CREDIT** 5/6 regenerated and the rest for production

STEMUP.CO.UK

Question			Expected Answer		Mark	Additional Guidance
3	(b)	(i)	oxygen used and carbon dioxide , produced / excreted ; (only) occurs in the light / light (energy) required **or** uses , (same) photosynthetic enzyme / Rubisco **or** involves Calvin cycle ;		2	**DO NOT CREDIT** comments that categorically state 'it **is** respiration' **CREDIT** 'sun' instead of 'light' **IGNORE** ref to light dependent stage [S & C x 2]
3	(b)	(ii)	**1**	reduces (rate of) photosynthesis / increases (rate of) photorespiration ;	3 max	***2*** **ACCEPT** oxygen blocks active site of Rubisco **CREDIT** 'enzyme' instead of 'Rubisco' Needs to convey the idea that oxygen more successful / more oxygenase activity Be careful not to credit RuBP ***5 & 6*** **IGNORE** number before name unless used to indicate more or less (compare flow charts) [S & C x 3]
			2	less Rubisco available for CO_2 / more oxygen competing with CO_2 for Rubisco / more O_2 binding to Rubisco O_2 outcompetes CO_2 for Rubisco ;		
			3	less CO_2 , fixation / for Calvin cycle ;		
			4	CO_2 given off ;		
			5	less , glycerate 3-phosphate / GP / TP , produced ;		
			6	less RuBP , regenerated / formed ;		

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(iii)	*idea that* oxygen **,** not a substrate for / cannot bind to / will not compete for **,** PEP carboxylase **or** PEP carboxylase **,** is only specific to carbon dioxide **;**	**1**	**ACCEPT** PEP carboxylase cannot 'fix' oxygen [S & C x 1]
			Total	**[11]**	

STEMUP.CO.UK

Question			Expected Answer		Mark	Additional Guidance
4	(a)	(i)	starch contains (only) glucose **and** sucrose contains , 50% glucose ***or*** glucose and fructose ; by hydrolysis , starch releases more glucose / sucrose releases less glucose ;		**2**	
4	(a)	(ii)	both starch and cellulose are (only) made of glucose ; starch , is digestible / can be broken down **and** cellulose , is indigestible / cannot be broken down ; (named) enzyme present for starch digestion / no (named) enzyme present for cellulose digestion ;		**2 max**	
4	(b)		**1**	low / decrease , starch ;	**3 max**	***1*** **ACCEPT** 'no starch'
			2	as starch has the greatest effect on blood glucose conc. ;		***2*** 'substantial' or 'high' or 'big' is not quite enough
			3	increase / include , cellulose / fibre / roughage / fat / protein / meat , as no effect on blood glucose ;		***3*** **IGNORE** the idea that , fat / protein , increases insulin and could indirectly lower blood glucose (as this is not relevant to Type 2 diabetes) **DO NOT CREDIT** little effect / less effect (as table shows **no** effect)
			4	some / medium amount of , sugars / sucrose / lactose ;		
			5	*idea of* limiting , sucrose / lactose / fat / protein , as causes an increase in insulin **and** will make cells less responsive (to insulin) ;		

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
4	(c)			3	**Award one mark per row** *both glycogen and glucagon* **IGNORE** polymer or macromolecule unless qualified *glycogen* **DO NOT CREDIT** complex sugar / sugar *both glycogen and glucagon* Look for ***qualification*** of glycogenolysis *glycogen* **ACCEPT** muscle / brain *glucagon* **ACCEPT** 'a cells' **IGNORE** pancrease **DO NOT CREDIT** beta / β , cells
			Total	**[10]**	

	glycogen	glucagon
type of compound	carbohydrate **OR** polysaccharide ;	hormone **OR** polypeptide **OR** protein ;
role of compound	storage **OR** to provide glucose (when blood glucose conc. falls) **OR** can undergo glycogenolysis ;	binds to cell receptor **OR** causes conversion of glycogen to glucose **OR** stimulates glycogenolysis **OR** increases (blood) glucose concentration ;
site of production	liver **OR** hepatocytes ;	pancreas **OR** islets of Langerhans **OR** alpha / α , cells ;

STEMUP.CO.UK

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(i)	**E ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(a)	(ii)	**A** and **F ;**	1	**Mark the first <u>two</u> answers for <u>one</u> mark.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(a)	(iii)	**D ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(a)	(iv)	**B ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(b)	(i)	**B ;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(b)	(ii)	channel / receptor / ion **,** is different **;** AVP **;**	1 max	**IGNORE** has enzyme to break it down (as Q states that it is stored in body) **DO NOT CREDIT** ref to active site e.g. • *idea that* toxin confined to **,** organelle / organ / part of the body • toxin not **,** in general circulation / (circulated) in blood • toxin stored in inactive form • contains a compound that neutralises toxin [S & C x 1]

STEMUP.CO.UK

Question				Expected Answer	Mark	Additional Guidance
5	(c)	(i)	1	attacked by the body's (own) immune system ;	2 max	*1* Named parts of the immune system are credited in mp 3 – not in this mp
			2	(immune system) mistakes / treats / recognises , body cells / neurones / myelin , as , 'foreign' / non self ;		
			3	correct ref. to , antibodies / (named) phagocytes / (named) B lymphocytes / (named) T lymphocytes ;		
5	(c)	(ii)	1	(damage to) myelin / sheath / Schwann cell(s) ;	2 max	*1* **IGNORE** damaged neurone (as given in Q) **IGNORE** damaged axon
			2	removes / has less , insulation ;		
			3	interferes with / slows / stops , conduction of , (nerve) impulse / action potential **or** slows / stops / prevents , saltatory conduction / described ;		*3* e.g. • more gaps where depolarisation needs to take place • shorter local , circuits / currents
			4	occurs , in sensory neurones / towards brain / towards CNS / from sensory organ / from receptor ;		
				Total	**[10]**	

[END]

STEMUP.CO.UK

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2010

THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

F214

Communication, Homeostasis and Energy

Candidates answer on the Question Paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Monday 25 January 2010
Afternoon

Duration: 1 hour

OCE/23852

F214

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

© OCR 2010 [A/500/8553]
DC (AC/CGW) ML10040 23852

OCR is an exempt Charity

STEMUP.CO.UK

Answer **all** the questions.

1 **(a)** Excretion and secretion are two processes that take place in the body of a mammal.

Complete the table below to compare the processes of excretion and secretion.

	excretion	secretion
one difference		
one example of a product		
one similarity		

[3]

(b) Aerobic respiration may be summarised by the following equation:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

Although carbon dioxide and water are products of aerobic respiration, this equation makes the process seem too simple.

State **and** explain **one** way in which this equation makes it seem too simple.

.....

.....

.....

..... **[2]**

© OCR 2010

STEMUP.CO.UK

(c) Over 2.3 million people in the UK are known to have diabetes. It is also estimated that 0.5 million more people have the condition but are unaware of it.

(i) Explain how **Type 1** diabetes is caused.

.....

.....

.....

..... **[2]**

(ii) Describe **three** factors that increase a person's risk of developing **Type 2** diabetes.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 10]

© OCR 2010

STEMUP.CO.UK

2 **(a)** Fig. 2.1 represents the first stage of respiration.

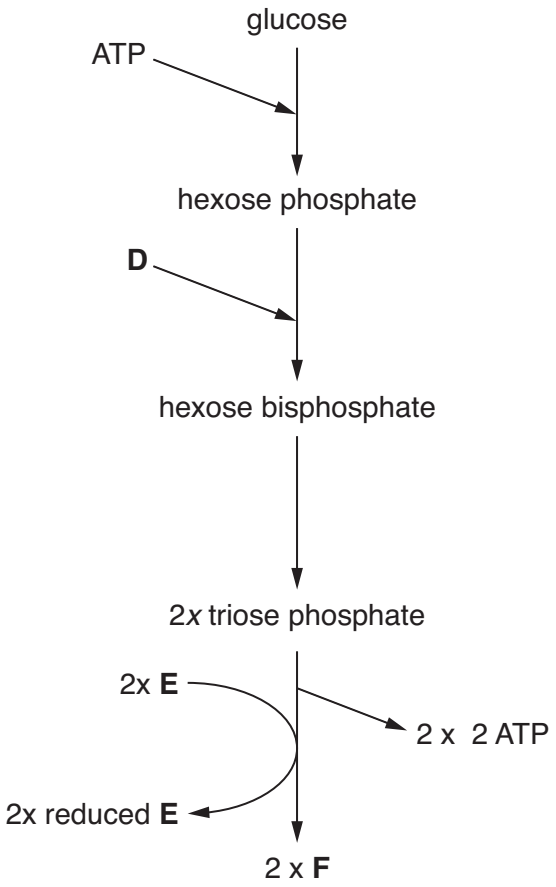


Fig. 2.1

(i) Name the stage represented by Fig. 2.1.

..... **[1]**

(ii) State precisely where this stage takes place in the cell.

..... **[1]**

(iii) Identify the compounds **D**, **E** and **F**.

D .....

E .....

F ..... **[3]**

© OCR 2010

STEMUP.CO.UK

(b) Compound **F** does not proceed to the link reaction in **anaerobic** conditions.

Describe the fate of compound **F** during anaerobic respiration in an animal cell **and** explain the importance of this reaction.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[5]**

TURN OVER FOR QUESTION 2(c)

© OCR 2010

STEMUP.CO.UK

(c) Fig. 2.2 is a drawing of a common seal, *Phoca vitulina*, an aquatic mammal.

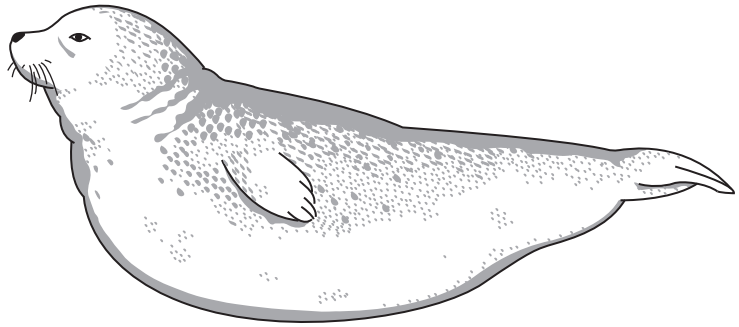


Fig. 2.2

The seal comes to the surface of the water to obtain air and it can then stay underwater for over 20 minutes.

Fig. 2.3 shows a seal at the surface of the water and Fig. 2.4 shows the same animal then submerging again.

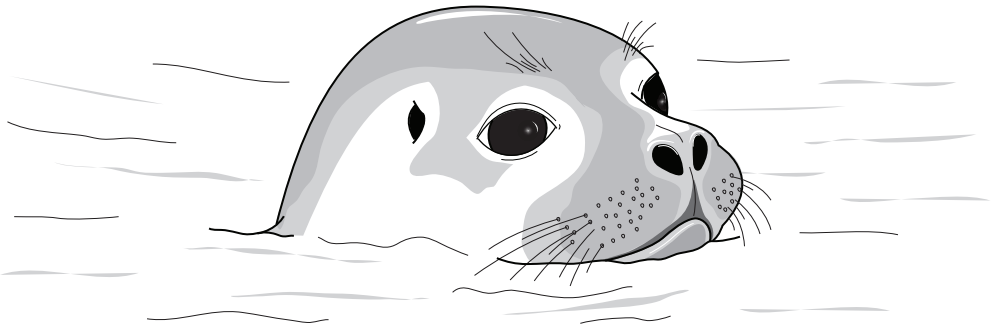


Fig. 2.3

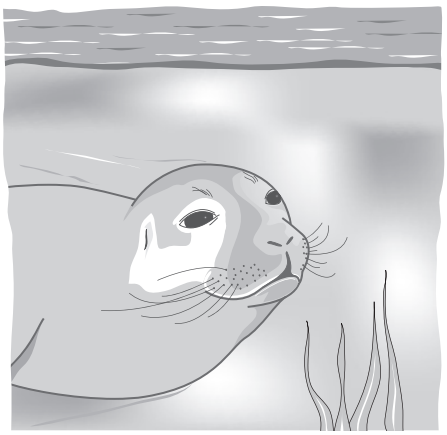


Fig. 2.4

© OCR 2010

STEMUP.CO.UK

7

Suggest how the seal is adapted to respire for such a long time underwater.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

[Total: 13]

© OCR 2010

STEMUP.CO.UK

3 **(a)** Fig. 3.1 represents part of the axon of a neurone.

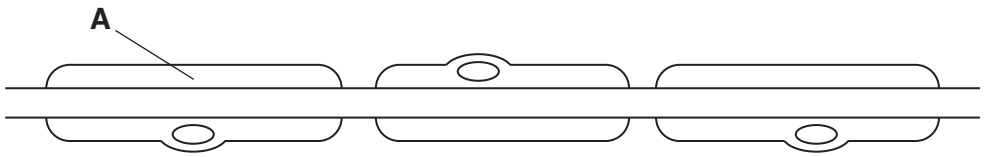


Fig. 3.1

Describe the **structure** of the feature labelled **A**.

.....

.....

.....

..... **[2]**

Table 3.1 shows details of the diameter and speed of conduction of impulse along the neurones of different animal taxa.

Table 3.1

type of neurone	axon diameter (μm)	speed of conduction ($m\,s^{-1}$)	animal taxon
myelinated	4	25	mammal
myelinated	10	30	amphibian
myelinated	14	35	amphibian
unmyelinated	15	3	mammal
unmyelinated	1000	30	mollusc

(b) Using **only the data in Table 3.1**, describe the effect of each of the following on the speed of conduction:

(i) myelination,

.....

.....

.....

.....

..... **[2]**

© OCR 2010

STEMUP.CO.UK

(ii) axon diameter.

.....

.....

.....

.....

..... **[2]**

(c) Temperature also affects the speed of conduction of a nerve impulse.

(i) Suggest why an increase in temperature results in an increase in the speed of conduction.

.....

.....

..... **[1]**

(ii) As the temperature continues to increase, it reaches a point at which the conduction of the impulse ceases. Suggest why.

.....

.....

..... **[1]**

(d) Outline the sequence of events following the arrival of an action potential at the synaptic knob until the acetylcholine has been released into the synapse.

In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

[Total: 12]

© OCR 2010

STEMUP.CO.UK

4 **(a)** Blood enters the kidneys through the renal arteries. The human kidneys process 1200 cm^3 of blood every minute. This 1200 cm^3 of blood contains 700 cm^3 of plasma. As this blood passes through a glomerulus, 125 cm^3 of fluid passes into the renal tubule.

(i) Name the process by which the fluid passes from the glomerulus into the renal tubule.

..... **[1]**

(ii) Calculate the percentage of plasma that passes into the renal tubule.

Show your working and **give your answer to one decimal place**.

Answer = ... % **[2]**

(b) Fig. 4.1, **on the insert**, is an electronmicrograph of a transverse section of part of a proximal convoluted tubule.

(i) Name the tissue that lines the proximal convoluted tubule.

..... **[1]**

(ii) Name the structures indicated by **X**.

..... **[1]**

© OCR 2010

STEMUP.CO.UK

(iii) Table 4.1 shows the approximate concentration of some of the substances in the blood plasma, the glomerular filtrate and the urine leaving the collecting duct.

Table 4.1

substance	concentration in blood plasma ($g\,dm^{-3}$)	concentration in glomerular filtrate ($g\,dm^{-3}$)	concentration in urine leaving collecting duct ($g\,dm^{-3}$)
amino acids	0.50	0.50	0.00
glucose	1.00	1.00	0.00
inorganic ions	7.30	7.30	15.60
nitrogenous waste (not including urea)	0.03	0.03	0.28
protein	80.00	0.00	0.00
urea	0.30	0.30	21.00

Activity in the proximal convoluted tubule accounts for some of the changes observed between the glomerular filtrate and the urine.

Refer to Table 4.1 to explain how these observed changes in concentration are brought about by the **proximal convoluted tubule**.

In your answer, you should use appropriate technical terms, spelt correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

© OCR 2010

STEMUP.CO.UK

(c) Renal dialysis may be necessary when the kidneys cease functioning or fail to work effectively.

Fig. 4.2 outlines the procedure of haemodialysis, a type of renal dialysis.

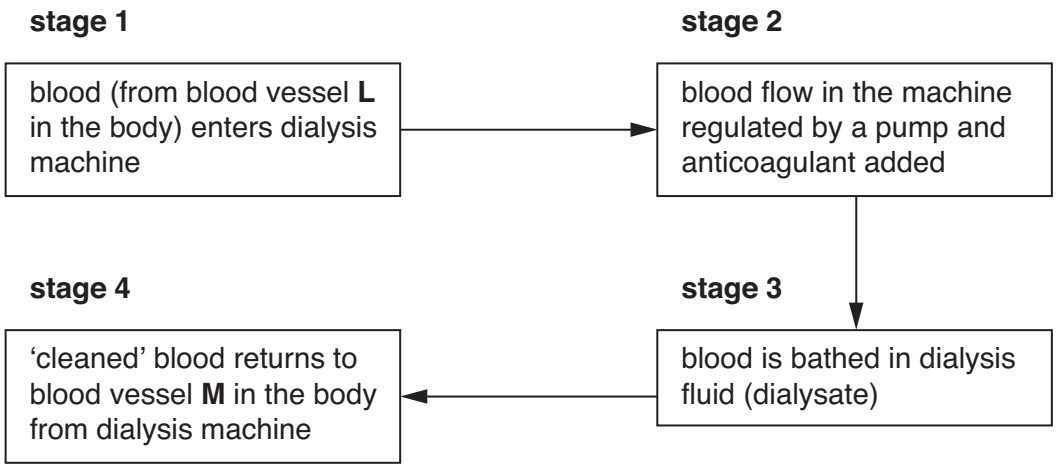


Fig. 4.2

Fig. 4.3 shows further detail of how **stage 3** is achieved.

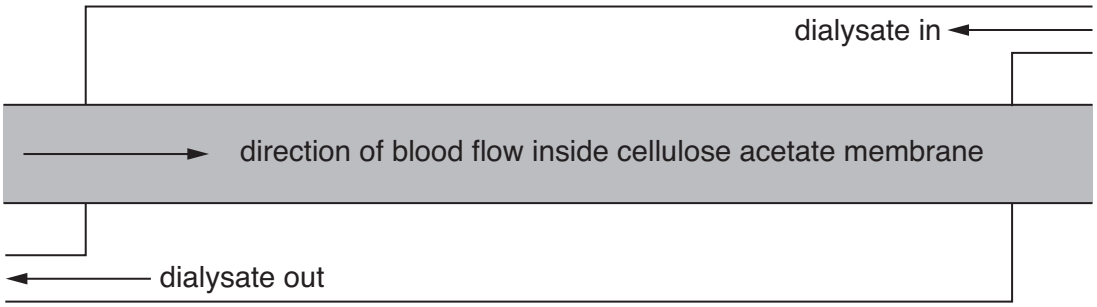


Fig. 4.3

(i) State the **types** of blood vessel represented by **L** and **M** in Fig. 4.2.

L .....

M ..... **[1]**

(ii) Suggest why it is necessary to add an anticoagulant to the blood in **stage 2**.

.....

..... **[1]**

(iii) Suggest why **no** anticoagulant is added to the blood towards the end of a dialysis session.

.....

..... **[1]**

© OCR 2010

(iv) State the process by which molecules and ions, **other than water**, will move from the blood into the dialysate.

..... **[1]**

(v) Suggest why the direction of flow of the blood and the dialysate is as it is shown in Fig. 4.3.

.....

..... **[1]**

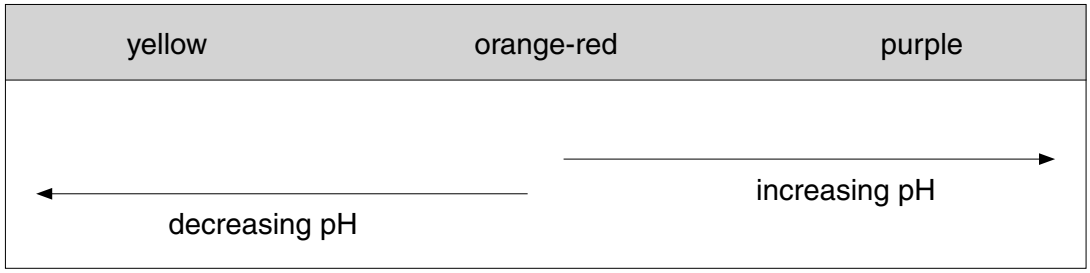
[Total: 14]

© OCR 2010

STEMUP.CO.UK

5 **(a)** An experiment was carried out into the effect of different wavelengths of light on the rate of photosynthesis.

Four sealed test-tubes were set up. Each one contained three leaf discs from the same plant suspended above hydrogencarbonate indicator solution. This solution changes colour at different pH values, as shown below.



At the start of the experiment, the contents of all four tubes were orange-red.

Each tube was illuminated by a lamp with a coloured filter in front of it. The tubes were illuminated for the same length of time. The colour changes were noted and the results are shown in Table 5.1.

Table 5.1

colour of filter	final colour of hydrogencarbonate indicator
colourless	purple
blue	purple
green	orange-yellow
red	red

A fifth tube was set up in the same way as the other tubes. This tube was then covered in black paper before being illuminated for the same length of time. The final colour of the hydrogencarbonate indicator in this tube was yellow.

(i) State the purpose of the tube covered with black paper.

.....

..... **[1]**

© OCR 2010

(ii) State **two** precautions that need to be taken when designing and carrying out this experiment to make sure the results allow valid conclusions to be drawn. Explain the need for each precaution.

precaution 1 .....

explanation .....

.....

precaution 2 .....

explanation .....

..... **[2]**

(iii) Name the pigment at the reaction centre of photosystems I and II.

..... **[1]**

(iv) Explain the change observed in the tube exposed to green light.

.....

.....

.....

.....

.....

.....

.....

..... **[3]**

TURN OVER FOR QUESTION 5(b)

© OCR 2010

STEMUP.CO.UK

(b) Market gardeners often grow plants in glasshouses in order to get maximum production. Light conditions can be controlled along with a number of other factors.

How can factors **other than light conditions** be controlled to increase the rate of photosynthesis and maximise production?

In your answer you should explain why the rate of photosynthesis is affected by the controlled factors you have discussed.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

[Total: 11]

END OF QUESTION PAPER

OCR
RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2010

F214 Communication, Homeostasis & Energy

Question			Expected Answers					Marks	Additional Guidance
1	(a)				*excretion*	*secretion*			**One mark per row.** **CREDIT** converse statements on either side or unmatched statements for each **IGNORE** name or type of product without qualification **DO NOT CREDIT** any ref to egestion in 'excretion'
			1	*one difference*	(metabolic) waste ***or*** toxin / harmful ***or*** substance is to be removed from body ***or*** does not use vesicles	useful product ***or*** used in cell communication (e.g. to target tissues) ***or*** released from glands (ducts or ductless) ***or*** uses vesicles ***or*** remain in body	;		
			2	*one example of a product*	urea / carbon dioxide / water / bile *pigment* / named example	hormone / enzyme / antibodies / mucus / bile *salts* / neurotransmitter / named example	;		**IGNORE** sweat / urine / bile / saliva / salt / (named) digestive juice

STEMUP.CO.UK

Question	Expected Answers			Marks	Additional Guidance
	3	*one similarity*	requires ATP ***or*** (involved in) homeostasis ***or*** (compounds) produced by cell(s) / produced by metabolism / need to cross membrane / need to move through membrane / need to leave cell / (may be) transported in blood ;	3	**3** **CREDIT** method of leaving cell e.g. exocytosis **IGNORE** going into cells (as some excretory products do)

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
1	(b)				S & C	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **CREDIT one statement and a suitable explanation related to that (first) given statement** (e.g. S3 + E3 but not S4 + E1) **DO NOT AWARD 2 marks for 2 statements or 2 explanations**
			S1	glucose is not the only substrate / there are other substrates ;		**1** 'fats can (also) be respired' = E1 'fats can be respired as well as glucose' = S1 + E1
			E1	named alternative substrate ;		
				or		
			S2	ATP is produced / energy is released ;		**S2** **DO NOT CREDIT energy** produced / made / created
			E2	(by) substrate level / oxidative, phosphorylation ;		
				or		
			S3	ATP / energy, required ;		
			E3	(for) phosphorylation / glycolysis ;		
				or		
			S4	is not a single step reaction / other steps involved / other products / other intermediates ;		**4** Krebs cycle / ETC , happens = E4 'other stages such as link reaction are involved' = S4 +
			E4	named stage(s) / named intermediate compound(s) ;		**E4** E4 e.g. pyruvate / acetyl CoA / acetate **IGNORE** NAD(H) / FAD(H) / ATP
				or		
			S5	enzymes are involved ;		
			E5	dehydrogenation / decarboxylation / oxidative phosphorylation / named (respiratory) enzyme ;		
				or		
			S6	coenzymes / NAD, involved ;		**S6** **DO NOT CREDIT** NADP
			E6	oxidative phosphorylation / link reaction / Krebs cycle / glycolysis ;		
				or		
			S7	glucose does not, combine / react , (directly) with oxygen ;		
			E7	(oxygen) used in oxidative phosphorylation / is final electron acceptor / is final hydrogen acceptor ;	**2**	

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
1	(c)	(i)				**Max 1 if referring to insulin receptors**
			1	unable to produce (enough) insulin / do not secrete insulin / produces ineffective insulin **;**		**1 DO NOT CREDIT** 'excrete' as incorrect
			2	insulin-producing cells / beta cells / islets of Langerhans, not functioning (correctly) / damaged / destroyed / attacked **;**		**2 ALLOW** lack of beta cells / ref to b cells **DO NOT CREDIT** alpha cells / B cells (if lymphocytes implied)
			3	by (body's own) immune system / by (body's own) antibodies / auto-immune disease **;**		**3 CREDIT** description
			4	(idea of) family history / genetic / hereditary **;**		
			5	(condition can be) triggered by **,** virus / environmental factor **;**		**5** e.g. • shock • drugs side effect • (pancreatic) cancer • infection / disease
					2 max	
1	(c)	(ii)				**Mark the first 3 responses only**
			1	increasing age / older / ageing / more prevalent over 40 **;**		**1 DO NOT CREDIT** age without 'older' implication
			2	(idea of) family history / genetic / hereditary **;**		
			3	(more common in) males **;**		
			4	(more common in) some ethnic groups / African / Afro-Caribbean / Asian / Hispanic / Oceanic **;**		
			5	obese / overweight / fat around abdomen **;**		**5 CREDIT** 'apple shaped'
			6	high / frequent, intake of **,** sugar / highly processed food / high GI food **;**		**6 IGNORE** 'poor diet' / 'bad diet' / 'unhealthy diet' **IGNORE** fat / carbohydrate **,** in diet
			7	lack of physical activity / sedentary lifestyle **;**		
			8	high blood pressure **;**		**8 CREDIT** history of **,** heart attack / stroke
			9	excessive alcohol intake **;**		**9** idea of *too much* is needed
					3 max	
				Total	**10**	

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	glycolysis / glycolytic pathway ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **CREDIT** phonetic spelling but must have 'glycol...'
2	(a)	(ii)	cytoplasm ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **CREDIT** cytosol **DO NOT CREDIT** cytoplasm, in / of, mitochondrion
2	(a)	(iii)	**D** ATP ; **E** NAD ; **F** pyruvate ;	3	**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 mark** **E** **ALLOW** oxidised NAD **DO NOT CREDIT** NADP / reduced NAD **F** **ACCEPT** pyruvic acid

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance	
2	(b)						**Award marks from labelled / annotated diagrams – but ensure that mp 2 only awarded if H clearly shown to be accepted by pyruvate**
			1	(pyruvate / **F**) converted to lactate **;**		**1**	**ACCEPT** lactic acid **DO NOT CREDIT** if pyruvate → ethanol in the animal is indicated/implied **DO NOT CREDIT** wrong reaction type (e.g. oxidation)
			2	**F** / pyruvate **,** accepts hydrogen (atoms) **;**		**2**	**ACCEPT** pyruvic acid **DO NOT CREDIT** hydrogen **ions** (unless also e^-) / molecules
			3	hydrogen from **, reduced** NAD / **reduced E ;**		**3**	**ACCEPT** NADH / $NADH_2$ / NADH + H^+
			4	(catalysed by) <u>lactate</u> dehydrogenase **;**		**4**	for pyruvate → lactate **ACCEPT** LDH
			5	no, oxygen / O_2 **,** to act as (final), hydrogen / electron, acceptor **;**			
			6	(so) link reaction / Krebs cycle / ETC, cannot take place **;**		**6**	Needs a clear statement of **not** taking place **CREDIT** no , electron transport chain / electron carrier chain / chemiosmosis / oxidative phosphorylation
			7	NAD / **E**, regenerated / recycled / able to be re-used **;**		**7**	**IGNORE** reduced NAD **,** oxidised / reoxidised (as this does not give the idea of reusing it)
			8	allows glycolysis to continue / pyruvate continues to be made **;**		**8**	Needs a clear statement
			9	limited / small amount of / some, ATP can be produced **;**		**9**	**CREDIT** 1 ATP (per pyruvate) / 2 ATP (rather than 28-38 per glucose) / only substrate level phosphorylation **IGNORE** 'enough ATP for ...'
					5 max		

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
2	(c)			*physical (probably from diagrams)*	S & C	
			1	large nostrils (open) to take in air ;		1 **ACCEPT** oxygen
			2	(when submerged) nostrils close / nose closes , to , keep air in / stop air from escaping ;		2 **ACCEPT** oxygen **IGNORE** ref to keeping water out
			3	lungs / airways , have high (vital) capacity ;		3 **ACCEPT** deep / barrel / large , chest **IGNORE** big lungs **CREDIT** large lung volume / takes in large volume of oxygen / larger numbers of alveoli / larger (exchange) surface area / increased number of capillaries
				links to respiration		
			4	*idea that* seal , has low(er) metabolic rate / has low(er) respiratory rate / has low(er) energy requirements / uses (relatively) little ATP ;		4 e.g. • (streamlined, less resistance so) uses less energy • (insulated so retain heat so) uses less energy • (buoyant so) less energy required • (small flippers so less surface area of extremity so loses less heat so) uses less energy
			5	able to respire anaerobically for a long time / more glycolysis ;		5 'anaerobic' needs time ref
			6	large supplies of NAD (to accept H) ;		
			7	(this) prevents , build-up of lactate / lowering of pH ;		7 **ACCEPT** lactic acid
			8	*idea that* (seal) tolerates lactate / removes lactate quickly ;		8 **ACCEPT** lactic acid
			9	*idea that* (seal) tolerates high CO_2 concentration ;		
			10	*idea that* (seal) tolerates low pH / has **more** pH buffers ;		
				synoptic / inference		
			11	*idea that* blood diverted from certain regions / certain regions have reduced metabolic activity ;		11 **DO NOT CREDIT** zero respiration rate
			12	*idea that* has plenty of , haemoglobin / red blood cells / myoglobin (as oxygen source) ;		
			13	*idea that* haemoglobin has a higher affinity for oxygen / dissociates less readily / dissociation curve shifted to **left** ;	3 max	
				Total	13	

STEMUP.CO.UK

<table>
<tr><th colspan="3">Question</th><th colspan="2">Expected Answers</th><th>Marks</th><th colspan="2">Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>1
2
3</td><td>myelin / myelinated / lipid / fatty (sheath) ;
(Schwann) <u>cell</u>, wrapped around / surrounds / AW, <u>axon</u> ;
except at nodes of Ranvier / (sheath) not continuous / presence of gaps (in the sheath) ;</td><td>2 max</td><td>1

3</td><td>DO NOT CREDIT fatty acids

must be in the context of structure rather than function (as many refer to it in context of saltatory conduction)</td></tr>
<tr><td>3</td><td>(b)</td><td>(i)</td><td>1
2
3</td><td>(myelination produces) greater speeds ;
unmyelinated needs larger diameter to produce same speed ;
comparative figs, all with units, to support either the general trend or the exception to the trend with the mollusc ;</td><td>2 max</td><td>1

3</td><td>IGNORE ref to axon diameter for this mp

1 speed for myelinated (25 / 30 / 35 , m s^{-1}) and 1 speed for unmyelinated (3 / 30 , <b>m s^{-1}) (allow m/s)
or
calculated difference in speed between myelinated and unmyelinated (with units unless a multiple e.g. approx. x12)</td></tr>
<tr><td>3</td><td>(b)</td><td>(ii)</td><td>1
2</td><td>larger axon diameter produces greater speeds ; ora
comparative figs, all with units, to support ;</td><td>2 max</td><td>1
2</td><td>needs to be a general statement
2 diameters & speeds (both with units) for myelinated
or
calculated difference in diameter for 2 stated speeds (both with units unless diameter is a multiple e.g. around x 1.4 / around 140%)
<table>
<tr><th>type of neurone</th><th>diameter (μm)</th><th>speed (m s^{-1})</th><th>animal taxon</th></tr>
<tr><td>myelinated</td><td>4</td><td>25</td><td>mammal</td></tr>
<tr><td>myelinated</td><td>10</td><td>30</td><td>amphibian</td></tr>
<tr><td>myelinated</td><td>14</td><td>35</td><td>amphibian</td></tr>
</table>
or
2 diameters & speeds (both with units) for unmyelinated
or
calculated difference in diameter for 2 stated speeds (both with units unless diameter is a multiple e.g. about x10)
<table>
<tr><th>type of neurone</th><th>diameter (μm)</th><th>speed (m s^{-1})</th><th>animal taxon</th></tr>
<tr><td>unmyelinated</td><td>15</td><td>3</td><td>mammal</td></tr>
<tr><td>unmyelinated</td><td>1 000</td><td>30</td><td>mollusc</td></tr>
</table></td></tr>
</table>

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
3	(c)	(i)	1	increased <u>kinetic energy</u> / <u>KE</u> so, • ions <u>diffuse</u>, across (axon) membrane / into neurone / into cell / between nodes / along neurone**,** more quickly ***or*** • faster movement of (neurotransmitter) vesicles / exocytosis (of neurotransmitter) ***or*** • neurotransmitter diffuses more quickly across, synapse / synaptic cleft ***or*** • neurotransmitter (ACh) broken down by enzyme (acetylcholinesterase) more quickly **;**	**S & C** **1 max**	description of ion movement must be correct (e.g. Na^+ in for depolarisation / Ca^{2+} into presynaptic knob)
			2	faster <u>diffusion</u> of ions leads to, • faster depolarisation ***or*** • shorter duration of action potential ***or*** • shorter refractory period ***or*** • faster repolarisation **;**		
3	(c)	(ii)	1	ion, channels / pumps, disrupted / denatured / no longer function **;**	**1 max**	**DO NOT CREDIT** general denaturation of proteins / enzymes
			2	fluidity of, membrane / phospholipid / bilayer, disrupted **;**		**IGNORE** leaky membrane unless qualified
			3	(named) synaptic enzymes denatured **;**		

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
3	(d)					**IGNORE** ref to influx of Na^+ and events when action potential arrives at the synaptic knob – start when the Ca^{2+} channels open
			1	calcium **channel**s open **;**		
			2	Ca^{2+} / Ca^{++} / calcium ions **,** enter / diffuse into,		**2** **DO NOT CREDIT** 'calcium' alone **DO NOT CREDIT** Ca^+ **DO NOT CREDIT** **'**enter membrane' – must cross it
			3	acetylcholine / ACh / **neurotransmitter**, in **vesicle**(s) **;**		
			4	(synaptic) vesicles move towards **presynaptic** membrane **;**		**4** **CREDIT** **pre-synaptic**
			5	vesicles fuse with membrane **;**		**5** **DO NOT CREDIT** attach / bind / join
			6	release acetylcholine, by **exocytosis ,** into synaptic **cleft ;**		'vesicles move and fuse with presynaptic membrane' = mps 4 & 5
					3 max	'vesicles move and fuse with membrane' = mp 5 only
			QWC – technical terms used appropriately and spelt correctly **;**		**1**	Use of **three** terms from: **channel**(s), **vesicle**(s), **neurotransmitter**, **presynaptic / pre-synaptic**, **exocytosis**, **cleft**,
				Total	**12**	

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	ultrafiltration ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** This term required but **ACCEPT** phonetic spelling
4	(a)	(ii)	17.9 ; ;	2	**Correct answer = 2 marks** If answer incorrect, not rounded or incorrectly rounded then allow 1 mark for working 125 ÷ 700 **or** an unrounded answer e.g. 17.857412
4	(b)	(i)	(cuboidal) epithelium / epithelial ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** 'epithelium **cells'** / 'ciliated epithelium' / 'squamous epithelium' / endothelium **ALLOW** columnar epithelium
4	(b)	(ii)	microvilli / microvillus ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** 'brush border' **DO NOT CREDIT** cilia

STEMUP.CO.UK

Question			Expected Answers		Marks	Additional Guidance
4	(b)	(iii)	***This is a QWC question***			
			1	selective **<u>re</u>absorption ;**	**S & C**	
			2	of glucose <u>and</u> amino acids **;**		**2** **DO NOT CREDIT** if glucose & amino acids **& proteins**
			3	**co-transport** / ***facilitated*** **diffusion** / uptake described **;**		**3** **ACCEPT** direct uptake , of glucose / amino acids, by active transport
			4	water follows by **osmosis** so concentration of, ions / nitrogenous waste / urea / remaining substances **,** increases **;**		
			5	AVP **;**		**5** e.g. • microvilli provide large surface area for uptake • many mitochondria provide energy for uptake • many brush border enzymes (ATPase) for active uptake • active secretion of nitrogenous waste into lumen
					3 max	
			QWC - technical terms used appropriately and spelt correctly **;**		**1**	Use of **three** terms from: **reabsorption** (or derived term), **co-transport** (or derived term), **facilitated diffusion**, **osmosis**

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
4	(c)	(i)	**L** artery / shunt / vein (at arterial end of shunt) **AND** **M** vein ;	1	**IGNORE** names of artery / vein (e.g. renal) **DO NOT CREDIT** aorta and vena cava
4	(c)	(ii)	so that clots don't form, while in the (dialysis) machine / during dialysis ;	1	**ALLOW** congeal instead of clot **IGNORE** prevents clotting in the body **IGNORE** clumping
4	(c)	(iii)	*idea of* allowing blood to clot normally after treatment ;	1	**CREDIT** preventing low blood pressure (as low viscosity)
4	(c)	(iv)	(simple) <u>diffusion</u> ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** dialysis **DO NOT CREDIT** facilitated diffusion
4	(c)	(v)	*idea that* it, maintains diffusion gradient / maintains concentration gradient / maximises diffusion gradient / maximises concentration gradient / allows maximum removal of waste / allows maximum rate of diffusion / AW ;	1	**IGNORE** unqualified ref to countercurrent e.g. • solutions in contact over greater distance • provides maximum contact for exchange • allows exchange over longer distance **IGNORE** ref to surface area
			Total	14	

STEMUP.CO.UK

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	control ;	1	**CREDIT** a description e.g. • comparison • to compare results with • to show that (wavelengths of) light is producing the effect • to show the result produced without light • create baseline • create set point • validity **IGNORE** 'fair test' **DO NOT CREDIT** 'control variable' / 'controlled variable'

STEMUP.CO.UK