WJEC GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B1 HIGHER TIER 0235 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

A.M. MONDAY, 28 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**6**	
3	**3**	
4	**6**	
5	**8**	
6	**6**	
7	**6**	
8	**5**	
9	**4**	
TOTAL	**50**	

0235
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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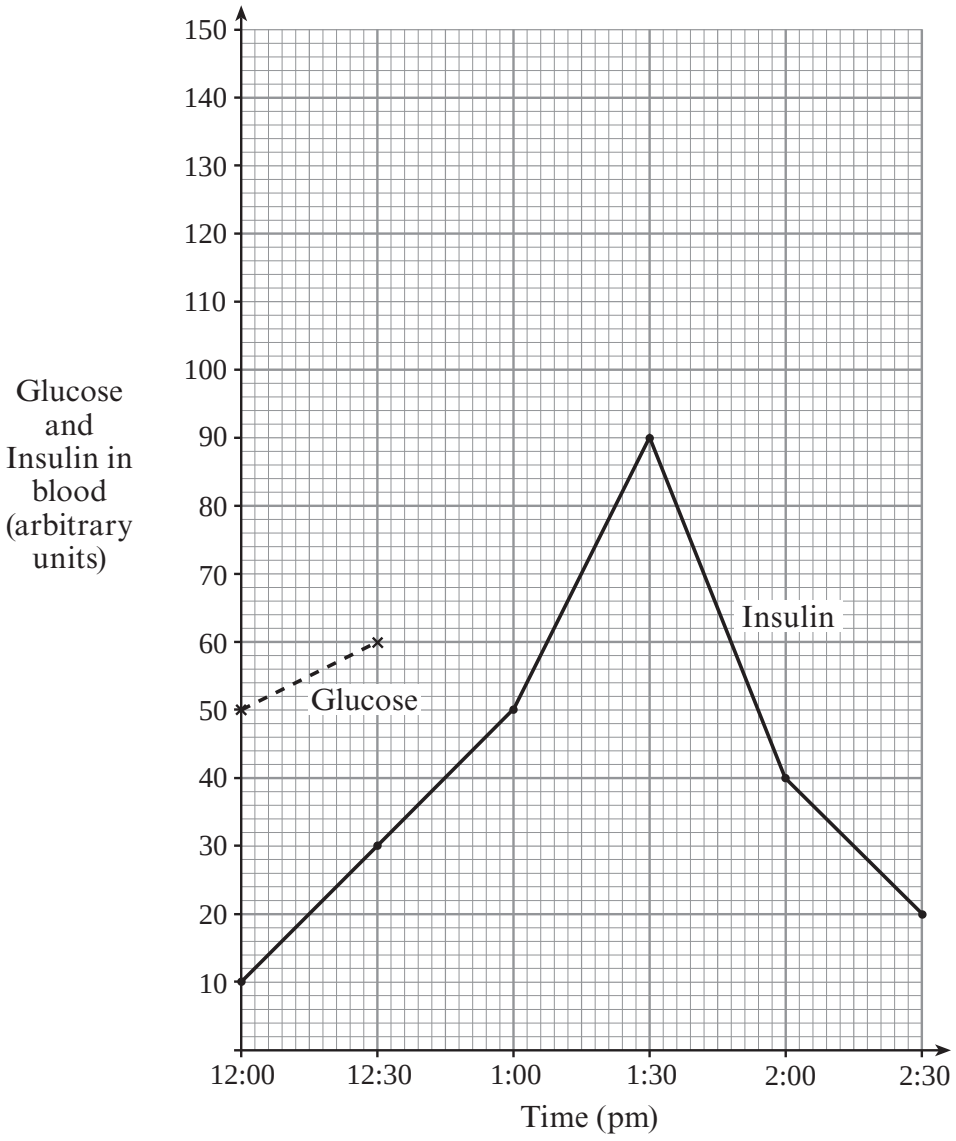
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Answer **all** *questions.*

1. In the human body, *insulin* controls the levels of sugar (glucose) in the blood.

The levels of insulin and glucose in Rehana's blood were measured during an investigation which started at lunchtime.
Rehana is not diabetic and eats lunch. The results are shown in the table and on the graph.

Time (pm)	Glucose in blood (arbitrary units)
12.00	50
12.30	60
1.00	140
1.30	120
2.00	60
2.30	50



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(a) The results for insulin have been plotted as a graph opposite.
Plot the results for glucose onto the same graph. Join the points with a ruler. The first two points have been done for you. [3]

(b) From the graph

(i) How much insulin is in the blood at 1.45 pm? [1]

.....

(ii) Suggest a possible reason for the increase in glucose in Rehana's blood between 12.00 pm and 1.00 pm. [1]

.....

(iii) Rehana rests after 12.00 pm. State what has caused the decrease in glucose between 1.00 pm and 1.30 pm. [1]

.....

6

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2. Gregor Mendel made important discoveries on how characteristics or traits are passed from parents to offspring.
In one of his experiments he crossed pea plants that produced seeds with round coats with plants that produced seeds with wrinkled coats.

Seeds with wrinkled coats

Seeds with round coats



R. W. Van Norman/Visuals Unlimited, Inc

The results of this cross were plants (F1) that only produced round coated seeds. Mendel explained this by saying that pea plants passed on **factors** (alleles) from one generation to the next. He also said that the factor for round seeds is dominant over the factor for wrinkled seeds.

Use the information in the passage and your knowledge to answer the following questions.

(a) (i) Complete the following to show how the F1 plants were produced in Mendel's experiment.

R = allele for round seeds
r = allele for wrinkled seeds

Phenotype of parents	Round	×	Wrinkled
Genotype of parents	**RR**		**rr**
Gametes	....		....

[1]

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(ii) Complete the Punnett square to show the genotypes produced in this cross. [2]

	Gametes		
F1			

(b) (i) Mendel then crossed two of these F1 plants together. Draw your own Punnett square and complete it to show the genotypes of the offspring that would be produced. [2]

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(ii) What is the ratio of round to wrinkled seeds produced above? [1]

..... round: ..... wrinkled

6

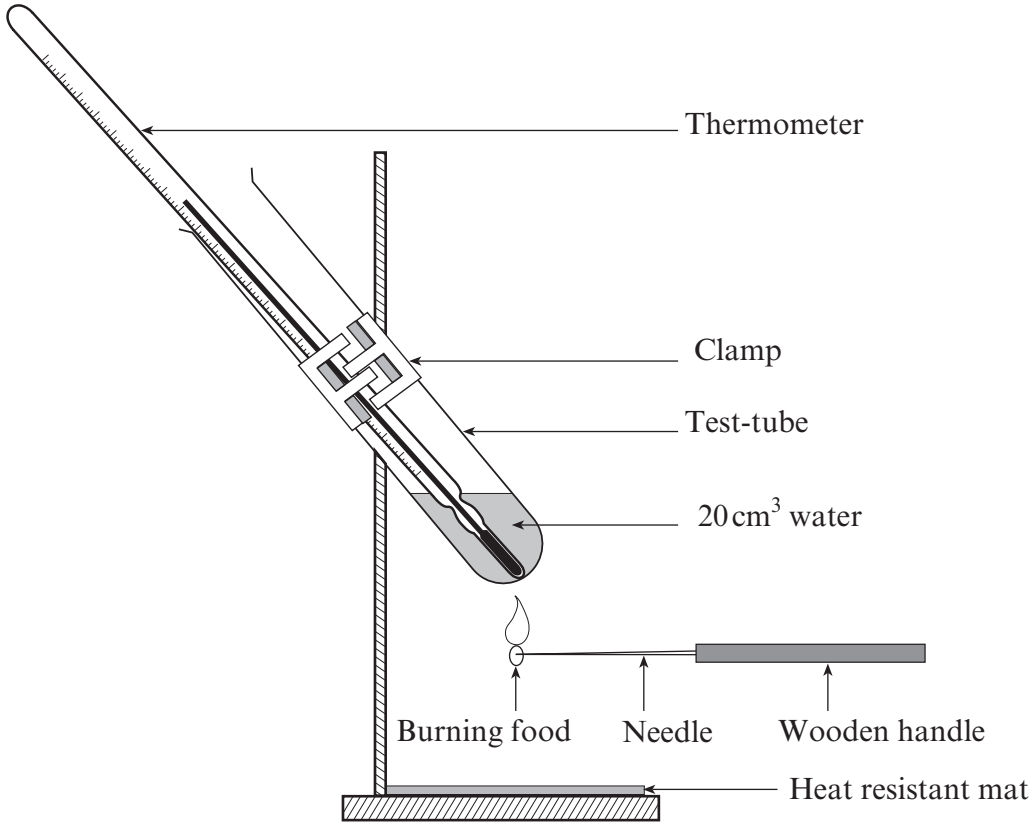
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3. The following apparatus was set up to measure the energy content of a piece of food.



(a) State **two** measurements that you must take in order to find the energy content of the food. [2]

.....

.....

(b) If you were comparing the energy content of two **different** foods state **one** *other* measurement that must be taken. [1]

.....

3

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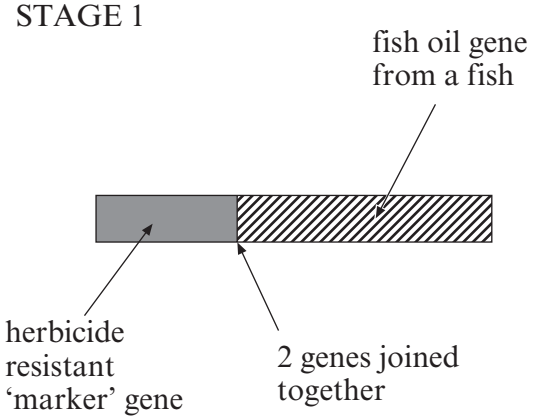
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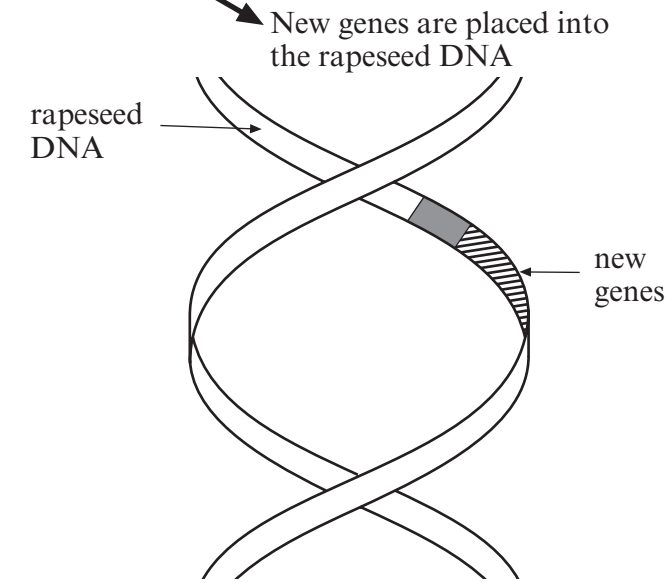
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4. Genes can be transferred artificially from one organism to another. Scientists transferred a gene, which controls production of fish oil (such as cod liver oil) from a fish and a herbicide resistant 'marker' gene into a rapeseed plant. The rapeseed plant will now produce fish oil. The diagram below shows this process.

STAGE 1



STAGE 2





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STAGE 3

The rapeseed plant should now contain the new genes

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(a) (i) The scientists don't know whether the gene for the production of fish oil has been successfully introduced into the DNA of the rapeseed plant. Suggest how the herbicide resistant 'marker' gene will allow them to find out. [1]

.....

.....

(ii) Fish oils are said to be good for the heart and nervous system. The world market for fish oils has grown very quickly over the last 25 years. Suggest **one** advantage of growing genetically modified (GM) rapeseed crops for the production of fish oils. [1]

.....

.....

(iii) Suggest why some people are concerned about the transfer of genes from one species to another, especially between animals and plants. [1]

.....

.....

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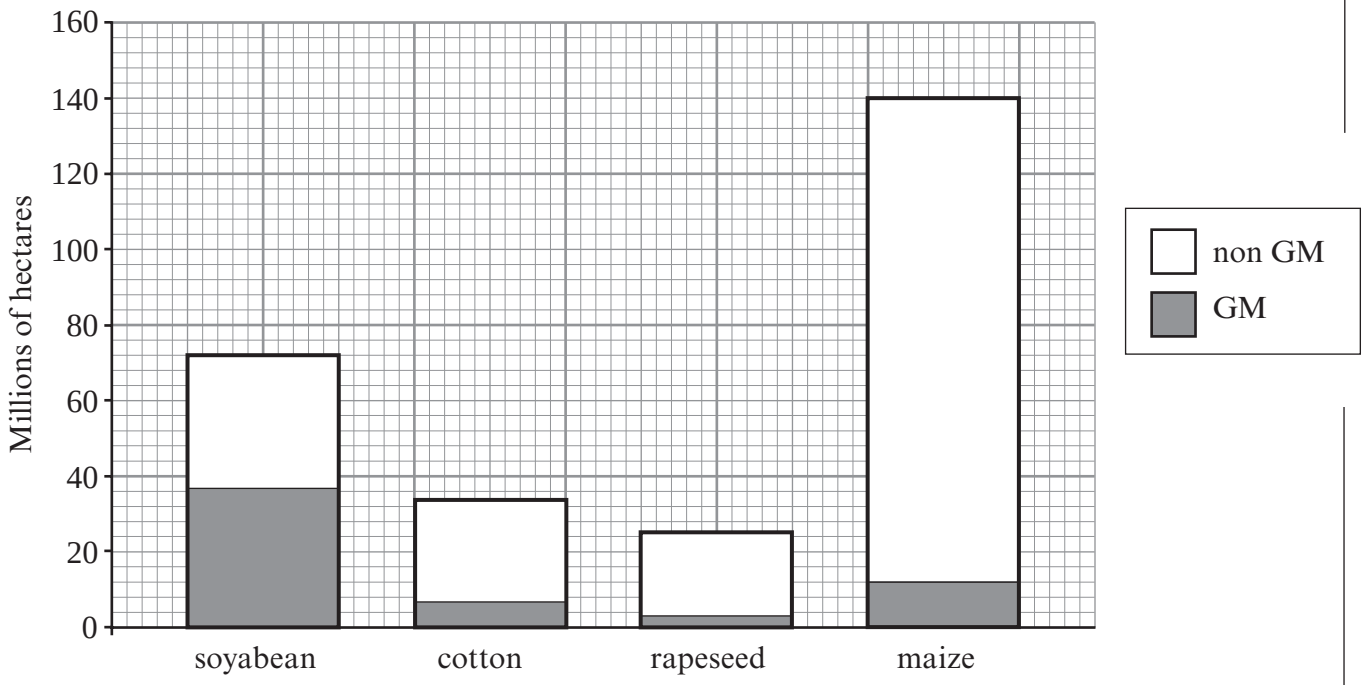
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(b) The worldwide cultivation of the four main commercial GM crops in 2002 and 2006 is shown in the table below.

	Millions of hectares			
	2002		2006	
Crop	Non GM	GM	Non GM	GM
Soyabean	72	37	50	45
Cotton	34	7	29	13
Rapeseed	25	3	24	4
Maize	140	12	116	36

(i) Plot the data for the millions of hectares of GM crops grown in **2006** on the **2006** chart opposite. [1]

2002

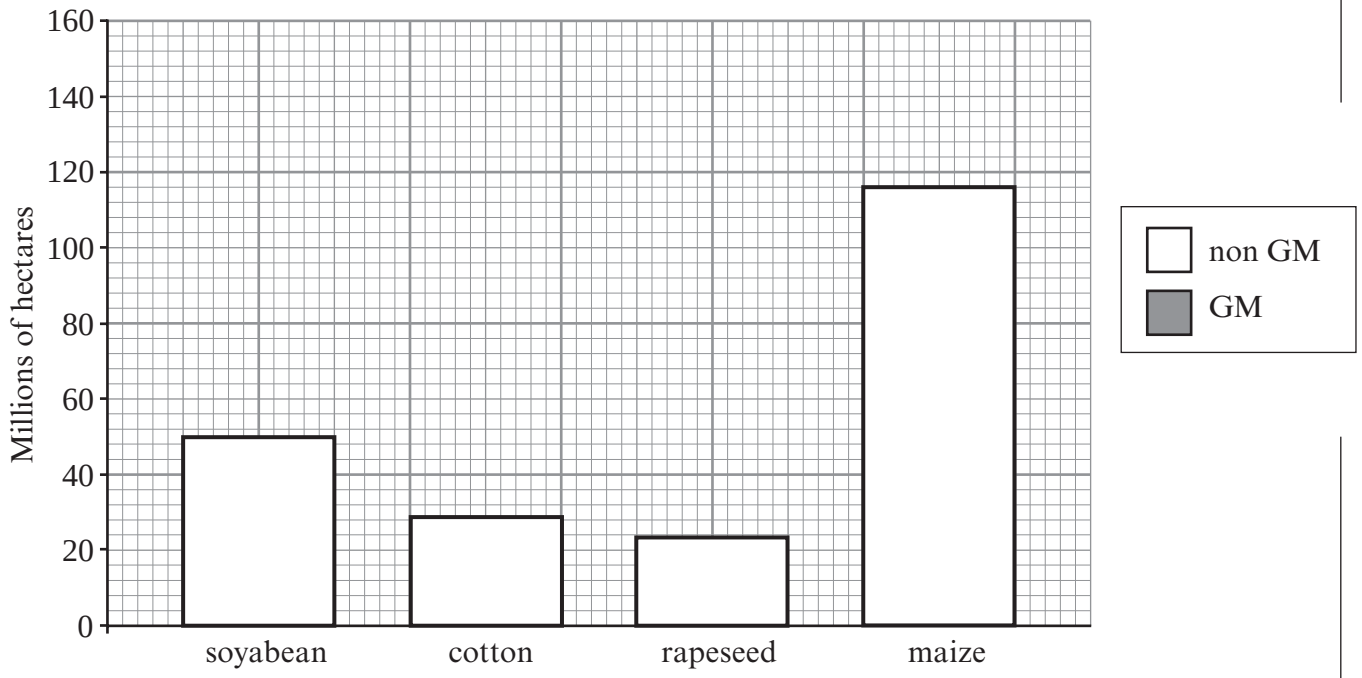


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2006



(ii) What is the relationship between the amount of non GM and GM crops grown in 2006 compared to 2002? [1]

.....

.....

(iii) What is the **percentage** increase in GM maize production in 2006 compared to 2002?

[1]

..... %

6

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5. A scientist measured the volume of sweat and urine a person produced at different air temperatures.
Here are the results:

Air temperature (°C)	Sweat produced (cm^3 per hour)	Urine produced (cm^3 per hour)
0	4	100
5	4	90
10	8	80
15	20	62
20	40	54
25	60	40
30	100	30
35	200	20

(a) Describe the changes in the volumes of sweat and urine as the air temperature increases. [2]

.....

.....

.....

.....

.....

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(b) Explain how the body causes the volume of sweat to change with increased air temperature and state the advantage of this change to the person. [2]

(i) Explanation

.....

.....

(ii) Advantage

.....

.....

(c) Apart from sweating, describe how else the skin controls body temperature when

(i) the body temperature increases, [2]

.....

.....

.....

.....

(ii) the body temperature decreases. [2]

.....

.....

.....

.....

8

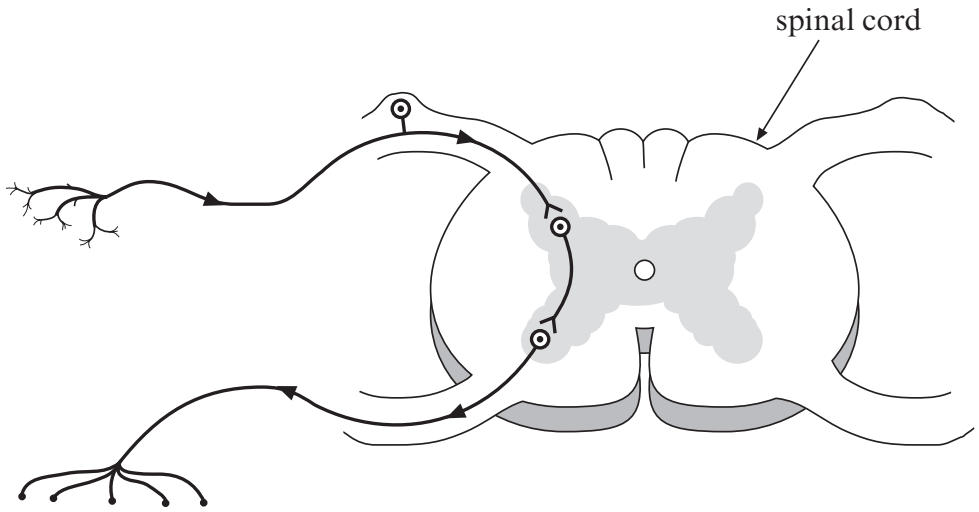
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6. The diagram below shows a reflex arc.



(a) On the diagram, label:

(i) the sensory nerve cell;

(ii) the connecting nerve cell;

(iii) a synapse;

(iv) the receptor. [4]

(b) In some diseases the motor nerve cells are damaged.
Explain how this would affect reflex actions. [1]

.....

.....

(c) When nerve impulses travel along nerves, chemical energy is changed into another form of energy. Name this form of energy. [1]

.....

6

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7.



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- Male guppies, as shown above, are colourful tropical fish.
- Their colours occur in various patterns.
- The patterns are controlled by genes.
- Some patterns are more commonly seen than others.
- Predators find it more difficult to target the rarer, most colourful patterns but easily find the less colourful patterns.
- Female guppies select the most colourful males to breed.

Use this information to explain how natural selection results in male guppies existing in such a rich variety of colours. [6]

.....

.....

.....

.....

.....

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.....

.....

6

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8. An investigation was carried out into the effect of caffeine on the reaction time of some people.
Each person was given 2 g of instant coffee dissolved in 200 cm^3 boiling water. A computer programme was used to measure the reaction time of the people before and after drinking the coffee.
In order to measure the reaction time, each person had to push a button as soon as a signal was heard.
The results are shown in the table.

			Reaction time(s)	
person	age	gender	before coffee	after coffee
A	15	male	0.17	0.16
B	17	female	0.15	0.14
C	19	female	0.18	0.15
D	16	male	0.19	0.17
E	17	male	0.14	0.12
F	20	male	0.17	0.14
G	18	male	0.21	0.15
H	16	female	0.17	0.16

(a) What is the effect of caffeine on the reaction times of the people tested? [1]

.....

(b) State **one** factor that has been kept constant. [1]

.....

(c) State **three** *other* factors which should have been kept constant to make this a fair test. [3]

(i) .....

(ii) .....

(iii) .....

5

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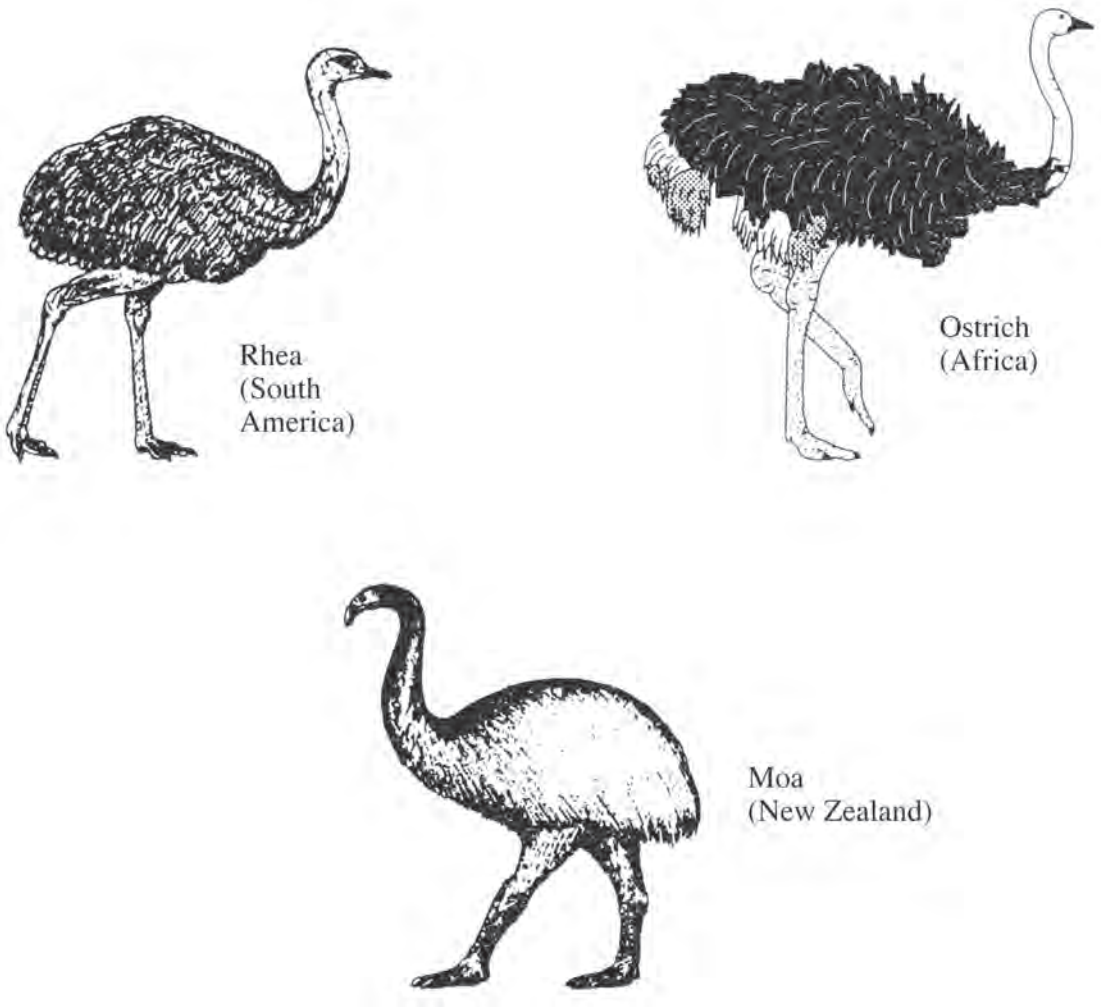
9. *(a)* (i) Name the theory which states that all living things have a common ancestor. [1]

.....

(ii) Which famous scientist proposed this theory in his book *The origin of species* in 1859? [1]

.....

(b) The drawings (not drawn to scale) show three species of bird from three different continents.



Scientists think that these three birds all developed from the same ancestor. Use the drawings to suggest **two** features of this ancestor. [2]

(i) .....

(ii) .....

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (LEGACY)

JANUARY 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE SCIENCE - BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Unit	Page
B1 (LEGACY) FOUNDATION TIER	1
B1 (LEGACY) FOUNDATION & HIGHER TIER	7
B1 (LEGACY) HIGHER TIER	11
B2 (LEGACY) FOUNDATION TIER	17
B2 (LEGACY) FOUNDATION & HIGHER TIER	21
BS (LEGACY) HIGHER TIER	23
B3 (LEGACY) FOUNDATION TIER	29
B3 (LEGACY) FOUNDATION & HIGHER TIER	35
B3 (LEGACY) HIGHER TIER	39

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B1 (LEGACY) MARK SCHEME - JANUARY 2013

FOUNDATION TIER

Question			Marking details	Marks Available
Q.1			**Predation**	
	(a)		Fox and rabbit;	1
	(b)	(i)	1.5 (months) (allow: 1.2 to 1.8);	1
		(ii)	(large) increase/growth in numbers (not: more rabbits);	1
			Fewer foxes so less predation /fewer foxes to {kill/eat rabbits};	1
			(not: no foxes/ no hunting or catching)	
	(c)		Shortage of food/space/disease/loss of habitat/competition for food;	1
			(not: named disease/habitat loss due to humans)	
	(d)		(they are) white/have white hair (not: paler);	1
			Not camouflaged/can be easily seen (against background)	1
			Question total	**[7]**

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Question		Marking details	Marks Available
Q.2	(a)	5 10 11;	1
	(b)	male;	1
	(c)	6;	1
	(d)	genes;	1
	(e)	DNA;	1
		Question total	**[5]**

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Question			Marking details	Marks Available
Q.3	(a)	(i)	Testing / discovery / developing <u>new</u> drugs;	1
		(ii)	2 from stroke / AIDS / kidney failure; (negate if extra answers) (not: HIV)	1
	(b)	(i)	Cause distress; (not: ref. cruel)	1
		(ii)	Computers; tissue cultures (negate if extra answers)	1
	(c)		Monkeys related to humans more <u>closely</u>;	1
	(d)		Use of <u>fewer</u> monkeys / <u>fewer</u> tests on monkeys in future;	1
			Question total	**[6]**

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Question			Marking details	Marks Available
Q.4	(a)	(i)	270;	1
		(ii)	2630;	1
	(b)	(i)	fat; (not:cream)	1
		(ii)	skimmed; (not:low fat)	1
	(c)	(i)	less sugar; and more calcium; (in milk) (not: acids/ref. to bones)	2
			Question total	**[6]**

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Question		Marking details	Marks Available
Q.5	(a)	asexual;	1
	(b)	clones;	1
	(c)	mutation;	1
	(d)	radiation / uv light / radioactive materials; (not : pollution / chemicals unqualified)	1
	(e)	(ii);	1
		Question total	**[5]**

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Question			Marking details	Marks Available
Q.6	(a)	(i)	Fast / quick / instant / rapid/ immediate;	1
			Not: sudden	
			automatic / without thinking /involuntary /	
			no control / unconscious;	1
			not: protection	
	(b)	(i)	sound; receptor; ears;	3
		(ii)	impulse / electrical {signal / message} / electrical (energy);	1
			Not: electric / electricity/ message	
			Question total	**[6]**

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B1

FOUNDATION AND HIGHER TIER

Question			Marking details	Marks Available
Q.7/1	(a)		Correctly plotted points (± ½ small square; -1 per error);	2
			Line correctly drawn through centre of points;	1
	(b)	(i)	64 →65 (units);	1
		(ii)	Eating/lunch/food/meal or description;	1
			Drinking - if clearly qualified e.g. sugary drink, or valid equivalent);	
			(not: lunchtime)	
		(iii)	(Increased) insulin;	1
			Question total	**[6]**

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Question			Marking details	Marks Available
Q.8/2	(a)	(i)	R R and r	1

(ii)

gametes	R	R
r	Rr	Rr
r	Rr	Rr

Gametes correct; 1

Genotypes correct using gametes given by candidate; 1

(b) (i)

gametes	R	r
R	RR	Rr
r	Rr	rr

Gametes correct; 1

Genotypes correct using gametes given by candidate; 1

(iii) 3:1/75%:25% (not: 75:25 or fraction); 1

Question total **[6]**

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Question		Marking details	Marks Available
Q.9/3	(a)	Initial temperature of (water) (however expressed);	1
		Final temperature of (water) (however expressed);	1
		Change/rise in temperature (2 marks) Allow 1 mark for the temperature of the water Award 2 marks for the difference between the temperature at the start and end. *(*not**:** gap between food and test tube / time taken for food burn) (neutral: volume of water / mass of food)	
	(b)	The mass/weight/grams (of the pieces of food);	1
		Question total	**[6]**

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B1

HIGHER TIER

Question			Marking details	Marks Available
Q.4	(a)	(i)	Spray/treat (the plant) with herbicide and it survives (the genes have successfully introduced)/plant will not be affected by herbicide;	1
		(ii)	Be able to provide sufficient fish oil to supply global demand / conserve fish stocks, owtte;	1
		(iii)	Ethical reasons/ create organisms that we have no control over/morally wrong/genes could spread to other species/long term effects unknown/could create herbicide resistant weeds/concern over eating GM produce (not: playing God/cross contamination/spread to other organisms)	1
	(b)	(i)	All bars correct, 0.25 small square tolerance; (not: on top of bars)	1
		(ii)	As the amount of GM crops grown increases, the amount of non-GM crops grown decreases/inverse relationship, comparison needed;	1
		(iii)	GM maize production 2002 = 12 million hectares GM maize production 2006 = 36 million hectares therefore % increase = 200%; (No evidence of calculation required.)	1
			Question total	**[6]**

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Question			Marking details	Marks Available
Q.5	(a)	(i)	(As the temperature rises) sweat production increases;	1
			urine production decrease;	1
			or ref to numbers	
	(b)	(i)	Explanation (As temperature rises) the sweat <u>glands</u> make more sweat;	1
		(ii)	to cool the body;	1
	(c)	(i)	hairs lie flat;	
			vasodilation occurs/capillaries increase in diameter;	
			not: get bigger/expand/move up/ref. to shivering)	2
		(ii)	Converse of c(i)	
			(allow ref. to shivering)	2
			Question total	**[8]**

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Question		Marking details		Marks Available
Q.6	(a)	(i) – (v)	correct + clearly indicated	4
	(b)	It would prevent the effector / muscle / gland from working / prevent / or slow down impulse reaching effector.		1
	(c)	Electrical; (not : electric / electricity / kinetic)		1
			Question total	**[6]**

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Question			Marking details	Marks Available
Q.7	(a)	(i)	1. Variation in colour/pattern; 2. results from mutation/change in genes/DNA; 3. Natural selection by predation/survival of the fittest; 4. and sexual selection/females select most colourful males to breed; 5. Most colourful males survive/are at an advantage; 6. to pass on genes;	6
			Question total	**[6]**

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Question		Marking details	Marks Available
Q.8	(a)	Reduce / decrease/quicker; (not: improved)	1
	(b)	Concentration of coffee / caffeine / mass of coffee / volume of water;	1
		(not:amount)	
		Gender, age, time between drinking and testing,	[any 3x1]
		fasting, health/hearing/volume of signal;	
		(not:answers to (b)same coffee/computer/body mass /reaction time before test)	
		Question total	**[5]**

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Question			Marking details	Marks Available
Q.9	(a)	(i)	Evolution;	1
		(ii)	(Charles) Darwin;	1
	(b)		Beak Feathers Long legs Long neck Claws on feet (Any 2) (not: no wings/ curved neck/ small head)	2
			Question total	**[4]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

P.M. WEDNESDAY, 30 May 2012

45 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1	**7**	
2	**5**	
3	**3**	
4	**4**	
5	**6**	
6	**5**	
7	**7**	
8	**6**	
9	**7**	
Total	**50**	

0235
020001

ADDITIONAL MATERIALS

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Write your answers in the spaces provided in this booklet.

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You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. In chickens the comb on the top of the head exists in 2 forms called the rose comb and the single comb.

Rose comb



Single comb



(a) A homozygous rose comb chicken is crossed with one which has a single comb. All the F1 offspring have rose combs.

Using **R** to represent the dominant allele and **r** to represent the recessive allele state the genotype of:

(i) The rose comb parent ..... [1]

(ii) The single comb parent ..... [1]

(iii) The F1 offspring ..... [1]

(b) (i) Complete the Punnett square to show the offspring produced when the single comb parent is crossed with an F1 offspring. [2]

Gametes		

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(ii) I. State the meaning of the term *phenotype*. [1]

.....

II. State the ratio of the different phenotypes found in the F2 generation. [1]

..... : .....

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2. The photograph shows a sample of cells being taken from a suspect in a criminal investigation.



(a) What chemical from these cells is going to be analysed? [1]

.....

(b) The genetic 'fingerprints' shown below are from a murder case.



(i) Which of the suspects could have been the murderer? Explain your answer. [2]

.....

.....

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(ii) The genetic fingerprints from both suspects would be kept on police records. Why do some people object to this? [1]

.....

.....

.....

.....

(c) State **one** *other* use of genetic 'fingerprinting' apart from in criminal cases. [1]

.....

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3. The spotted owl *(Strix occidentalis)* is an indicator species in the USA. It feeds on squirrels, birds, bats and large insects.



(a) Explain how the spotted owl could be used as an indicator species in its habitat in the USA. [2]

.....

.....

.....

.....

(b) When scientists survey populations of spotted owls they always use its scientific rather than its common name. Explain why. [1]

.....

.....

3

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4. Scientists have created genetically modified (GM) zebra fish that glow. These 'GloFish' have a gene for the production of a protein which causes them to glow. This gene was transferred to the zebra fish from a jellyfish.



(a) Explain how the gene was transferred from the jellyfish to the zebra fish. [3]

.....

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(b) Zebra fish are kept by fish enthusiasts in aquaria but 'GloFish' are banned from sale in the European Union and in many of the states in the USA. [1]
Apart from ethical issues, suggest a reason for this ban.

.....

.....

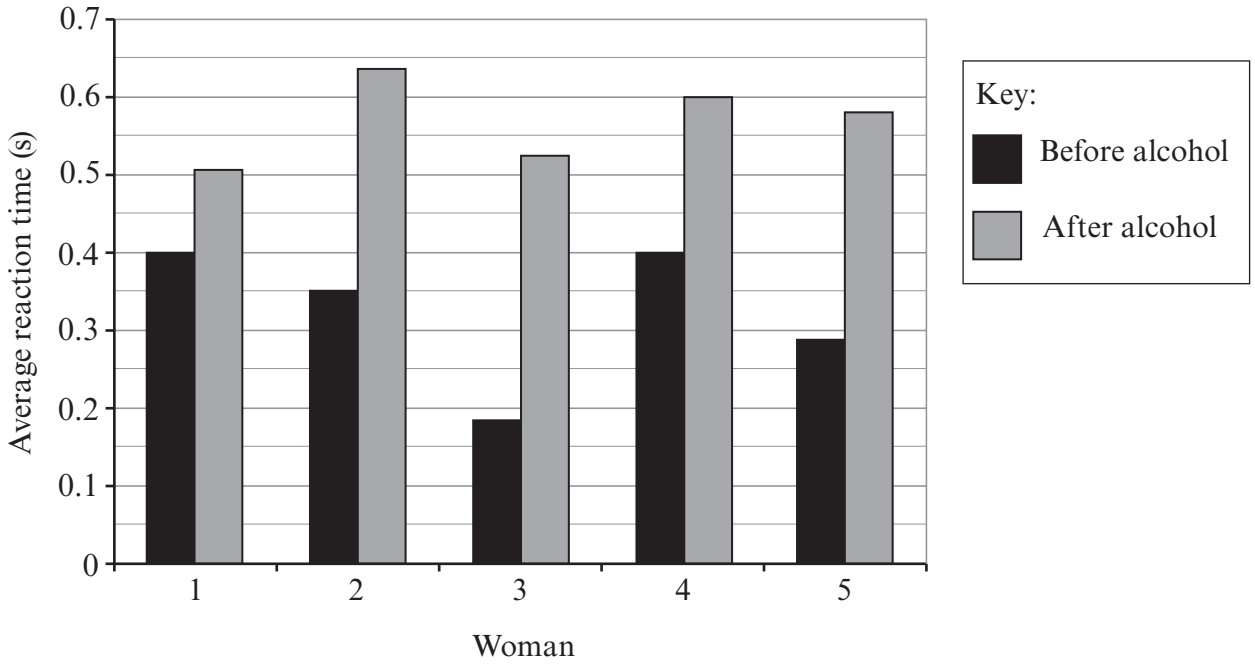
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5. A scientist measured the reaction times of 5 women before and after drinking the same volume of alcohol. The women had to press a buzzer when a light flashed. This was repeated 5 times and the average reaction time was calculated for each woman.
The results are shown in the graph below.



(a) State **one** conclusion which can be drawn from the results. [1]

.....

.....

(b) Why was the experiment repeated five times for each woman? [1]

.....

.....

(c) Calculate the percentage change in the average reaction time for woman 4, after drinking alcohol. [1]

..... %

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(d) Explain why there is a legal limit on the level of alcohol in the blood of drivers. [2]

.....

.....

.....

.....

(e) Apart from its effect on the nervous system state **one** *other* harmful effect alcohol can have on the body. [1]

.....

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6. The following headline appeared in the Western Mail in May 2010.

Farms still suffering Chernobyl restrictions

1986 disaster fall-out still a hazard

In April 1986 a disaster occurred at a nuclear power station at Chernobyl in the Ukraine. Radioactive substances escaped into the air and spread throughout parts of Europe, increasing the level of ionising radiation normally found in the environment.
Thousands of sheep from 355 farms in North Wales are still being monitored for radiation. Meat from affected sheep is not allowed to enter the human food chain.

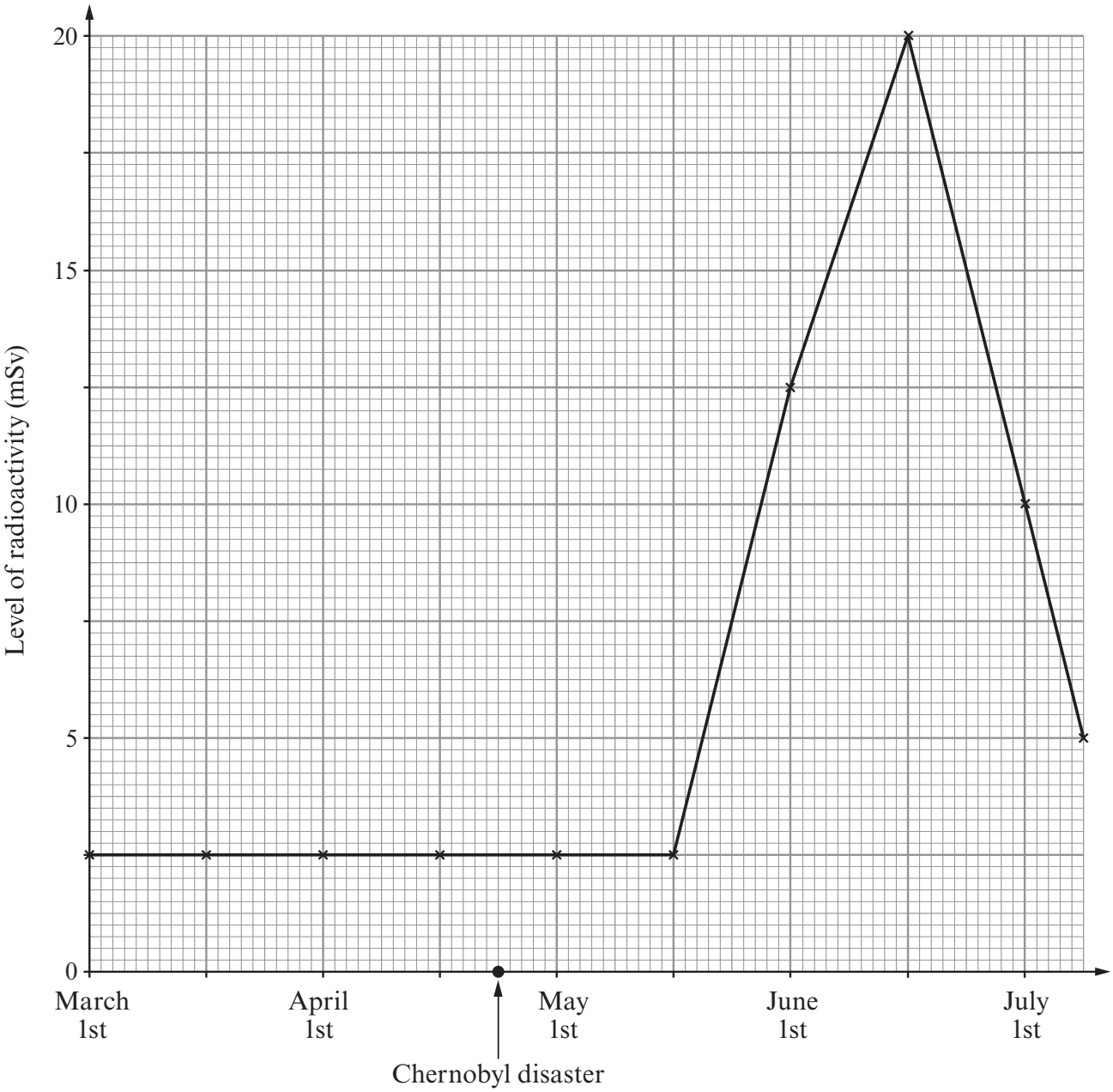
(a) State **one** long term effect of increasing levels of ionising radiation on human health. [1]

.....

(b) The graph opposite shows the level of radioactivity in the meat of sheep in North Wales from March to July in 1986.

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(i) From the graph, suggest the safe level of radioactivity in the meat for it to be legally sold as food. [1]

.....

(ii) Suggest a reason for the time delay between the Chernobyl disaster and the increase in radioactivity in the meat. [1]

.....

(c) (i) Suggest what restrictions were placed on sheep farmers in North Wales in 1986. [1]

.....

(ii) How would these restrictions affect the sheep farmers? [1]

.....

5

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Turn over.

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7. In 2009, scientists investigated a new treatment for people suffering from diabetes.
They planned to take liver cells from people with diabetes and genetically modify them so that they could produce insulin.
The modified cells would then be injected back into the same people.
The scientists first tried this procedure with diabetic monkeys.

(a) There is a gene (Pdx-1) that controls the development of the gland that normally makes the protein, insulin.

Name

(i) the gland that normally makes insulin. [1]

.....

(ii) the chemical which controls the production of proteins. [1]

.....

(iii) the group of chemicals to which the protein, insulin belongs. [1]

.....

(b) The Pdx-1 gene is taken from a human embryo and put into the diabetic person's liver cells which are in the process of cell division. The modified liver cells are then injected back into the diabetic person.

(i) Name the type of cell division which takes place in the liver. [1]

.....

(ii) From which structure in the nucleus of a cell would the gene be taken? [1]

.....

(c) Use the above information and give **two** reasons why some people might object to this research. [2]

.....

.....

.....

7

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8. *(a)* The following shows some processes which occur during a withdrawal reflex. They are not shown in the correct order.

A An impulse passes along the motor nerve to the effector.

B An impulse passes along the relay nerve.

C An impulse passes from the receptor to the co-ordinator.

D The receptor reacts to a stimulus.

E The impulse passes across a synapse between the relay nerve and the motor nerve.

Re-arrange the statements and write the letters **A**–**E** in the correct order in which they take place. [3]

1st ..... 2nd ..... 3rd ..... 4th ..... 5th .....

(b) State **two** features of a withdrawal reflex. [1]

(i) .....

(ii) .....

(c) (i) Name the effector in a withdrawal reflex. [1]

.....

(ii) In which part of the body is the relay nerve found? [1]

.....

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9.



- Sea campion is a flowering plant that grows on sea cliffs.
- Its stem length is controlled by environmental factors and by genes.
- The stems are either long, short or medium.
- Insects pollinate the flowers and therefore help the plants reproduce sexually.

A scientist noted that insects did not often stay on the flowers with the longest or shortest stems for enough time to pollinate them.

(a) Investigations into the evolution of the sea campion required knowledge of natural selection and of the basic principles of inheritance. Who was the first person to explain the basic principles of inheritance? [1]

.....

(b) In a population of sea campion, what would you expect to be the most common stem length? [1]

.....

(c) Describe how natural selection has allowed this stem length to become the most common. [2]

.....

.....

.....

.....

(d) Suggest **three environmental** factors which might cause the difference in stem length in populations of sea campion. [3]

.....

.....

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (LEGACY)

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT B1 (LEGACY)

FOUNDATION TIER

Question			Marking details	Marks Available
1.	(a)		(Thick) fur Accept hair	1
	(b)		Rough (hair) gives good grip / prevents slipping	1
	(c)	(i)	Any two from Fox / Eagle / Stoat	1
		(ii)	High rate of (re)production / many young produced /	1
	(d)		Camouflage / cannot be seen (by predators) Accept: blends into background	1
	(e)	(i)	Eats only plants/ does not eat animals/ it is a herbivore NOT does not eat meat/ kill other animals/ does not hunt	1
		(ii)	Eats/ takes/ destroys (farm) crops	1
			Question total	**[7]**

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Question			Marking details			Marks Available
2.	(a)		17 (consistent with graph)			1
	(b)		Two bars correct height Tolerance +/- ½ small square			2
	(c)		160 – 164			1
	(d)	(i)	All males / same age			1
		(ii)	Improves reliability/ increases confidence in the results NOT fair test/ accuracy/ precision			1
	(e)		Sexual	Continuous	Environmental	3
					Question total	**[9]**

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Question			Marking details	Marks Available
3.	(a)	(i)	Light Sound Touch Chemical Chemical	3 max (-1 per error)
		(ii)	Eyes, ears	1
	(b)	(i)	Receptors	1
		(ii)	Electrical NOT electric/ electricity	1
			Question total	**[6]**

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FOUNDATION / HIGHER TIER

Question			Marking details	Marks Available
4.	(a)		Fat/ glycogen/ lipids	1
	(b)	(i)	Any two from heart disease / cancer / knee or joint damage/ harm	1
		(ii)	Fish/ sushi	1
		(iii)	Running	1
		(iv)	1400 / 350 4 hours (2 marks for correct answer)	2
	(c)		Increase/ regular/ lots of/ enough exercise (qualified)/ named activity e.g. football/ go to keep fit / OR {Not too much/ decrease} high energy food/ correct comparison from table/ eat less fat or carbohydrate/ eat a balanced diet NOT eat less/ eat healthy/ ref to surgery or medication	1
			Question total	**[7]**

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Question		Marking details	Marks Available
5.	(a)	A hair	1
		B {carries / transports / conveys} sweat/ sweat travels through	1
		C erector muscle	1
		D produces/ makes sweat	1
		E (blood) capillary/ blood vessel	1
	(b)	Releases sweat / allows sweat out (onto skin surface) NOT: water	1
		Question total	**[6]**

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Question			Marking details	Marks Available
6/1	(a)	(i)	RR	1
		(ii)	rr	1
		(iii)	Rr	1
	(b)	(i)	Award 1 mark for all 4 gametes being correct	1
			Award 1 mark for all 4 offspring being correct	1
			Allow e.c.f from (a) if different letters used	

Gametes	r	r
R	Rr	Rr
r	rr	rr

(ii)	I	The {appearance / features/ looks/ characteristic} of an organism that results from the {genotype / genes}.	1
	II	1 rose (comb) : 1 single (comb). (ecf from punnett square) NOT 2:2/ 50:50	1

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Question			Marking details	Marks Available
7/2	(a)		DNA NOT saliva	1
	(b)	(i)	Suspect 1; Has the same {genetic/ DNA} {'fingerprint'/ profile} as found at the scene of the crime; Accept DNA matches the scene of the crime	1 1
		(ii)	Reference to ownership of DNA of innocent suspect/ because it is an {invasion/ breach} of privacy/ it is against human rights	1
	(c)		Disputed paternity / parentage cases / classification/ correct reference to use by insurance companies/ identification of dead bodies.	1
			Question total	**[5]**

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Question		Marking details	Marks Available
8/3	(a)	Number of prey has fallen and so numbers of spotted owls fall ;	1
		Something wrong with environment;	1
		OR	
		More prey species leading to more owls;	
		Showing environment is healthy;	
		To check if there is anything wrong with the environment = 1 mark	
	(b)	Common names are different in different {parts of USA / areas}/	1
		scientific names are the same all over the world (OWTTE)/	
		scientific names are always the same	
		Question total	**[3]**
		TOTAL FOUNDATION TIER	**50**

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HIGHER TIER

Question		Marking details	Marks Available
4.	(a)	{Jellyfish /fluorescent protein} gene/allele is cut out of DNA	1
		OR gene is cut out of jellyfish DNA;	
		Zebrafish DNA (in egg) cut open;	1
		{Jellyfish /fluorescent protein} gene {inserted / spliced} into	
		zebrafish DNA;	1
	(b)	Concerns of escape of gene into wild/ native population/ transfer	1
		gene to other fish;	
		Question total	**[4]**

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Question		Marking details	Marks Available
5.	(a)	Alcohol slows reaction time / the time taken to react is longer with alcohol/ reaction time is increased with alcohol/ reactions are slower with alcohol/ ORA Must be clear whether answer refers to alcohol NOT reaction time decreased/ reduced/ lowered	1
	(b)	Improves reliability / confidence in the results. NOT accuracy/ validity/ fair test	1
	(c)	50%	1
	(d)	Alcohol slows reaction times/ increases thinking time/ Alcohol affects sight / impairs vision; Increases the time taken to brake/ increase likelihood of accident;	1 1
	(e)	liver damage or cirrhosis / mouth cancer/ heart disease/ stomach damage/ kidney damage/ damage to foetus; NOT heart attack.	1
		Question total	**[6]**

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Question			Marking details	Marks Available
6.	(a)		Increased {number/ rate} of mutations or cancers;	1
	(b)	(i)	2.5 mSv Accept any figure 0 – 2.5 mSv (unit must be written correctly)	1
		(ii)	{Time / distance} for radioactivity to {be blown to/ travel to / be carried to/ reach} (Wales) / time for radioactivity to enter food chain.	1
	(c)	(i)	{Meat/ sheep} could not be sold / sheep could not be moved to other areas; NOT less meat sold	1
		(ii)	so loss of income/ lose jobs;	1
			Question total	**[5]**

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Question			Marking details	Marks Available
7.	(a)	(i)	Pancreas	1
		(ii)	DNA	1
		(iii)	Hormones	1
	(b)	(i)	Mitosis (correct spelling)	1
		(ii)	Chromosome	1
	(c)		Any 2 from (Objections) to use of embryos; (Objections) to use of monkeys / animals; genetically modified; animals may respond differently to humans; NOT unethical/ cruel (unqualified)	2
			Question total	**[7]**

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Question			Marking details	Marks Available
8.	(a)		D.C.B.E.A. 4/5 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks.	3
	(b)		Any 2 = 1 mark. Protective or stops body being harmed / fast or rapid or quick / automatic or involuntary or does not involve brain/thought;	1
	(c)	(i)	Muscle /any named voluntary muscle	1
		(i)	Spinal cord	1
			Question total	**[6]**

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Question		Marking details	Marks Available
9.	(a)	(Gregor) Mendel (Spelling of Mendel must be correct).	1
	(b)	Medium	1
	(c)	Any 2 from Variation; Medium stem length better adapted; (survival advantage) increased chance of pollination/ reproduction; genes/ DNA/ alleles passed on;	2
	(d)	Any 3 Wind; Soil / pH; minerals / nutrients / water/ rain; Light / shade; Temperature; NOT heat Grazing/ grazers; Salt spray; NOT disease/ habitat destruction/ space/ pollution/ predators/ weather/ climate	3
		TOTAL HIGHER TIER	**50**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

A.M. TUESDAY, 24 January 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**4**	
3	**5**	
4	**6**	
5	**4**	
6	**3**	
7	**5**	
8	**5**	
9	**7**	
10	**5**	
TOTAL	**50**	

0235
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. John and Tracey are a young couple who each smoke 25 cigarettes a day on average. They have both tried to stop smoking many times without success.

(a) Why do John and Tracey find it so difficult to stop smoking? [1]

.....

(b) Suggest **two** reasons why John and Tracey should wish to stop smoking. [2]

(i) .....

.....

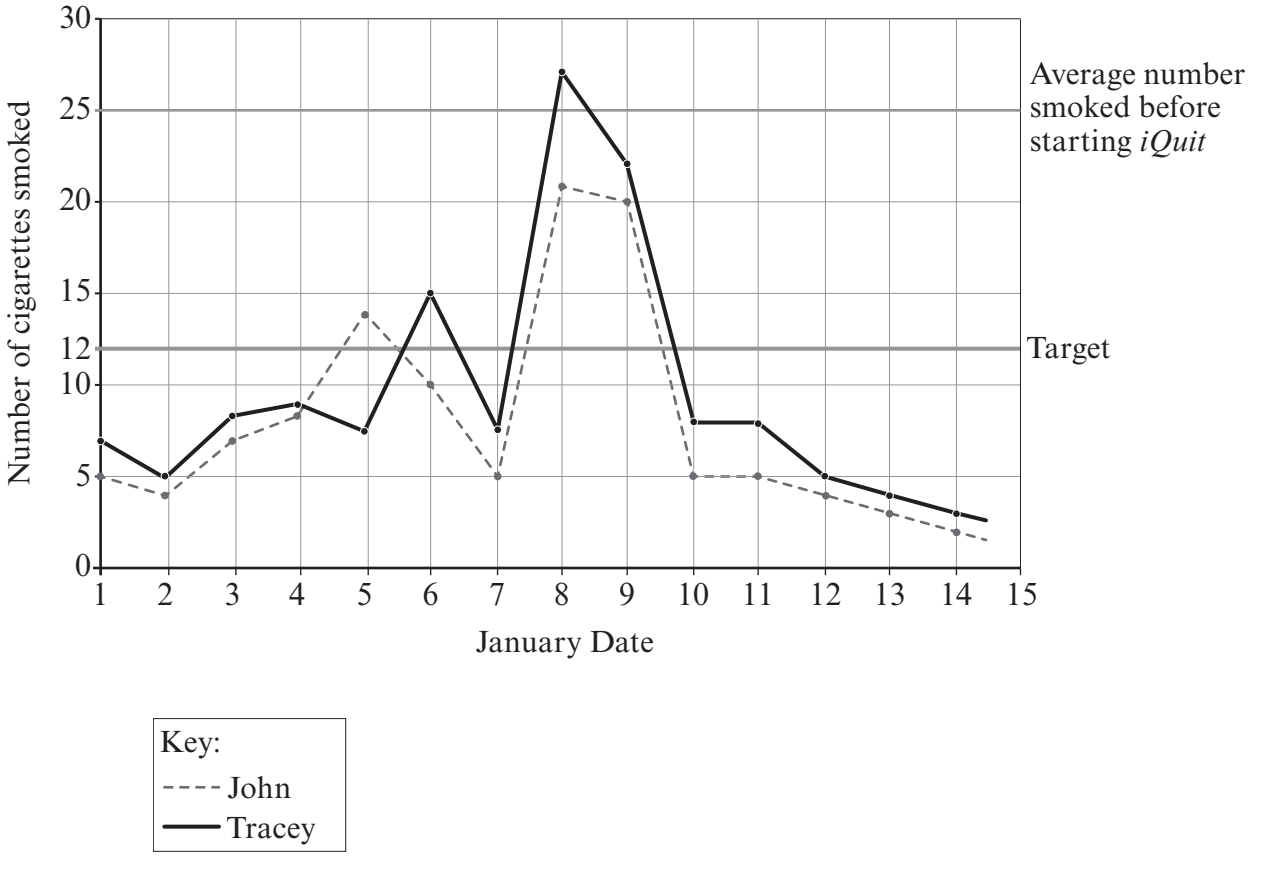
(ii) .....

.....

(c) Both John and Tracey downloaded an 'iQuit Smoking' App to their mobile phones. Using this App they input the maximum number of cigarettes they wish to smoke in a day - the target - and also the **actual** number of cigarettes they smoke each day. The App then produces a graph of the progress made in attempting to stop smoking.

The graph below shows the data from John and Tracey's first 2 weeks of this attempt at stopping smoking.

iQuit Smoking progress chart



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(i) For how many days did John smoke more than his target number of cigarettes? [1]

..... days.

(ii) Use the graph to explain why John and Tracey's attempt at stopping smoking has been a success so far. [2]

.....

.....

.....

.....

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2. The European adder *(Vipera berus)* is a snake found in many parts of Wales. The body colour is usually brown, cream or red with a dark zig-zag pattern along the back.

European adder



(a) What word is used to describe the differences between members of the same species? [1]

.....

(b) Adders whose colour is all black are seen occasionally.

(i) What word is used to describe this sudden change in colour? [1]

.....

(ii) What chemical is altered to cause this change in colour? [1]

.....

(c) State **one** way the offspring produced by sexual reproduction differ from those produced by asexual reproduction. [1]

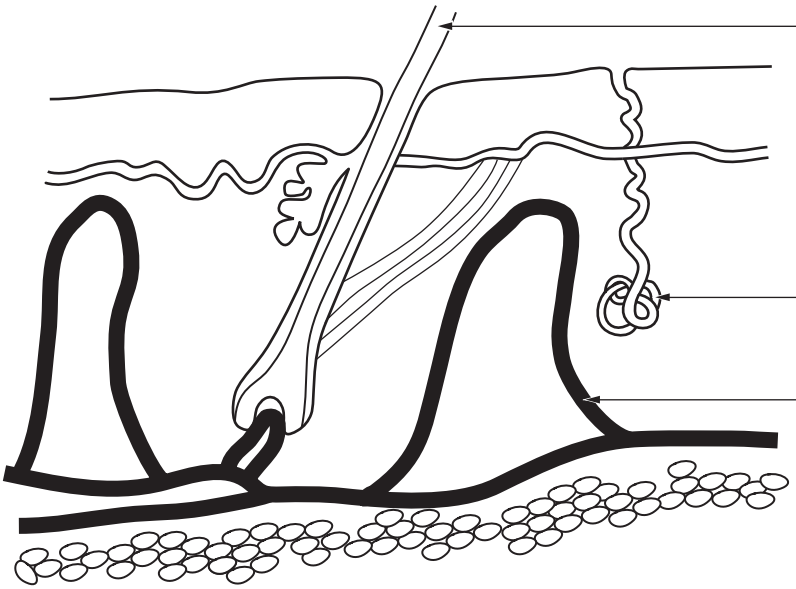
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3. The diagram shows a section through human skin.



(a) Label parts **A** and **C** on the diagram. [2]

(b) When the body temperature rises, explain how part **B** helps to lower it. [3]

.....

.....

.....

.....

.....

.....

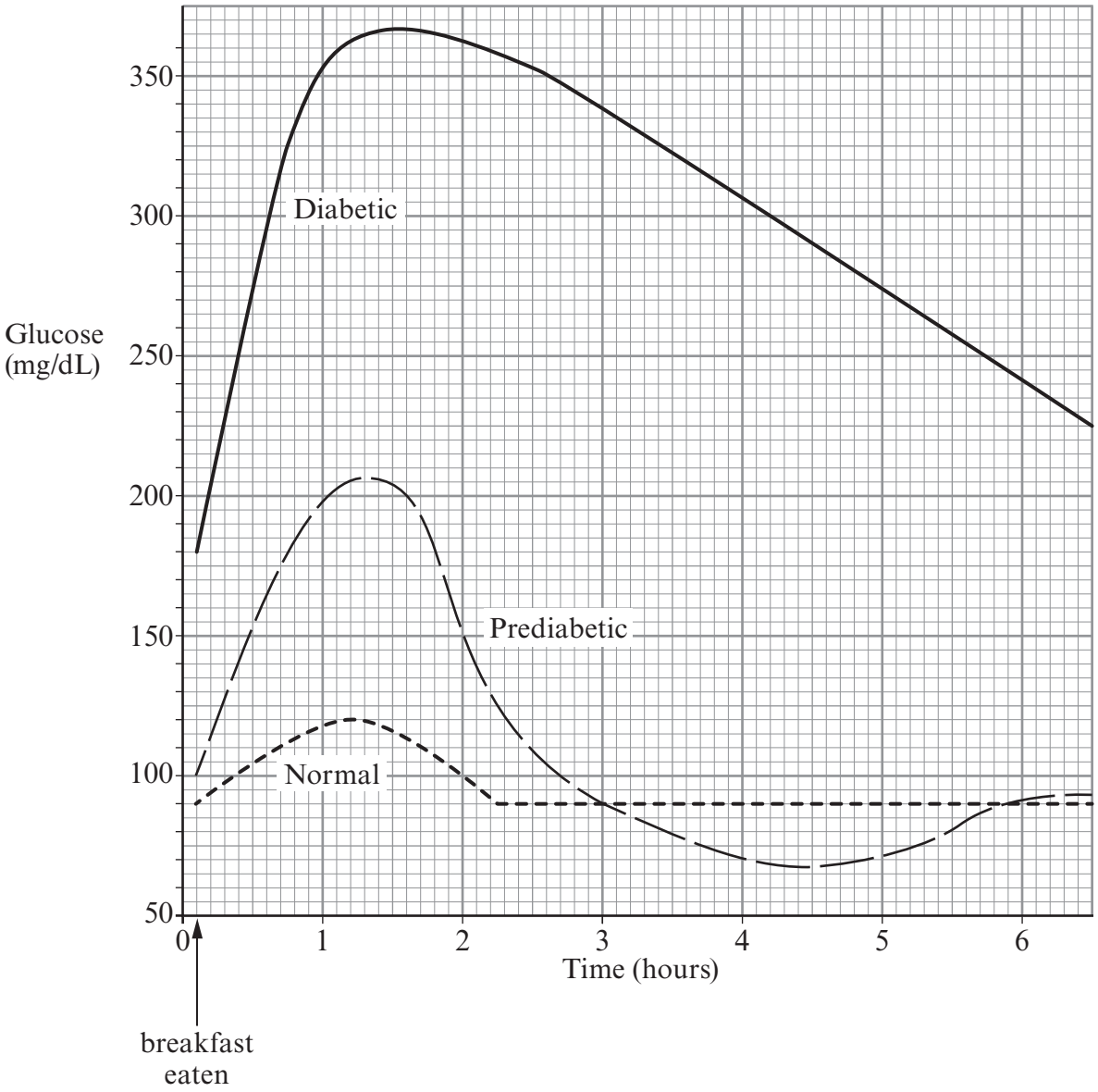
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4. The blood glucose level of people with no sign of diabetes is 80 - 90 mg/dL before meals and may rise up to 120 mg/dL after they eat. (mg/dL = milligrams of glucose per decilitre of blood).

The blood glucose levels in 3 men were measured first thing in the morning and every hour for the next 6 hours. Each of the men ate exactly the same food for breakfast.
The results are shown in the graph below.



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(a) A prediabetic is a person who is developing diabetes. Describe how the results of the prediabetic man differ from the results of the normal man. [3]

.....

.....

.....

.....

.....

.....

(b) How could the **diabetic** man avoid the high rise in blood glucose that occurs after eating? [1]

.....

.....

(c) No more food was eaten during the six hours after breakfast.
What is happening in the body of the normal man to reduce the blood glucose level between hours one and two? [2]

.....

.....

.....

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020007

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5. In rabbits the allele for black fur (**B**) is dominant to the allele for white fur (**b**).
A rabbit breeder bought a rabbit with black fur but she didn't know whether it was homozygous black or heterozygous black. The breeder used a white rabbit to find out the genotype of the black rabbit.

(a) Complete the two Punnett squares below to show how the breeder could find out the genotype of the black rabbit. [2]

Cross 1 – if the black rabbit is **BB**.

Gametes		

Cross 2 – if the black rabbit is **Bb**.

Gametes		

(b) Explain how the results shown in the Punnett squares determine whether the bought rabbit was homozygous or heterozygous. [2]

.....

.....

.....

.....

4

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6. Ghost slug *(Selenochlamys ysbryda)*



Google images

In 2008, a type of slug was discovered in a garden in Caerphilly, South Wales. It had probably been introduced by accident in plant pots from abroad. This slug was new to 'science', and it was given the common name of *ghost slug*. Biologists compared a chemical from it with the same chemical from other types of slugs to see if they were closely related.

(a) Name the chemical that was compared. [1]

.....

(b) From which structures found in the nucleus of cells was the chemical taken? [1]

.....

(c) Give **one** reason why scientists use scientific rather than common names for organisms. [1]

.....

.....

3

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7. Using some of the letters from the list below, complete the table to show the children produced by the possible combinations of X and Y chromosomes.
Place **one** letter in each box.

List: Possible children produced

A = twins, one boy and one girl;

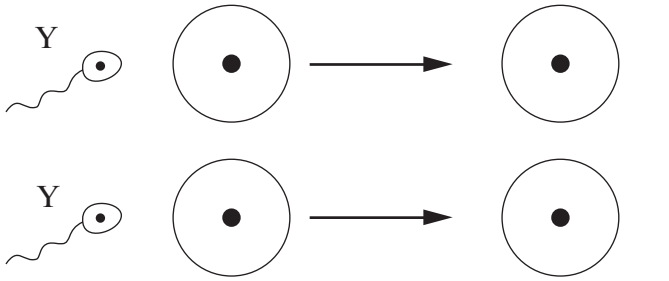
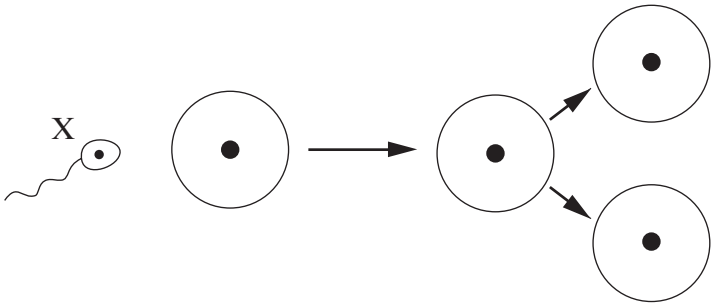
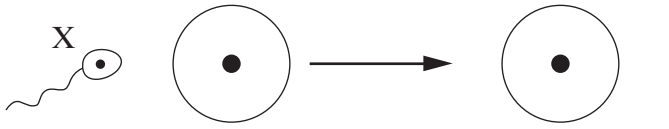
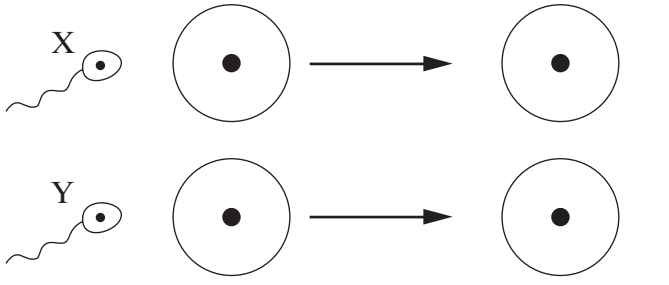
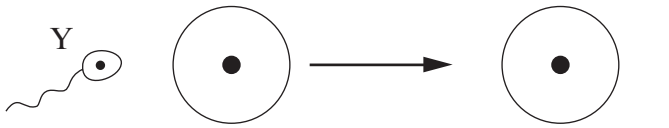
B = identical twin girls;

C = twin boys, one with brown eyes the other with blue eyes;

D = one boy;

E = one girl;

F = twin girls, one with red hair and one with brown hair. [5]

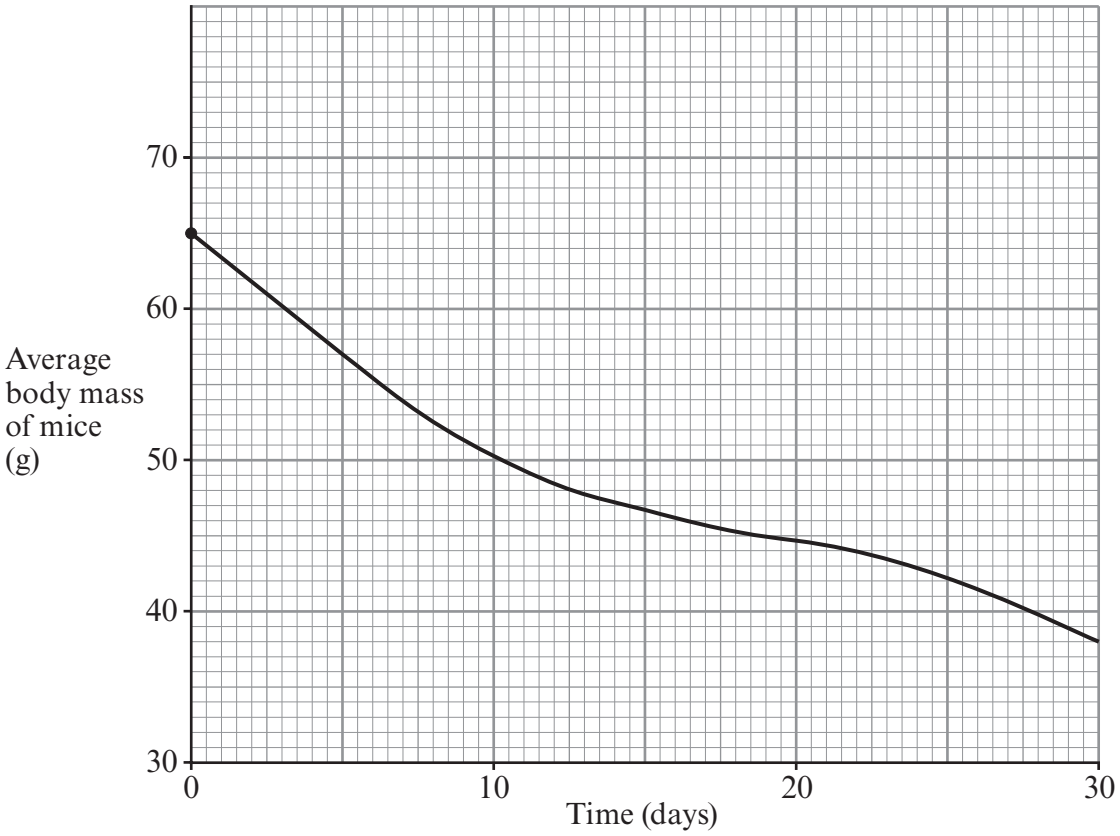
Sperm and its sex chromosome	Egg	Fertilized egg	Children produced
			.....
			.....
			.....
			.....
			.....

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8. Scientists have used mice when investigating the possibility of reducing obesity in humans. Obesity increases the risk of developing heart disease. Mice produce a hormone called leptin. Leptin controls body mass by affecting the part of the brain involved with appetite.

In 1998 an experiment was set up to measure how leptin affects body mass.
A group of adult mice were injected with leptin every day for 30 days. The same mass of food was available each day throughout the experiment. The graph below shows how their body mass changed.



(a) Suggest an explanation of how leptin is involved in the decrease in mass shown in the graph. [2]

.....

.....

.....

(b) (i) Another group of adult mice, with an average mass of 70 g, were given the same mass of food as the test group but were not injected with leptin. Draw a line on the graph to show the results you would expect for this group of mice. [1]

(ii) What word describes the group of mice that were used to make this comparison? [1]

.....

(c) Give **one** reason why some people might object to this research involving mice. [1]

.....

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Turn over.

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9. Modern humans belong to the species *Homo sapiens* and have evolved from more primitive ancestors. Three of these ancestors were *Australopithecus africanus*, *Homo habilis*, and *Homo erectus*. These three species are now extinct. The table shows the average brain volume measured from the skeletal remains of each of the extinct species and of modern humans *(Homo sapiens)*.

Species	When extinct. (Millions of years ago)	Average brain volume (cm^3)
Australopithecus africanus	2.6	400
Homo habilis	1.6	600
Homo erectus	1.0	850
Homo sapiens	Not extinct	1300

(a) State **two** factors that should have been considered to make the comparison, of the brain size of these four species, fair. [2]

.....

.....

(b) Write an explanation, in terms of natural selection, for the change in brain size during the evolution of *Homo sapiens*. [4]

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(c) Why were the ideas of Charles Darwin concerning human evolution not accepted by many people in the 19th century? [1]

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Examiner only

10. Describe the path taken by a nerve impulse during a withdrawal reflex when a hand touches a hot object. [5]

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THERE ARE NO MORE QUESTIONS IN THE EXAMINATION.

5

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WJEC
CBAC

GCSE MARKING SCHEME

SCIENCE – BIOLOGY (LEGACY)

JANUARY 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2011 examination in GCSE SCIENCE – BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Unit	Page
B1 (Legacy)	1
B2 (Legacy)	14

UNIT B1 (LEGACY)

Question	Answer	Mark
1. (a) (i)	4 bars - correct height with a label	2
	Tolerance +/- $^1/_2$ small square -1 for each error	
(ii)	I decrease/ decline/ go down	1
	II Warmer conditions/ Global warming AND so more eggs/ young/ caterpillars produced/ more reproduction	1
(b)	Survive genes generation	3
	Become extinct/ died out/ wiped out/ disappeared/ endangered/ decrease in number/ decrease in population NOT died off/ it dies	1
	Total for Question	**8**

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Question	Answer	Mark
2. (a) (i)	5.7	1
(ii)	Uses all feet/ legs / ORA	1
(b) (i)	Most (90%) of life{ in the water/ swimming}/ ORA NOT better adapted to water	1
(ii)	Strong legs / large feet	1
(c) (i)	Not as much/less fat (must be comparative)	1
(ii)	less body heat produced/ medium body heat produced	1
(d)	Long time underwater/ can stay underwater for 8 minutes/ fast swimming/ swims at 15 km/h	1
	(Very) deep diving/ swimming/ 90% time spent in water/ long time spent in water	1
	Total for Question	**8**

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Question	Answer	Mark
3. (b) (i)	dominant	1
(ii)	No, No	1
(c) (i)	2 or 3 4 1 or 2	3
(ii)	50%	1
	Total for Question	**6**

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Question	Answer	Mark
4. (a) (i)	I Heart Disease – contains higher fat	1
	II Stroke – contains higher salt	1
	Answers must be comparative	
(ii)	(Savoury Pie) high in salt SO risk of kidney damage	1
(iii)	Calculation method and numbers correct 300 x 2 / 150 or 600/15	1
	Answer correct with units (4) = 2 marks	1
(b)	Obesity/ overweight/ excessive weight or mass/ diabetes/ high blood pressure	1
	NOT put on weight/ too fat	
	Total for Question	**6**

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Question	Answer	Mark
5. (a) (i)	Within a certain range	1
(ii)	Increase followed by decrease	1
(iii)	Eating (lunch / food/ dinner etc)	1
(b) (i)	Insulin	1
(ii)	diabetes	1
(iii)	I Urine II Glucose	2
	Total for Question	**7**

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FOUNDATION AND HIGHER TIER

Question	Answer	Mark
6/1 (a)	smoking is **addictive**/contains nicotine which is **addictive**/contains a drug or chemical which is **addictive/** they get **addicted**/ **dependent** NOT hooked/ crave/ withdrawal symptoms	1
(b)	any two disease/health related reasons - accept 2 cancers {lung/ throat/ tongue/ bladder/ pancreas} cancer/ lung disease/ emphysema/ narrowed arteries/ heart disease/ reduction of fertility/ may have underweight babies/ decreased life expectancy/ increased chance of miscarriage NOT heart attack/ breathing problems/ bronchitis/ lung damage accept answer related to secondary smoking/ ref to other people breathing their smoke accept answer related to cost of cigarettes	Any 2
(c) (i)	3	1
(ii)	For last five days they have smoked less each day; There is a decrease in the number of cigarettes smoked/ correct numerical answer; Only once in the 2 week period has the previous daily average of 25 cigarettes smoked been reached (therefore considered successful); Most of the time both smoke less than their target Accept answers only referring to one of the people.	Any 2
	Total for Question	**6**

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Question	Answer	Mark
7/2 (a)	variation	1
(b) (i)	mutation	1
(ii)	(change in) DNA (not: change in genetics)	1
(c)	(offspring produced by sexual reproduction) show variation are different or not identical/ have genes from two parents/ have different alleles (accept: are not a clone) ORA NOT have two parents/ have different genes or chromosomes	1
	Total for Question	**4**

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Question	Answer	Mark
8/3 (a)	A - hair	1
	C – (blood) capillary/ blood vessel	1
(b)	(sweat gland) removes salts and water (NOT water alone) /sweat from blood/produces sweat	1
	(poured onto surface of skin (water in)) sweat evaporates	1
	Withdrawing or releases or takes heat from body/ body heat required to evaporate (water in) sweat/ lowers skin or blood temperature/ taking heat with it NOT cools you down/ lets out heat	1
	Total for Question	**5**

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HIGHER TIER

Question	Answer	Mark
4. (a)	Starts off higher	Any 3
	(blood) glucose rises higher/ more rapidly/ falls more rapidly	
	blood glucose takes longer to get back to normal or level off	
	blood glucose drops below normal/ lower than the normal	
	man	
(b)	inject insulin (before eating breakfast)/ use insulin pen	1
	or ensure that the breakfast is very low in glucose/sugar/carbohydrate/fruit	
	or take Metformin/ Novonorm	
(c)	insulin produced which converts glucose to glycogen (in the liver) Spelling must be accurate for glycogen	1
	Total for Question	**6**

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Question	Answer	Mark
5. (a)	Cross 1 - **award 1 mark for all the offspring being Bb**	1

Gametes	B	B
b	**Bb**	**Bb**
b	**Bb**	**Bb**

Cross 2 - **award 1 mark for 50% Bb and 50% bb** 1

Gametes	B	b
b	**Bb**	**bb**
b	**Bb**	**bb**

(b) If the bought rabbit or it was homozygous or BB then all offspring would be black/ there will be no white offspring 1

If the bought rabbit or it was heterozygous or Bb then 50% of offspring would be black and 50% white or some white/ Bought rabbit must be Bb to produce any white rabbits 1

Total for Question 4

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Question		Answer	Mark
6.	(a)	DNA	1
	(b)	Chromosomes / genes	1
	(c)	scientific names are used by all / are constant / do not vary/ it will be the same in all languages/ used by all scientists/ international communication/ universally understood/ common names are different in different countries	1
			(Total 3)
7.		C B E A D	5 x 1
		Total for Question	**5**

Question	Answer	Mark
8. (a)	Decrease in appetite/ makes them not feel hungry	1
	NOT affect appetite	
	so less food is eaten NOT so they do not eat	1
(b) (i)	correct line starts at 70 and shows no decrease in mass (can increase)	1
(ii)	control	1
(c)	Animal rights/ human not same as mice/research on mice is not valid for humans/ might cause mice to starve/ unethical to experiment on animals (not: simple idea of cruelty/ harmed/ suffer)	1
	Total for Question	**5**

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Question	Answer	Mark
9. (a)	Age and gender	2
(b)	Mutation	1
	leading to <u>variation</u>	1
	large brain size advantage/survival value NOT survival of the fittest alone	1
	Genes/ alleles passed on NOT mutation passes on unless qualified by gene	1
(c)	Most believed in creationism/God made humans/ went against religious views/ against bible NOT lack of proof/ against church	1
	Total for Question	**7**
10.	In order: Stimulus – heat/ hot object Receptor – skin/ nerve endings/ sensory cells (NOT hand) sensory neurone/ nerve connecting/ relay/ intermediate/ internuncial neurone or nerve motor neurone/ nerve muscle/ effector synapses - anywhere where correctly referenced Any 5 from 7	(5 x 1)
	Total for Question	**5**

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Candidate Name	Centre Number	Candidate Number
		0

WJEC CBAC

GCSE

235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

P.M. TUESDAY, 7 June 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**7**	
3	**3**	
4	**6**	
5	**4**	
6	**6**	
7	**6**	
8	**6**	
9	**7**	
Total	**50**	

0235 020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

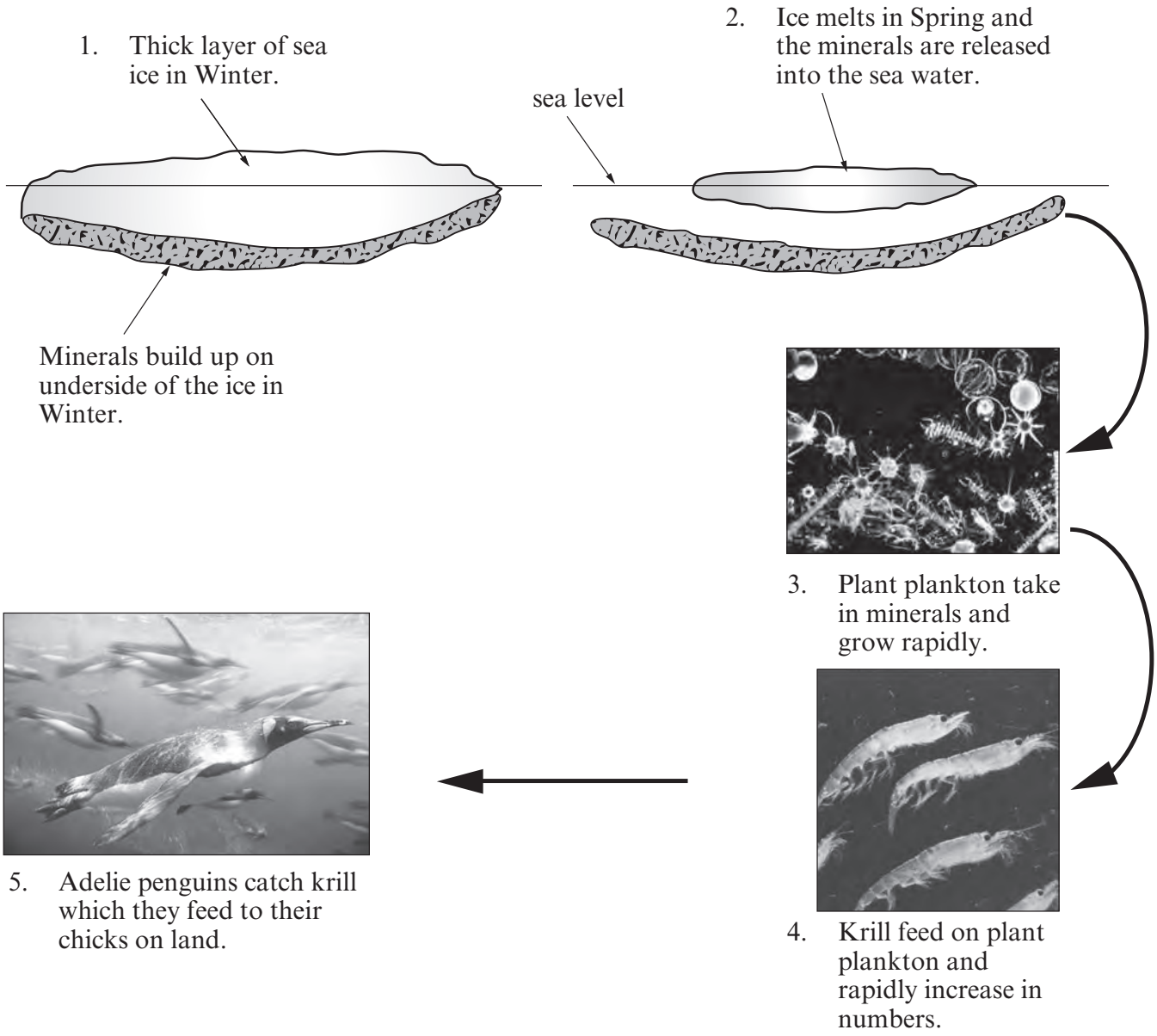
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. Sea ice builds up in the southern oceans around Antarctica every Winter. Vast quantities of minerals build up on the underside of the ice. In the Antarctic Spring the ice melts and releases the minerals into the sea water.



Fact file:

- In the Antarctic Winter of 1995 not as much sea ice formed as usual.
- In the following Antarctic Spring up to 50 Adelie penguin chicks starved to death each day on an Antarctic island.

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Examiner only

(a) Using the information provided opposite, explain why the Adelie penguin chicks starved to death. [3]

.....

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(b) Apart from competition for food and minerals, state **two** *other* environmental factors that can affect the size of a population of organisms. [2]

(i) .....

(ii) .....

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2. Nearly 1 in 15 adults in the UK is obese. It is more likely that people will develop diabetes if they are obese.

(a) Suggest **two** ways in which a person could help to reduce the risk of developing diabetes. [2]

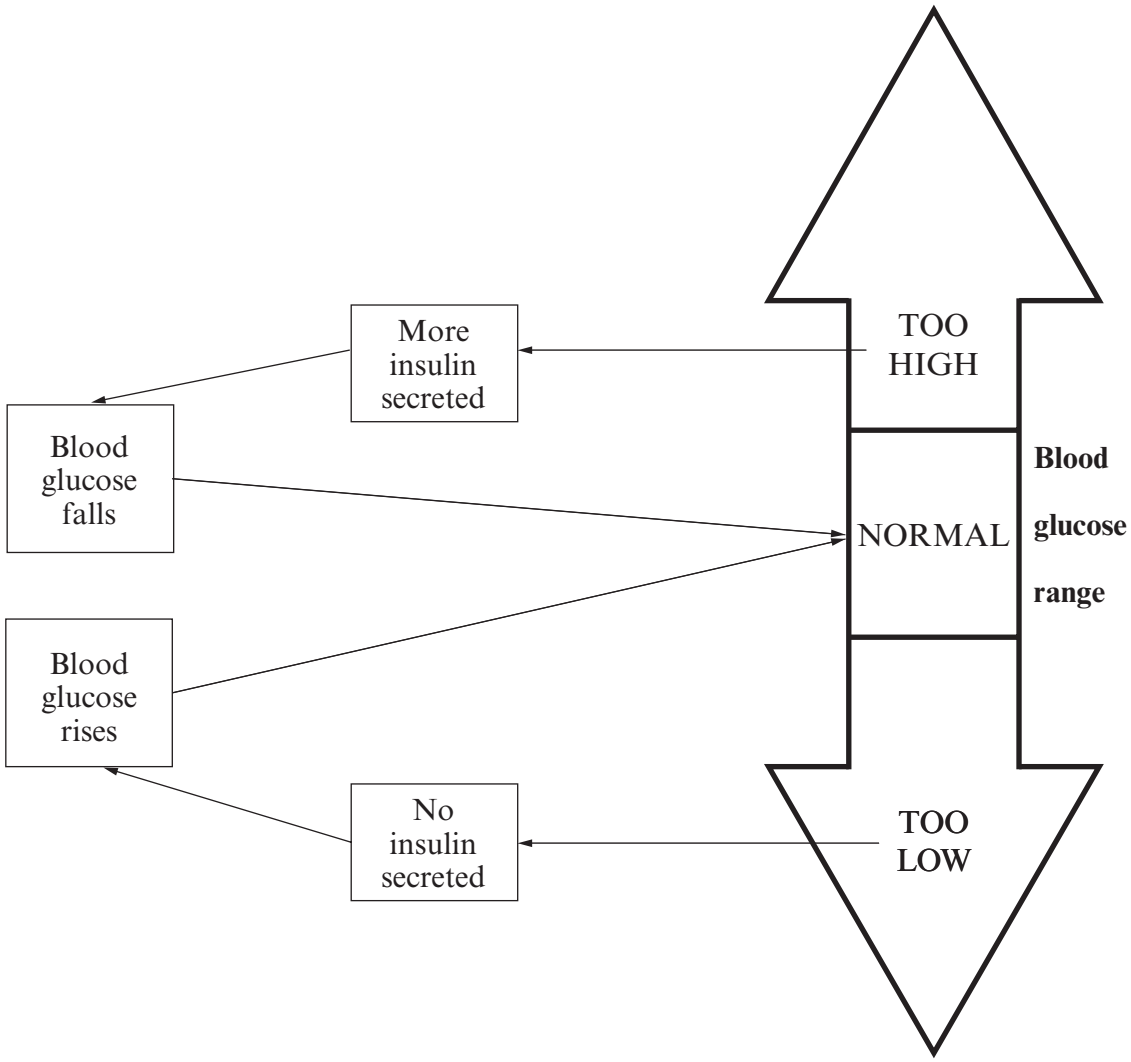
(i) .....

.....

(ii) .....

.....

(b) The diagram shows the mechanism of blood glucose control.



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(i) Use your knowledge and the information in the diagram to explain how the blood glucose level is returned to normal when it rises too high. [3]

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(ii) I. How would the mechanism of blood glucose control differ in a person with diabetes? [1]

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II. How would this affect the blood glucose level? [1]

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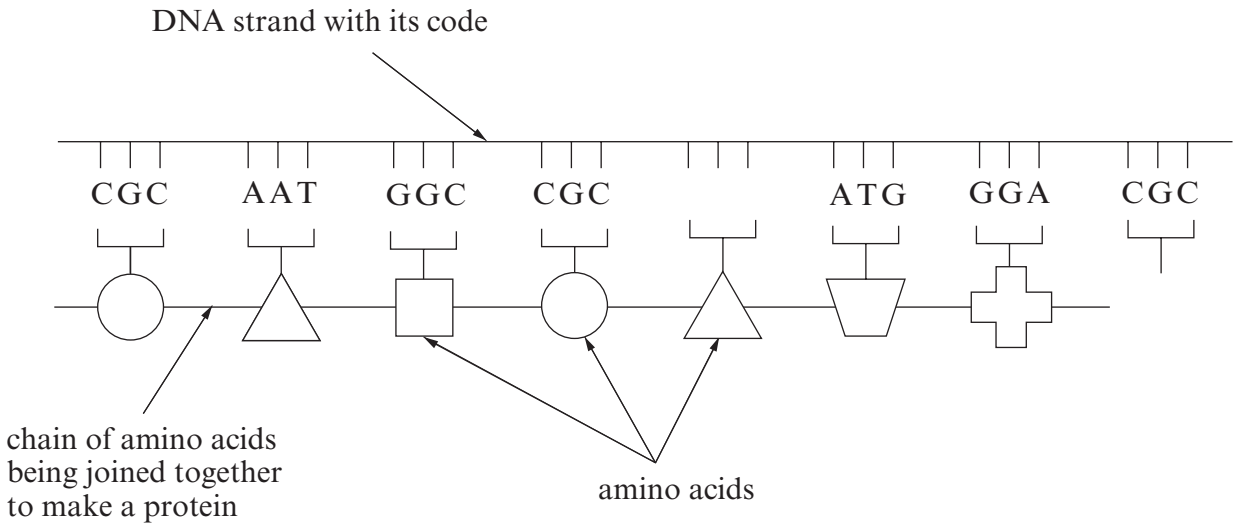
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Examiner only

3. DNA contains a code which arranges amino acids in an order to form proteins. The code is represented by the letters A, G, T and C.

The simplified diagram shows a strand of DNA with its code and amino acids being arranged to form a protein.



(a) Complete the diagram by

(i) drawing the missing amino acid, [1]

(ii) writing in the missing piece of the code. [1]

(b) A mutation occurred which changed the code in the strand of DNA shown above. Suggest what effect this would have on the protein which is formed. [1]

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3

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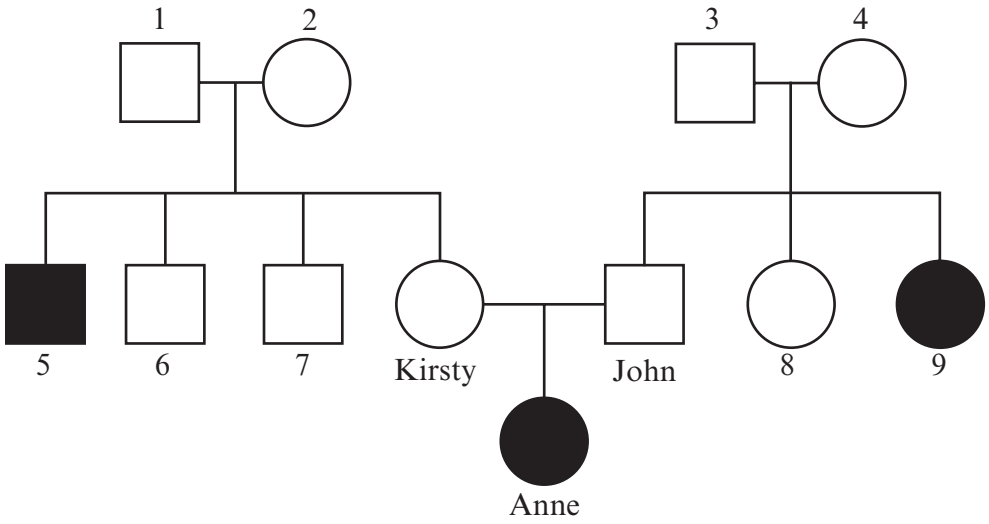
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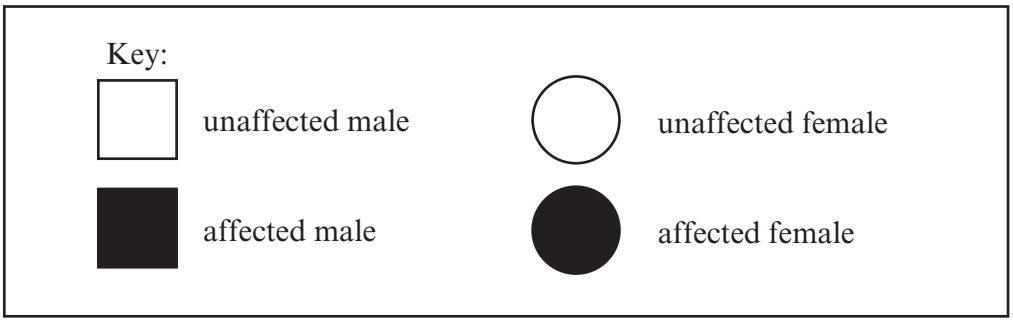
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Examiner only

4. Kirsty and John have a daughter, Anne, with cystic fibrosis. They went to see a genetic counsellor because they wanted to know the probability of any future children developing cystic fibrosis.

The genetic counsellor drew up the following family tree.





The allele for cystic fibrosis **n** is recessive to the normal allele **N**.

(a) Using these letters, state the genotype of:

(i) Kirsty ..... John ..... [1]

(ii) Anne ..... [1]

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(b) (i) Complete the Punnett square below to show the possibility of the different genotypes if Kirsty and John have more children. [2]

Gametes		

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(ii) What is the probability of Kirsty and John's next child

I. having cystic fibrosis; [1]

.....

II. being a carrier of the cystic fibrosis allele? [1]

.....

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Examiner only

5. Scientists grew two varieties of Soya beans in a farm scale trial.
Variety **A** was genetically modified (GM). Variety **B** was unmodified.
During growth the Soya bean crops were regularly sprayed with herbicide to kill the weeds growing amongst them.



Google images

After 4 months the crops were analysed for their survival and weeds remaining.
The results are shown in the table.

	Field with Soya bean variety **A** (GM)		Field with Soya bean variety **B** (unmodified)	
	Variety **A**	Weeds	Variety **B**	Weeds
Plants remaining after spraying with herbicide (%)	100	13	74	13

(a) Soya bean variety **A** was genetically modified to be resistant to the herbicide. How do the results show that the genetic modification was successful? [1]

.....

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(b) Describe how variety **A** was genetically modified. [2]

.....

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(c) No genetically modified crops have been approved for commercial growth in the UK. One of the main reasons for this is that the general public have voiced their concerns over genetic modification.
Suggest **one** concern that some people have about genetically modified crops. [1]

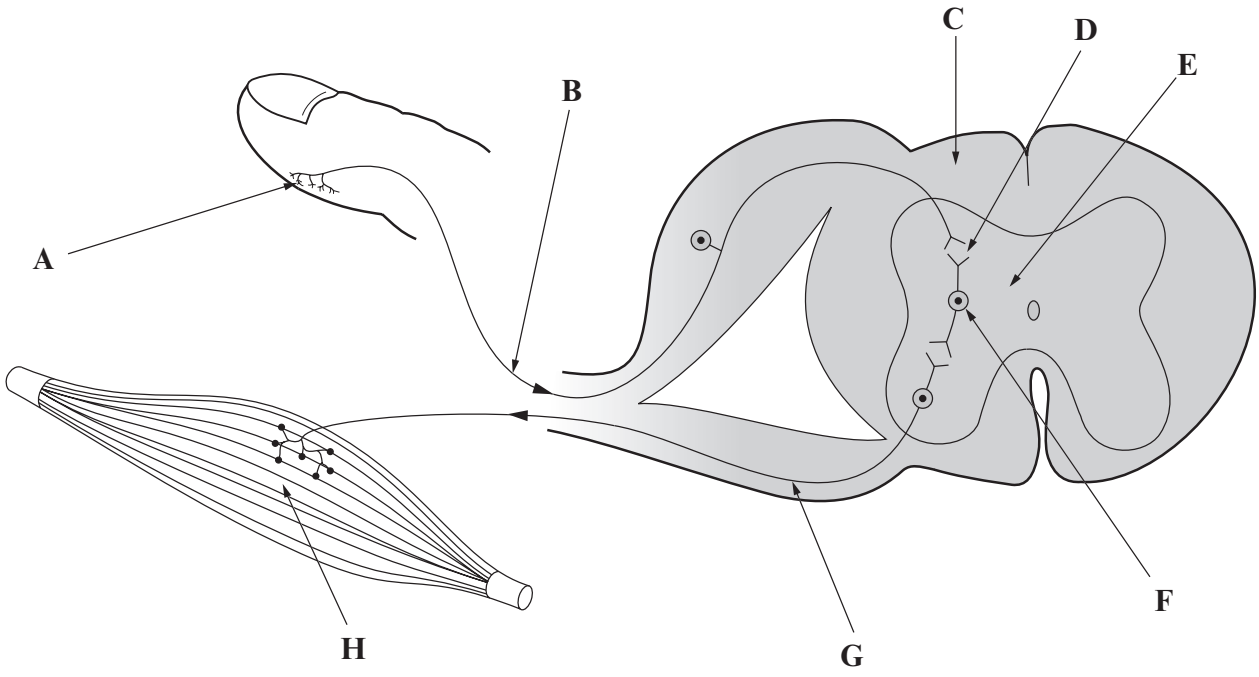
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Examiner only

6. The diagram shows the pathway of a reflex arc.



Select six correct letters from the diagram and match them with the labels in the table below.

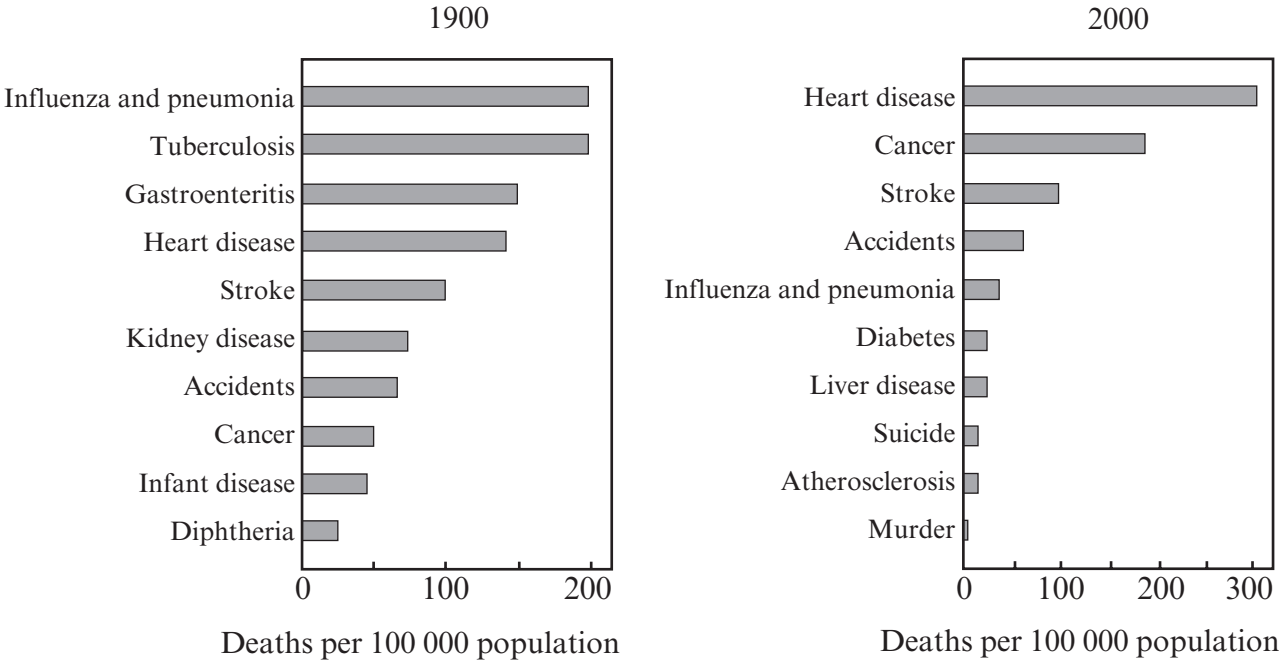
Label	Letter
Connecting nerve cell	
Motor nerve cell	
Sensory nerve cell	
Synapse	
Receptor	
Effector	

[6]

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Examiner only

7. The data shows the 10 main causes of death in the U.K. in 1900 and 2000.



(a) State the causes of death which appear in the top ten in **both** 1900 and 2000. [1]

.....

.....

(b) Suggest reasons, due to lifestyle choices, for the difference in the data for each of the following in 1900 and 2000.

(i) Heart disease. [3]

I. .....

II. .....

III. .....

(ii) Cancer. [1]

.....

(iii) Liver disease. [1]

.....

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8. Lichens grow on stone and tree bark. They are affected by sulphur dioxide from combustion of fossil fuels polluting the air. Table **A** shows the numbers of species of lichens present at different distances from the centre of an industrial city which is surrounded by a motorway.

Table **A**

Distance from city centre (km)	Number of species of lichens
0	1
2	4
4	8
6	14
8	20
10	12
12	20
14	26

(a) (i) Use the data to suggest the distance of the motorway from the city centre. [1]

..... km

(ii) Explain your answer. [2]

.....

.....

.....

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(b) Table **B** below gives the names of five lichens and the highest concentration of sulphur dioxide in the air in which each can survive.

Table **B**

Name of lichen	Highest concentration of sulphur dioxide in which the lichen can survive (μg m^{-3})
Lobaria	30
Evernia	35
Parmelia	60
Xanthoria	70
Lecanora	150

(i) Only one species of lichen was found in the city centre (in Table **A**). From Table **B**, suggest the name of this lichen. [1]

.....

(ii) The concentration of sulphur dioxide near the motorway surrounding the city was 50 μg m^{-3}. Give the names of those lichens you would expect to find growing near the motorway. [1]

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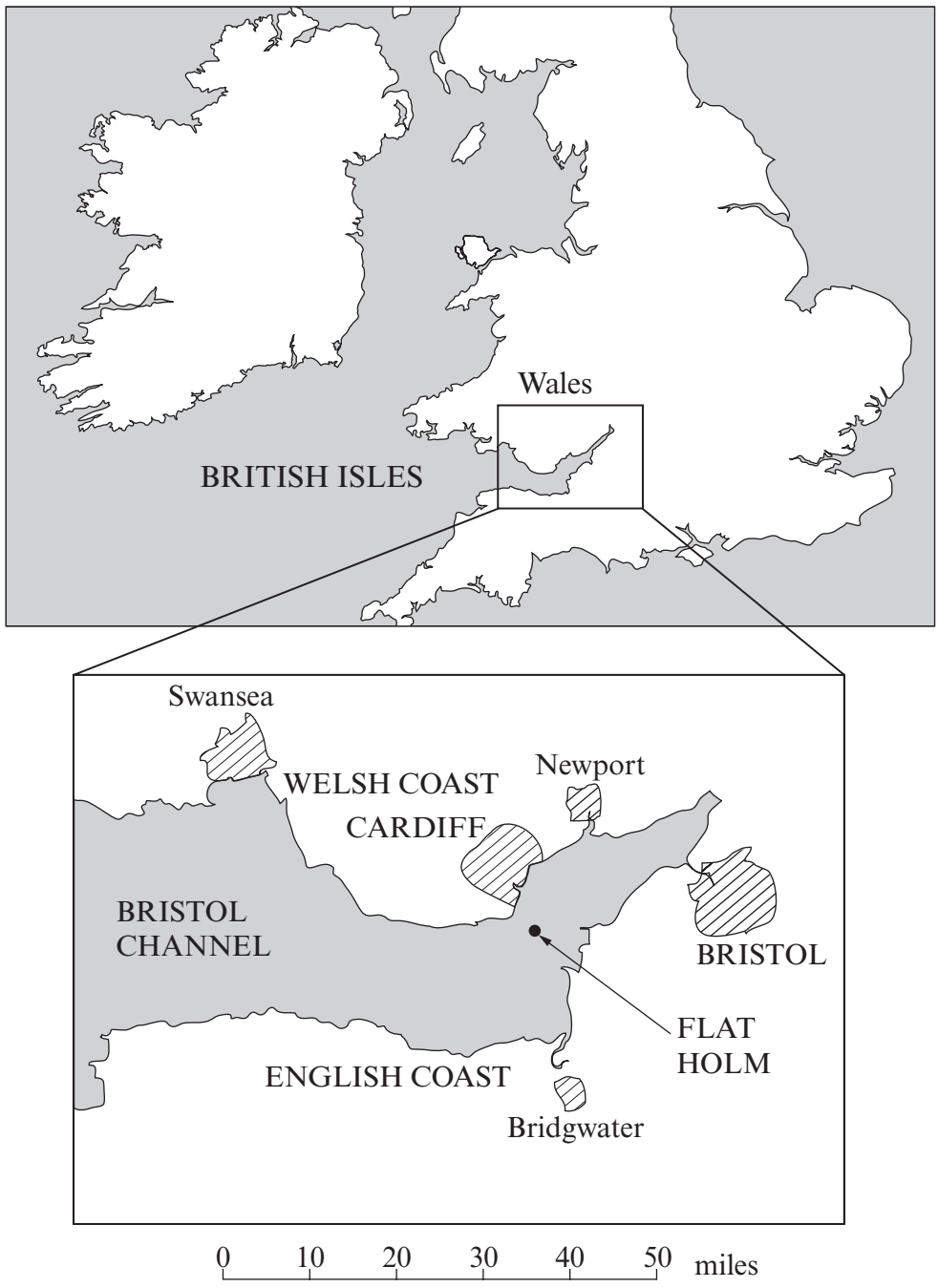
(iii) What name is given to a species which can be used to estimate the level of pollution in an environment? [1]

.....

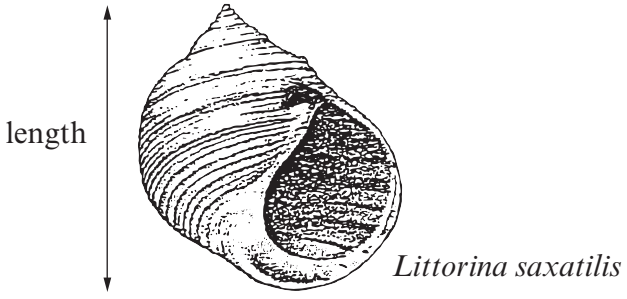
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9. Flat holm is an island in the Bristol Channel.



A population of the rough periwinkle *Littorina saxatilis* is found on the rocky shore of Flat Holm.



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The rough periwinkles on Flat Holm are larger than those on the rocky shore of the mainland opposite Flat Holm.
Some students investigated the reasons for the difference in size of the rough periwinkles.
Their research showed the following:

The shell length of rough periwinkles is controlled by genes and by the availability of its food.

Periwinkle population	Average length of shell (mm)	Predators	Competition for food
Flat Holm	9.4	Very few	Very little
Mainland	6.3	Birds (rock pipits), crabs, fish (blennies)	Much competition from similar species

(a) State **two** factors which the students would have to keep the same when taking samples of *Littorina saxatilis* from Flat Holm and the mainland. [2]

(i) .....

(ii) .....

(b) Use all the information given above and your knowledge of Charles Darwin's theory of evolution to explain the difference in the average shell length in the two populations of *Littorina saxatilis.* [5]

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Candidate Name	Centre Number	Candidate Number
		0

GCSE

235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

A.M. THURSDAY, 13 January 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**6**	
3	**3**	
4	**5**	
5	**5**	
6	**6**	
7	**5**	
8	**8**	
9	**6**	
Total	**50**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. In tigers the normal fur colour is mainly orange with black stripes. This orange colour is caused by a dominant allele **R**.

Tiger



Source: *Google Images*

Over a number of years, a pair of heterozygous orange tigers named Sashi and Ravi produced 13 cubs in a Zoo in India. Three of these cubs were white. (White with black stripes).

(a) (i) State the genotypes of Sashi and Ravi. [1]

Sashi ..... Ravi .....

(ii) Complete the Punnett square below to show how the white cubs were produced. [2]

Gametes		

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(b) Complete the Punnett square below to show how an orange tiger mated with a white tiger could produce offspring **all** of which were orange. [2]

Gametes		

(c) The orange tigers and the white tigers are the same species *(Panthera tigris)*.
What name is given to the differences that are found between organisms of the same species? [1]

.....

6

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2. *(a)* (i) Name the organ in the body which produces insulin. [1]

.....

(ii) I. How does insulin reduce the concentration of glucose in the blood? [1]

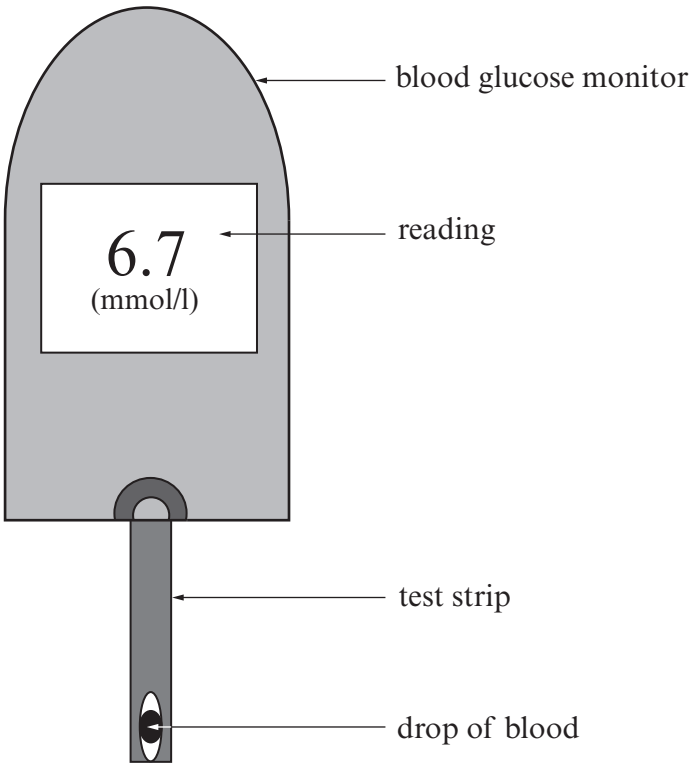
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II. In which organ in the body does this take place? [1]

.....

(b) Owen has diabetes. He measures his blood glucose level using a monitor.



Owen injects himself with a measured dose of insulin before each meal. The dose depends on his blood glucose reading. If the glucose reading is high, Owen injects a higher dose of insulin.

Owen monitors his blood glucose regularly throughout each day. He records his readings in a diary. He tries to keep his blood glucose reading within the normal range of 4.0 - 7.0 (mmol/l).

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The table below shows a section from Owen's diary over a 3 day period.

	Owen's blood glucose level (mmol/l)						
Date	*Before breakfast*	*2 hours after breakfast*	*Before midday meal*	*2 hours after midday meal*	*Before evening meal*	*2 hours after evening meal*	*Before bed*
29 Jan 09	7.0		9.1	6.8	4.3	(14.2)	12.9
30 Jan 09	9.0	7.5	7.1		6.2		7.9
31 Jan 09	5.3		7.4		(2.9)		8.2

(i) Suggest a reason for:

I. the high reading 2 hours after the evening meal on 29 Jan (circled); [1]

.....

.....

II. the low reading before the evening meal on 31 Jan (circled). [1]

.....

.....

(ii) Suggest why Owen always measures his blood glucose before bedtime. [1]

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3. Some people are at higher risk of heart attack because their blood contains a high level of cholesterol.

Simvastatin and Pravastatin are drugs which lower the cholesterol in the blood.

A trial was carried out to find out which of the 2 drugs was more effective in reducing heart attacks.

- The same number of patients were given either Simvastatin, Pravastatin or a placebo (a pill containing neither drug).
- The patients did not know which pill they were taking.
- The level of cholesterol in the blood of the patients at the start of the trial was the same.

The results are shown in the table below.

Treatment	People who had heart attacks (%)
Simvastatin	26
Pravastatin	11
Placebo	33

(a) Suggest what conclusion the researchers came to at the end of the trial. [1]

.....

.....

(b) Suggest **one** reason why a placebo was used in this trial. [1]

.....

.....

.....

(c) Give **one** way in which the trial was kept fair. [1]

.....

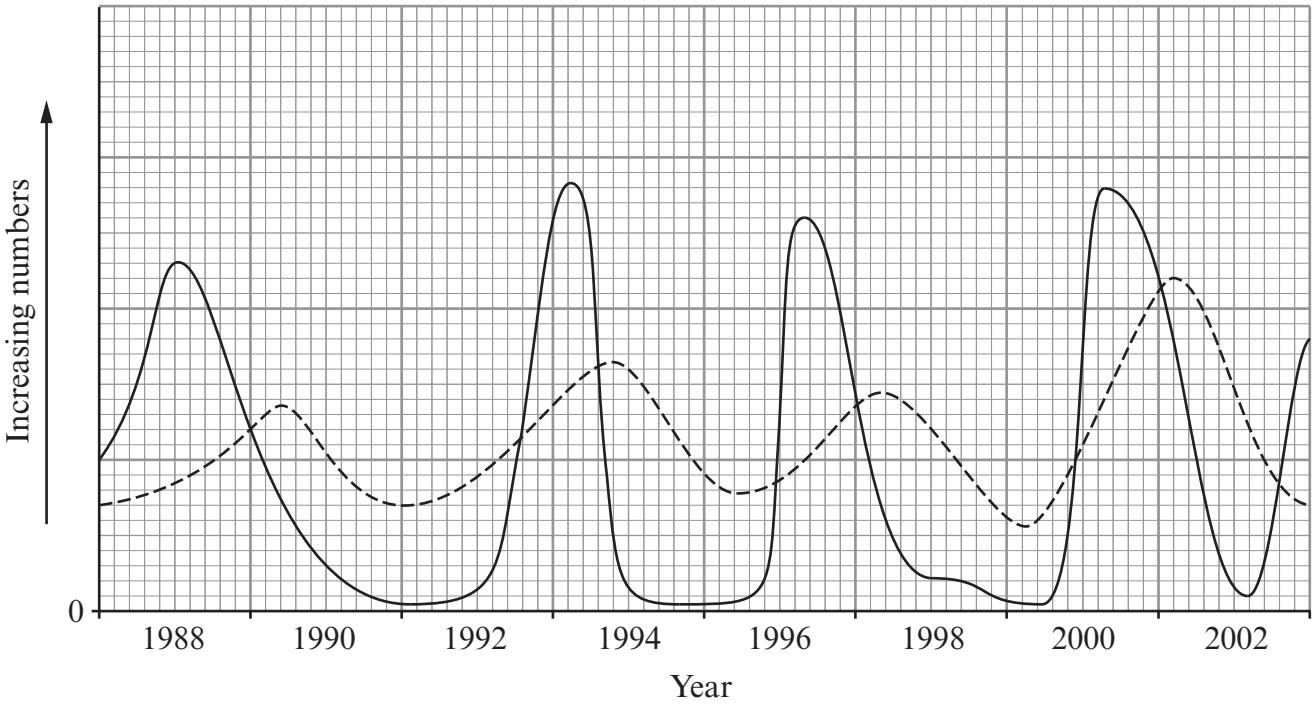
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4. Lemmings are small mammals that are found in the Arctic. Their main predator is the Arctic fox. The population of lemmings peaks and troughs at regular intervals.
The graph shows the population of lemmings and Arctic foxes between 1988 and 2002.



Key:
——— Lemmings - - - - - - - Arctic foxes

(a) What is the approximate period of time between the population peaks of lemmings? [1]

.....

(b) Use the graph to state the relationship between the number of lemmings and the number of Arctic foxes. [1]

.....

(c) Suggest **two** factors, other than predation, that might be responsible for the decrease in lemming populations after each peak. [2]

(i) .....

(ii) .....

(d) The lemming is the preferred food of the Arctic fox. When the lemming population crashes the Arctic foxes eat Brent geese instead. Describe how the numbers of Brent geese might change between 1988 and 1992. [1]

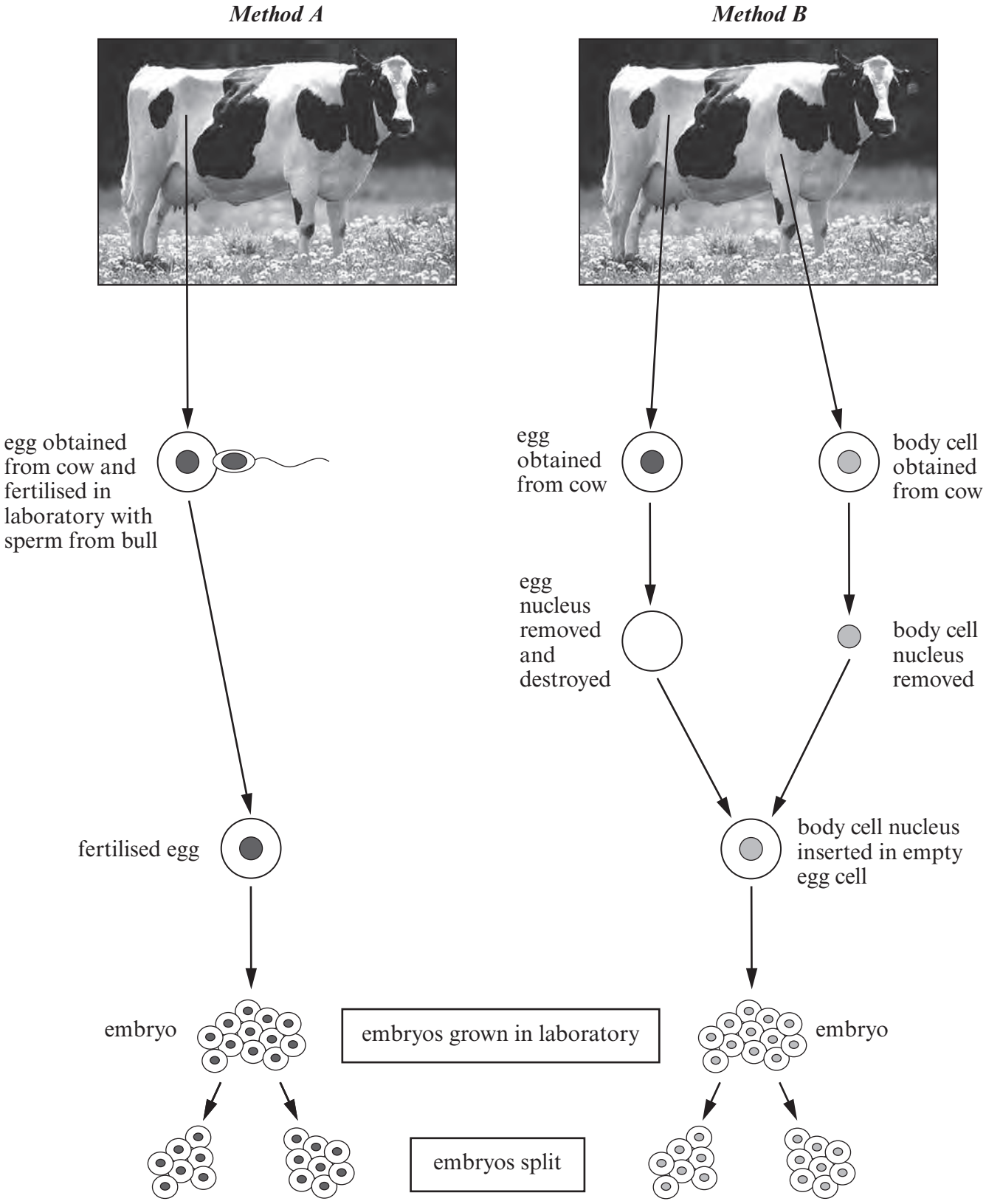
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5. A farmer had cows which produced a high yield of milk. The farmer decided to produce calves from these dairy cows. She wanted to produce as many calves as possible in the shortest time and decided to use embryo splitting. Two methods were available as shown below.



Female embryos are selected and placed into surrogate mother cows and develop into normal calves.

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(a) The farmer wanted to increase the number of cows with a high milk yield. Which of the Methods A or B, would you advise the farmer to use?

Method .....

Explain your answer. [2]

.....

.....

.....

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(b) The scientists carrying out the embryo splitting process would have to guarantee to the farmer that only **female** calves would be produced when Method A is used. How would they do this? [2]

.....

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(c) What word is used to describe the calves produced by embryo splitting? [1]

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6. *(a)* Cigarette smokers become addicted to tobacco because it contains a chemical that affects nerve centres in the brain.

Name this chemical ..... [1]

(b) Smokers who try to give up the habit sometimes use patches of material containing the addiction-causing chemical. The patches are attached to the skin.
How does this chemical pass from the skin to the brain? [1]

.....

(c) In *The Times* in 1994, it was reported that a parrot kept as a pet in a living room, died of lung cancer. Its owner smoked 40 cigarettes each day.
What does this suggest about the benefits of banning smoking in public places such as restaurants and shops? [1]

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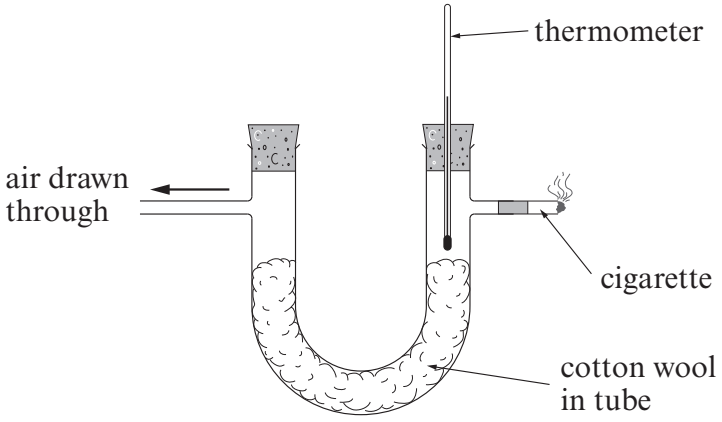
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(d) State **one** withdrawal symptom of giving up smoking. [1]

.....

(e) The following apparatus was used in a fume cupboard to investigate some effects of smoking.



Within 3 minutes the cotton wool had changed colour.

Which part of the body is represented by the cotton wool? ..... [1]

(f) Other than lung cancer, state **one** of the harmful effects of smoking. [1]

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7. *(a)* Underline the correct answer to complete the statement below: [1]

A withdrawal reflex action begins with

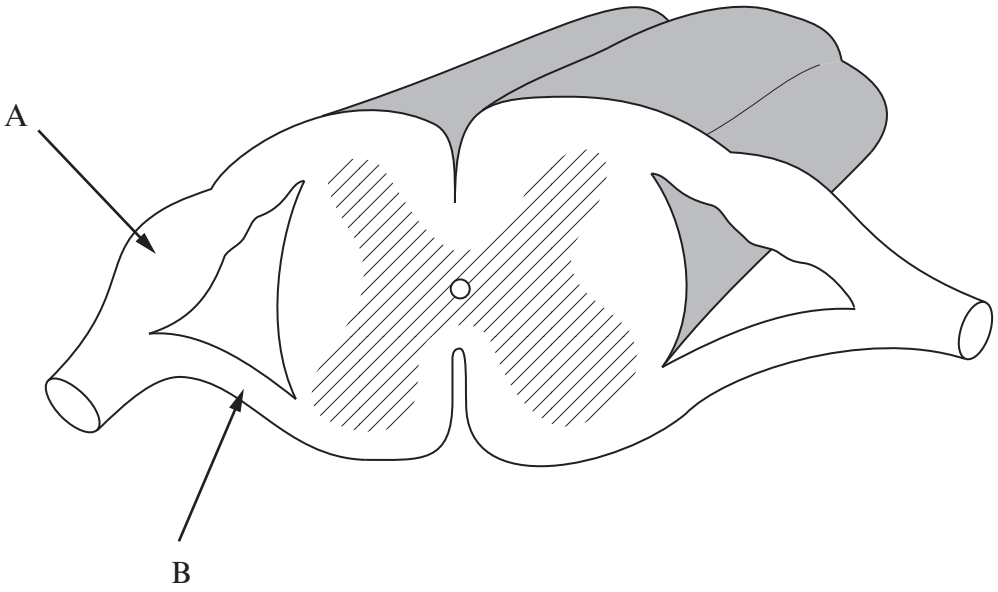
(i) a painful sensation;

(ii) stimulation of a receptor;

(iii) an unconscious impulse in the spinal cord;

(iv) an unconscious impulse in the brain.

(b) The diagram shows a section through the spinal cord in a human.



(i) In a reflex arc, name the type of nerve cell which is present in [2]

A .....

B .....

(ii) I. Name the nerve cell which links A and B in the spinal cord. [1]

.....

II. Name the gaps between nerve cells. [1]

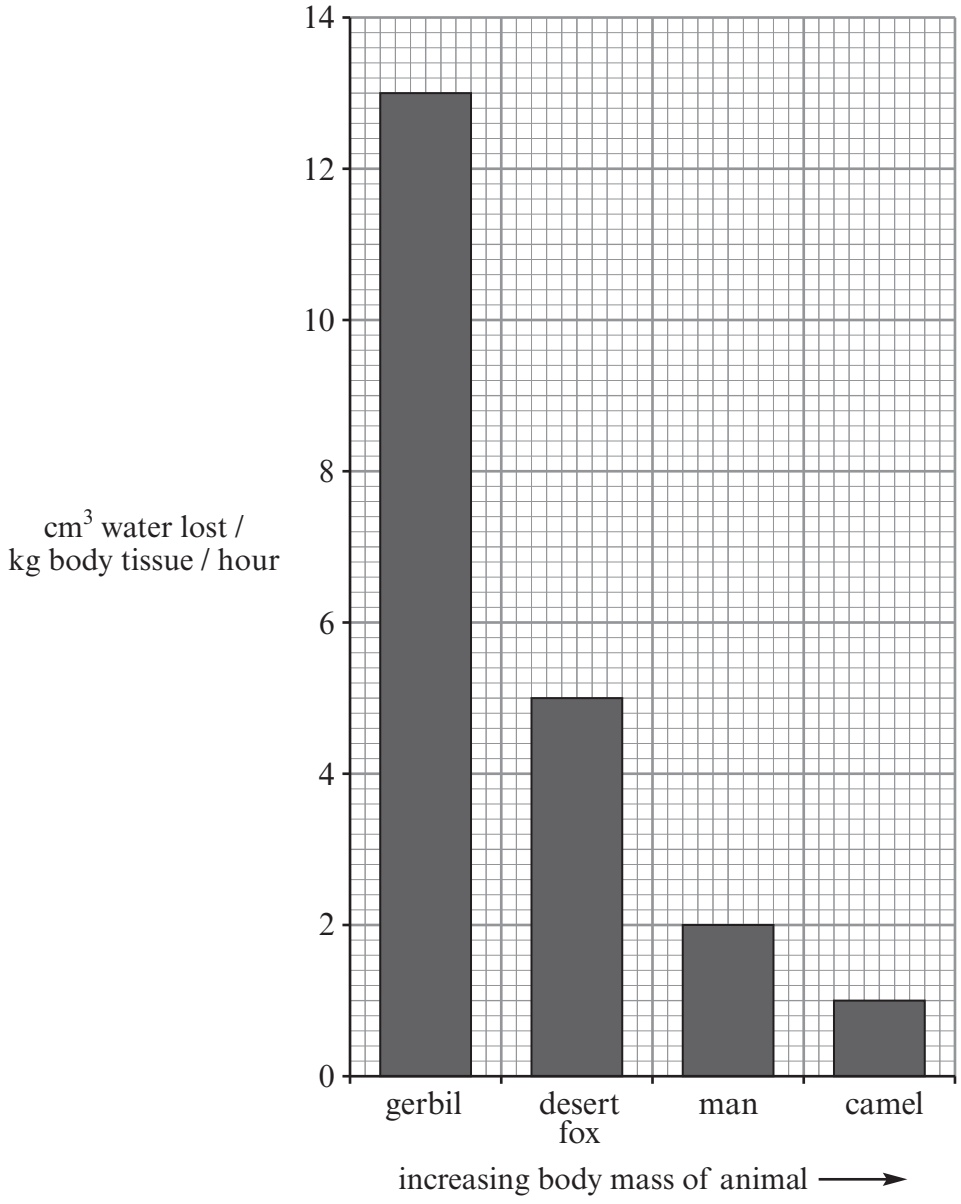
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8. Different mammals have to lose different volumes of water to keep their body temperatures constant in a desert. This is shown in the bar chart below:



Use the data in the bar chart to answer the following.

(a) (i) What is the effect of **increasing** body mass on the volume of water lost per kg? [1]

.....

(ii) The body mass of a desert fox is 3 kg.
Calculate the volume of water it would have to lose in 12 hours to keep its body temperature constant. [2]
Show your working.

Volume of water lost = ...

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(b) (i) Explain how the loss of water helps humans to maintain a constant body temperature. [2]

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.....

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(ii) Suggest why it is an advantage to a camel to lose so little water when keeping its body temperature constant. [1]

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(iii) Gerbils are most active in deserts at night. Suggest why this adaptation is an advantage to the gerbil. [2]

.....

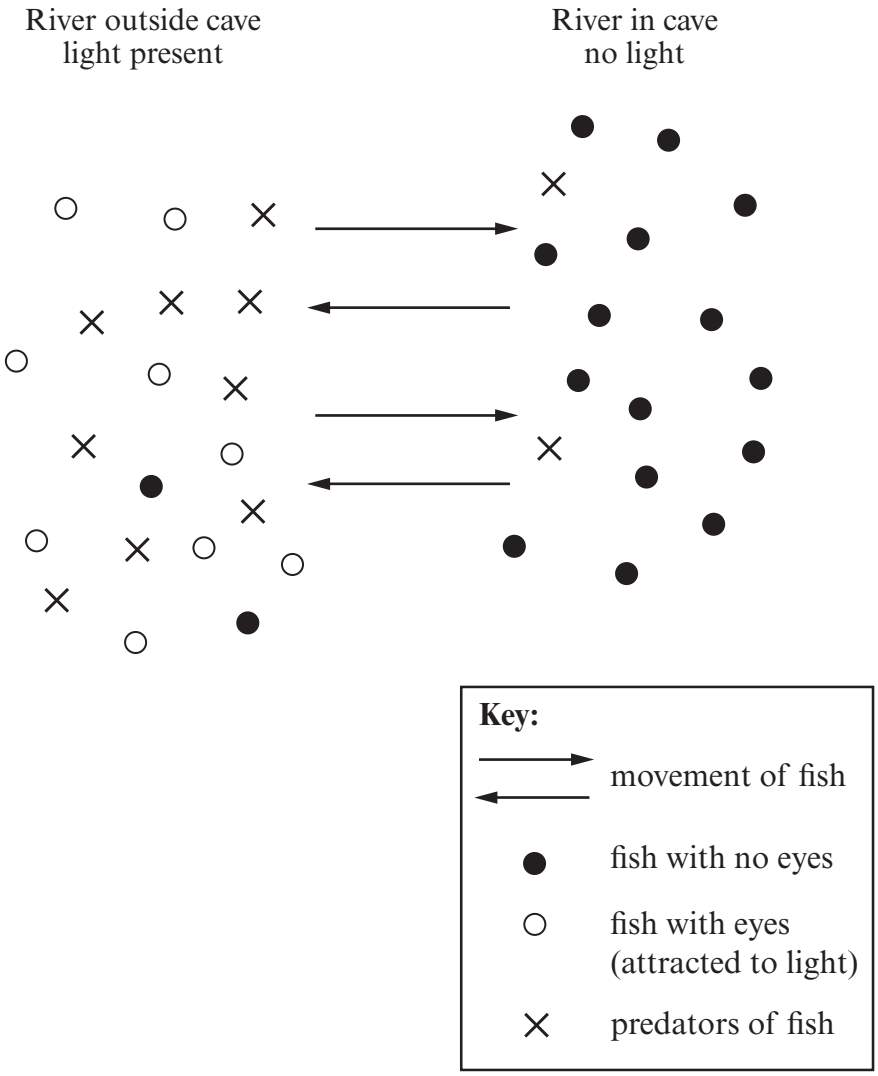
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9. There are 38 known species of fish with no eyes which live in rivers flowing in caves. A scientist produced a computer model to suggest an explanation of how these blind cave fish have developed over millions of years. It is assumed that the ancestors of these fish had eyes but that occasionally some fish did not have eyes when they hatched from eggs.
Below is a computer model that the scientist produced.



(a) What name is given to the change from one species into another over millions of years? [1]

.....

(b) Name the part of the fish's chromosome which controls the development of eyes. [1]

.....

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(c) Use your knowledge and the information given to explain how natural selection has allowed the new species of blind cave fish to develop from their ancestors that had eyes. [4]

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