EDEXCEL GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B1 HIGHER TIER 5BI1H PAPERS

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | Candidate Number

Biology/Science

Unit B1: Influences on Life

Higher Tier

Monday 15 January 2018 – Afternoon
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Plant growth

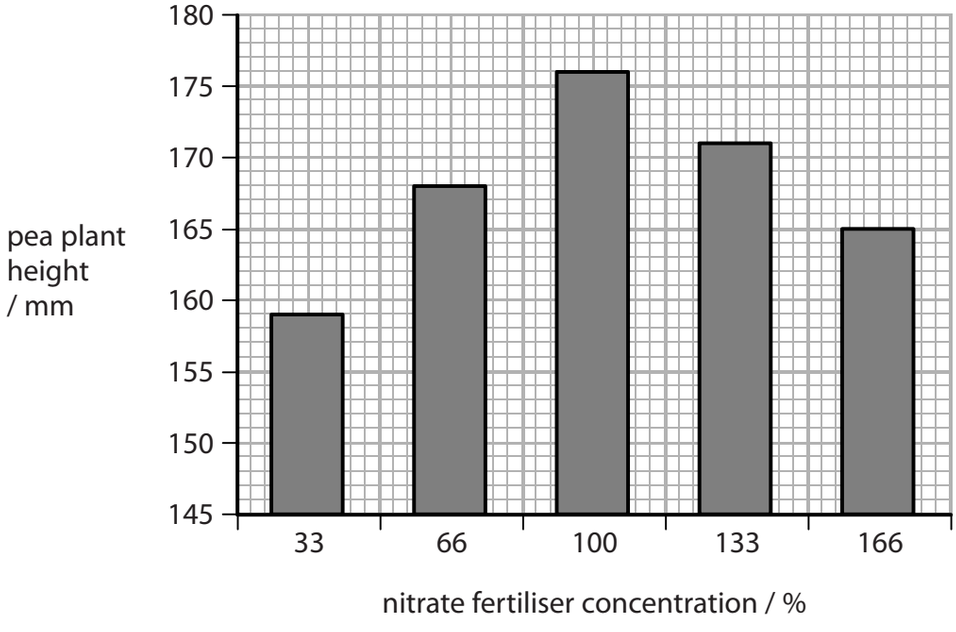
1 (a) A scientist investigated the effect of nitrate fertiliser concentration on the growth of pea plants.

Five different concentrations of nitrate fertiliser were used.

Two concentrations were below the recommended 100% and two concentrations were above the recommended 100%.

The pea plants were grown for two weeks and their final heights were recorded.

The graph shows these results.



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(i) Describe the effect of nitrate fertiliser concentration on the final height of the pea plants.

(2)

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The pea plants need nitrate ions to produce

(1)

☒ **A** carbohydrate

☒ **B** fat

☒ **C** glucose

☒ **D** protein

(iii) Describe how the scientific community can validate the evidence produced in this investigation.

(2)

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(b) Describe how nitrate ions are removed from the soil as part of the nitrogen cycle.

(3)

(Total for Question 1 = 8 marks)

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Classification

2 The photograph shows Britain's favourite bird, the robin.



(a) (i) The binomial name of the robin is *Erithacus rubecula*.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Erithacus is the

(1)

☒ **A** family of the robin

☒ **B** genus of the robin

☒ **C** order of the robin

☒ **D** species of the robin

(ii) Name the phylum of the robin.

(1)

.....

(iii) The robin belongs to the kingdom Animalia.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Organisms in the kingdom Animalia feed

(1)

☒ **A** autotrophically

☒ **B** heterotrophically

☒ **C** saprophytically

☒ **D** photosynthetically

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(b) Robins are very territorial.

A breeding pair of robins will attack other robins in their territory.

(i) Explain why this behaviour helps future generations of robins to survive.

(2)

.....

.....

.....

.....

(ii) An area of woodland in Scotland is 80 km^2.

There are 250 breeding pairs of robins in each square kilometre of woodland.

Calculate the total number of male and female robins in this area of woodland.

(2)

..... robins

(iii) Suggest why so many robins can survive in this area of woodland.

(1)

.....

.....

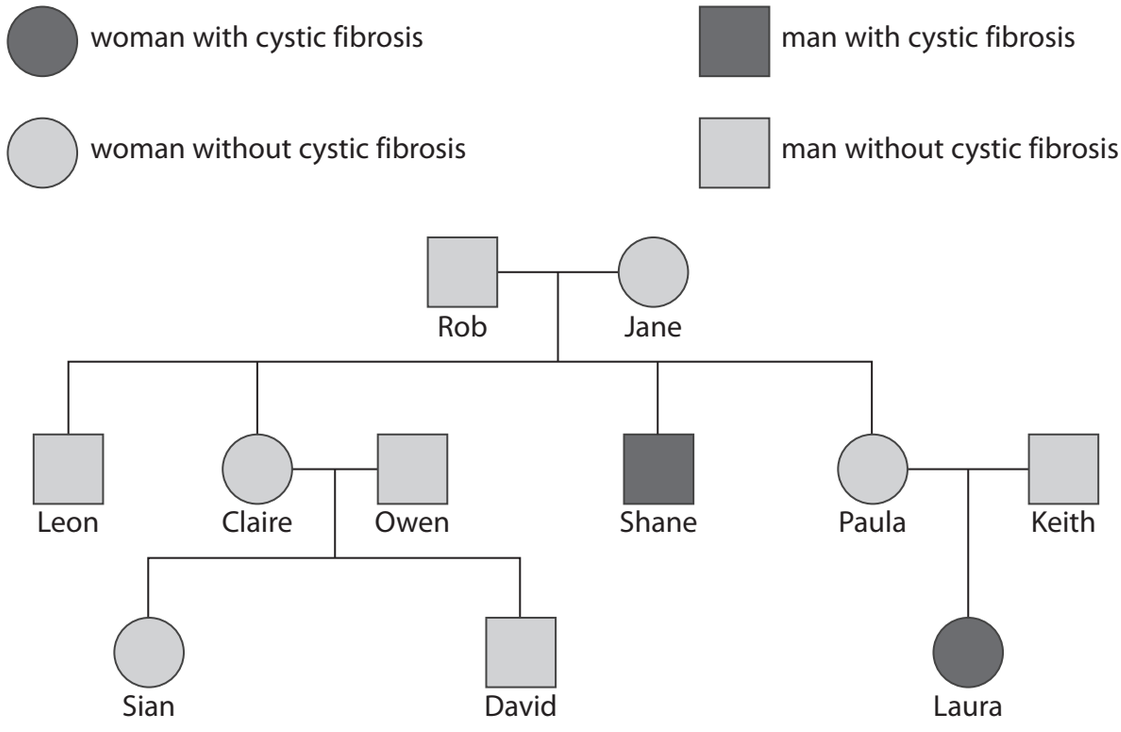
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Cystic fibrosis

3 Cystic fibrosis is a recessive genetic disorder.

The pedigree chart shows the inheritance of cystic fibrosis in a family.



(a) (i) Explain how the pedigree chart shows that cystic fibrosis is a recessive genetic disorder.

(2)

.....

.....

.....

.....

(ii) Which genotype is **not** possible for Leon?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** Ff

☒ **B** FF

☒ **C** fF

☒ **D** ff

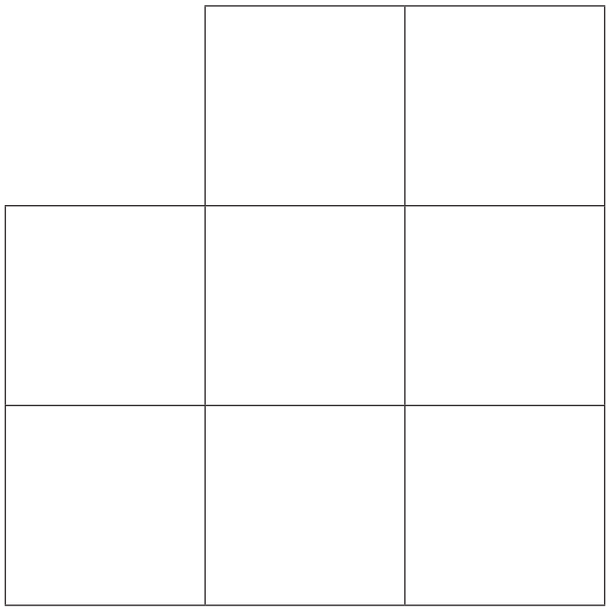
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(iii) Paula and Keith decide to have a second child.

Complete the Punnett square and calculate the percentage probability that their second child will be a carrier of the cystic fibrosis allele.

(3)



probability of being a carrier ..... %

(iv) Complete the sentence by putting a cross (☒) in the box next to your answer.

A carrier of cystic fibrosis is also said to be

(1)

☒ **A** dominant

☒ **B** heterozygous

☒ **C** homozygous

☒ **D** recessive

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(b) Describe the symptoms of cystic fibrosis.

(3)

(Total for Question 3 = 10 marks)

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4 Vaping was introduced as a way of helping people to give up smoking tobacco.

The liquid used in vaping contains nicotine but not the other chemicals found in tobacco smoke.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Nicotine is classified as a

(1)

☒ **A** depressant

☒ **B** hallucinogen

☒ **C** painkiller

☒ **D** stimulant

(ii) Describe the effect of nicotine on the human brain.

(2)

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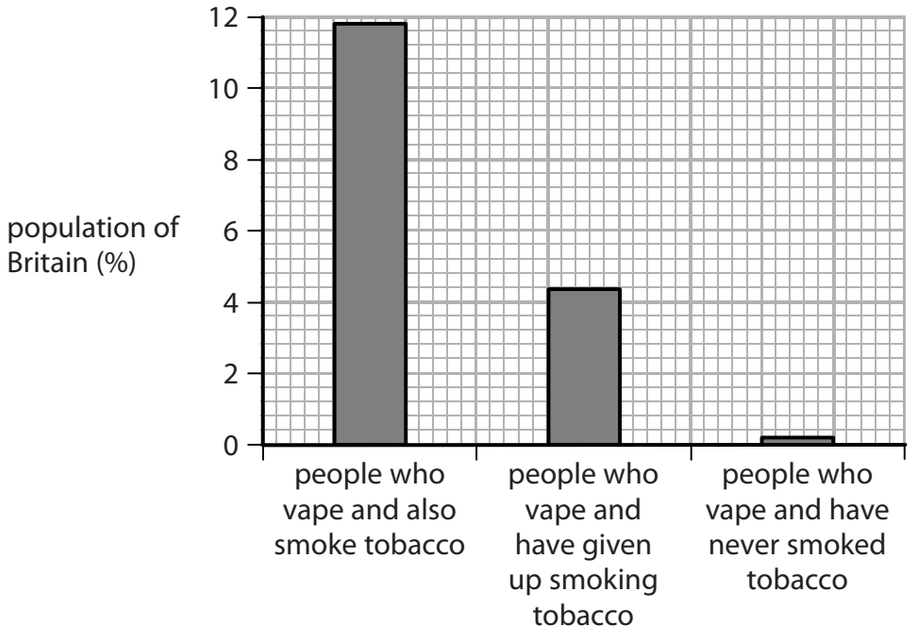
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(b) The graph shows the percentage population of Britain who are vaping.



(i) Vaping has not affected the smoking of tobacco in Britain.

Describe how data from the graph supports this statement.

(2)

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(ii) Vaping does not lead to the inhalation of carbon monoxide.

Explain **one** other reason why vaping could be better for a person's health than smoking tobacco.

(2)

(iii) Explain why inhaling carbon monoxide can affect a person's ability to exercise.

(3)

(Total for Question 4 = 10 marks)

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Blood glucose regulation

5 (a) Gestational diabetes can occur when a woman is pregnant.

The effects are the same as Type 2 diabetes.

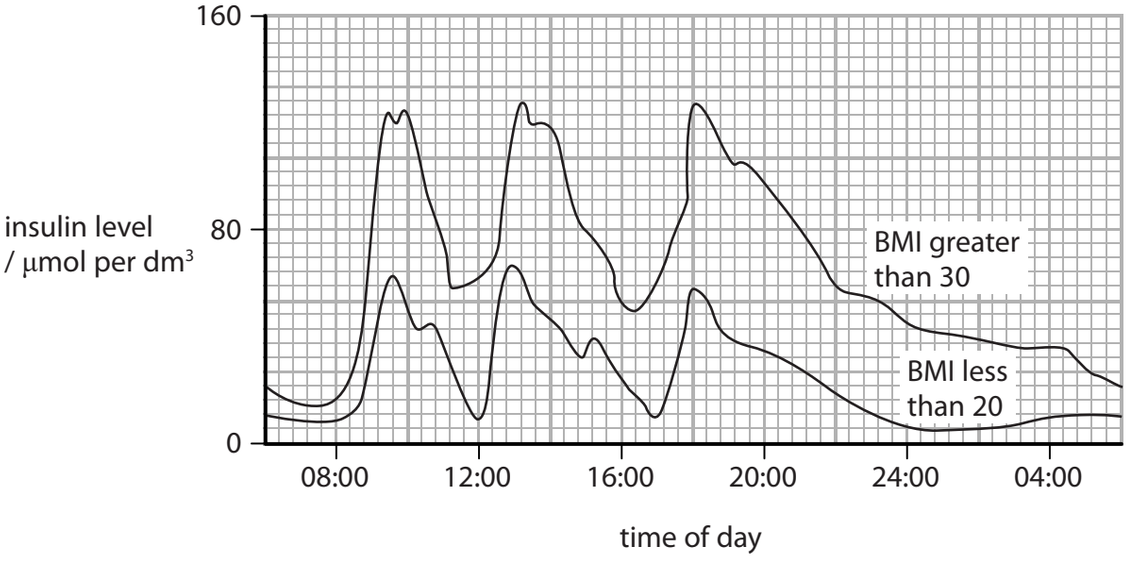
(i) Explain how gestational diabetes affects the blood of a pregnant woman.

(2)

(ii) Describe the lifestyle changes that a doctor would suggest to control gestational diabetes without using medication.

(2)

(b) (i) The graph shows the insulin level of a person with a BMI over 30 and that of a person with a BMI of less than 20.



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Compare the insulin levels of the person with a BMI greater than 30 with the insulin levels of a person with a BMI less than 20.

(2)

*(ii) Explain how blood glucose is regulated.

Use information from the graph to support your answer.

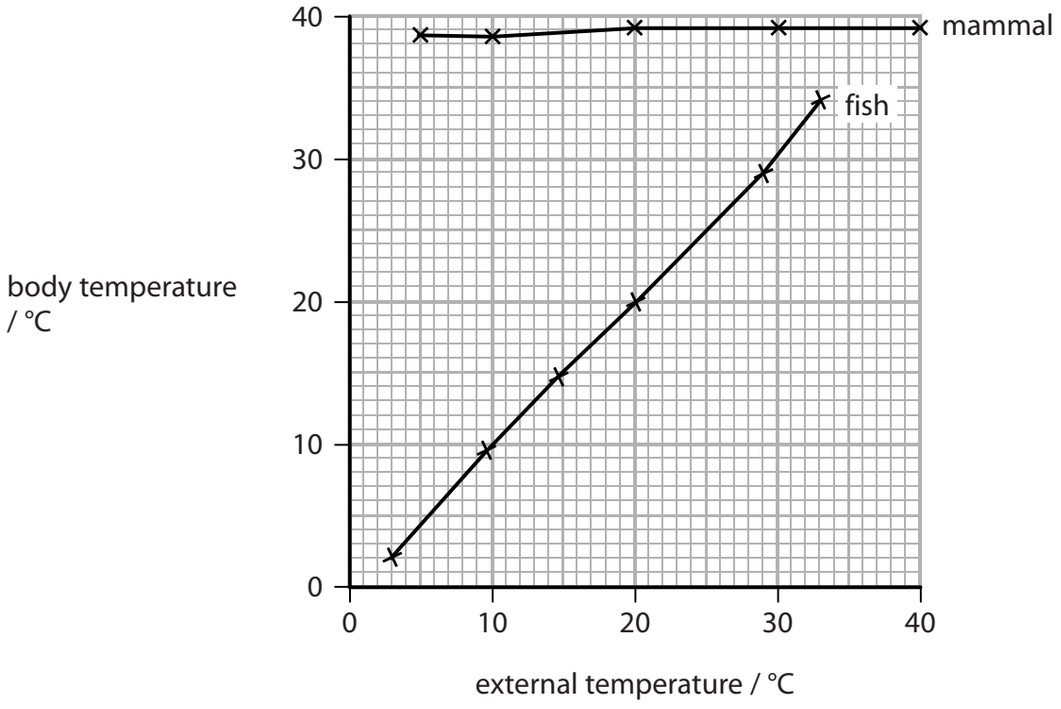
(6)

(Total for Question 5 = 12 marks)

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Thermoregulation

6 (a) The graph shows the body temperature of two animals at different external temperatures.



(i) Calculate the difference in body temperature of these two animals when the external temperature is 25 °C.

(2)

..... °C

(ii) Explain the relationship between the body temperature of the fish and the external temperature.

(2)

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(iii) Explain why this fish will die at external temperatures above 40 °C.

(2)

*(b) Explain how thermoregulation allows mammals to maintain a constant body temperature when the external temperature is 5 °C.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

January 2018

Pearson Edexcel GCSE
In Biology (5BI1H)
Paper 01

edexcel

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January 2018
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Acceptable answers	Marks
1 (a) (i)	A description to include the following: • below 100% nitrate concentration less growth / above 100% nitrate concentration less growth (1) • optimum is 100% / max height of 176mm / 100% is the maximum height (1)		(2)

Question number	Answer	Acceptable answers	Marks
1 (a) (ii)	**D** ☒ protein		(1)

Question number	Answer	Acceptable answers	Marks
1 (a) (iii)	A description to include two of the following: • published in scientific journals (1) • the results can be peer reviewed (1) • discussed at scientific conferences (1)	Accept other scientists do the experiment Accept talk to other scientists Accept repeat the experiment (1)	(2)

Question number	Answer	Acceptable answers	Marks
1 (b)	A description to include the following: • taken up by plants for growth (1) • denitrification / denitrifying bacteria (1) • convert nitrates to nitrogen gas (1) • in anaerobic / anoxic / low oxygenated areas (1)	Accept in waterlogged areas	(3)

Total for Question 1 = 8 marks

Question number	Answer	Acceptable answers	Marks
2 (a) (i)	**B** ☒ genus of the robin		(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (ii)	Chordata / chordates	accept any reasonable phonetic spelling	(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (iii)	**B** ☒ heterotrophically		(1)

Question number	Answer	Acceptable answers	Marks
2 (b) (i)	An explanation including the following: • the robins will have access to food / nesting sites / territory / protection from predators (1) • so the young live long enough to reproduce (1)	Accept allow successful competition	(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (ii)	Substitution 80 x 250 = 20 000 (1) 20 000 X 2 = 40 000 OR 2 x 250 = 500 (1) 500 x 80 = 40 000	2 marks awarded for correct answer with no working	(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (iii)	availability of food / nesting sites / lack of predators		(1)

Total mark for question 2 = 8 marks

Question number	Answer	Acceptable answers	Marks
3 (a) (i)	An explanation to include the following: • Rob and Jane / Paula and Keith / two parents without cystic fibrosis had a child with cystic fibrosis (1) • parents must be heterozygous / carriers / pass on one recessive allele each (1)	 accept to have CF a person must have 2 recessive alleles	(2)

Question number	Answer	Acceptable answers	Marks
3 (a) (ii)	**D** ☒ ff		(1)

Question number	Answer	Acceptable answers	Marks
3 (a) (iii)	<table><tr><td></td><td>F</td><td>f</td></tr><tr><td>F</td><td>FF</td><td>Ff</td></tr><tr><td>f</td><td>Ff</td><td>ff</td></tr></table> 1 mark for correct gametes 1 mark for correct offspring genotypes 1 mark for correct probability of 50%	Accept incorrect gametes with correct offspring (1) Accept correct probability calculated from Punnett square (1)	(3)

Question number	Answer	Acceptable answers	Marks
3 (a) (iv)	**B** ☒ heterozygous		(1)

Question number	Answer	Acceptable answers	Marks
3 (b)	A description to include three of the following: • build-up of thick / of sticky mucus / extra mucus (1) • lung infections (1) • breathing difficulties (1) • weight loss / malnutrition (1) • infertility (1)	accept: blocked pancreatic duct accept: blocked reproductive tubes	(3)

Total for Question 3 = 10 marks

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	**D** ☒ stimulant		(1)

Question number	Answer	Acceptable answers	Marks
4 (a) (ii)	A description linking the following: • increases the number of receptors for nicotine in the brain (1) • causing addiction (1) OR • speeds up neurotransmission (1) • at the synapse (1)		(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (i)	A description linking **two** of the following: • Only 4.4% have used vaping to give up smoking (so this is not an indication that it is as a tool to give up smoking) (1) • 11.8 % are vaping and also smoking tobacco (so this is not an indication that it is as a tool to give up smoking) (1) • 0.2% of people vaping have never smoked (so this is not an indication that it is as a tool to give up smoking) (1)	Accept +/- 0.2% on graph interpretation	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	An explanation linking two of the following: • tobacco smoke contained tar (1) • which is cancer forming / a carcinogen (1)	Accept other harmful effects of tobacco smoke	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (iii)	An explanation including the following points: • carbon monoxide binds to the haemoglobin / red blood cells (1) • reducing the amount of oxygen that can be carried around the body (1) • oxygen is needed for muscle action to exercise (1)	Accept oxygen is needed for (cellular) respiration (1)	(3)

Total marks for question 4 = 10 marks

Question number	Answer	Acceptable answers	Marks
5 (a) (i)	An explanation linking the following points: • the insulin cannot reduce blood glucose levels / blood glucose levels are high (1) • because the body cells become resistant to insulin (1)		(2)

Question number	Answer	Acceptable answers	Marks
5 (a) (ii)	A description linking the following points: • reduce carbohydrate / sugar intake / low sugar / carbohydrate diet (1) • increase in exercise (to lower blood glucose) (1)	ignore healthy diet	(2)

Question number	Answer	Acceptable answers	Marks
5 (b) (i)	A comparison including: • the person with a BMI greater than 30 has the same pattern of insulin levels as the person with a BMI less than 20 (1) • the levels of insulin use are much higher in the person with a BMI greater than 30 than the person with a BMI of less than 20 (1)	Accept fluctuate in the same way	(2)

Question Number		Indicative Content	Mark
QWC	***5(b)(ii)**	An explanation to include some of the following points: When blood glucose levels are low • at 08:00, 12:00, 17:00, 01:00 • glucagon is released • from the pancreas • causing stored glycogen • from the muscles and liver • to be converted to glucose • to raise the blood glucose levels When blood glucose levels are high • at 10:00, 13:00 and 19:00 • insulin is released • from the pancreas • causing glucose to be stored as glycogen • in the liver and muscles • reducing blood glucose levels	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation of one method of blood glucose regulation or correct data quoted from the graph • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation of both methods of blood glucose regulation OR a detailed explanation of one method • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation of both methods of blood glucose regulation including the role of glucagon and glycogen in the process • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total mark for question 5 = 12 marks

Question number	Answer	Acceptable answers	Marks
6 (a) (i)	39 (°C) and 25 (°C) (1) 14 (°C)		(2)

Question number	Answer	Acceptable answers	Marks
6 (a) (ii)	An explanation to include the following: • (fish is) poikilothermic (1) • body temperature is the same as the external temperature (1)	Accept ectothermic Accept as external temperature increases, body temperature increases	(2)

Question number	Answer	Acceptable answers	Marks
6 (a) (iii)	An explanation to include the following: • enzymes (that control metabolic reactions) (1) • **denature** (1)	oxygen levels would be too low (1) respiration would stop (1)	(2)

Question Number		Indicative Content	Mark
QWC	***b**	A explanation to include some of the following points • negative feedback mechanism • hypothalamus detects changes in blood temperature / receives neural stimulation from skin receptors • shivering • rhythmic involuntary contraction of muscles • respiratory heat warms body • erector muscles contract • hairs attached to erector muscles rise • trap a layer of insulating air • stops the loss of heat energy from skin • vasoconstriction • blood vessel or arterioles close to surface of skin / diameter narrows • stops the loss of heat energy from skin as blood redirected away from skin	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation of one method of thermoregulation • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation of at least two methods of thermoregulation • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation of three methods of thermoregulation • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 6 = 12 marks

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Centre Number | | | | | |

Candidate Number | | | | |

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 16 May 2017 – Afternoon
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

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Advice

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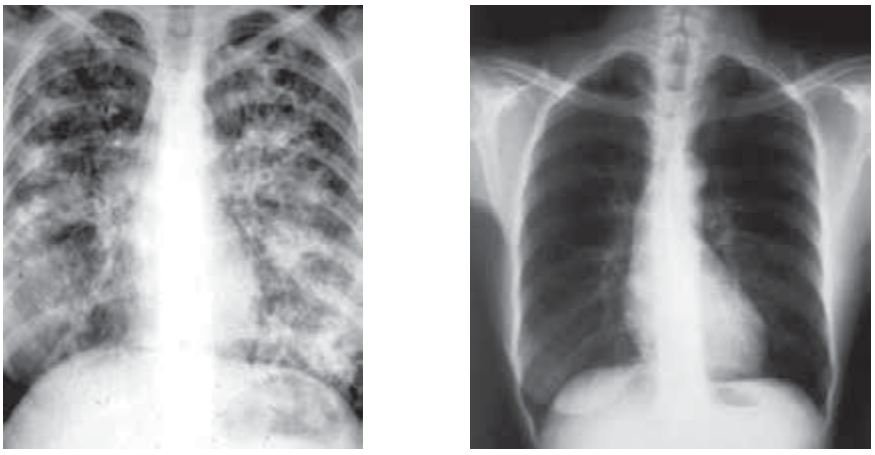
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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Cystic fibrosis

1 (a) The x-ray image on the left shows how cystic fibrosis can affect the human lungs.
The x-ray image on the right shows healthy human lungs.



cystic fibrosis lungs

healthy lungs

© smithbiologyp3

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

The lungs of a person who has cystic fibrosis can be blocked with

☒ **A** carbon monoxide

☒ **B** cilia

☒ **C** mucus

☒ **D** red blood cells

(ii) Explain why a person who has cystic fibrosis may have more lung infections than a person who does not have cystic fibrosis.

(2)

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(iii) Weight loss is a symptom of cystic fibrosis.

Use words from the box to complete the following sentence.

(2)

large intestine	enzymes	acids
pancreas	hormones	stomach

A person who has cystic fibrosis may lose weight because .....

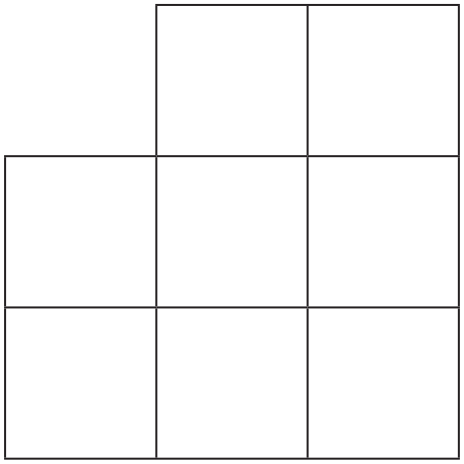
that digest insoluble food molecules are restricted from leaving the

..... to enter the small intestine.

(b) Genetic screening can be used to determine the probability of a child inheriting cystic fibrosis.

(i) Complete the Punnett square to show the inheritance of cystic fibrosis when both parents are heterozygous (Aa) for cystic fibrosis.

(2)



(ii) State the percentage probability that a child born to these parents will be a carrier of the cystic fibrosis gene.

(1)

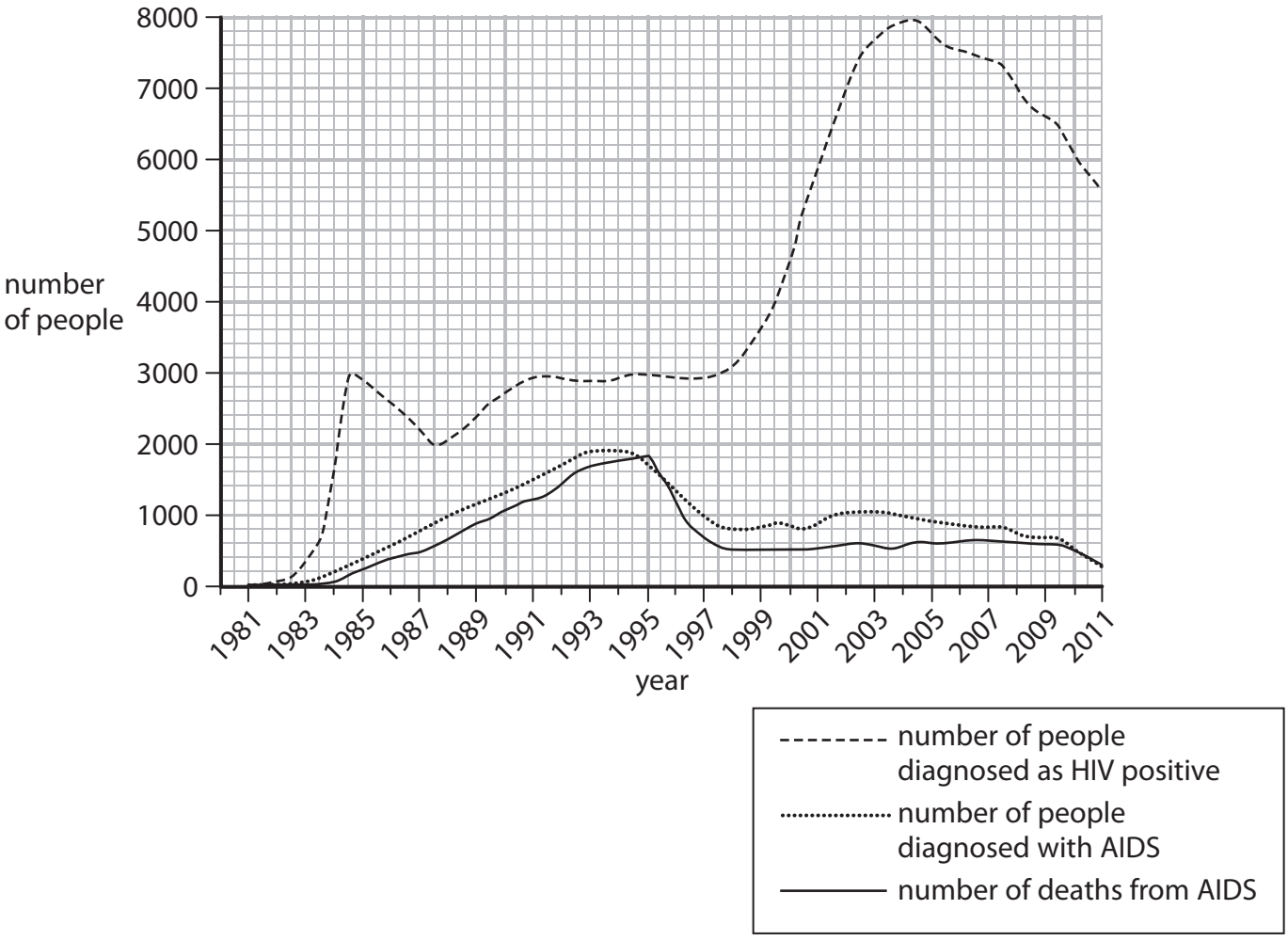
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(Total for Question 1 = 8 marks)

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Infection

2 (a) The graph shows data about people with HIV and people with AIDS from 1981 to 2011.



(i) Which statement about the graph is correct?

Put a cross (☒) in the box to indicate your answer.

(1)

☒ **A** There is a direct correlation between the number of people diagnosed as HIV positive and the number of people diagnosed with AIDS.

☒ **B** There is a direct correlation between the number of people diagnosed as HIV positive and the number of deaths from AIDS.

☒ **C** The number of people diagnosed with AIDS and diagnosed as HIV positive peaked at 7900.

☒ **D** The highest number of deaths from AIDS occurred in 1995.

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(ii) Calculate the difference between the number of people diagnosed as HIV positive in 2005 and in 2011.

(2)

(iii) Suggest a reason for this difference in the number of people diagnosed as HIV positive.

(1)

(iv) Describe how HIV can be passed from person to person.

(1)

(b) A study found that the number of children hospitalised due to MRSA infections doubled between 2000 and 2007.

Explain why bacterial infections caused by MRSA have increased.

(3)

(Total for Question 2 = 8 marks)

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Water pollution

3 An environmental scientist investigated the pollution of a stream by recording the number of bloodworms at various locations in the stream.

(a) State the term used to describe organisms that show pollution levels in air or water.

(1)

.....

(b) She recorded the number of bloodworms found at five different distances along the stream and repeated these recordings three times.

The results of the investigation are shown in the table.

	number of bloodworms found			
distance along the stream / m	**repeat 1**	**repeat 2**	**repeat 3**	**mean**
5	1	3	2	2
25	2	0	1	1
55	12	20	19	17
75	15	15	18	
95	26	13	15	18

(i) Calculate the mean number of bloodworms at a distance of 75 m along the stream.

(2)

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(ii) Describe what these results show about the pollution level of the stream.

(2)

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(iii) Which of these living organisms can be used to determine high oxygen levels in the water of the stream?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** blackspot fungi
- ☒ **B** lichens
- ☒ **C** sludgeworms
- ☒ **D** stonefly larvae

(c) Low oxygen levels in the stream can be caused by a process called eutrophication.

Explain how eutrophication can result in low oxygen levels in the water in the stream.

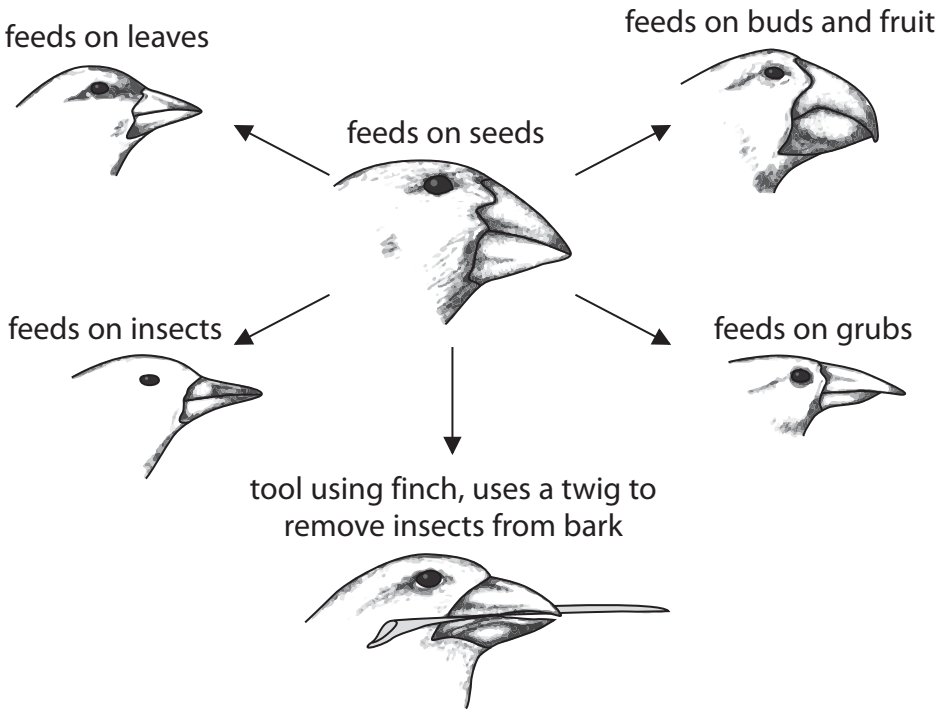
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(Total for Question 3 = 10 marks)

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Natural selection

4 (a) Charles Darwin studied finches on the Galapagos Islands.
The diagram shows the beak shapes and the food source of some of these finches.



(i) Explain how natural selection resulted in the different beak shapes of these finches.

(3)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

These finches show speciation due to the

☒ **A** geographic isolation of the Galapagos Islands

☒ **B** overproduction of offspring

☒ **C** development of ring species

☒ **D** survival of the fittest

(b) Variation within a species can make classification of an organism difficult.

(i) Explain why hybridisation also makes classification of an organism difficult.

(2)

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(ii) State one source of genetic variation in a species.

(1)

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(c) The photograph shows another organism found on the Galapagos Islands called the blue-footed booby.



© Totally Latin America

The blue-footed booby is classified into the kingdom Animalia.

Describe the main characteristics of organisms in the kingdom Animalia.

(3)

(Total for Question 4 =10 marks)

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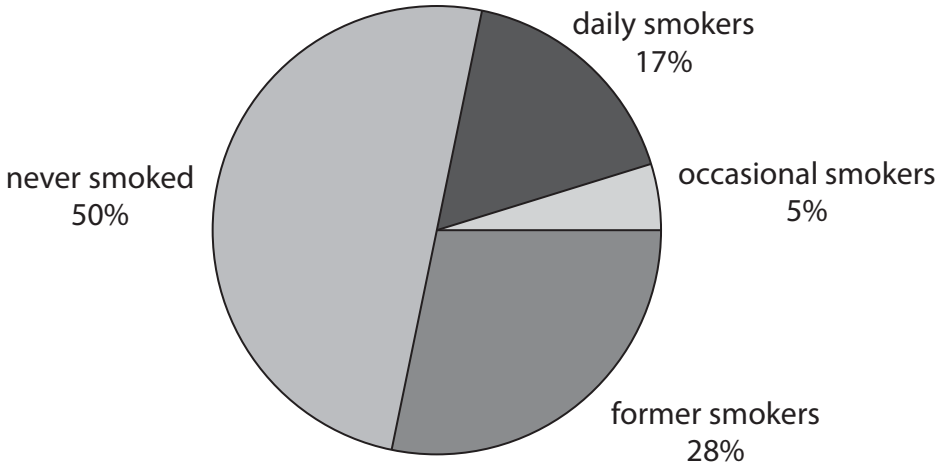
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5 The pie chart shows the results of an investigation into the tobacco-smoking habits of 20 000 people in 2008.



(a) (i) Calculate the number of individuals who were daily smokers in 2008.

(2)

.....

(ii) The same 20 000 people were asked again in 2013 about their tobacco-smoking habits. The percentage of former smokers had risen from 28% to 36%.

Suggest one reason why these people gave up smoking tobacco.

(1)

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(b) Tobacco smoke contains carbon monoxide.

Explain how carbon monoxide affects a person's ability to exercise.

(3)

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*(c) Tobacco contains nicotine, which is a drug.

Describe how the four groups of drugs affect the human body.

(6)

(Total for Question 5 = 12 marks)

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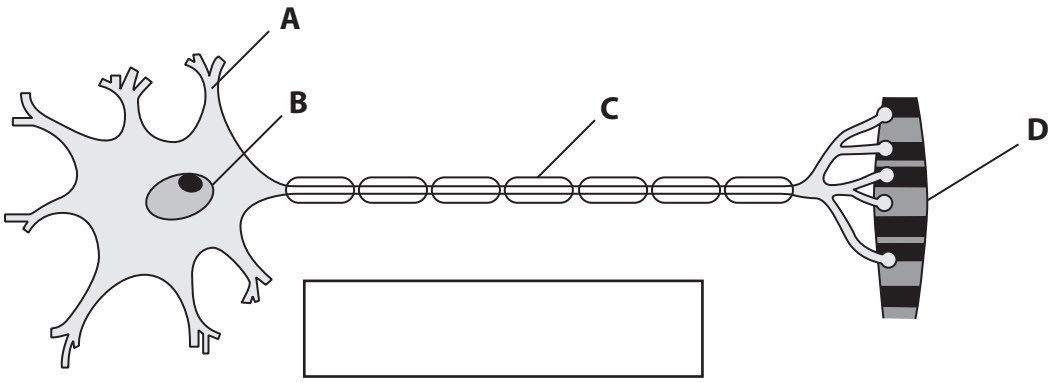
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The nervous system

6 The diagram shows a motor neurone.

(a) (i) Draw an arrow in the box to show the direction of travel of the electrical impulse in this motor neurone.

(1)



(ii) Which letter labels the dendron in this motor neurone?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(b) (i) Name the **two** parts of the body that make up the central nervous system (CNS).

(1)

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

Sensory neurones carry electrical impulses from

- ☒ **A** effector cells to the CNS
- ☒ **B** the CNS to effector cells
- ☒ **C** receptor cells to the CNS
- ☒ **D** the CNS to receptor cells

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(c) Describe how a synapse is involved in the conduction of a nerve impulse.

(2)

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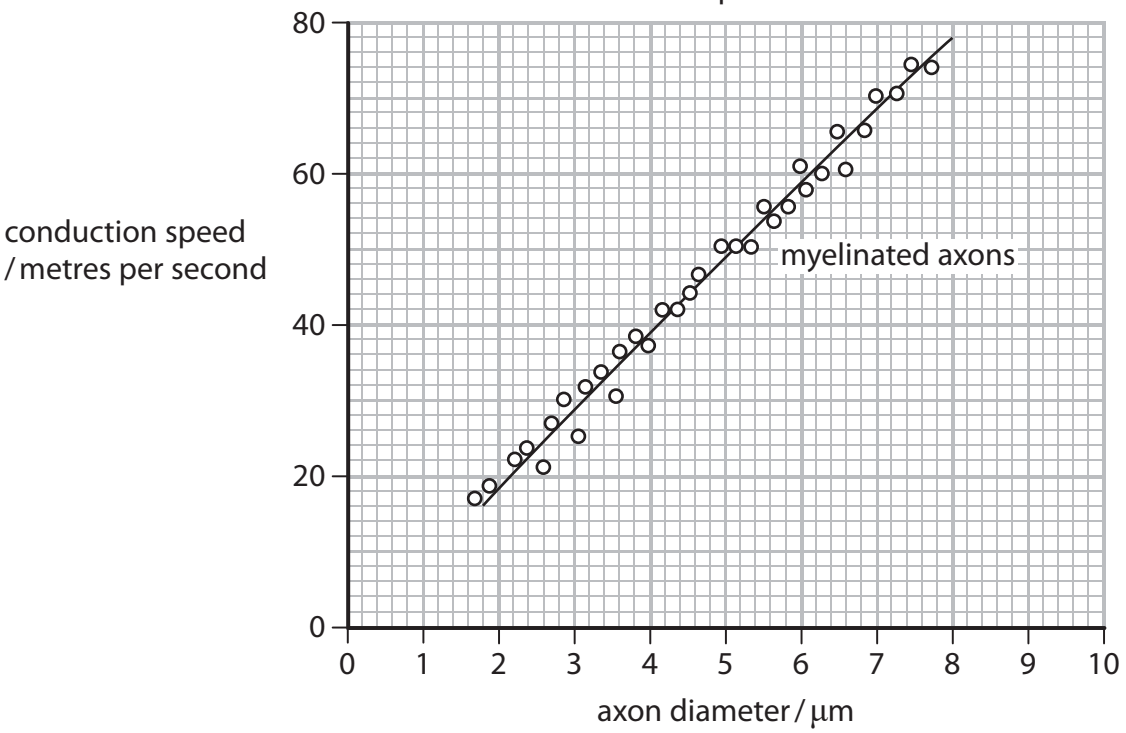
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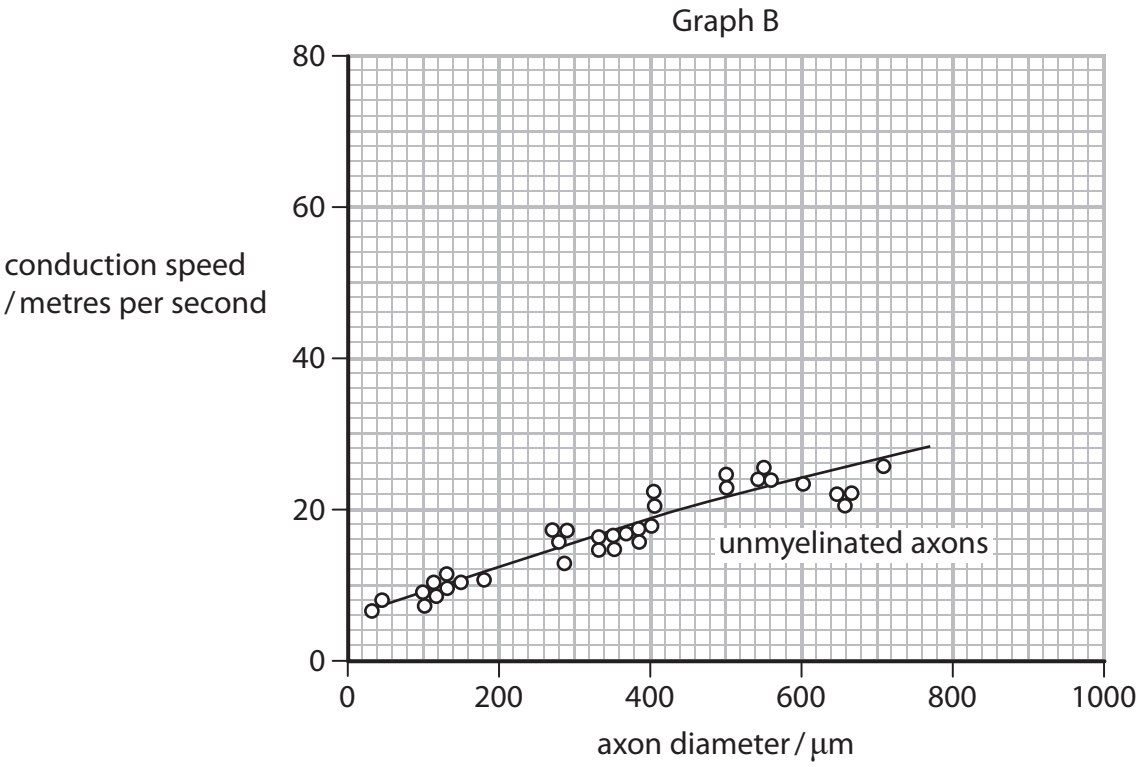
*(d) Graph A shows the relationship between the conduction speed and the diameter of myelinated axons (axons with a myelin sheath).

Graph B shows the relationship between the conduction speed and the diameter of unmyelinated axons (axons without a myelin sheath).

Graph A



Graph B



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Compare the conduction speed and diameter of these axons to explain the role of the myelin sheath.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE

In Biology (5BI1H) Paper 01

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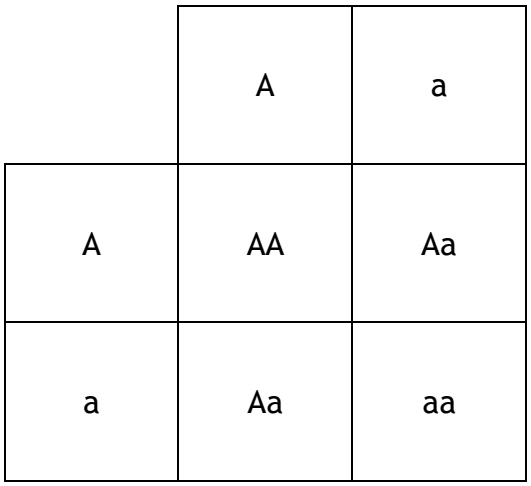
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Marks
1 (a) (i)	**C** mucus **The only correct answer is C** ***A** is not correct because **carbon dioxide** does not block the lungs although it does cause breathing difficulties* ***B** is not correct because **cilia** are the structures that move the mucus not cause the mucus* ***D** is not correct because **red blood cells** are not found in the lungs although they are associated with carrying of oxygen*	(1)

Question number	Answer	Acceptable answers	Marks
1 (a) (ii)	An explanation to include two of the following: • {build up /thick / sticky} mucus (1) • mucus traps pathogens / bacteria are in the mucus (which cause infection) (1) • prevent the cilia from removing pathogens (1)	accept bacteria / micro-organisms / viruses accept bacteria / micro-organisms / viruses / mucus	(2)

Question number	Answer	Acceptable answers	Marks
1 (a) (iii)	enzymes (1) pancreas (1)	answers must be in this order	(2)

Question number	Answer	Acceptable answers	Marks
1 (b) (i)	 One mark for correct gametes (1) One mark for correct offspring genotypes (1)	accept aA for Aa	(2)

Question number	Answer	Acceptable answers	Marks
1(b)(ii	50%	accept ecf for correct percentage calculated from their Punnett square	(1)

Total for question 1 = 8 marks

Question number	Answer	Marks
2 (a) (i)	**D** the highest number of deaths from AIDS occurred in 1995. **The only correct answer is D** ***A** is not correct because although there is a correlation between the cases this is not a direct correlation* ***B** is not correct because although there is a correlation between the number of people diagnosed this is not a direct correlation* ***C** is not correct because only the people diagnosed with HIV peaked at 7900 not he number of people with AIDs*	(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (ii)	7800 – 5600 (1) 2200	accept range of 7700 -7800 and 5500 - 5600	(2)

Question number	Answer	Acceptable answers	Marks
2 (a) (iii)	fewer people being tested for HIV /greater awareness of how HIV is spread / less sharing of needles	accept methods of prevention such as safe sex used or using a condom	(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (iv)	exchange of bodily fluids / sexual intercourse (with someone who has HIV)/ transfer of blood	accept illustrated point such as sharing needles	(1)

Question number	Answer	Acceptable answers	Marks
2 (b)	An explanation including three of the following: • MRSA/bacteria are resistant (1) • to antibiotics /so cannot be treated using antibiotics (1) • so their numbers keep increasing (leading to more infections) (1) • this was caused by an overuse of antibiotics (1)	ignore references to bacteria becoming immune accept courses of antibiotics are not completed accept poor hospital hygiene	(3)

Total for question 2 = 8 marks

Question number	Answer	Acceptable answers	Marks
3 (a)	indicator species / living indicators / pollution indicators / pollution indicator species	accept any recognisable phonetic spelling ignore indicators	(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (i)	15 + 15 + 18 = 48 (1) OR 48 ÷ 3 = (1) 16 (2)	2 marks for correct answer no working	(2)

Question number	Answer	Marks
3 (b) (ii)	A description to include two or the following: • bloodworms are an {indicator of polluted water / indicator of low oxygen levels} (1) • low water pollution before 25m / pollution enters the stream after 25m (1) after 55m pollution levels seem constant / level (1)	(2)

Question number	Answer	Marks
3 (b) (iii)	**D** stonefly larvae **The only correct answer is D** ***A** is not correct because **blackspot fungus** is an air pollution indicator not a water pollution indicator* ***B** is not correct because **lichens** are an air pollution indicator not a water pollution indicator* ***C** is not correct because **sludge worms** indicate that the water has low levels of oxygen not high levels of oxygen*	(1)

Question number	Answer	Acceptable answers	Marks
3 (c)	An explanation to include four of the following linked points: • (excess) nitrates / fertiliser enters stream (1) • causing algal bloom on surface of stream (1) • (sunlight blocked) so plants under the algae cannot photosynthesise (1) • plants are decomposed / decomposers break down the plants (1) • bacteria use up oxygen during respiration (lowering the oxygen within the stream) (1)	accept increased growth of algae/more algae	(4)

Total for question 3 = 10 marks

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	An explanation linking three of the following: • there is variation in species/ mutations cause variation (1) • different foods were available / there was competition for **food** (1) • finches with beaks better adapted for a food source lived / finches without specially adapted beaks died (1) • those better adapted finches {survived to reproduce / pass on their genes} (1)	accept survival of the fittest	(3)

Question number	Answer	Marks
4 (a) (ii)	**A** geographic isolation of the Galapagos Islands **The only correct answer is A** ***B*** *is not correct because* ***overproduction of offspring*** *is not a reason for speciation although it is the first stage of natural selection* ***C*** *is not correct because the* ***development of ring species*** *is an outcome of speciation not the cause* ***D*** *is not correct because* ***survival of the fittest*** *can result in any form of natural selection not specifically speciation*	(1)

Question number	Answer	Marks
4 (b) (i)	An explanation linking: • from two (different) **species** (1) so offspring have a mixture of characteristics (1)	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	mutation / sexual reproduction (1)	meiosis / crossing over	(1)

Question number	Answer	Acceptable answers	Marks
4 (c)	A description including three of the following: • organisms are multicellular (1) • has a nucleus (1) • organisms do not have cell walls (1) • cells do not have {chlorophyll / chloroplasts} (1) • feed **heterotrophically** / heterotrophs (1)	accept references to eukaryotes	(3)

Total for question 4 = 10 marks

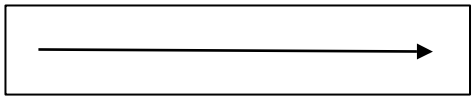
Question number	Answer	Acceptable answers	Marks
5 (a) (i)	20 000 ÷ 100 = 200 (1) OR 20 000 x 0.17 (1) 200 x 17 = 3400	accept alternative methods of calculating percentages 2 marks for correct answer no working	(2)

Question number	Answer	Acceptable answers	Marks
5 (a) (ii)	A suggestion to include one of the following: • more health awareness of smoking dangers (1) • changes in legislation qualified (1) • better alternative methods of giving up smoking (1) • increased cost (1)	accept named methods vaping/nicotine patches	(1)

Question number	Answer	Acceptable answers	Marks
5 (b)	An explanation including: • (carbon monoxide) binds to haemoglobin (1) • less oxygen carried (1) • less oxygen to the muscles /less energy provided (for exercise) (1)	accept red blood cells accept less **aerobic** respiration	(3)

Question Number		Indicative Content	Mark
QWC	5c*	A description to include some of the following points • stimulants • other examples include caffeine, amphetamine, cocaine • increase the speed of neurotransmission • across the synapse • depressants • examples include alcohol, marijuana • decrease the speed of neurotransmission • across the synapse • painkillers • examples include morphine, paracetamol, aspirin, ibuprofen • blocking nerve impulses to the brain • less pain will be felt from the affected area • hallucinogens • examples include LSD, PCP, magic mushrooms • distort the sense of perception or reality • hallucinations may occur as the drug mimics neurotransmitter	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description of one group of drugs and their effects OR at least three examples / types of drugs. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of at least two groups of drugs and their effects • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description of at least three groups of drugs and their effects including reference to the neurotransmission or the synapse. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 5 = 12 marks

Question number	Answer	Acceptable answers	Marks
6 (a) (i)		arrow toward the muscle cell labelled D accept any size arrow in the correct direction	(1)

Question number	Answer	Marks
6 (a) (ii)	**A** **The only correct answer is A** ***B*** *is not correct because it is the nucleus of the nerve cell not the dendron* ***C*** *is not correct because it is the Schwann cell making up the myelin sheath not the dendron* ***D*** *is not correct because it is the effector muscle not the dendron*	(1)

Question number	Answer	Acceptable answers	Marks
6 (b) (i)	brain and spinal cord	both required for the mark in any order reject spine accept phonetic spellings such as chord	(1)

Question number	Answer	Marks
6 (b) (ii)	**C** receptor cells to the CNS **The only correct answer is A** ***B*** *is not correct because the impulse is carried from receptor cells in the skin to the CNS nor* ***effector*** *cells* ***C*** *is not correct because the direction and the site is incorrect effectors are not involved with the sensory neurone and the direction of travel is reversed* ***D*** *is not correct because the direction of travel is incorrect this is the reverse to the correct way the impulse travels*	(1)

Question number	Answer	Marks
6 (c)	A description including two of the following: • gap between two neurones (1) • neurotransmitters / chemical transmitters are released (1) • (neurotransmitters) travel from one neurone to another (1) • and stimulate electrical impulse in that neurone(1)	(2)

Question Number		Indicative Content	Mark
QWC	*6d	A explanation to include some of the following points: Myelinated axon • as the diameter of the axon increases the speed of conductance of the impulses increase • direct readings from the graph at various points • speed of conductance of myelinated axon is higher than the unmyelinated axon • diameter of the myelinated axon is narrower than unmyelinated axon • 1.8μm – 8μm Unmyelinated axon • as the diameter of the axon increases the speed of conductance of the impulses increase • direct readings from the graph at various points • speed of conductance of myelinated axon is lower than the unmyelinated axon • diameter of the unmyelinated axon is wider than myelinated axon • 20μm – 765μm (to be checked with graph) Myelin sheath • Myelin sheath acts to insulate the axon • Speeding up the impulse • Allowing for a smaller diameter to the axon	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation of one of the following: effect of myelination, effect of axon diameter, role of myelin sheath • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation that includes two of the following: effect of myelination, effect of axon diameter, role of myelin sheath • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation that includes quoted data and all three of the following: effect of myelination, effect of axon diameter, role of myelin sheath as an insulator • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 = 12 marks

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Surname	Other names

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Centre Number | | | | | |

Candidate Number | | | | |

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 17 May 2016 – Afternoon
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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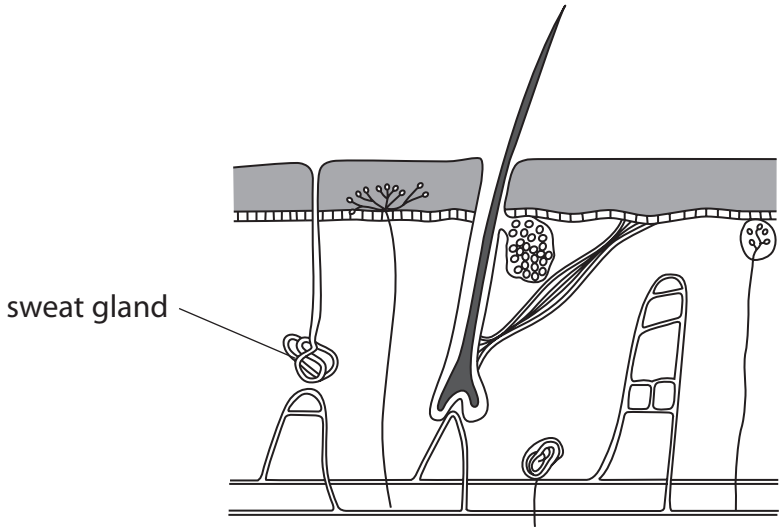
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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A changing environment

1 The diagram shows a section through human skin.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The maintenance of a stable internal environment is called

(1)

- ☒ **A** speciation
- ☒ **B** homeostasis
- ☒ **C** hybridisation
- ☒ **D** variation

(ii) Explain how sweat glands can help the human body to cool down.

(2)

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(b) Blood vessels in the skin help to regulate body temperature.

Explain how blood vessels reduce the amount of heat lost from the body.

(3)

(c) Body temperature can vary.

Describe how the brain is involved in thermoregulation.

(2)

(Total for Question 1 = 8 marks)

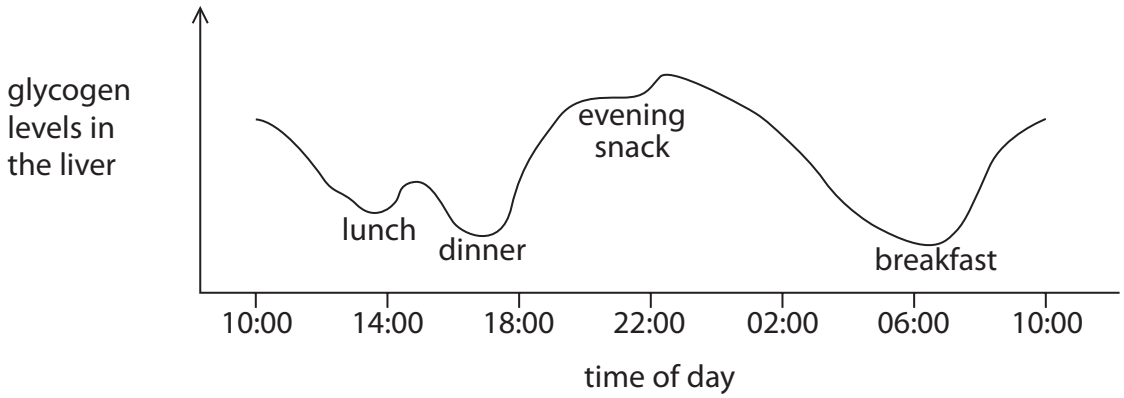
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Blood glucose regulation

2 The graph shows the glycogen levels in the liver of a healthy male during 24 hours.



(a) State the time when the glycogen in the liver is at its highest level.

(1)

(b) Explain why glycogen levels in the liver increase after a meal.

(4)

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(c) A male with untreated Type 2 diabetes ate lunch with the same carbohydrate content as the healthy male in the graph.

Explain why the glycogen level in the liver of the male with untreated Type 2 diabetes would be different from the healthy male after this meal.

(3)

(Total for Question 2 = 8 marks)

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Plant hormones

3 Paul investigated the effect of sunlight on the growth of the shoots of four plants.

The shoots were treated in the following way.

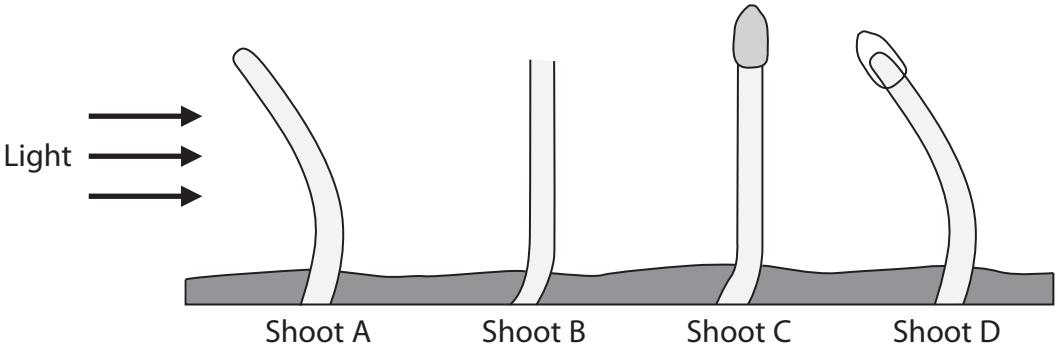
Shoot A had no changes made to it.

Shoot B had the tip of the shoot removed.

Shoot C had a black cap placed over the tip.

Shoot D had a clear cap placed over the tip.

The diagram shows the shoots after one week.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The growth response shown by shoot A and shoot D is an example of

(1)

☒ **A** negative geotropism

☒ **B** negative phototropism

☒ **C** positive geotropism

☒ **D** positive phototropism

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(ii) Explain how shoot A and shoot D show this growth response.

(3)

(iii) Explain why shoot C did not respond in the same way as shoot A and shoot D.

(2)

(b) Auxins can be used as a selective weed killer.

Explain how auxins kill weeds.

(2)

(c) State two commercial applications of plant hormones.

(2)

1 .....

2 .....

(Total for Question 3 = 10 marks)

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Sickle cell disease

4 Sickle cell disease is caused by a change in one of the bases coding for an amino acid on chromosome 11.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The part of the cell that contains chromosome 11 is the

(1)

☒ **A** cytoplasm

☒ **B** cell membrane

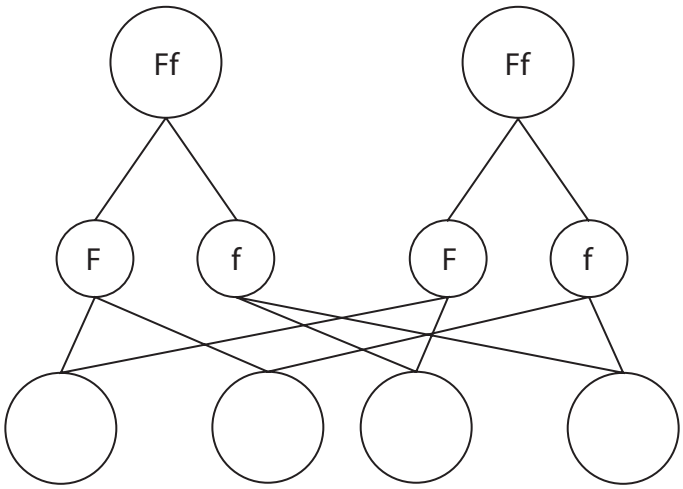
☒ **C** nucleus

☒ **D** cell wall

(b) (i) Sickle cell disease is a recessive genetic disorder.

Complete the genetic diagram to show the possible genotypes from two heterozygous parents.

(2)



(ii) Calculate the percentage probability that the offspring will be carriers of the sickle cell allele but not have sickle cell disease.

(1)

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(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

People with sickle cell disease have a change in the shape of their

(1)

☒ **A** ciliated cells

☒ **B** mucus-producing cells

☒ **C** red blood cells

☒ **D** white blood cells

(d) People with an allele for sickle cell disease are less likely to have malaria.

(i) Describe how malaria is transmitted.

(2)

(ii) Explain why the percentage of people with sickle cell disease is higher in countries where malaria is present than in countries where malaria is not present.

(3)

(Total for Question 4 = 10 marks)

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Nutrient cycles

5 Scientists set up three experiments to investigate the effect of watering plants with solutions containing different masses of nitrate fertiliser.

Plants were watered with 100 cm^3 of a solution containing either 0.1 g, 0.3 g or 0.5 g of nitrate fertiliser. This was repeated each day for four weeks.

The increase in height of each plant was recorded and the results are shown in the table.

mass of nitrate fertiliser / g	increase in plant height after 4 weeks / mm			
	plant 1	plant 2	plant 3	mean
0.1	32	27	37	32
0.3	39	40	41	40
0.5	51	67	56	58

(a) (i) Using information from the table, describe the effect of nitrate fertiliser on the growth of these plants.

(2)

.....

.....

.....

.....

(ii) Calculate the difference in growth per week for the plants watered with solutions containing 0.1 g and 0.5 g of nitrate fertiliser.

(3)

..... mm per week

(iii) Plants absorb nitrates and use them to make molecules required for growth.

State the name of this type of molecule that is required for growth.

(1)

.....

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*(b) Describe the roles of bacteria in the nitrogen cycle.

(6)

(Total for Question 5 = 12 marks)

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Classification and evolution

6 The photograph shows the Californian puffball.

This is a type of fungus.



(a) (i) Which of the following is the correct way of writing the binomial name of the Californian puffball?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** LYCOPERDON PERLATUM

☒ **B** lycoperdon perlatum

☒ **C** *Lycoperdon perlatum*

☒ **D** *lycoperdon Perlatum*

(ii) Which row of the table shows the correct description for a binomial name?

Put a cross (☒) in the box next to your answer.

(1)

	first part of binomial name	second part of binomial name
☒ **A**	genus	species
☒ **B**	species	genus
☒ **C**	kingdom	species
☒ **D**	kingdom	genus

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(iii) Describe the main characteristics of the cells of organisms in the kingdom Fungi.

(2)

(iv) Describe how organisms in the kingdom Fungi feed.

(2)

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*(b) Explain Darwin's theory of evolution by natural selection.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE in Biology (5BI1H) Paper 01 Unit B1: Influences on Life

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question number	Answer	Notes	Marks
1 (a) (i)	**B** homeostasis		(1)

Question number	Answer	Notes	Marks
1 (a) (ii)	An explanation linking the following: water **evaporates** (1) heat / energy removed (1)	 Accept sweat/oils for water Accept heat released/lost	(2)

Question number	Answer	Notes	Marks
1 (b)	An explanation including three of the following: <u>vasoconstriction</u> / blood vessels narrow/constrict(1) (blood vessels) near to the (surface of the) skin (1) this reduces blood flow (1) so less heat lost by <u>radiation</u> (1)		(3)

Question number	Answer	Notes	Marks
1 (c)	A description linking two of the following: (brain contains the) <u>hypothalamus</u> (1) (brain/hypothalamus) detects changes in temperature (1) by {receiving/sending} information via {nerve endings / sense organs / skin receptors / effectors} (1)		(2)

(Total for Question 1 = 8 marks)

Question number	Answer	Notes	Marks
2 (a)	any value from 22.00 hours to 23.00 hours	accept from 10 pm to 11 pm	(1)

Question number	Answer	Notes	Marks
2 (b)	An explanation linking four of the following: **blood glucose** levels increases (1) (**increased** glucose means) insulin is released (1) (insulin is released) from the pancreas (1) (insulin stimulates the) conversion of glucose into glycogen (1) glycogen is stored in the liver (1)	Accept **glucose** absorbed into the blood	(4)

Question number	Answer	Notes	Marks
2 (c)	An explanation linking **three** of the following points: glycogen levels lower / graph would be flatter (1) a person with type 2 diabetes does release insulin / the amount of insulin released is not enough (1) but <u>cells</u> have become resistant to insulin (1) so no / less glucose is converted to glycogen (1)	Accept <u>cells</u> do not respond to insulin	(3)

(Total for Question 2 = 8 marks)

Question number	Answer	Notes	Marks
3 (a) (i)	**D** positive phototropism		(1)

Question number	Answer	Notes	Marks
3 (a) (ii)	An explanation to include three of the following points: The plant (shoot) has grown towards the sunlight (1) auxin (1) {diffuse / move / collect /more} on shaded side of the shoot (1) **cell elongation** (on the shaded side) (1)	Accept alternatives to grown elongates/bends etc	(3)

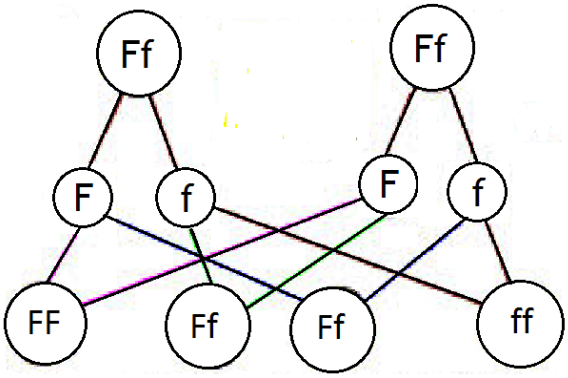
Question number	Answer	Notes	Marks
3 (a) (iii)	An explanation to include two of the following: no light (to tip) (1) tip is where auxin is (produced) (1) (auxin) did not move to shaded side (1)	Accept black cap blocks the light Accept (auxin) evenly distributed in the tip	(2)

Question number	Answer	Notes	Marks
3 (b)	A explanation to include two of the following Acts / used on broad leaf plants (1) overgrowth of weeds (1) due to cell elongation / thinning of cell wall (1) lack of support for weed (1)	 Accept weeds grow too fast OWTTE	(2)

Question number	Answer	Notes	Marks
3 (c)	Any two of the following: rooting powder (1) fruit ripening (1) seedless fruit (1)	 Accept (selective) weedkillers (1)	(2)

(Total for Question 3 = 10 marks)

Question number	Answer	Notes	Marks
4 (a)	**C** ☒ nucleus		(1)

Question number	Answer	Notes	Marks
4 (b) (i)		All correct (2) 2 or 3 correct (1) Accept Ff or fF for heterozygous	(2)

Question number	Answer	Notes	Marks
4 (b)(ii)	**50(%)**	ecf clip with (b) (i)	(1)

Question number	Answer	Notes	Marks
4 (c)	**C** red blood cells		(1)

Question number	Answer	Notes	Marks
4 (d) (i)	A description including (female Anopheles) mosquito / vector(1) sucks blood / bites / injects (1) Plasmodium / malarial protozoan (1)		(2)

Question number	Answer	Notes	Marks
4 (d) (ii)	An explanation linking **three** of the following: In areas where Malaria is prevalent people may die before reproducing (1) People with sickle cell (alleles) live long enough to reproduce (1) Sickle cell (alleles) are passed onto future generations (1) More sickle cell (alleles) in the population (1) As a result of natural selection / survival of the fittest (1)		(3)

(Total for Question 4 = 10 marks)

Question number	Answer	Notes	Marks
5 (a) (i)	A description to include the following: as the mass of nitrate fertiliser increases so does the height of plant (1) correct information quoted from the table about the effect of **different** concentrations (1)		(2)

Question number	Answer	Notes	Marks
5 (a) (ii)	32 ÷ 4 = 8 (1) 58 ÷ 4 = 14.5 (1) 14.5 – 8 = 6.5 (mm per week)	Correct answer 3 marks Accept 58 – 32 = 26 (1) 26 ÷ 4 (1) = 6.5 (mm per week)	(3)

Question number	Answer	Notes	Marks
5 (a) (iii)	protein / enzyme	Accept amino acid	(1)

Question Number		Indicative Content	Mark
QWC	**5b***	A description to include some of the following points Decomposition • decomposers break down dead animals or plants or animal waste • bacteria convert the proteins and urea into ammonia • ammonia released into the soil Nitrification • nitrifying bacteria (*Nitrosomonas*/*Nitrobacter*) • convert ammonia to nitrites • nitrites are then converted into nitrates • available for the plant root to absorb Fixation • nitrogen fixing bacteria (*Rhizobium*) • in soil can fix nitrogen gas from the atmosphere • mutualistic root nodule bacteria • can fix nitrogen gas to nitrogen compounds / ammonia / nitrates • found in leguminous plants Denitrification • denitrifying bacteria • can convert nitrates back into nitrogen gas • this happens when the soil becomes waterlogged • and occurs under anaerobic conditions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description of **at least** one stage of the nitrogen cycle • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of **at least** two stages of the nitrogen cycle • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description of **at least** three stages of the nitrogen cycle including denitrification which removes nitrates from the soil • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 5 = 12 marks

Question number	Answer	Notes	Marks
6 (a) (i)	**C** *Lycoperdon perlatum*		(1)

Question number	Answer	Notes	Marks
6 (a) (ii)	**A** genus species		(1)

Question number	Answer	Notes	Marks
6 (a) (iii)	A description including the following points: cells have cell walls (1) cells do not have chlorophyll / chloroplasts (1) (organised into) mycelium / hyphae (1) cells have nuclei (1)	Accept: cell wall not made of cellulose / is made of chitin (2)	(2)

Question number	Answer	Notes	Marks
6 (a) (iv)	A description including two of the following points: fungi are saprophytes / saprophytic feeders (1) they feed on dead / decaying organisms (1) extracellular digestion (1)	Accept named fungi such as ringworm as a parasite (1)	(2)

Question Number		Indicative Content	Mark
QWC	***6(b)**	An explanation to include some of the following points: **Variation and competition** • most organisms produce more young than can survive to adulthood • populations have organisms with individuals that differ (slightly) from one another • the struggle for existence means that these organisms compete with each other to survive • they compete for resources e.g. food, shelter, mates **Survival of the fittest and inheritance** • those organisms with the most advantageous characteristics survive • those organisms less well adapted die • those organisms that survive will reproduce • the advantageous characteristics will be passed onto their offspring **Gradual change** • over time more organisms will express the advantageous characteristics / alleles • non-advantageous characteristics / alleles will be lost • species will evolve over time	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of at least one section above, a simple statement is enough to enter level one • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation at least two sections above this must link together ideas in a coherent way • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of all three sections above. The response must refer to the idea of competition between organisms and the idea of survival of the fittest. NB – the candidate may only give one side of the story – e.g. the advantageous characteristics. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 6 = 12 marks)

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Surname	Other names

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Centre Number | | | | | |

Candidate Number | | | | |

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 12 May 2015 – Afternoon
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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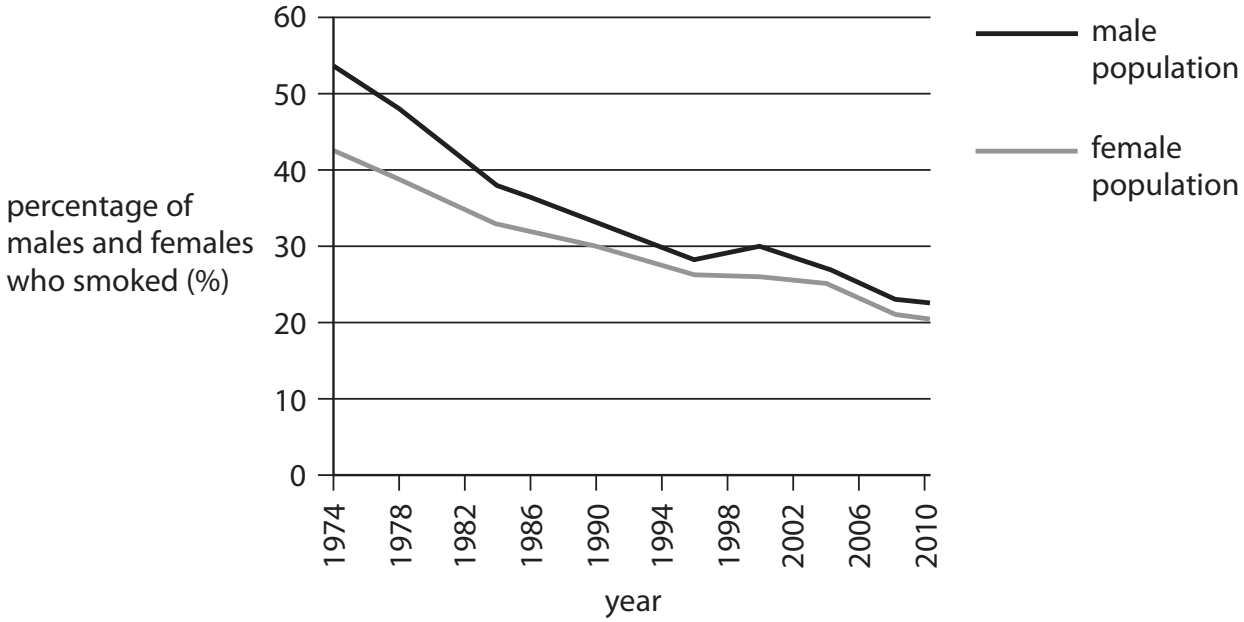
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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Drugs

1 The graph shows some data about smoking tobacco in the UK.



(a) (i) Calculate the decrease in the percentage of females who smoked tobacco from 1990 to 2010.

(1)

..... %

(ii) Suggest **two** reasons why smoking tobacco has decreased in the UK.

(2)

.....

.....

.....

.....

.....

.....

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(b) (i) Smoking tobacco is addictive.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The main addictive substance in tobacco is

(1)

☒ **A** caffeine

☒ **B** carbon monoxide

☒ **C** morphine

☒ **D** nicotine

(ii) Research shows that there is a link between smoking tobacco and the development of lung cancer.

Explain why smoking tobacco can cause lung cancer.

(2)

.....

.....

.....

.....

.....

.....

(iii) Explain why people who smoke tobacco may find it difficult to exercise.

(2)

.....

.....

.....

.....

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.....

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.....

(Total for Question 1 = 8 marks)

Pollution

2 (a) The bar chart shows the presence of organisms in six lakes.

Each lake has a different pH.

The bars show if a particular organism is present at a certain pH.

	pH of lake					
organism	6.5	6.0	5.5	5.0	4.5	4.0
trout						
bass						
perch						
frogs						
salamanders						
clams						
crayfish						
snails						
mayfly						

(i) Describe how pH affects the variety of organisms in these lakes.

(2)

.....

.....

.....

.....

(ii) Acid rain can affect the pH of a lake.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The main pollutant that causes acid rain is

(1)

☒ **A** carbon dioxide

☒ **B** carbon monoxide

☒ **C** oxygen

☒ **D** sulfur dioxide

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(b) Water pollution can be caused by an increase in nitrates and phosphates.

Explain the problems associated with an increase of nitrates and phosphates levels in a lake.

(3)

.....

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.....

.....

(c) Complete the table by writing the name of an indicator species for clean water and an indicator species for polluted water.

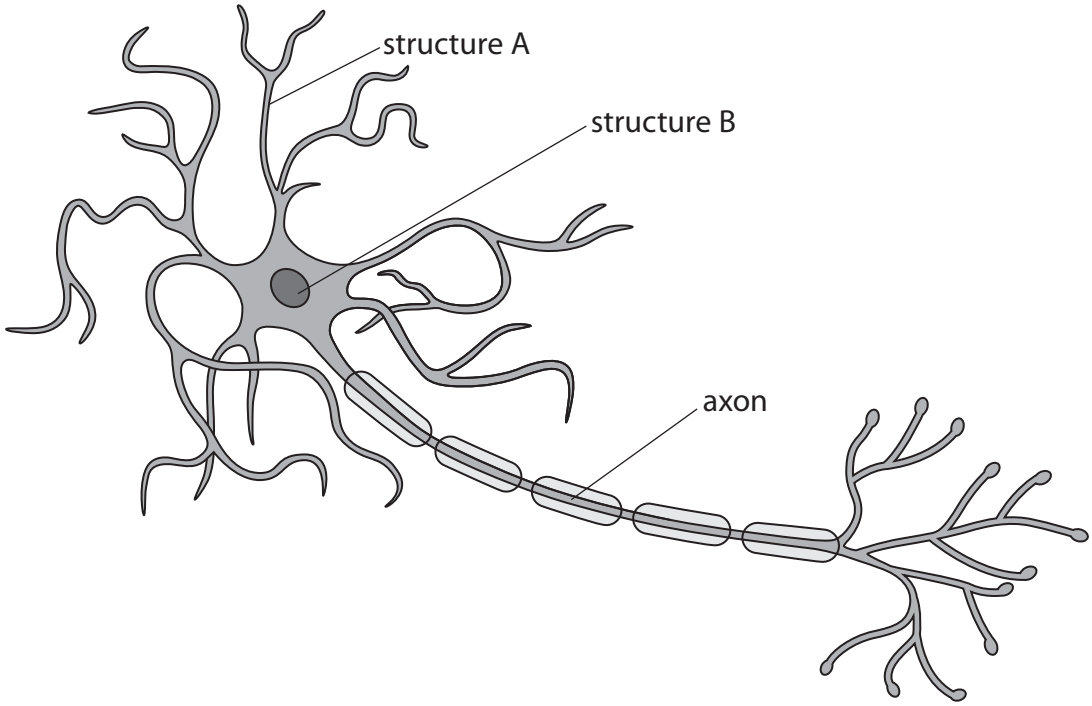
(2)

condition	indicator species
clean air	lichen
clean water	.....
polluted water	.....

(Total for Question 2 = 8 marks)

Nervous system

3 Neurones form part of the nervous system.



(a) (i) Name structures A and B.

(2)

structure A .....

structure B .....

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The axon carries information along the neurone as

(1)

☒ **A** chemical messages

☒ **B** electrical impulses

☒ **C** neurotransmitters

☒ **D** hormonal responses

(iii) Describe the role of the myelin sheath surrounding the axon.

(2)

.....

.....

.....

.....

.....

.....

(iv) There is a gap between neurones.

State the name for this gap between neurones.

(1)

.....

(b) Humans have reflexes.

Describe the route of an impulse through a reflex arc.

(4)

(Total for Question 3 = 10 marks)

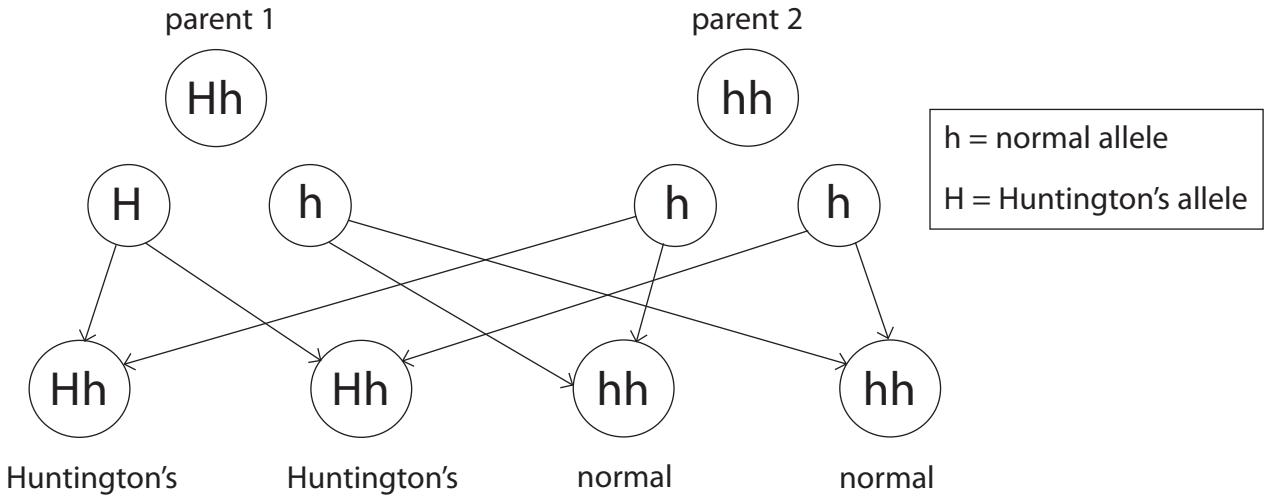
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Genetics

4 Huntington's disease is a genetic disorder.

The genetic diagram shows the inheritance of this disorder.



(a) (i) Use words or letters from the box to complete the following sentences.

(2)

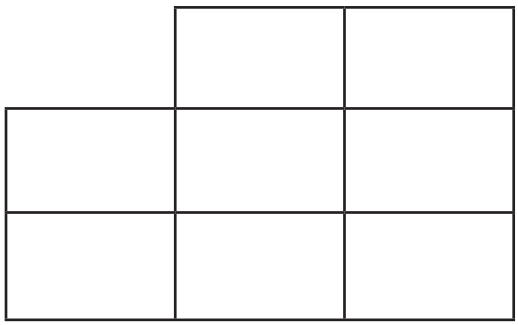
dominant	recessive	phenotype
h	HH	hh

Huntington's disease is caused by a ..... allele.

People with Huntington's disease can have the genotype Hh or ..... .

(ii) Complete the Punnett square to show the potential offspring of two parents heterozygous for Huntington's disease.

(2)



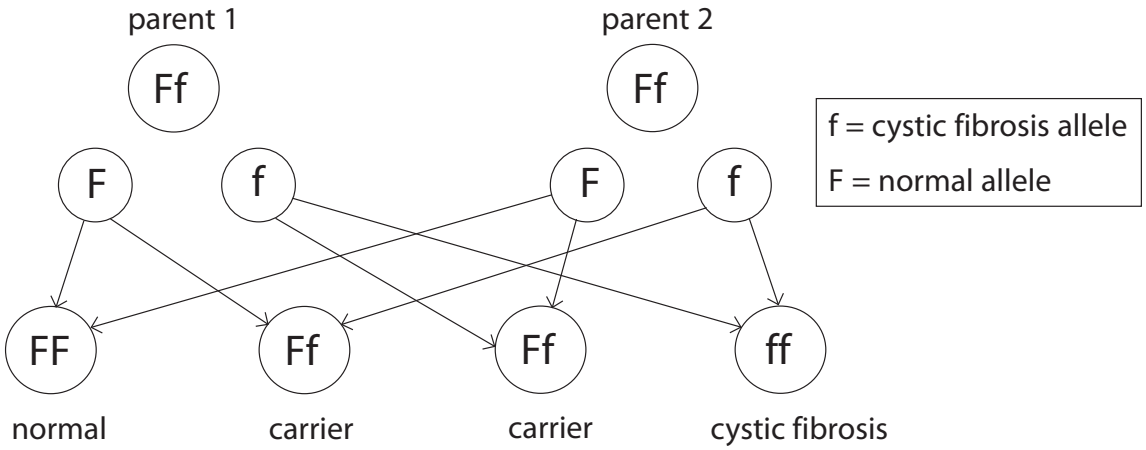
(iii) State the probability that a child of two parents, heterozygous for Huntington's disease, will have the disease.

(1)

.....

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(b) The genetic diagram shows the inheritance of cystic fibrosis.



(i) Explain why, if both sets of parents are heterozygous, the chance of inheriting Huntington's disease is greater than the chance of inheriting cystic fibrosis.

(2)

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

A symptom of cystic fibrosis is the overproduction of

(1)

- ☒ **A** mucus
- ☒ **B** red blood cells
- ☒ **C** stomach acid
- ☒ **D** white blood cells

(iii) Explain why a man with cystic fibrosis may be infertile.

(2)

(Total for Question 4 = 10 marks)

Interdependence

5 The food chain shows the energy transferred between organisms.

oak tree —(7760 kJ)→ caterpillars —(620 kJ)→ blue tits —(50 kJ)→ sparrowhawk

(a) (i) The oak tree is the producer in the food chain.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The oak tree obtains energy

(1)

☒ **A** autotrophically

☒ **B** heterotrophically

☒ **C** parasitically

☒ **D** saprophytically

(ii) The energy available in the oak tree that could be transferred to the caterpillars was 97 000.

Calculate the percentage loss of energy between the oak tree and the caterpillars.

(3)

.....%

(iii) Suggest how energy is lost between trophic levels in this food chain.

(2)

.....

.....

.....

.....

*(b) The survival of some organisms may depend on mutualism.

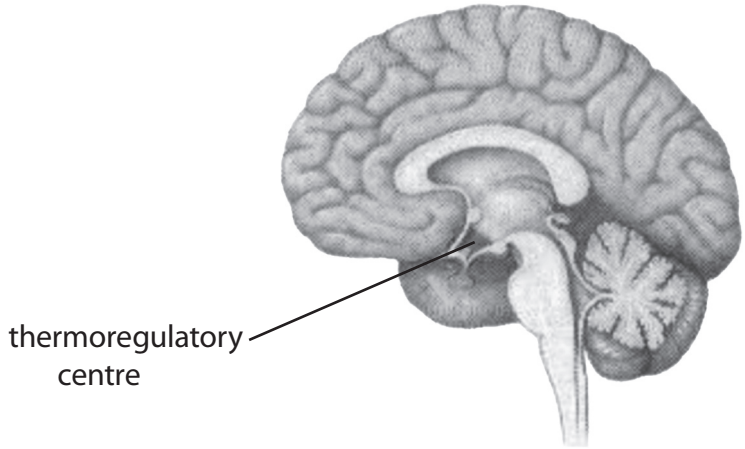
Explain, using **three** examples, how some organisms benefit from mutualism.

(6)

(Total for Question 5 = 12 marks)

Homeostasis

6 The diagram shows a brain with the thermoregulatory centre labelled.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The part of the brain that contains the thermoregulatory centre is the

(1)

- ☒ **A** cerebrum
- ☒ **B** cerebellum
- ☒ **C** hypothalamus
- ☒ **D** medulla

(ii) The thermoregulatory centre controls internal body temperature.

Explain how the blood vessels in the skin help to control internal body temperature.

(4)

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(b) Water content is also controlled within the human body.

State the name given to the control of water content in the body.

(1)

*(c) The human body prevents blood glucose levels from becoming too high or too low.

Explain how the human body maintains blood glucose levels within a narrow range.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE in Biology (5BI1H) Paper 01 Unit B1: Influences on Life

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Mark
1a(i)	9 -10 (%)	**(1)**

Question Number	Answer	Acceptable answers	Mark
1a(ii)	A suggestion to include two of the following more health awareness (1) more (NHS) support programmes (1) Increased use of nicotine replacement products as an alternative to smoking (1) increases in cost / taxation (1) new laws / smoking outdoors (1) more negative opinions against smokers (1)	 accept advertising on cigarette packets for this mp / people know more about the risks / awareness of passive smoking / health campaigns accept reference to other stop smoking aids such as patches, gum, e cigarettes etc accept restrictions in advertising Ignore references to age limits as this has not changed	**(2)**

Question Number	Answer	Acceptable answers	Mark
1b(i)	**D** ☒ nicotine		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	A explanation linking two of the following: cigarettes / tobacco / smoke contains tar (1) (tar) is **carcinogenic** / a **carcinogen** (1) leads to mutations in DNA (1)	 Ignore references to causes cancer / tumours accept: mutations in cells /rapid cell division	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(iii)	A explanation linking two of the following points: cigarette smoke contains carbon monoxide / carbon monoxide attaches to {red blood cells / haemoglobin}(1) which reduces the oxygen carrying capacity of {red blood cells/haemoglobin} (1) less oxygen to the muscles /reduced respiration in muscles / reduced muscle contraction (1) OR tar reduces the surface area of the lungs (1) so decreased gas exchange / less oxygen absorbed into the bloodstream (1) less oxygen to the muscles /reduced respiration in muscles / reduced muscle contraction (1)	 Accept {red blood cells / haemoglobin} carry less oxygen / forms carboxyhaemoglobin Accept: smoke particles for tar accept causing emphysema (1)	**(2)**

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	A description including **two** of the following: as pH decreases so do the number of species in the lake (1) all the organisms /species in the lake are found at 6.0/6.5 (1) comment on specific reading from the graph e.g. (only) {frogs / 1 organism} remain at lowest pH. eq. (1)	accept: the more acidic the lake is the lower the number of species {more species / types of organisms} live in more neutral conditions /less organisms live where {low pH /more acidic}	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	**D** ☒ sulfur dioxide		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	An explanation linking **three** of the following: eutrophication (1) causes an algal bloom (1) plants {at the bottom of the lake / underneath the algae} cannot get light to photosynthesise (1) plants at the bottom of the lake die and microorganisms break them down (1) microorganisms respire removing oxygen from the water (1) reduction in biodiversity (1)	accept: **increase**d growth of algae accept: decomposers for microorganisms Ignore references to fish suffocating / dying this is insufficient for this marking point	**(3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>Q02c</td><td>
<table>
<tr><th>condition</th><th>indicator species</th></tr>
<tr><td>clean water</td><td>stonefly (larvae / nymph)/
(freshwater) shrimp /
mayfly larvae/nymph/
caddis fly larvae /
dragonfly nymph /
damselfly nymph /
riffle beetle /
water penny larvae /</td></tr>
<tr><td>polluted water</td><td>bloodworm /
sludgeworm /
algae /
rat tailed maggot /
water louse/
leeches/
planarian worms /
aquatic worms /</td></tr>
</table>

Ignore general references to organisms such as frogs / snails/ squid the answers need to be specific indicator species.

If unsure of an organism then please put into review</td><td>(1)

(1)</td></tr>
</table>

Total for Question 2 = 8 marks

Question Number	Answer	Mark
Q03ai	structure A – dendron / dendrite structure B – nucleus answers must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	**B** ☒ electrical impulses		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A description to include: **insulates** the (electrical) impulse / **insulates** the {axon / neurone} (from surrounding tissue) (1) allows quicker (electrical) conductance (1)	accept: speeds up transmission / sends {impulses / signals} faster ignore references to protection of the axon ignore reference to messages	**(2)**

Question Number	Answer	Mark
Q03aiv	synapse(s) / synaptic cleft / synaptic gap	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)	A description linking four of the following {receptor} detects a stimulus (1) sensory neurone passes (impulse)to {relay neurone / spinal cord / CNS} (1) relay neurone in spinal cord /CNS (1) relay neurone passes (impulse) onto motor neurone (1) motor neurone passes (impulse) to {effector / muscle /gland} (1) {effector / muscle /gland} initiates response (1)	accept sensory neurone to motor neurone for 1 mark	**(4)**

Total for question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4a(i)	answers must be in this order. dominant HH		**(2)**

Question Number	Answer	Acceptable answers	Mark
4a(ii)	<table><tr><td></td><td>H</td><td>h</td></tr><tr><td>H</td><td>HH</td><td>Hh</td></tr><tr><td>h</td><td>Hh</td><td>hh</td></tr></table>	1 mark for correct gametes 1 mark for correct offspring If incorrect gametes allow 1 mark for correct Punnett square based on selected gametes	**(2)**

Question Number	Answer	Acceptable answers	Mark
4a(iii)	75% / ¾ / 0.75	accept error carried forward from their Punnett square **accept:** 3 : 1	**(1)**

Question Number	Answer	Acceptable answers	Mark
4b(i)	An explanation linking **two** of the following: Huntington's disease is caused by a dominant <u>allele</u> / CF is caused by a recessive <u>allele</u> (1) only one allele for Huntington's disease needs to be inherited to have the disease / would have the disease if heterozygous (or homozygous dominant)(1) two alleles (recessive) need to be inherited to have CF / be homozygous recessive for CF (1)	Ignore refs to gene for allele against this marking point Ignore refs to gene for allele against this marking point	**(2)**

Question Number	Answer	Acceptable answers	Mark
4b(ii)	**A** ☒ mucus		**(1)**

Question Number	Answer	Acceptable answers	Mark
4b(iii)	An explanation linking **two** of the following: (thick / sticky / more) mucus (1) builds up in the tubes (of the reproductive system) (1) (the mucus) blocks the flow of sperm (1)	**Reject: mucus in lungs/intestine** accept sperm duct / vas deferens	**(2)**

Total for question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5a(i)	**A** ☒ autotrophically		**(1)**

Question Number	Answer	Acceptable answers	Mark
5a(ii)	7 760 / 97 000 = 0.08 (1) 0.08 x 100 = 8.00 (1) 100 – 8.00 = 92.00 (%) OR 97000 - 7760 = 89240 (1) 89240/97000 = 0.92 (1) X 100 = 92(%)	**Award 3 marks for correct bald answer** **Accept alternate method of calculation**	**(3)**

Question Number	Answer	Acceptable answers	Mark
5a(iii)	Any two of the following: not all of the organisms are consumed (1) indigestible / **egestion** (1) **excretion** (1) movement (1) heat / respiration (1) reproduction (1)	 hunting / flying	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(b)**	An explanation to include some of the following points • mutualism involves organisms living closely with each other • both organisms benefit oxpeckers • relationship with large herbivores in Africa • oxpecker feeds off of the parasitic insects that live on the herbivore • disease reduced in herbivores from parasitic insect removal cleaner fish • relationship with ocean species such as sharks and large fish • cleaner fish eats the dead skin and parasites on the large fish or sharks • large fish / sharks have disease reduced by removal of parasites nitrogen fixing bacteria • relationship with leguminous plants such as beans • bacteria live inside root nodules • bacteria fix nitrogen for the plant to use • bacteria obtain nutrition from the plant and are protected from the environment chemosynthetic bacteria • relationship tubeworms in deep sea vents • lack of light so no photosynthesis • tubeworm gathers chemical substances needed by the bacteria for chemosynthesis / provide protection from heat • bacteria produce chemicals for the tubeworm	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of at least one example of mutualism or definition of mutualism • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of at least two examples of mutualism or a detailed explanation of one • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of at least three examples of mutualism including nitrogen fixing bacteria or chemosynthetic bacteria • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6a(i)	**C** ☒ hypothalamus		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	An explanation linking **four** of the following: vasodilation occurs when the body is hot (1) blood vessels near the surface of the skin widen / the blood vessels increase the amount of blood flow near the surface of the skin (1) vasoconstriction occurs when the body is cold (1) blood vessels near the surface narrow /the blood vessels reduce the blood flow near the surface of the skin (1)	accept: description of shunt valve (1)	**(4)**

Question Number	Answer	Acceptable answers	Mark
6(b)	osmoregulation		**(1)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	An explanation to include some of the following points: lowering blood glucose concentrations • insulin is released • from the pancreas • into the bloodstream • causing glucose to be converted to glycogen • stored in the liver / muscle tissue • blood glucose concentrations are lowered raising blood glucose concentrations • glucagon is released • from the pancreas • into the bloodstream • causing glycogen to be converted to glucose • glucose released into the bloodstream • blood glucose concentrations are raised	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of either lowering or raising glucose concentrations in the blood • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of both lowering and raising glucose concentrations in the blood or a detailed explanation of one of them • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of both raising and lowering blood glucose concentrations including the role of the hormones and the role of glycogen. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 – 12 marks

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Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 13 May 2014 – Morning
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 3 4 1 3 A 0 1 2 4

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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Disease

1 (a) The photograph shows a housefly.



(i) Houseflies can be the animal vector for the disease dysentery.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The disease dysentery is caused by a

(1)

☒ **A** bacterium

☒ **B** fungus

☒ **C** protozoan

☒ **D** virus

(ii) Describe how a housefly can cause a person to become infected with dysentery.

(2)

.....

.....

.....

.....

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(iii) Explain how a chemical defence mechanism of the human body can reduce the chance of dysentery.

(3)

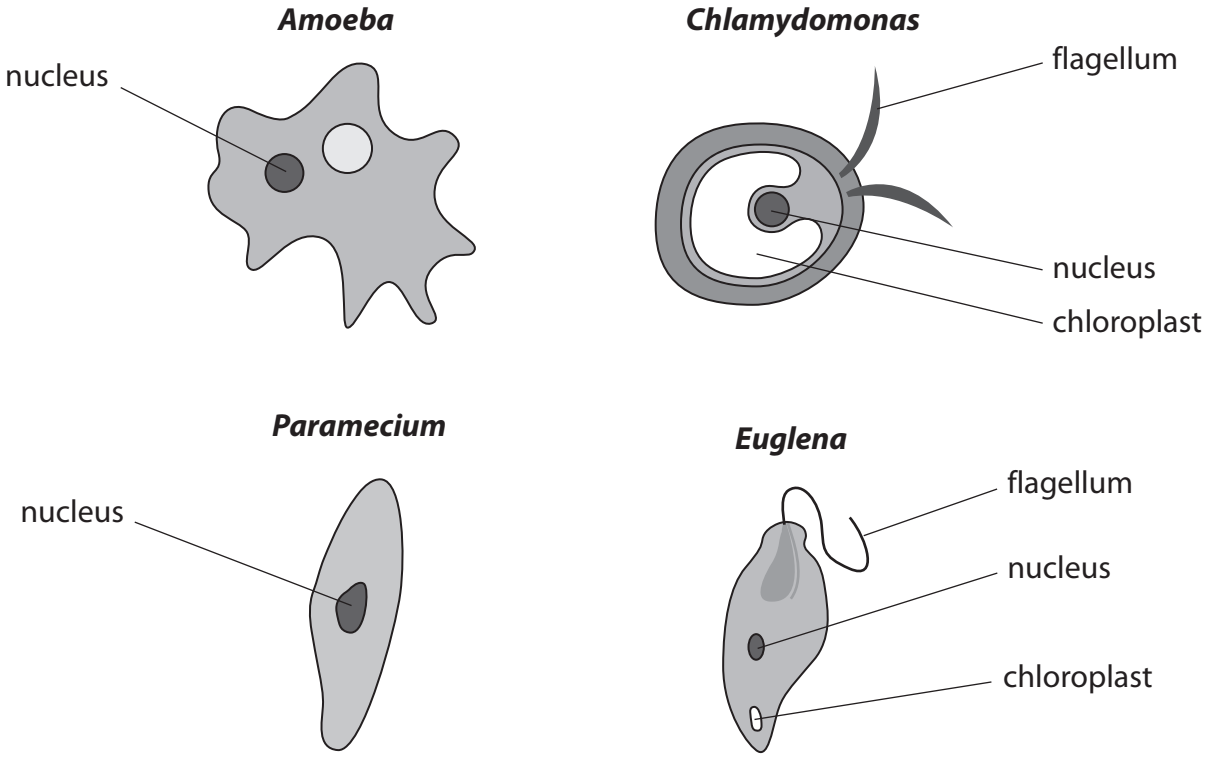
(b) Explain how the *Anopheles* mosquito can spread the disease malaria.

(2)

(Total for Question 1 = 8 marks)

Classification

2 (a) All the organisms in the diagram belong to one Kingdom.



(i) Which Kingdom do these organisms belong to?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** Animalia

☒ **B** Fungi

☒ **C** Protoctista

☒ **D** Prokaryotes

(ii) In which structure are the chromosomes of these organisms found?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** cilia

☒ **B** chloroplast

☒ **C** flagellum

☒ **D** nucleus

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(iii) Suggest **one** reason why both *Euglena* and *Chlamydomonas* could be placed into the Kingdom Plantae.

(1)

(b) (i) *Euglena* is unusual because it is both heterotrophic and autotrophic.

Explain how this helps *Euglena* to survive.

(3)

(ii) A scientist discovered a new species of *Euglena* in boiling acidic mud in Costa Rica.

Explain how this discovery could be validated by the scientific community.

(2)

(Total for Question 2 = 8 marks)

Plant growth substances

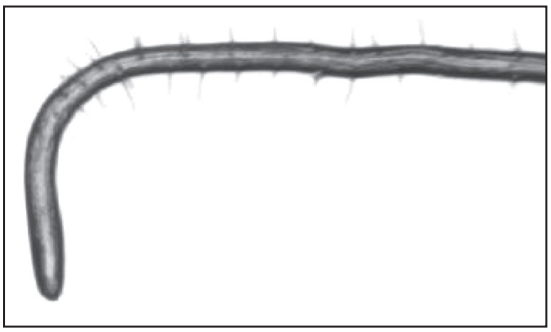
3 Photograph **A** shows the root of a plant when it was positioned horizontally.

The root was kept in the dark and left in this position.

Photograph **B** was taken three days later.



photograph **A**



photograph **B**

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The process that resulted in the type of root growth shown in photograph **B** is

(1)

- ☒ **A** negative gravitropism
- ☒ **B** negative phototropism
- ☒ **C** positive gravitropism
- ☒ **D** positive phototropism

(ii) Explain how this change in root growth has occurred.

(3)

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(iii) Suggest the advantages to the plant of this response.

(2)

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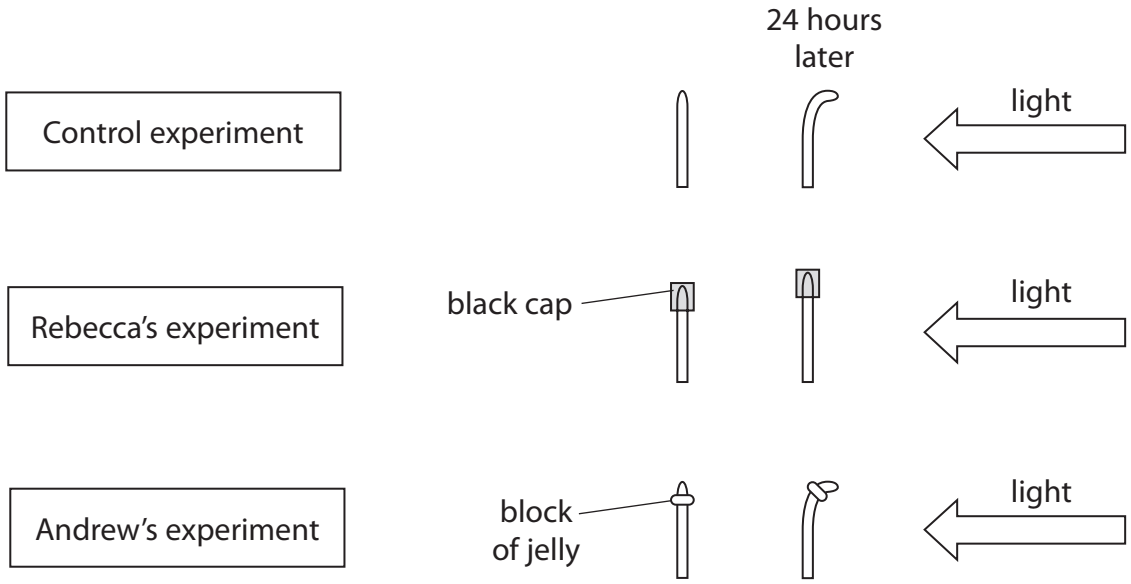
(b) Rebecca and Andrew each set up an experiment to investigate the effect of light on plant shoots.

They also set up a control experiment.

Rebecca placed a black cap over the tip of her plant shoot.

Andrew removed the tip from his plant shoot, placed a thin block of jelly on top of the plant shoot and then replaced the tip.

All three experiments were left for 24 hours.



(i) Suggest why Rebecca and Andrew set up a control experiment.

(1)

.....

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(ii) Explain the results of Rebecca's experiment and Andrew's experiment.

(3)

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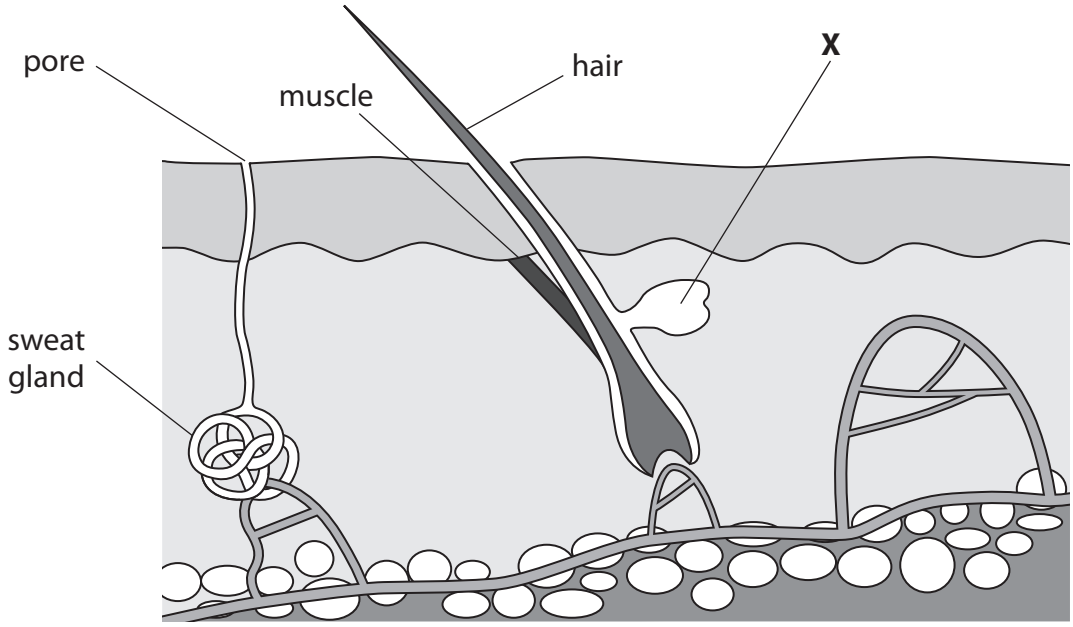
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(Total for Question 3 = 10 marks)

The skin

4 (a) The diagram shows a cross section through human skin.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Structure **X** is the

(1)

☒ **A** blood capillary

☒ **B** dermis

☒ **C** nerve ending

☒ **D** sebaceous gland

(ii) Describe the role of the sweat gland in thermoregulation.

(2)

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(iii) Explain why the muscle attached to the hair follicle is important when a person starts to feel cold.

(2)

(b) Thermoregulation is one way in which a constant internal environment is maintained.

What is the name given to the maintenance of a constant internal environment?

Place a cross (☒) in the box next to your answer.

(1)

- ☒ **A** homeostasis
- ☒ **B** hypothalamus
- ☒ **C** vasoconstriction
- ☒ **D** vasodilation

(c) Explain why the temperature of the human body needs to be maintained at 37 °C.

(2)

(d) The photograph shows a reptile lying in sunlight.



Explain why reptiles lie in sunlight for long periods of time.

(2)

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(Total for Question 4 = 10 marks)

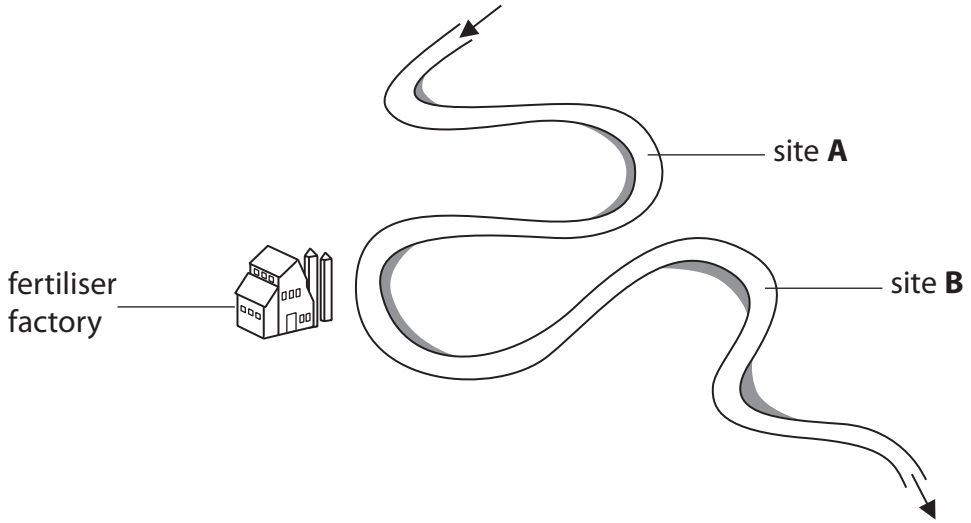
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Question 5 is on the next page

Pollution

5 The diagram shows a river and the location of a fertiliser factory.

The arrows indicate the direction of the flow of the river.



A scientist recorded the nitrate concentrations of the water at site **A** and site **B**.

Her results are shown in the table.

site	nitrate concentration / mg per dm^3			
	sample 1	**sample 2**	**sample 3**	**mean**
A	17	25	18	20
B	49	64	58	

(a) (i) Calculate the mean nitrate concentration found at site **B**.

(2)

answer = ... mg per dm^3

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(ii) The scientist observed algae and some dead fish in the river at site **B**.

These were not present at site **A**.

Give an explanation for these observations.

(4)

*(b) Scientists observe living organisms in an environment to assess the level of pollution.

Describe how the level of water pollution and air pollution can be assessed using living organisms.

(6)

(Total for Question 5 = 12 marks)

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Question 6 is on the next page

Resistant organisms

6 (a) The photograph shows the common rat *Rattus norvegicus*.



State the level of classification for both parts of the binomial name *Rattus norvegicus*.

(2)

Rattus .....

norvegicus .....

(b) Some rats have a mutation which enables them to eat the rat poison Warfarin and survive.

Suggest how the use of Warfarin could lead to an increase in the number of rats with this mutation.

(2)

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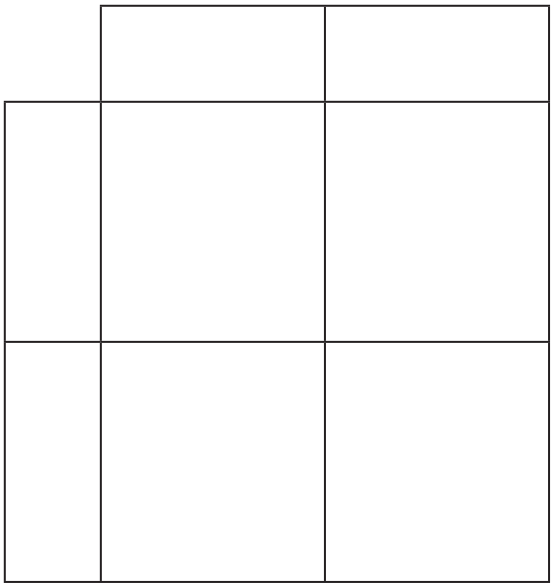
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(c) The allele for Warfarin resistance is recessive.

Complete the Punnett square to show how two rats, both heterozygous for Warfarin resistance, could produce Warfarin resistant offspring.

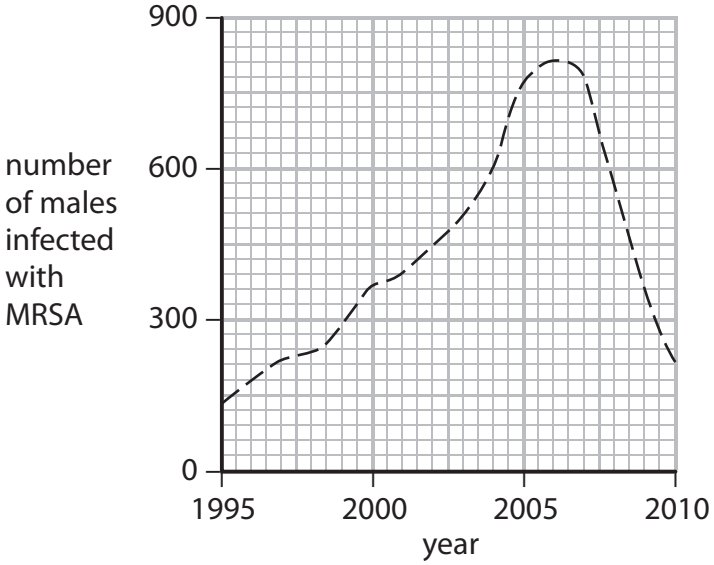
Use **R** and **r** to show the dominant and recessive alleles.

(2)



*(d) Hospitals have introduced programmes to reduce MRSA infections in patients because antibiotics have become less effective.

The graph shows the number of males infected with MRSA during their stay in hospital.



A programme of intensive use of antiseptics in hospitals has been used since 2005.

Use the information given and your own scientific knowledge to explain the trends shown in the graph.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Biology (5BI1H) Paper 01

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Question Number	Answer	Mark
1a(i)	**A** - bacterium	**(1)**

Question Number	Answer	Acceptable answers	Mark
1a(ii)	A description to include two of the following points: Housefly carries a pathogen (1) housefly lands on (contaminated) faeces/animal waste (1) transfers dysentery /bacteria onto food (1) (infected) food eaten (1)	Ignore references to other types of disease transmission lands on food /infects the food	**(2)**

Question Number	Answer	Acceptable answers	Mark
1a(iii)	An explanation to include the following points: <u>Hydrochloric</u> acid / <u>HCl</u>(1) in stomach (1) (acid) kills bacteria/ dysentry (1)	 Both words needed for mark – stomach acid gets 1 mark for stomach. destroys/breaks down accept correct responses about antibodies/antitoxins for 1 mark	**(3)**

Question Number	Answer	Acceptable answers	Mark
1(b)	an explanation to include two of the following points: mosquito is a <u>vector</u> (1) carries **protozoan / *Plasmodium*** (1) pierces skin (1) transfers (protozoan/*Plasmodium***)** to blood (1)	Accept bites/injects/ sucks blood / feed on blood for pierces skin	**(2)**

(Total for question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	**C** Protoctista		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	**D** nucleus		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	(both) contain chloroplasts / chlorophyll	Both can photosynthesise	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	An explanation linking 3 of the following points: • autotrophs can make their own food (using sunlight) • heterotrophs eat other food • *Euglena* can make carbohydrates and/or eat carbohydrates • (so are) able to survive in different environments / survive in changing environments	autotrophs photosynthesise accept sugars/nutrients for carbohydrates	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	A suggestion including **two** of the following points: • publish findings in scientific journals • use the peer review process • attend scientific conferences	speak to other scientists	**(2)**

(Total for question 2 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	C - positive gravitropism		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	An explanation to include three of the following points: auxin (1) moves to / on the underside of the plant root (1) inhibits the elongation of root cells (on the underside of the root) (1) cells on upper side continue to elongate (1) making the root grow downwards (1)	Grows towards gravity (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A suggestion to include the following points anchor the plant /make plant stable (1) root can reach water / absorb water / access to mineral ions (1)	Accept nutrients/named mineral ion/ mineral for mineral ions	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	A suggestion to include the following to see what the shoot should do under normal conditions /to compare the control results with the experimental results (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A explanation to include three of the following: Rebecca's shoot did not curve and Andrew's shoot did curve (1) Rebecca's experiment (black cap will) does not allow light to shine on the tip (1) auxin / plant growth substance will not move (to shaded side of shoot) / is evenly distributed (1) Andrew's experiment jelly will allow auxin / plant growth substance to diffuse /move (through to shaded side) (1) causing cell elongation (1)	auxin is made/found in the tip	**(3)**

(Total for question 3 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**D** sebaceous gland		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description linking **two** of the following points: the sweat gland releases water / sweat onto (the surface of the skin) (1) the water evaporates (1) by removing heat from the surface of the skin / heat energy lost as latent heat(1)	Accept cooling effect	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	An explanation linking **two** of the following points: the (erector) muscle raises the hair (1) the hair traps **air** (next to the surface of the skin) (1) this acts as an insulator (1) causing more heat to be retained in the body (1)	Ignore references to hair follicle standing up	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	**A** homeostasis		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	An explanation linking **two** of the following points: this is the optimum temperature (1) involving enzymes (1) for chemical reactions in the body /metabolic reactions (1) denaturation occurs at higher temperatures / at lower temperatures reactions are slower (1)	Named chemical reactions e.g. digestion	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	An explanation linking **two** of the following points: reptiles are poikilothermic / ectothermic(1) they cannot generate heat to maintain their own body temperature (1) (so use the sun) to warm their bodies (1) for chemical reactions to occur (quickly) (1)	use the environment to control body temperature / internal temp is dependent on external temp	**(2)**

(Total for question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5a(i)	$\frac{(49 + 64 + 58)}{3}$ or 171 / 3 (1) = 57	Correct bald answer award 2 marks ecf applies if incorrect total is calculated but divided correctly by 3 for 1 mark	**(2)**

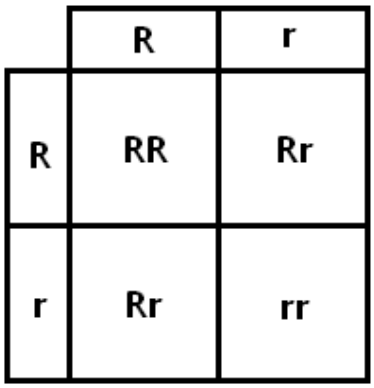
Question Number	Answer	Acceptable answers	Mark
5a(ii)	An explanation to linking four of the following points: nitrates leaked/leached into river (between the two sites) (1) causing eutrophication (1) algae block light to underwater plants / underwater plants cannot photosynthesise (1) (dead plants / algae) broken down by microorganisms (1) microorganisms respire (1) causing oxygen depletion / less oxygen available for the fish (1)	accept fertiliser for nitrates allow bacteria/decomposers	**(4)**

Question Number		Indicative Content	Mark
QWC	***5(b)**	A description to include some of the following points • indicator species used • number of indicator used as an assessment of pollution level Water pollution – polluted • bloodworms / sludgeworms /other named species • their presence signify high water pollution • they can survive in low oxygenated waters Water pollution – clean • freshwater shrimp / stonefly (larvae) / other named species • their presence signify low water pollution • they can only survive in areas of high oxygen (thus low pollution) Air pollution • blackspot fungus found on roses • blackspot fungus grows on roses in unpolluted areas because it is killed by the presence of sulfur dioxide that would be found in polluted air. • lichen – certain types of lichen can survive in polluted areas – so depending on the type of lichen found will be used to assess the pollution level of air	**(6) Exp**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited description of the use of indicator species no names of species needed • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple description of the assessment of air or water pollution and the name/s of the species used with some idea of the level of pollution they respond to • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed description of the assessment of both air and water pollution and the names of indicator species with clear indication of polluted water and/or unpolluted water organisms as well as the response of lichen or blackspot fungus to sulphur dioxide • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 5 = 12 mark)

Question Number	Answer	Acceptable answers	Mark
6(a)	Genus; Species;	Must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	A suggestion including the following points: • rats with the mutation survive to reproduce (1) • pass on the allele which makes the offspring resistant to warfarin (1)	accept breed / produce offspring etc for reproduce accept gene / mutation for allele	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)	 Correct gametes (1) Correct offspring (1)	If incorrect gametes are entered into the Punnett square but the offspring for those gametes are correct 1 mark can be awarded as an error carried forward	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	A explanation to include some of the following points • MRSA is a bacterial infection • number of cases increased from 1995 to 2006 • MRSA is resistant to antibiotics • so MRSA infection not easy to treat • number of cases were similar between 2005 and 2007 • antiseptics killed the bacteria • less bacteria were transferred from person to person • number of cases decreased from 2007 • antiseptics kill bacteria on surfaces • causing less infections from MRSA	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited explanation of the graph including correct data reading or the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple explanation of one trend of the graph including correct data reading and the effect of the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed explanation of at least two trends of the graph linking it to antibiotic resistance and antiseptic programme • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 6 = 12 marks)

Total for paper = 60 marks

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Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Biology/Science

Unit B1: Influences on Life

Higher Tier

Monday 20 May 2013 – Afternoon
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Genetic disorders

1 The images show a normal red blood cell and a red blood cell from someone who has sickle cell disease. Sickle cell disease is a genetic disorder caused by two recessive alleles.



Normal red blood cell



Red blood cell from someone who has sickle cell disease

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

An individual with sickle cell disease is said to be

(1)

☐ **A** a carrier for sickle cell disease

☐ **B** heterozygous

☐ **C** homozygous dominant

☐ **D** homozygous recessive

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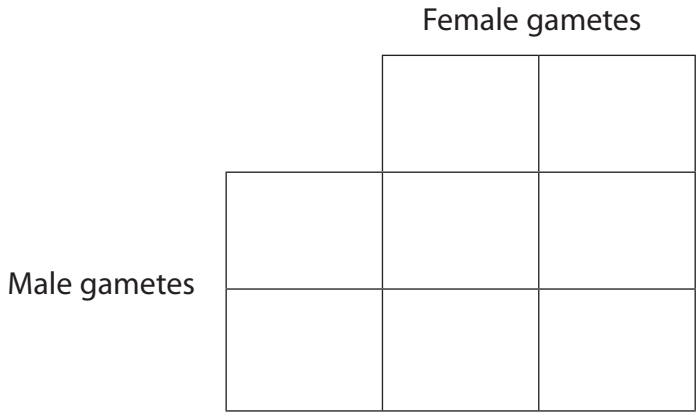
(ii) Describe the main symptoms of sickle cell disease.

(3)

(b) (i) A female with the genotype (**Dd**) and a male with the genotype (**DD**) for sickle cell disease are about to start a family.

Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease.

(2)



(ii) State the percentage chance that a child from these individuals will be

(2)

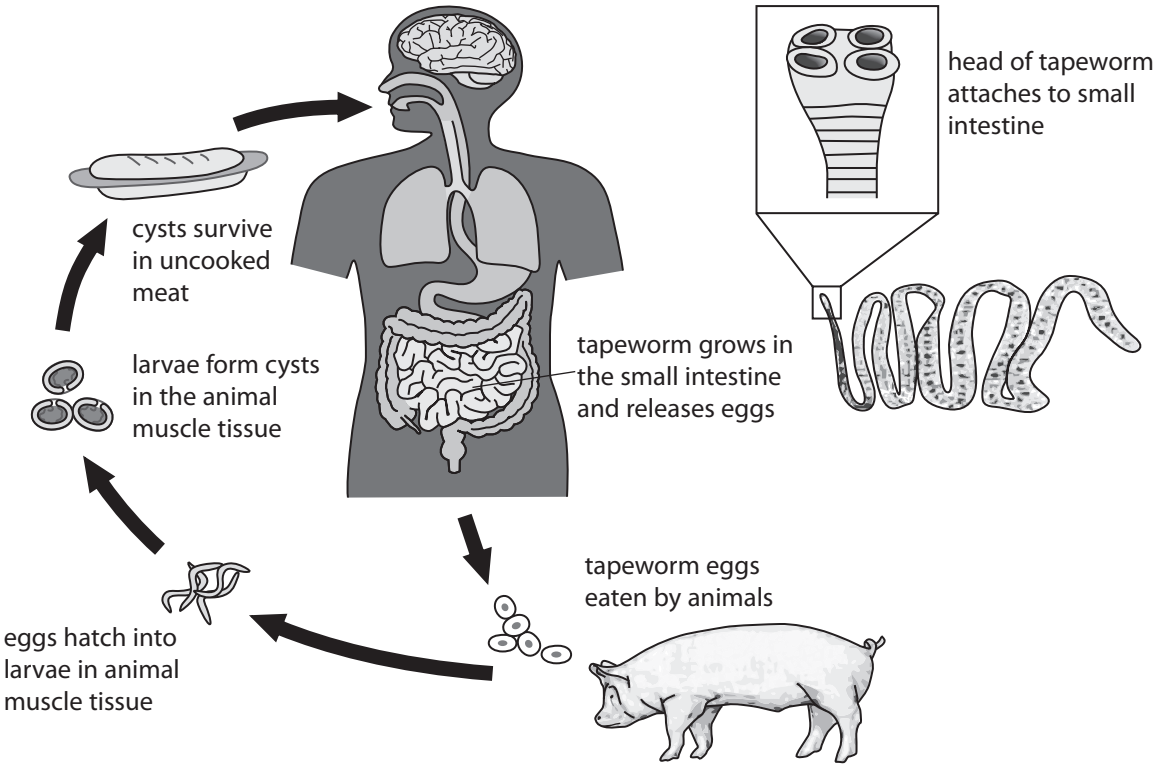
1. a carrier of sickle cell disease ..... %

2. an individual with sickle cell disease ..... %

(Total for Question 1 = 8 marks)

Worms

2 (a) The diagram shows the life cycle of the human tapeworm.



(i) The tapeworm absorbs food in the human intestine.

Complete the sentence by putting a cross (☒) in the box next to your answer.

A tapeworm is an example of a

(1)

☒ **A** living indicator

☒ **B** mutualist

☒ **C** parasite

☒ **D** producer

(ii) Use information in the diagram to describe how an adaptation of the tapeworm enables it to live in the human intestine.

(2)

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(iii) Using information in the diagram, suggest how humans could avoid becoming infected with tapeworms.

(2)

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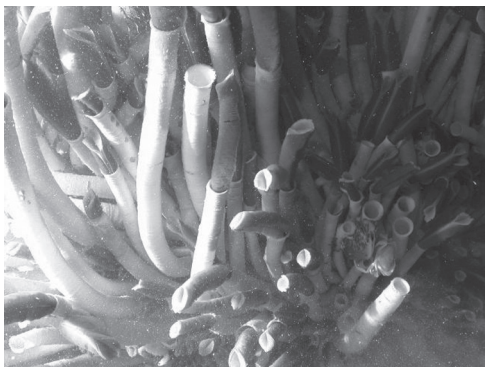
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(b) The photograph shows another type of worm.

These are tube worms that live near hydrothermal vents.



Explain the relationship between these tube worms and chemosynthetic bacteria.

(3)

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.....

(Total for Question 2 = 8 marks)

Variation

3 The dodo was a flightless bird which is now extinct.

The photograph shows the skeleton of a dodo.



(a) (i) Explain why the dodo was placed in the kingdom Animalia.

(2)

.....

.....

.....

.....

(ii) The dodo was classified as a chordate.

Using the information in the photograph, explain why scientists classified the dodo into the phylum Chordata.

(1)

.....

.....

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(iii) The binomial name for the dodo is *Raphus cucullatus*.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The name *Raphus* refers to the dodo's

(1)

☒ **A** family

☒ **B** genus

☒ **C** order

☒ **D** phylum

(b) The dodo lived on the small island of Mauritius. It became extinct in 1681.

Using your knowledge of natural selection, suggest why the dodo may have become extinct.

(3)

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The formation of a new species due to geographical isolation is called

(1)

☒ **A** adaptation

☒ **B** competition

☒ **C** hybridisation

☒ **D** speciation

(d) Describe the causes of variation in a population.

(2)

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(Total for Question 3 = 10 marks)

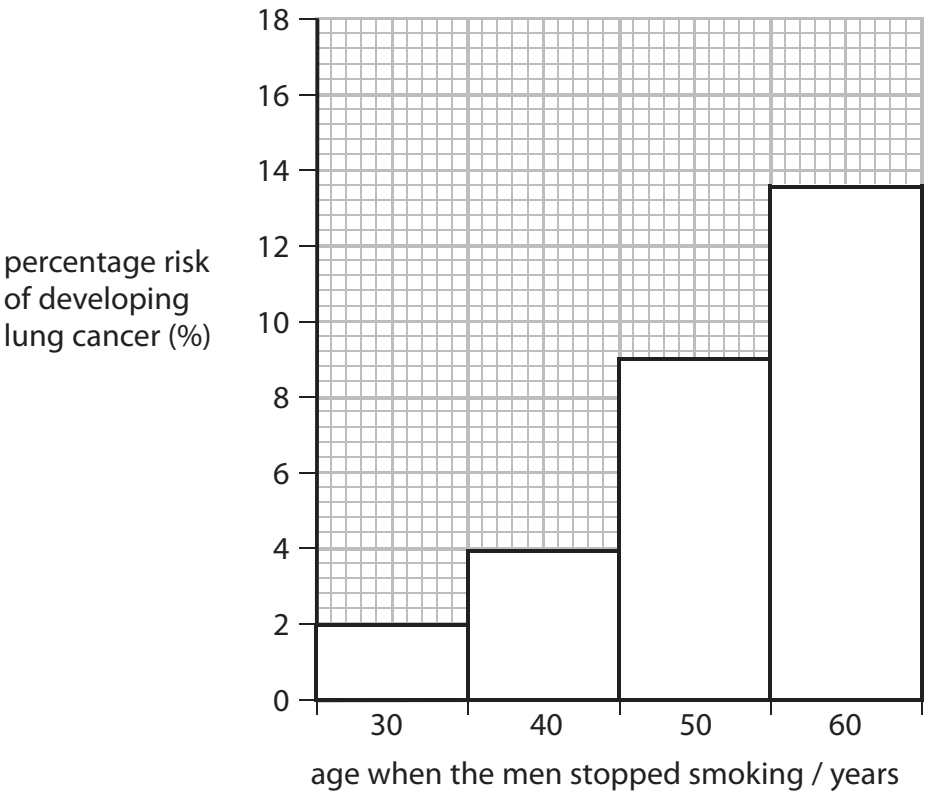
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Question 4 is on the next page

Drugs

4 (a) The graph shows the percentage risk of developing lung cancer for 75-year-old men who gave up smoking tobacco at an earlier age.



(i) Describe the trend shown in the graph.

(1)

.....

.....

(ii) State the percentage risk of lung cancer for a man who gave up smoking at 50 years of age.

(1)

.....%

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(iii) For a population of 500 000 men, how many would be likely to develop lung cancer if they stopped smoking at the age of 50?

(2)

.....men

(b) (i) Explain why smoking tobacco increases the risk of developing lung cancer.

(2)

.....

.....

.....

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Smoking tobacco reduces the oxygen carrying ability of the blood because it contains

(1)

☒ **A** carbon monoxide

☒ **B** carbon particles

☒ **C** nicotine

☒ **D** tar

(c) A chemical in tobacco acts as a stimulant.

Explain how stimulants affect neurotransmission.

(3)

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(Total for Question 4 = 10 marks)

Thermoregulation

5 The temperature of Rebecca's brain and of one of her fingers was recorded at six different external temperatures.

temperature / °C		
external	**brain**	**finger**
20	36.9	37.0
15	37.0	36.8
10	36.7	36.5
5	36.9	36.2
0	36.8	35.6
-5	37.0	34.3

(a) (i) Calculate the maximum temperature range for Rebecca's finger.

(1)

answer ..... °C

(ii) Compare the temperature of Rebecca's brain and her finger as the external temperature decreased.

(2)

.....

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(iii) Explain why the temperature of Rebecca's finger showed this response to the decrease in the external temperature.

(3)

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*(b) Explain how the human body responds to an external temperature of 40 °C.

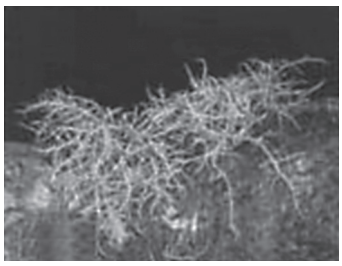
(6)

(Total for Question 5 = 12 marks)

Pollution

6 (a) The photographs show three species of lichen.

Each species can tolerate different concentrations of pollutants present in the air.

species 1	species 2	species 3
		
tolerant to oxides of nitrogen	tolerant to oxides of sulfur	not tolerant to oxides of nitrogen or sulfur

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Lichens are examples of

(1)

☒ **A** living indicators

☒ **B** pathogens

☒ **C** pollutants

☒ **D** vectors

(ii) Explain which one of these species is most likely to be found near a coal-burning power station.

(2)

.....

.....

.....

.....

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(b) Plants cannot use nitrogen directly from the air but need it to make proteins.

Explain how plants get the nitrogen they need to make protein.

(3)

*(c) Explain how an increase in the production of pollutants can be due to an increase in human population.

Include both air and water pollution in your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2013

GCSE Biology (5BI1H)
Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	**D** ☒ homozygous recessive		(1)

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	**A description to include three of the following points:** tired / lethargic (1) short of breath / reduced oxygen carrying capacity / problems exercising (1) swelling of hands and feet (1) painful / weak joints (1) blocked blood vessels / blood clots(1)	 **Accept weak / fatigued /** Accept difficulty breathing Accept reference to pain or painful episodes/sickle cell crisis Ignore references to the shape of the red blood cell Ignore references to mucus	(3)

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	<table><tr><td></td><td>D</td><td>d</td></tr><tr><td>D</td><td>DD</td><td>Dd</td></tr><tr><td>D</td><td>DD</td><td>Dd</td></tr></table> correct gametes (1) correct offspring genotypes (1)	 **Allow ECF for incorrect gametes**	(2)

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	50(%) (1) 0(%) (1)	**Answers must be in this order** **Possible ecf from the candidates Punnett square** **Clip together with 1bi**	(2)

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	**C** ☒ parasite		(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	A suggestion linking **two of the following:** • suckers on the head /adaptation of the head (1) • attaches to the intestine (1) OR • a very long thin shape / large surface area (1) • for absorption (1) OR • surface / skin (1) • resistant to enzymes (1)	Accept hooks, teeth for suckers Reject large intestine Accept long flexible shape Ignore references to resistance to stomach acid Ignore references to larvae, eggs and reproduction	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	A suggestion including two of the following: • cooking meat thoroughly (1) • do not eat meat /become a vegetarian / vegan(1) • destroy/don't eat the cysts in the meat(1) • prevent animals from eating tapeworm eggs (1) • worm the animal (1)	Accept food/pork for meat	(2)

Question Number	Answer	Acceptable answers	Mark
2(b)	An explanation including **three** of the following: • (chemosynthetic) bacteria live in (the gut of) the tube worms (1) • the bacteria convert sulphurous / hydrogen sulphide compounds (1) • into food for the tube worms (1) • the tube worms provide place for the bacteria to live / provides oxygen for bacteria (1) • this is a mutualistic relationship (1)	**Accept sulphur** Accept bacteria make food for worms **Accept protection** Accept mutualism / mutual benefit / mutual relationship	(3)

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	An explanation including **two** of the following: the dodo was multicellular (1) the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	 Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll Ignore references to legs /backbone etc	 (2)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	(1)

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	**B** ☒ genus		(1)

Question Number	Answer	Acceptable answers	Mark
3(b)	A suggestion including 3 of the following: • Predation / disease (1) • change in environmental conditions (1) • loss of food source / reduced food source (1) • increased competition (1) • limited adaptations / survival of the fittest (1) • unable to reproduce / reproduce less (1)	 Accept named environmental change / climate change Accept food source eaten by other animals / humans Accept unable to fly so cannot escape	 (3)

Question Number	Answer	Acceptable answers	Mark
3(c)	**D** ☒ speciation		(1)

Question Number	Answer	Acceptable answers	Mark
3(d)	A description to include two of the following: genetic (variation) (1) due to mutation (1) due to sexual reproduction / interbreeding / hybridisation (1) environmental (variation) (1)	 Accept references to different genes/DNA Accept named environmental change e.g.change in climate	(2)

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	the later that a person gives up smoking/the longer you smoke for the higher risk of lung cancer	ORA	(1)

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	9 (%)		(1)

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	$\frac{500\,000 \times 9}{100}$ (1) = 45 000 (1)	2 marks for the correct bald answer if value other than 9 (2 – 14) inserted into correct equation ecf applies if calculation is correct	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	An explanation linking **two** of the following: • tobacco contains tar (1) • tobacco/tar contains carcinogens / causes mutations /is cancer forming (1) • nicotine in tobacco is addictive which makes it difficult to give up /causes people to smoke for longer (1)		(2)

Question Number	Answer	Acceptable answers	Mark
4b(ii)	**A** ☒ carbon monoxide		(1)

Question Number	Answer	Acceptable answers	Mark
4(c)	An explanation including **three** of the following**:** • (stimulants) act at the synapse (1) • **more** neurotransmitters (1) • so speeds up neurotransmission(1)	Accept increases neurotransmitters Accept decreases reaction time/speeds up reactions/ speeds up brain activity	(3)

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	2.7	Allow -2.7 (^{o}C)	(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	a comparison to include the following linked points (Rebecca's) brain temperature fluctuated / stayed similar / did not change very much (1) (whereas) finger temperature decreased (1)	Ignore references to brain temperature going up	(2)

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	an explanation to include three of the following points heat lost to the environment /from finger (1) **less** blood delivered to the skin's surface/finger (1) narrowing of the arterioles near the skin's surface (1) vasoconstriction (1) **less** heat loss by radiation(1)	accept ref to temperature gradient accept more blood flow to vital organs accept blood vessels for arterioles	(3)

Question Number		Indicative Content	Mark
QWC	***5(b)**	A explanation to include some of the following • homeostasis / regulation of the body's internal environment • controlled by the hypothalamus / thermoregulatory • hypothalamus / thermoregulatory centre monitors blood temperature • negative feedback mechanism • sweat rate increases • sweat glands will release sweat on to skin surface • evaporation of this sweat / water will remove heat energy from skin • hairs on skin's surface lay flat • no trapping of insulating air layer so body loses heat • vasodilation occurs • widening of the arterioles / blood vessels eq, near the skin delivers warm blood to skin surface • body loses heat by radiation	(6)
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of at least one method of thermoregulation • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation including at least two methods of thermoregulation • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of at least 3 methods of thermo regulation. Use of the term vasodilation or including information on the process of homeostasis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6a(i)	**A** ☒ living indicators		(1)

Question Number	Answer	Acceptable answers	Mark
6a(ii)	An explanation linking the correct species with the reason: • species 2 (1) reason • coal powered power stations produce sulfur dioxide gas (1) • species 2 is tolerant of sulfur (1)	Accept sulphur for sulphur dioxide Note mark points are independent 1 mark can be attained for candidate stating that sulphur dioxide gas is produced by coal powered power stations	(2)

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation linking three of the following: • plants use /nitrogen taken in as nitrates (1) • fertilisers / compost (1) • nitrogen fixation / nitrogen fixing bacteria / lightning (1) • nitrification /nitrifying bacteria (1) • absorption through the roots (1) • by active transport (1)	Accept nitrates in the correct context	(3)

Question Number		Indicative Content	Mark
QWC	***6(c)**	A explanation to include some of the following Air pollution • Humans burn more fossil fuels coal/oil/gas • nitrogen oxides in car exhausts • Releasing sulfur dioxide • Which causes acid rain • carbon dioxide gas • causes climate change • deforestation causing increase in carbon dioxide • increased population – increased respiration more carbon dioxide Water pollution • Humans produce sewage • Sewage contains phosphates • Phosphates are water pollutants • Nitrate pollution can be caused by the overuse of fertilisers • Nitrate pollution causes eutrophication	(6)
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of how humans effect pollution – increasing pollution in either air or water • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of both air and water pollution including the effects of one air and one water pollutant or a detailed explanation of either air or water pollution • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of the effect of humans on both air and water pollution including the role of sulphur dioxide or carbon dioxide and nitrates or phosphates • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 = 12 marks

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Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Biology/Science

Unit B1: Influences on Life

Higher Tier

Friday 1 March 2013 – Morning
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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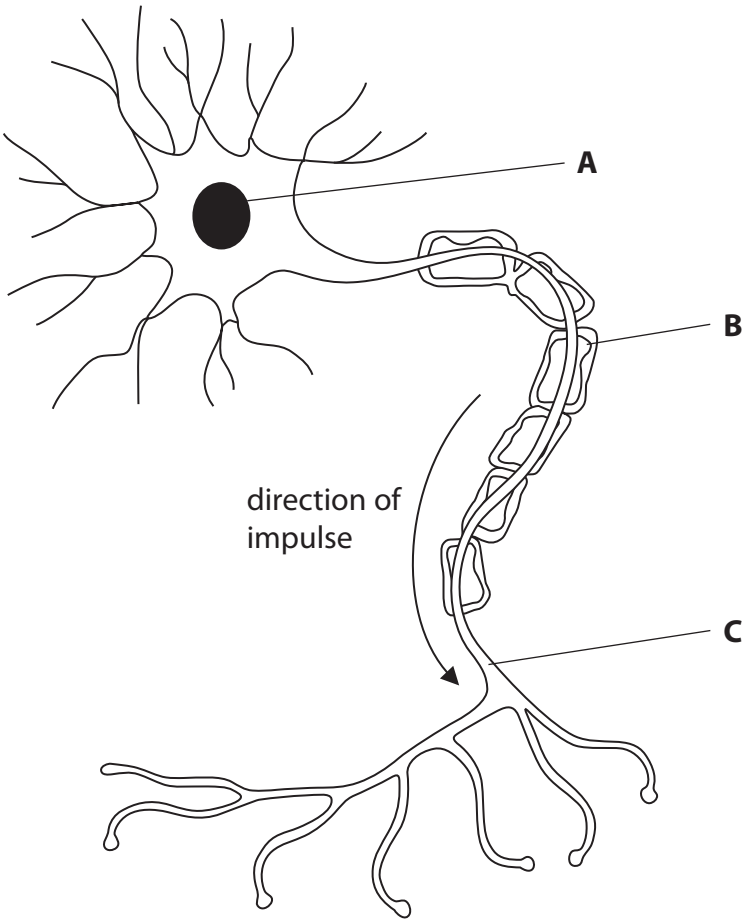
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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Nervous system

1 The diagram shows a motor neurone.



(a) (i) Name the structures labelled **A**, **B** and **C**.

(3)

A .....

B .....

C .....

(ii) When the brain receives impulses from receptor cells it coordinates a response.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Responses are carried out by

(1)

☒ **A** alleles

☒ **B** dendrons

☒ **C** effectors

☒ **D** senses

(b) A response can be affected by drugs.

The effect of drinking alcohol on reaction time was investigated using five adult volunteers A, B, C, D and E.

After drinking a number of units of alcohol, the reaction time for each volunteer was measured three times.

The results are shown in the table.

		Reaction time / ms			
Volunteer	**Number of units of alcohol drunk**	**1st attempt**	**2nd attempt**	**3rd attempt**	**Mean**
A	0.5	34	38	27	33
B	1.5	36	47	40	41
C	3.0	59	62	59	60
D	4.5	67	60	62	
E	6.0	80	68	83	77

(i) Calculate the mean reaction time for volunteer D.

(2)

Answer .....ms

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(ii) Explain why alcohol causes a change in reaction time.

(2)

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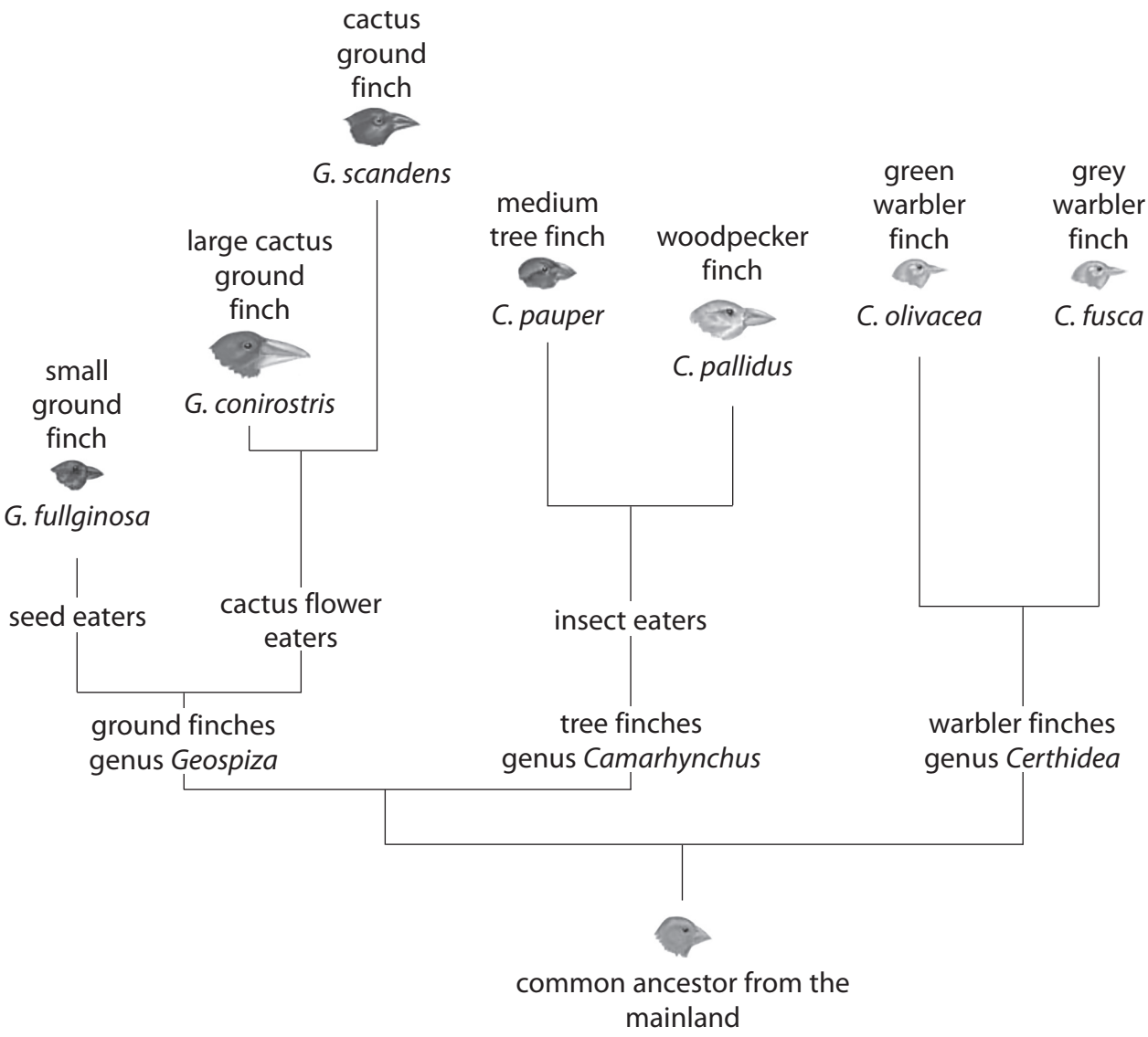
(Total for Question 1 = 8 marks)

Darwin's finches

2 Charles Darwin studied the variety of finches on the Galapagos Islands.

He used this information to develop his theory of evolution.

Some of the finches are shown in the diagram.



(a) (i) State the genus and the species of the large cactus ground finch.

(2)

genus.....

species.....

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(ii) Suggest how the size and shape of their beaks enabled all of these types of finches to survive.

(2)

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Darwin's finches are an example of speciation due to

(1)

- ☒ **A** selective breeding
- ☒ **B** geographic isolation
- ☒ **C** hybridisation
- ☒ **D** the development of ring species

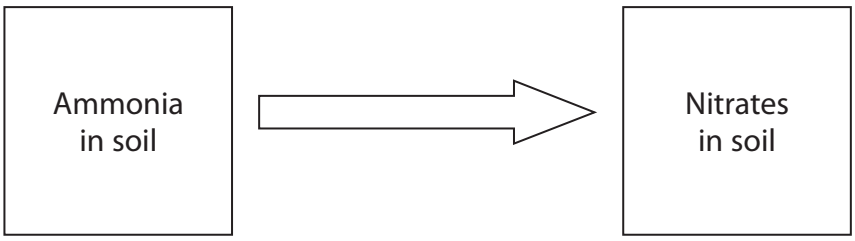
(b) Suggest how these species of finches could have evolved.

(3)

(Total for Question 2 = 8 marks)

Nitrogen

3 The diagram shows one of the stages of the nitrogen cycle.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The name of this stage is

(1)

☒ **A** decomposition

☒ **B** denitrification

☒ **C** nitrification

☒ **D** nitrogen fixation

(ii) Explain how plants use the nitrates from the soil.

(2)

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(iii) Describe how the over-use of nitrate fertilisers can cause eutrophication.

(4)

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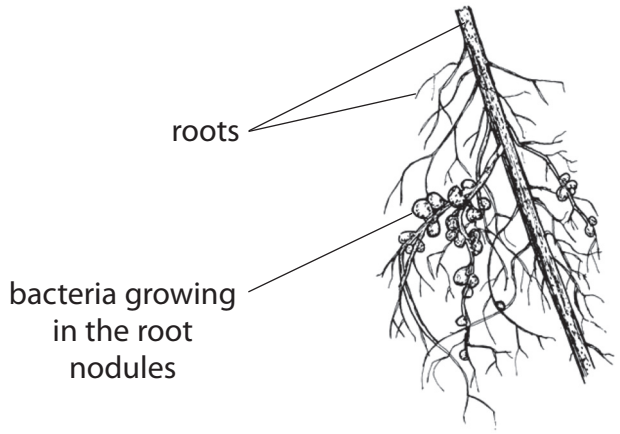
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(b) Leguminous plants such as beans and peas have bacteria growing inside nodules on their roots.

The diagram shows some nodules on a root.



Explain the relationship between this bean plant and the bacteria growing in the root nodules.

(3)

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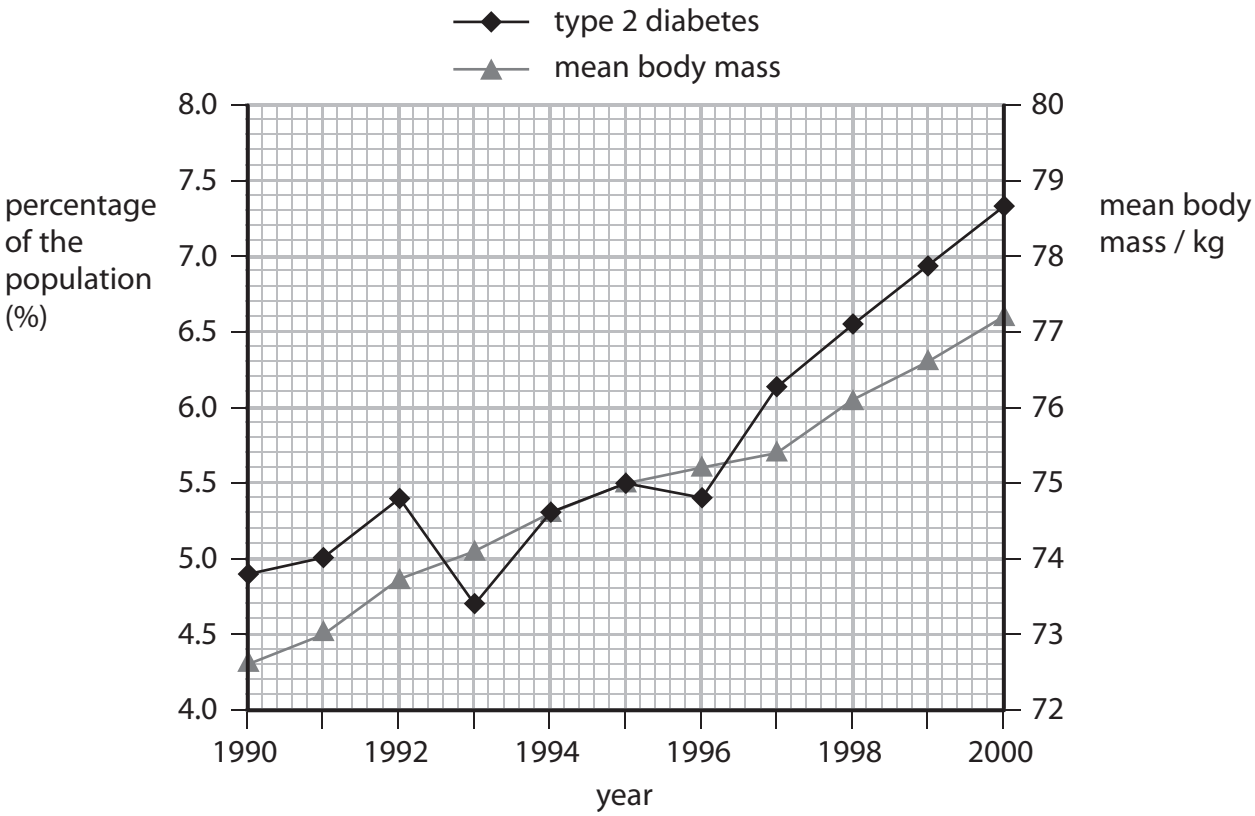
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(Total for Question 3 = 10 marks)

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Diabetes

4 The graph shows the percentage of the population with type 2 diabetes and the mean body mass of the population, from 1990 to 2000.



(a) (i) Use information from the graph to describe the correlation between type 2 diabetes and body mass shown from 1993 to 2000.

(2)

.....

.....

.....

.....

(ii) Suggest how a change in body mass may cause a person to develop type 2 diabetes.

(2)

.....

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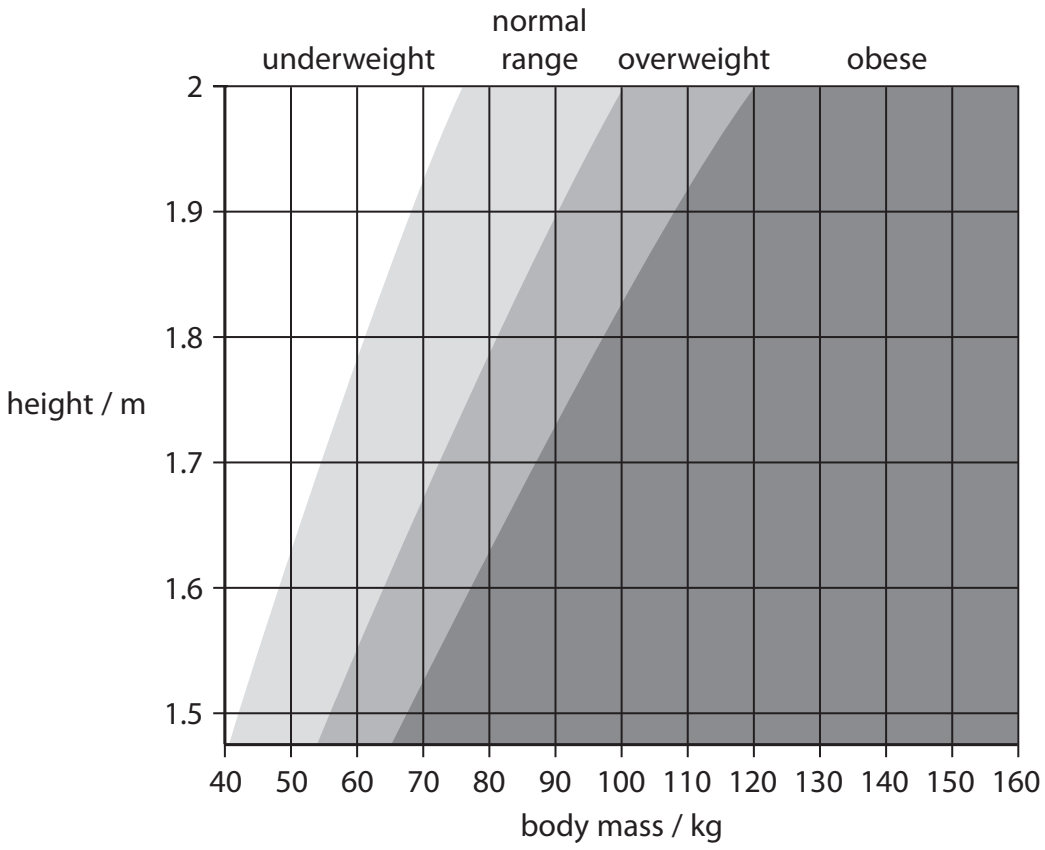
(b) (i) Use the equation to calculate the body mass index (BMI) for a person with a body mass of 78 kg and a height of 1.7 m.

$$\text{BMI} = \frac{\text{mass / kg}}{(\text{height in metres})^2}$$

(2)

BMI .....

(ii) Use the chart to find the BMI category for this person.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The BMI category for this person is

(1)

☒ **A** underweight

☒ **B** normal range

☒ **C** overweight

☒ **D** obese

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(c) Describe how the human body acts in response to low glucose levels in the blood.

(3)

(Total for Question 4 = 10 marks)

BLANK PAGE

Plant hormones

5 Auxins are plant hormones.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Auxins cause the shoot of a plant to grow towards light in a process called

(1)

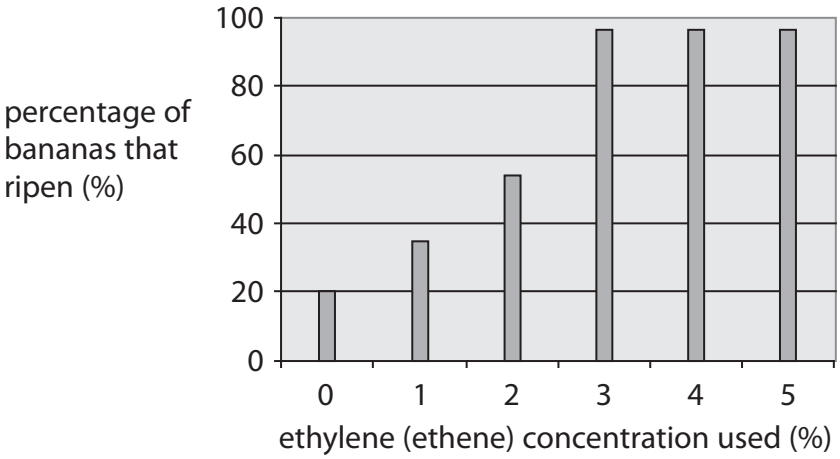
- ☒ **A** negative gravitropism
- ☒ **B** negative phototropism
- ☒ **C** positive gravitropism
- ☒ **D** positive phototropism

(ii) Explain how auxins cause the shoot of a plant to grow towards light.

(2)

(b) Ethylene (ethene) is a plant hormone that stimulates the ripening of fruit.

The graph shows the effect of ethylene (ethene) concentration on the ripening of bananas after three days.



(i) Describe the effect of ethylene (ethene) on the ripening of bananas.

(1)

.....

.....

(ii) Explain which concentration of ethylene (ethene) a supermarket should use to be most cost effective when ripening bananas.

(2)

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*(c) Fruit ripening is one use of plant hormones.

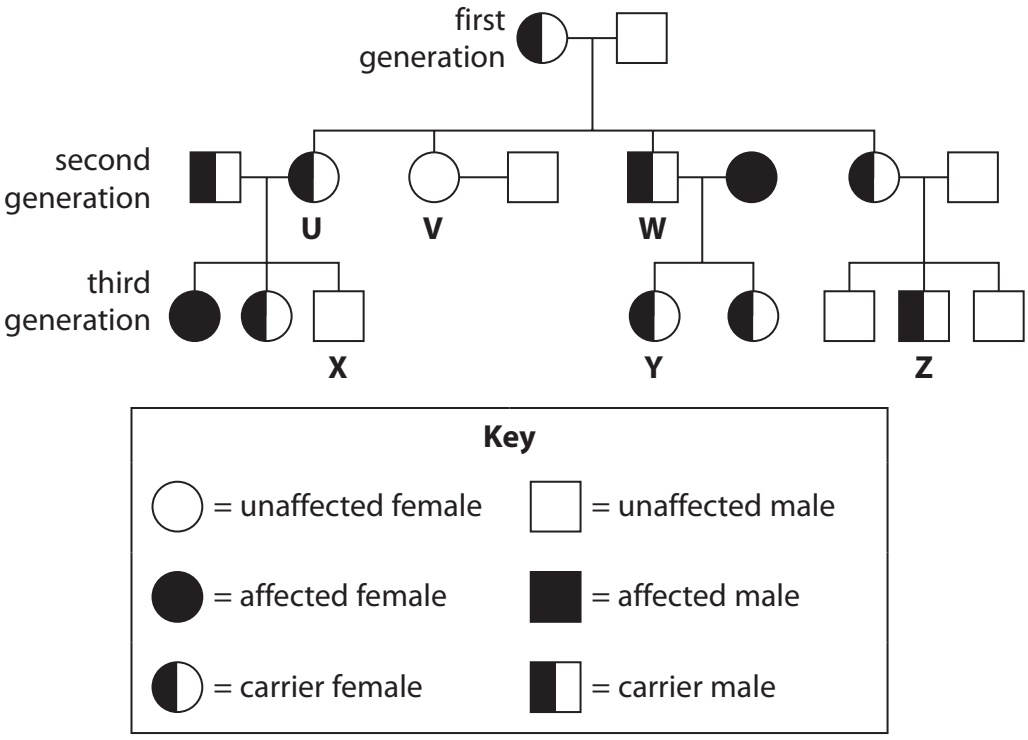
Describe the other uses of plant hormones in crop production.

(6)

(Total for Question 5 = 12 marks)

Genetic inheritance

6 The family pedigree shows the inheritance of sickle cell disease through three generations.



(a) (i) Calculate the percentage of the offspring from the first generation who are heterozygous for sickle cell disease.

(1)

.....%

(ii) Explain why the offspring produced by the first generation parents are not the same as those predicted in a Punnett square.

(2)

.....

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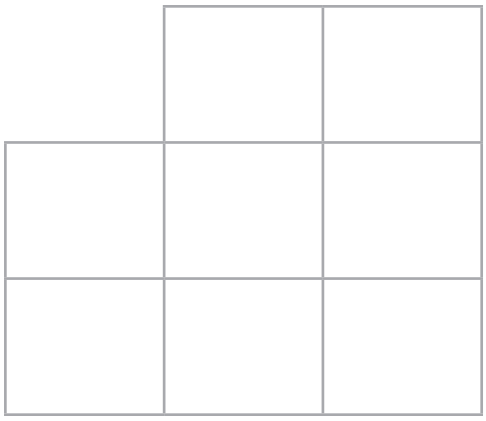
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(iii) Person **W** and his partner have a third child.

State the probability that this child will have sickle cell disease.

Complete the Punnett square to show this.

(2)



probability .....

(iv) Complete the sentence by putting a cross (☒) in the box next to your answer.

The genotype of person **V** is

(1)

☒ **A** homozygous dominant

☒ **B** homozygous recessive

☒ **C** heterozygous

☒ **D** carrier

*(b) Explain why it is important that individuals **X**, **Y** and **Z** have pedigree analysis completed before they consider having children.

You should use diagrams and mathematical calculations to illustrate your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

March 2013

GCSE Biology
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Question Number	Answer	Acceptable answers	Mark
1a(i)	A – nucleus (1) B – myelin (sheath) (1) C – axon (1)	A – cell body B – Schwann cell / fatty layer	**(3)**

Question Number	Answer	Acceptable answers	Mark
1a(ii)	C - effectors		**(1)**

Question Number	Answer	Acceptable answers	Mark
1b(i)	(67 + 60+ 62) = 189 (1) (189) / 3 ans = 63 (ms) (1)	Two marks for correct bald answer ECF for incorrect calculation carried out correctly.	**(2)**

Question Number	Answer	Acceptable answers	Mark
1b(ii)	An explanation to include the following points: alcohol is a depressant (1) slows down the activity of the brain (1) (slows down) neurotransmission (1) (slows down) transmission at the synapse (1)	**Reject** stimulant (no further marks awarded) **Ignore** references to CNS accept sedative accept: slows reactions / reactions take longer / reaction time increases	**(2)**

Total for question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2a(i)	Genus – Geospiza Species -conirostris	**accept geospiza** **accept Conirostris**	**(2)**

Question Number	Answer	Acceptable answers	Mark
2a(ii)	A suggestion including two of the following: • (different beak sizes/adapted) enable different finches to feed on different food types (1) • less competition between species (1)	eat different foods accept comparison between 2 beaks and food source more species are able to co-exist (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2a(iii)	**B** ☒ geographic isolation		**(1)**

Question Number	Answer	Acceptable answers	Mark
2b	A suggestion linking **three** of the following points: • variation between species/ beak sizes/ shapes (1) • due to mutation(1) • competition for resources (1) • survival of the fittest /those best adapted to the environment survived (1) • those who survive pass their genes/characteristics onto their offspring (1) • natural selection (1)		**(3)**

Total for question 2 – 8 marks

Question Number	Answer	Acceptable answers	Mark
3a(i)	**C** ☒ nitrification		**(1)**

Question Number	Answer	Acceptable answers	Mark
3a(ii)	an explanation to include the following points • used to make protein (1) • for growth (1)	**Ignore references to use as food (plants do not feed)** accept amino acids/ chlorophyll /DNA ignore references to photosynthesis / respiration	**(2)**

Question Number	Answer	Acceptable answers	Mark
3a(iii)	A description linking **four** of the following points (nitrates) leach/flow into water (1) algae and small plants grow **rapidly** /algal bloom (1) **underwater** plants cannot photosynthesise (1) (lack of photosynthesis / sunlight) causes plants to die (1) decomposers / (decomposing) bacteria break down the dead material / plants (1) these bacteria use up oxygen during respiration(1)	accept fertilisers for nitrates	**(4)**

Question Number	Answer	Acceptable answers	Mark
3b	An explanation to include three of the following points bacteria use nitrogen / nitrogen fixing bacteria (1) make ammonia / ammonium / nitrogen compounds /nitrates for use by plants (1) bacteria protected (within the root nodule) (1) bacteria obtain chemical substances / glucose / sugar from the plant (1) this is called a mutualism / symbiosis(1)	**Ignore food / nutrients** **reject parasitism**	**(3)**

Total for question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A description including the following points: • as mean mass increases so does the percentage of population with type 2 diabetes (1) • correct readings from the graph to illustrate the comparative point (1)	**accept** positive correlation ORA	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A suggestion linking **two** of the following: • increasing body mass leads to over weight / obesity • don't respond to insulin / reference to insulin resistance		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	Calculation (1.7 x 1.7) = 2.89 (1) 78 / 2.89 = 27 (1)	Two marks for correct bald answer Ecf for incorrect numbers but correct calculation 26.98 / 26.9 Accept continued decimal places	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	**C** ☒ overweight		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	A description linking **three** of the following: • glucagon is released (1) • from the pancreas (1) • glycogen to glucose (1) • in the liver / muscle cells(1) • which acts to raise blood glucose levels (1)	correct spelling of glycogen and glucagon only No mark for glucagon is injected Ignore references to glucagon turning into glucose	**(3)**

Total for question 4 – 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**D** ☒ positive phototropism		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	An explanation to include the following linked points (auxins) move to the shaded side of a shoot (1) causing cells on the shaded side to <u>elongate</u> (1)	 accept move to the side opposite the light accept get longer for elongate Ignore references to cell division	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	there is an increase in the % of bananas that ripen as the ethylene concentration increases	Ignore positive effect	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	An explanation to include two of the following points • concentration of ethylene to use is 3% (1) • would be more expensive to increase the ethylene concentration above 3% • when there is no added ripening benefits past 3%(1) • below 3% not all bananas are ripe (1)	 Do not credit ideas related to longer shelf life as the question asks about ripening	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	A description to include some of the following points • selective weedkillers • allows broad-leaved plants to grow uncontrollably and die • narrower-leaved plants and crops left unaffected • auxins and or gibberellins are used • rooting powders • plant cuttings are dipped into rooting powder • roots develop rapidly • large number of plants can be produced from the same plant • no need to wait for plants to grow from seeds • auxins are used • seedless fruit production • the fruit will develop but the seeds inside will not • fruits are able to grow larger (larger biomass) • gibberellins are used	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of at least one use of plant hormones • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of two or more uses of plant hormones • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of two or more uses of plant hormones with at least auxin, gibberellins or other relevant hormone in the correct context • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	75%		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	An explanation linking **two** of the following: • Punnett square would predict 50% normal 50% carrier (1) • actual offspring are not 50% carrier (1) • the probability is applied to each child not the overall offspring (1)	accept ratios or probabilities instead of percentages actual offspring are 75% accept references to random assortment	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(iii)	<table><tr><td></td><td>b</td><td>b</td></tr><tr><td>B</td><td>Bb</td><td>Bb</td></tr><tr><td>b</td><td>bb</td><td>bb</td></tr></table> Probability = 50% Ratio 2/4, 2:2, can be given for probability 1 mark for correct gametes 1 mark for completed Punnett square with correct probability	Accept reverse order for gametes Accept letters other than B/b (but alleles must be the same letter) 50% mark can only be given if 50% of the offspring are homozygous recessive	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(iv)	**A** ☒ homozygous dominant (BB)		**(1)**

<table>
<tr><th colspan="2">Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC</td><td>*6(b)</td><td>A explanation to include some of the following points:

Pedigree analysis would show the likelihood of their offspring inheriting the disorder
Pedigree analysis should also be carried out on the partners of the third generation.
• X is not a carrier
• X is homozygous dominant
• and does not have sickle cell disease
• The parents of X are heterozygous / his sister has sickle cell
• so will not pass on the allele for the disease to offspring
• if his partner is a carrier
• there will be a 50% chance of the child being a carrier

• Y and Z are carriers of the sickle cell allele
• Y and Z are heterozygous
• The mother of Y has sickle cell / Y will inherit the sickle cell allele
• The parents of Z do not have sickle cell / mother is a carrier/heterozygous
• They have a 50% chance of passing the sickle cell allele onto their potential offspring
• If their partners were also carriers
• There would be a 25% chance that the offspring will have the sickle cell disease
• There would be a 50% chance that the offspring would also carry the allele for sickle cell disease
Example Punnett square:

<table><tr><td></td><td>B</td><td>b</td></tr><tr><td>B</td><td>BB</td><td>Bb</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr></table></td><td>(6)</td></tr>
<tr><td>Level</td><td>0</td><td colspan="2">No rewardable content</td></tr>
<tr><td>1</td><td>1 - 2</td><td colspan="2">• a limited explanation the genetic profile of X,Y and Z or an explanation of the use of pedigree analysis
• the answer communicates ideas using simple language and uses limited scientific terminology
• spelling, punctuation and grammar are used with limited accuracy</td></tr>
<tr><td>2</td><td>3 - 4</td><td colspan="2">• A simple explanation of the genetic profile of X, Y and Z and an explanation of the use of pedigree analysis
• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately
• spelling, punctuation and grammar are used with some accuracy</td></tr>
<tr><td>3</td><td>5 - 6</td><td colspan="2">• a detailed explanation of the genetic profile of X, Y and Z and explanation of the use of pedigree analysis plus either an explanation of one genotype or a prediction of one of the offspring outcomes
• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately
• spelling, punctuation and grammar are used with few errors</td></tr>
</table>

Total for Question 6 – 12 marks

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Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Biology/Science

Unit B1: Influences on Life

Higher Tier

Monday 5 November 2012 – Morning **Time: 1 hour**	Paper Reference **5BI1H/01**

You must have: Calculator, ruler	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
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- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
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Advice

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Turn over ▶

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P 4 1 7 6 0 A 0 1 1 6

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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Evolution

1 In extreme environments organisms have characteristics that enable them to survive.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

These characteristics are

(1)

- ☒ **A** adaptations
- ☒ **B** alleles
- ☒ **C** habitats
- ☒ **D** hybrids

(ii) The photograph shows a Pompeii worm.

Pompeii worms are found in hydrothermal vents in the Pacific Ocean.



The temperature of these hydrothermal vents can be very high.

Suggest a feature that helps to protect the Pompeii worm from the extreme heat.

(1)

.....

.....

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(iii) Pompeii worms were discovered by French marine biologists in the early 1980s.

Explain how these biologists may have validated the evidence for the discovery of the Pompeii worms.

(2)

(b) Variation in a population enables evolution to occur.

(i) Explain, using Darwin's theory of evolution, how variation can lead to a species evolving.

(2)

(ii) Evolution can lead to speciation.

Describe what is meant by the term **speciation**.

(2)

(Total for Question 1 = 8 marks)

Nutrient pollution

2 The photograph shows a lake which has been polluted by excess nutrients.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The build-up of nutrients in an aquatic environment is known as

(1)

- ☒ **A** decomposing
- ☒ **B** eutrophication
- ☒ **C** mutualism
- ☒ **D** parasitism

(ii) Suggest how farming can lead to a build-up of nutrients in the lake.

(2)

.....

.....

.....

.....

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(iii) State the effects of nitrates on plant growth.

(1)

.....

.....

(b) (i) Nitrates can be produced by soil bacteria.

Explain how soil bacteria produce nitrates.

(3)

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(ii) Name **one** type of bacteria that reduce the nitrate content of soil.

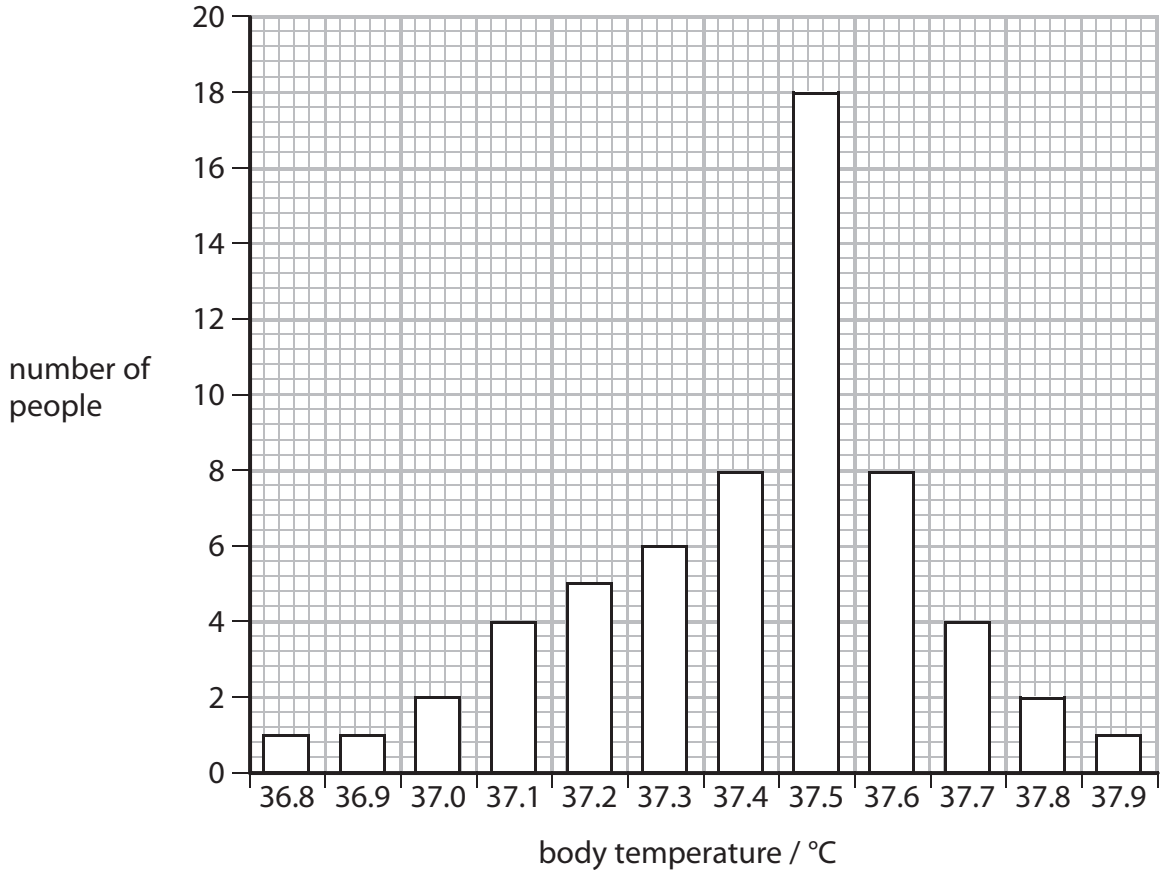
(1)

.....

(Total for Question 2 = 8 marks)

Thermoregulation

3 (a) The graph shows the body temperature of 60 people.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The range in body temperature is

(1)

☒ **A** 0.1

☒ **B** 1.1

☒ **C** 11.0

☒ **D** 11.1

(ii) State the type of variation, shown in the graph, that results in a normal distribution curve.

(1)

.....

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(iii) Calculate the percentage of people with a body temperature of 37.5 °C.

(2)

answer = ... %

(b) A person with a body temperature of 37.9 °C had a body temperature of 37.5 °C one hour later.

(i) Explain how thermoregulation causes this reduction in body temperature.

(4)

(ii) Explain how exercise can cause body temperature to increase.

(2)

(Total for Question 3 = 10 marks)

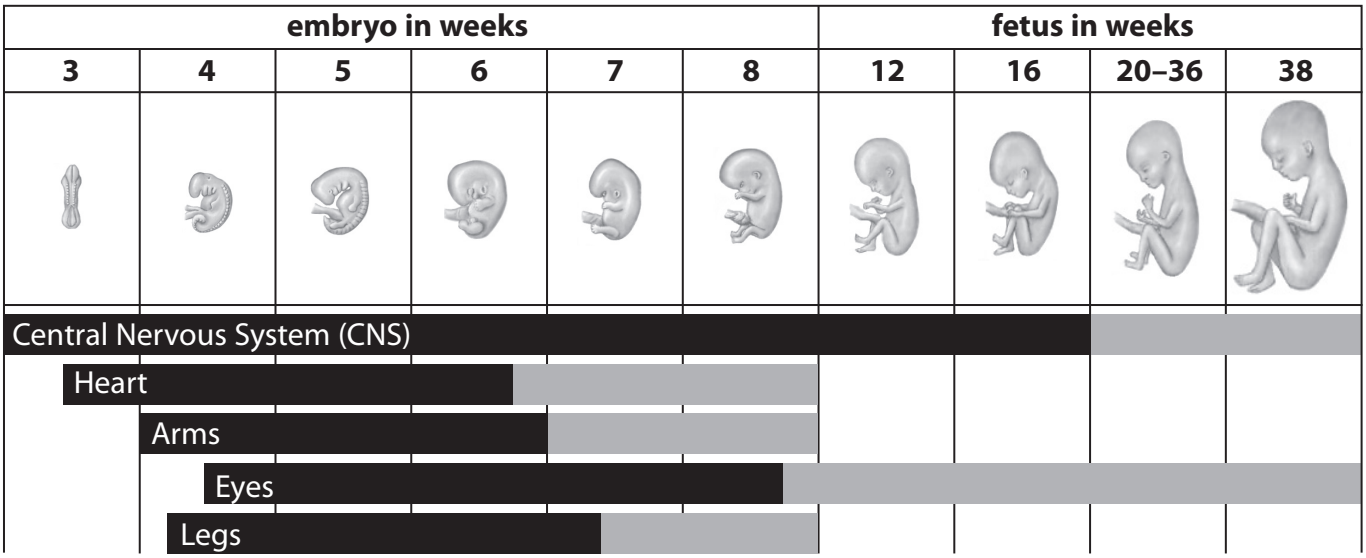
Alcohol abuse

4 Fetal alcohol syndrome occurs when a pregnant woman drinks large quantities of alcohol.

The diagram shows the development of the embryo and fetus during its time in the uterus.

The bars show the time period during which fetal alcohol syndrome can cause an abnormality in a specific body part.

The darker the bar, the more likely an abnormality will occur in that body part.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The body part most likely to be affected by fetal alcohol syndrome throughout pregnancy is the

(1)

☒ **A** central nervous system

☒ **B** heart

☒ **C** arms

☒ **D** eyes

(ii) State the period of time when a defect in the development of the legs is most likely to occur.

(1)

.....weeks

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(b) (i) Alcohol is a drug.

Define the term **drug**.

(2)

(ii) Explain why alcohol is classed as a depressant.

(2)

(c) (i) Describe a long-term effect of alcohol abuse.

(2)

(ii) Discuss the ethics of allowing alcoholics to have an organ transplant.

(2)

(Total for Question 4 = 10 marks)

Genetic disorders

5 Cystic fibrosis (CF) is a recessive genetic disorder.

The recessive allele is shown as **f** and the dominant allele as **F**.

(a) (i) What is the genotype of a person with cystic fibrosis?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** **FF**
- ☒ **B** **Ff**
- ☒ **C** **fF**
- ☒ **D** **ff**

(ii) Explain why a person with cystic fibrosis (CF) may lose body mass.

(2)

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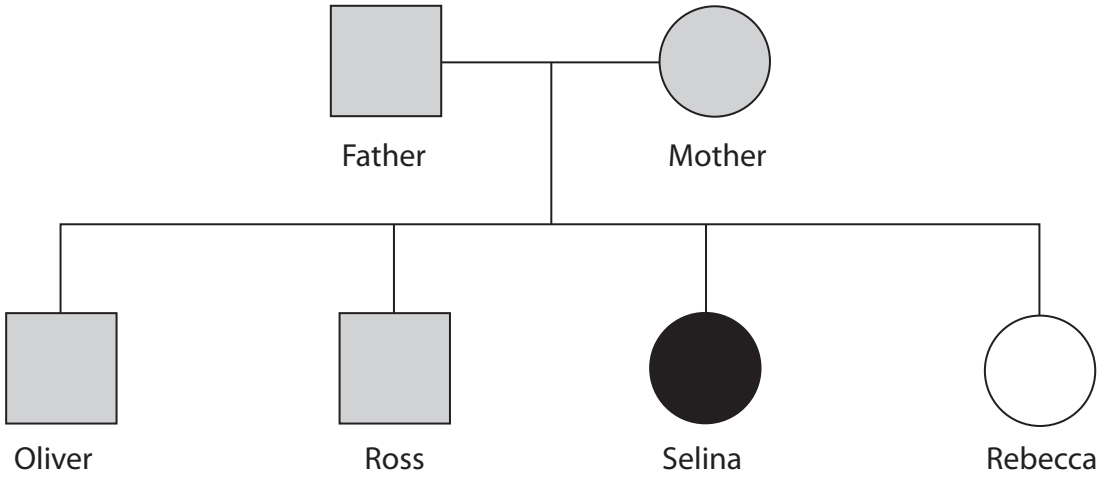
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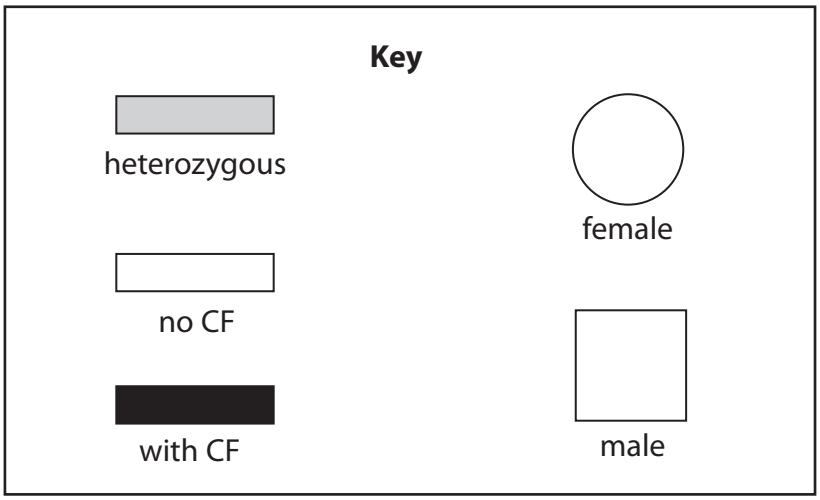
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(b) The family pedigree shows the inheritance of cystic fibrosis (CF).

Both parents are heterozygous for CF.





(i) State what is meant by the term **heterozygous**.

(1)

.....

.....

(ii) Explain why Rebecca does not have CF.

(2)

.....

.....

.....

.....

*(c) Sickle cell disease is another genetic disorder caused by a recessive allele **(d)**.

Explain the inheritance of sickle cell disease in a family with a heterozygous father and a homozygous recessive mother.

You should use a genetic diagram or Punnett square and percentage outcomes in addition to your explanation.

(6)

(Total for Question 5 = 12 marks)

Messages in the body

6 (a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

A person with diabetes cannot control

(1)

- ☒ **A** the water content of their blood
- ☒ **B** the glucose content of their blood
- ☒ **C** their body temperature
- ☒ **D** their body mass index

(ii) Explain how Type 1 diabetes can be controlled.

(3)

(b) Adrian is 180 cm tall and has a mass of 120 kg.

A person who has a high Body Mass Index (BMI) is more likely to develop Type 2 diabetes.

Calculate Adrian's BMI using the equation.

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(2)

answer = ...

*(c) Body movement is controlled by nerve impulses.

Explain how impulses are transmitted in a reflex arc to prevent a person from injuring themselves.

(6)

.....

.....

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

November 2012

GCSE Biology
5BI1H/01

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GCSE Biology 5BI1H/01 Mark Scheme – November 2012

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	A – adaptations		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	Any one from the following: • large surface area to facilitate heat loss (1) • insulating/fat layer (1) • correct adaptation of skin / fur / hair(1)	(thick layer) of bacteria credit observable valid 'suggestions' from the photo ref to not needing to regulate temperature as poikilothermic (1)	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	A explanation to include **two** of the following points: • publishing the evidence and results in scientific journals (1) • getting other scientists to review their experiment / repeat the experiment (1) • scientists to investigate hydrothermal vents (1) • participating in scientific conferences to discuss experiment / results (1) • taking samples of organisms in hydrothermal vents for comparison (1)	use peer review (1) scientists searched the ocean (1) comparing notes/meeting with other scientists (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	An explanation to include **two** of the following: • competition (occurs between members of a species) (1) • best suited / better adapted members out-compete and survive (1) • these members will reproduce (more times) (1) • the members who cope less well will die / extinction occurs (1) • reference to natural selection (1)	idea of survival of the fittest (1) reference to passing on genes to help them survive (1) reference to species interbreeding to form hybrids (1)	**(2)**

Question number	**Answer**	**Acceptable answers**	**Mark**
1(b)(ii)	A description to include the following: • the formation of a new species / new characteristics (1) • due to geographical isolation (1) • no longer able to breed with the original species	{development / evolution} of a {different type / new type} of species (1) due to separation from the original species / change of habitat (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	B - eutrophication		**(1)**

Question Number	Answer	Acceptable answers	Mark
2a(ii)	Any **two** from the following: • (over use of) nitrates / phosphates fertilisers (1) • leaching into the lake(1) • sewage leakage into the lake (1)	flowing into lakes / washing into lakes (accept streams, rivers for lakes)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2a(iii)	(plant growth) is increased / protein is made(1)	excessive/overgrowth of algae/plants on the surface	**(1)**

Question Number	Answer	Acceptable answers	Mark
2b(i)	An explanation linking **three** of the following points: • decomposers /decomposer bacteria (1) • bacteria /they break down dead animal and plant matter in the soil (1) • into ammonia (1) • {ammonia / nitrites} is/are converted into nitrates (1) • by nitrifying bacteria (1)	ref to nitrogen fixing bacteria (fixing nitrogen) (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
2b(ii)	denitrifying (bacteria) (1)	named bacteria e.g *Thiobacillus denitrificans, Micrococcus denitrificans, Serratia, Pseudomonas,* and *Achromobacter*	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	B – 1.1		**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (a) (ii)	continuous (data / variation)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a) (iii)	$\frac{18}{60}$ (1) 0.3 x 100 = 30(%) (1) Or 0.33 x 100 = 33(%) (1)	correct answer 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b) (i)	An explanation to include **four** of the following: • **hypothalamus** controls body temperature(1) • causing the body to sweat (more) (1) • (sweating cools the body by) **evaporation** of water / sweat (1) • vasodilation (of blood vessels) (1) • heat lost by **radiation** (1) • this is called negative feedback (1)	explanation of vasodilation – more blood flowing near surface of skin hairs lie flat on skin (so no insulation) (1)	**(4)**

Question Number	Answer	Acceptable answers	Mark
3(b) (ii)	An explanation to include **two** of the following: • muscles (contract and relax)(1) • friction (1) • releasing heat by respiration (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4a(i)	A – central nervous system		**(1)**

Question Number	Answer	Acceptable answers	Mark
4a(ii)	4 – 7 weeks	Accept 4 ½ - 7 ½ 4 – 7 ½ 4 ½ - 7	**(1)**

Question Number	Answer	Acceptable answers	Mark
4 b (i)	A definition including any two of the following: • a **chemical** substance (1) • has an effect on the body / nervous system / brain (1) • causing psychological / physiological / behavioural changes (1)	causing changes in behaviour / addiction	**(2)**

Question Number	Answer	Acceptable answers	Mark
4b(ii)	An explanation including two of the following: • increases reaction times / slows down impulses / reactions(1) • slows down the activity of the brain / nervous system (1) • acts on neurotransmission /at the synapse (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4c(i)	A description linking the following points: • addiction / alcoholism (1) • liver / brain /kidney damage (1) • cirrhosis / cancer (1)	**accept** – other organ damage related to alcohol abuse but **ignore** lung damage	**(2)**

Question Number	Answer	Acceptable answers	Mark
4 c (ii)	A suggestion linking **two** of the following points: • alcoholics have caused their liver to fail by their addiction (1) • if alcoholics continue to drink, the organ could be damaged (1) • other people may deserve the liver transplant more (1) • addiction is an illness(1) • everybody has a right to life (1)	alcoholics damage their own liver / people choose to be alcoholics it is not their fault they are addicted alcoholics may die if they do not get a transplant	**(2)**

Question Number	Answer	Acceptable answers	Mark
5a (i)	D - ff		**(1)**

Question Number	Answer	Acceptable answers	Mark
5a (ii)	An explanation linking two of the following: • mucus blocks (pancreatic) duct /small intestine wall / digestive system(1) • preventing enzymes/named enzyme being released (into small intestine) (1) • less digestion of food (1) • less absorption (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
5b (i)	an individual who has one recessive allele and one dominant allele (1)	2 different alleles	**(1)**

Question Number	Answer	Acceptable answers	Mark
5b (ii)	An explanation to include two of the following: • Rebecca is homozygous dominant(for CF)(1) • Rebecca has (inherited) one dominant allele from each parent(1) • cystic fibrosis involves the inheritance of two recessive alleles (1)	Rebecca has (inherited) 2 dominant alleles	**(2)**

<table>
<tr><th>Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC
*5(c)</td><td>An explanation including the following points:

• A Punnett square or genetic diagram showing the following gametes and offspring

<table><tr><td></td><td>D</td><td>d</td></tr><tr><td>d</td><td>Dd</td><td>dd</td></tr><tr><td>d</td><td>Dd</td><td>dd</td></tr></table>
• mother gametes = d, d
• father gametes = D, d
• offspring = 50% Dd, 50% dd
• probability of offspring with sickle cell disease = 50%
• probability of carrier / heterozygous = 50%
• both parents will give one allele to the possible offspring
• the father can give either the dominant or recessive allele
• the mother can only give a recessive allele
• a dominant and recessive allele will result in heterozygous offspring</td><td>(6)</td></tr>
</table>

Level	0	No rewardable content
1	1-2	• Limited written explanation is provided by the candidate of the inheritance and / or a genetic diagram/ Punnett square with only correct gametes or offspring • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3-4	• The genetic diagram/ Punnett square is correct for both gametes and offspring with a simple explanation • the answer communicates ideas showing some evidence of clarity and organisation and mostly uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5-6	• The Punnett Square/genetic diagram is complete and accurate for both gametes and offspring plus percentage outcomes and a detailed explanation of inheritance of CF • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6a (i)	B – the glucose content of their blood		**(1)**

Question Number	Answer	Acceptable answers	Mark
6a (ii)	An explanation linking **three** of the following points: • (the hormone) insulin (1) • (insulin)is injected (into subcutaneous fat) (1) • use a low carbohydrate /healthy diet (1) • (increase) exercise (1) • to lower blood glucose levels / when blood glucose levels get too high / regulate glucose levels(1)	use of epipen	**(3)**

Question Number	Answer	Acceptable answers	Mark
6b	Body Mass Index calculation: $120/1.8^2$ (1) 37 (1)	ecf for correct manipulation with incorrect figures	**(2)**

Question Number		Indicative Content	Mark
QWC *6(c)		An explanation including the following points in a logical order: • a reflex response is an involuntary response • reflex responses do not involve the brain • reflex responses involve sensory neurones • reflex responses involve relay neurones • reflex responses involve motor neurones • relay neurones are in the spinal cord • impulses travel along neurones as electrical signals • the axon is insulated by the myelin sheath • which ensures the electrical signal does not lose energy • at the junction between two neurones there is a synapse • the message is carried across the synapse by neurotransmitters • the message travels from the stimulus along the axon and dendron of the sensory neurone to the spinal cord • the reflex arc is important to keep the body safe	**(6)**
Level	0	No rewardable content	
1	1-2	• A limited written explanation of some of the neurones involved in the reflex arc or a limited explanation of how messages /impulses are transmitted as electrical signals • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	3-4	• A simple explanation of the neurones involved in the reflex arc in the correct order, with the method of transmission along neurones, one neurone may be missing **or** a detailed description of all of the neurones in the reflex arc and the role of the CNS • the answer communicates ideas showing some evidence of clarity and organisation and mostly uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	5-6	• A detailed explanation of the neurones involved in the reflex arc in the correct order, with the method of transmission along neurones including the role of the synapse and/or myelin sheath. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Edexcel GCSE

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 15 May 2012 – Morning
Time: 1 hour

Paper Reference
5BI1H/01

You must have:
Calculator, ruler

Total Marks

Instructions

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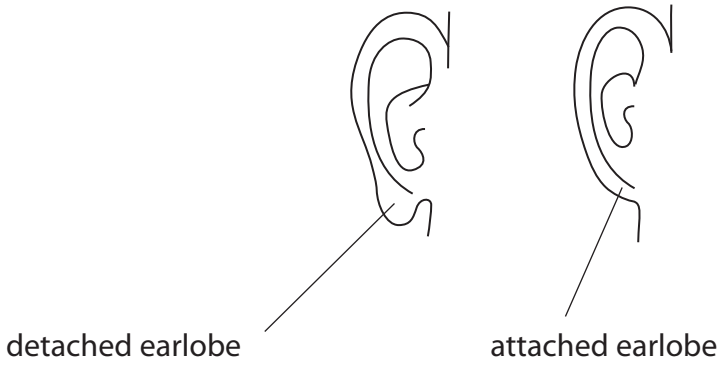
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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Inheritance

1 (a) The earlobes of an individual are detached or attached. This is determined by the alleles inherited from their parents.



An individual with attached earlobes must have inherited two recessive alleles from each of their parents and will have the genotype **ee**.

(i) State the genetic term used to describe an individual with the genotype **ee** for attached earlobes.

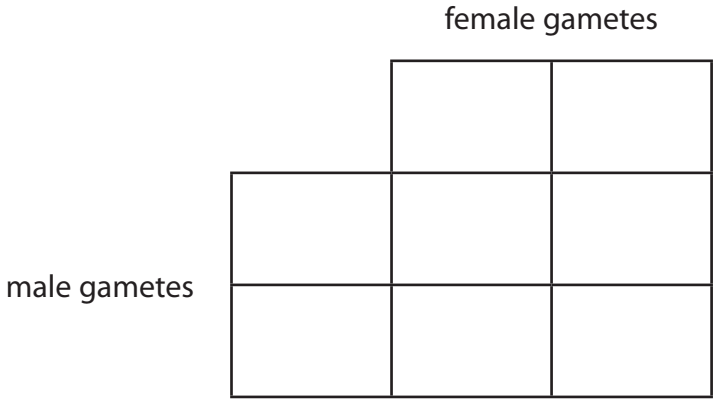
(1)

.....

(ii) A female with the genotype **ee** has attached earlobes and a male with the genotype **Ee** has detached earlobes.

Complete the Punnett square to show the gametes and genotypes of the offspring for this female and male.

(2)



(iii) State the probability of the offspring having detached earlobes.

(1)

.....

(iv) What is the percentage probability of a homozygous dominant mother and homozygous recessive father producing a child with attached earlobes?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** 0%
- ☒ **B** 25%
- ☒ **C** 75%
- ☒ **D** 100%

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(b) Cystic fibrosis is a genetic disorder that is caused by the inheritance of two recessive alleles.

Describe the symptoms of cystic fibrosis.

(3)

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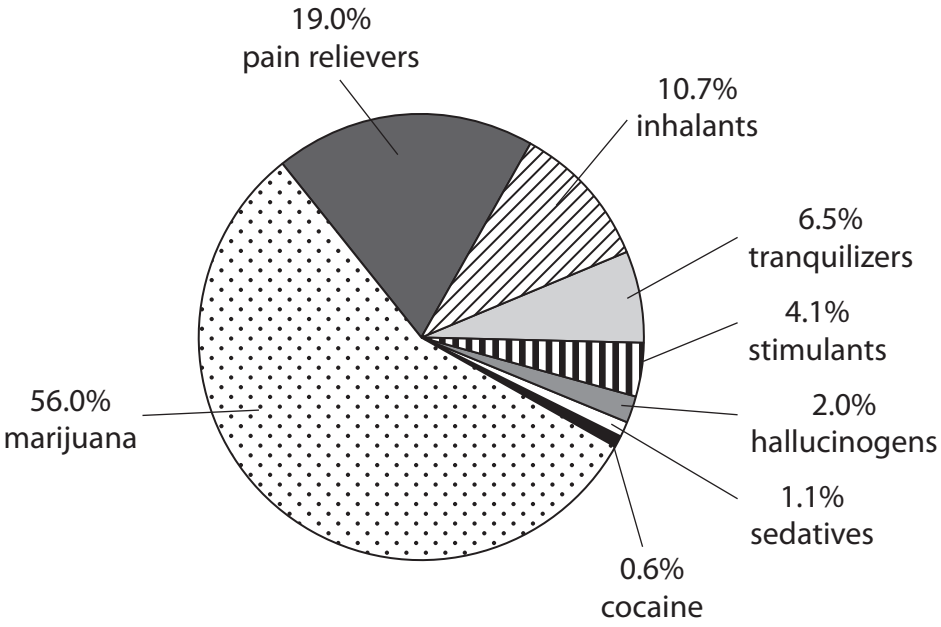
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(Total for Question 1 = 8 marks)

Drugs

2 In the USA, 2.7 million people admitted using illegal drugs.

The pie chart shows the percentage of these people using different illegal drugs.



(a) (i) Calculate the number of people who admitted using marijuana illegally.

(2)

answer = ... million people

(ii) Suggest **one** reason why the information in the pie chart may not be reliable.

(1)

.....

.....

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(b) Marijuana is often smoked with tobacco.

Suggest why combining tobacco with marijuana makes it more difficult to give up smoking marijuana.

(2)

.....

.....

.....

.....

(c) (i) Which of these drugs is a stimulant?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** alcohol

☒ **B** caffeine

☒ **C** LSD

☒ **D** morphine

(ii) Explain how stimulants affect reaction times.

(2)

.....

.....

.....

.....

(Total for Question 2 = 8 marks)

Blood glucose

3 Humans regulate the glucose concentration of their blood.

A scientist recorded the blood glucose concentration of an individual over a seven-hour period.

The results are shown in the table.

time of day	blood glucose concentration / mg per 100 cm^3
06.00	76
07.00	77
08.00	124
09.00	91
10.00	83
11.00	81
12.00	79
13.00	130

(a) (i) Describe the trend in blood glucose concentration for this seven-hour period.

(2)

(ii) Suggest reasons for the changes in blood glucose concentration.

(2)

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(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Excess blood glucose is converted into

(1)

☒ **A** glucagon in the liver

☒ **B** glucagon in the pancreas

☒ **C** glycogen in the liver

☒ **D** glycogen in the pancreas

(b) (i) Scientists have discovered that a high body mass index (BMI) is a risk factor that may cause Type 2 diabetes.

Calculate the BMI for a female who has a mass of 67.5 kg and a height of 1.50 m.

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in metres})^2}$$

(2)

answer = ...

(ii) Explain how a Type 2 diabetic can regulate their blood glucose concentration.

(3)

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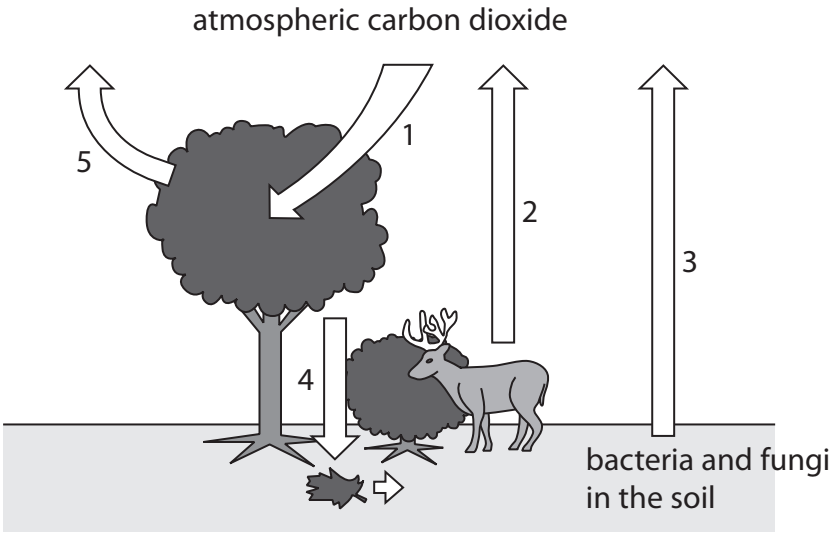
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(Total for Question 3 = 10 marks)

Environment cycling

4 (a) The diagram shows the processes involved in the carbon cycle. Each process is numbered.



(i) What is the name of process 1?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** decomposition

☒ **B** denitrification

☒ **C** photosynthesis

☒ **D** respiration

(ii) Describe the numbered processes that return carbon dioxide back into the atmosphere.

(3)

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(b) The human population is increasing.

Explain how this could change the concentration of carbon dioxide in the atmosphere.

(2)

(c) Air quality can be monitored using indicator species.

Name an indicator species used to monitor air quality.

(1)

(d) The overuse of fertilisers can cause eutrophication.

Explain the effects of eutrophication that may lead to the death of aquatic animals.

(3)

(Total for Question 4 = 10 marks)

Temperature regulation

5 (a) (i) Conditions in the human body must be regulated to maintain a stable internal environment.

Name the process that maintains a stable internal environment.

(1)

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The temperature that enzymes work most effectively in the human body is

(1)

☒ **A** 31 °C

☒ **B** 33 °C

☒ **C** 35 °C

☒ **D** 37 °C

(b) Receptor cells in the skin detect temperature changes in the external environment.

Explain how this information is transmitted to the brain.

(4)

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*(c) In the UK, the external temperature can drop below 0 °C.

Explain how the human body maintains a stable internal temperature when the external temperature is 0 °C.

(6)

(Total for Question 5 = 12 marks)

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Controlling infections

6 (a) Athlete's foot fungus is a pathogen.

(i) Describe how athlete's foot fungus is spread.

(1)

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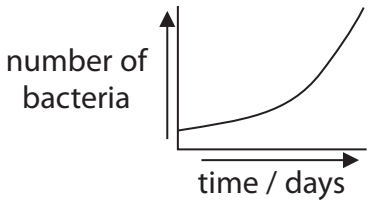
(ii) State the type of medication that can be used to treat this pathogen.

(1)

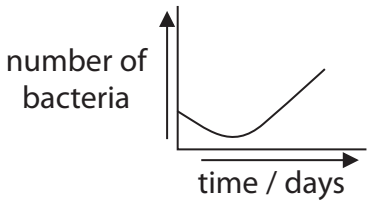
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(b) The graphs show the effect of three different antibiotics on bacterial growth.

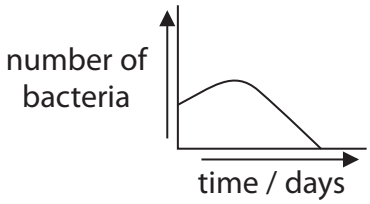
antibiotic A added



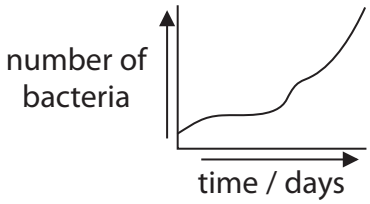
antibiotic B added



antibiotic C added



no antibiotic added



(i) Which of these is most effective at reducing the number of bacteria?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** antibiotic A

☒ **B** antibiotic B

☒ **C** antibiotic C

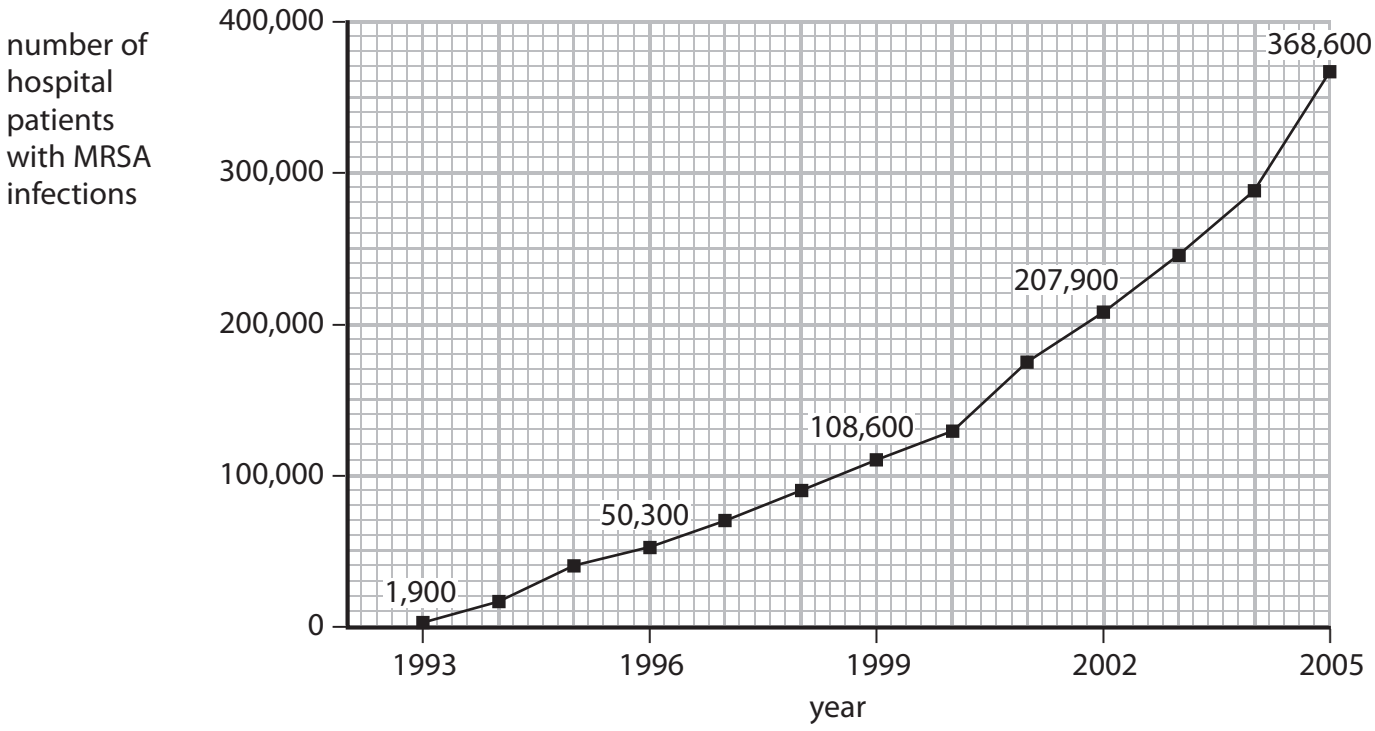
☒ **D** no antibiotic

(ii) Explain how chemical defence mechanisms in the body reduce the chance of infection.

(3)

*(c) MRSA is a bacterial infection.

The graph shows the number of cases of hospital patients with MRSA infections from 1993 to 2005.



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Explain the trend in the graph, even though the patients were treated with antibiotics.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2012

GCSE Biology
5BI1H/01

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GCSE Biology 5BI1H/01 Mark Scheme – Summer 2012

Question Number	Answer	Acceptable answers	Mark
1a(i)	homozygous recessive	Accept in any order: homozygous recessive (alleles)	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	female gametes male gametes |	**e**	**e**
E	Ee	Ee
e	ee	ee | correct gametes in male/female gametes headings (1) correct offspring genotypes (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1a(iii)	Any **one** of the following • 1/2 • 0.50 • 2/4 • 50 % • 1:1 / 2:2	Accept if 2 correct answers are given e.g. ½, 50% evens chance	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iv)	**A** 0%		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	A description including the following points • reference to mucus (1) • location described e.g. lungs / pancreas / reproductive system (1) • consequence described e.g. breathing difficulty / infection / weight loss due to blocking of enzymes / difficulty with digestion or absorption / infertility (1)	**Accept** three symptoms described (3) Ignore: references to symptoms of sickle cell Accept – airways for lungs Accept fertility problems for infertility Symptoms may include diabetes (1) malnutrition (1) incontinence in females (1) sinusitis (1) nasal polyps (1) arthritis (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	substitution (1) 2700000/100 or 27,000 evaluation (1) 27000 x 56 = 1.512 (million people) / 1.5	give full marks for correct answer, no working Accept 1,512,000 (2 marks)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	not every person was questioned / not all people questioned would give a correct answer /be honest / people may have taken more than one type of drug / reference to date so may not be relevant		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	Any **two** of the following points • tobacco contains **nicotine** (1) • is **addictive** (1) • it acts on **receptor sites in the brain** to make you crave more of the same drug (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	**B** caffeine		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	An explanation linking the following points • stimulants reduce reaction times/increase the speed of reactions / speed up reaction times (1) • by increasing neurotransmission (1) • acts at the synapse (1)	speed up neurotransmission (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (a)(i)	A description including two of the following points • initial /at the start increase in concentration (1) • 06.00 to 08.00 / 12.00 to 13.00 (1) • decrease in concentration after 08.00 / fall in concentration between 08.00 and 12.00 (1) • increased again at 13.00 (1)	accept specific times eg. at 8.00 concentration high	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a) (ii)	• increase due to food intake (1) • decrease due to glucose being used up / stored /insulin released / doing exercise(1)	accept 8:00 or 13:00 for increase answers must be linked to idea of increase or decrease not simply eating food	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	**C** glycogen in the liver		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	substitution (1) $1.50^2 = 2.25$ or $67.5 / 1.5^2$ (1) evaluation (1) 67.5 ÷ 2.25 = BMI of 30	 accept 45 (1) (as this is the correct calculation without squaring the 1.5) give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation including the following points • physical activity can be performed (to reduce glucose levels) (1) • diet can be controlled (to reduce glucose levels) (1) • take medication (orally or injected) (1)	 accept insulin/ metformin for medication	 **(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**C** photosynthesis		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description of the processes that return carbon dioxide to the atmosphere including • respiration in animals / respiration from arrow 2 (1) • respiration in plants / respiration from arrow 5 (1) • decomposition /respiration by microorganisms / decomposition /respiration arrow 3 (1)	accept trees combusting/burning releasing CO_2 **ignore -** references to arrow 1 returning carbon dioxide to the atmosphere / photosynthesis / references to arrow 4	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(b)	An explanation linking the first bullet point with an explanation including • increase in carbon dioxide levels (1) Plus **one** of the following • respiration/ burning of **fossil** fuels/ waste decaying (1) • deforestation leading to reduced photosynthesis (1)	maximum 1 mark for reason accept named fossil fuel	**(2)**

Question Number	Answer	Acceptable answers	Mark
4 (c)	lichen / blackspot fungus	other air quality indicator species eg. canaries / algae / moss / peppered moths	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(d)	An explanation linking **three** of the following including points • algal bloom/ **increased** algae / **more** algae (1) • blocks sunlight (from plants growing on the bottom of the lake/river) (1) • so stops photosynthesis (1) • (plants die) so decomposers break them down • which use oxygen for respiration /oxygen depletion (1)	Ignore encourages algae to grow Accept bacteria/microorganisms for decomposers No mark for 'plants die' Do not give mark for just low oxygen this must be linked to microorganisms (respiring)	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(a) (i)	homeostasis / thermoregulation / osmoregulation		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a) (ii)	**D** 37 °C		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	An explanation linking the following points • (travel along) sensory neurones (1) • axons / dendrons (1) • as electrical / electric impulses (1) • across synapses (gap between two neurones) (1) • using neurotransmitters (1) • reference to spinal cord /CNS (1) • reference to myelin sheath (1)	dendrites accept signals for impulses ignore electronic	**(4)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	An explanation of thermoregulation in response to a low external temperature • hypothalamus detects a drop in the blood's temperature • vasoconstriction • blood vessels near the surface of the skin constrict • reduce blood flow to the skin • reduce heat loss via radiation • hair erector muscles contract • raises hairs on body to trap a layer of insulating air between cold environment and body surface • reduce heat loss via conduction • shivering will occur • skeletal muscles contract and relax involuntarily • produces respiratory heat to warm up body • hypothalamus detects a rise in the blood's temperature • reference to negative feedback	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation is provided for one of the methods of raising body temperature • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of two of the methods of raising body temperature or one method explained in detail, alternatively a limited explanation of all three methods • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of at least one of the methods of raising body temperature with a simple explanation of two others • most of the steps are identified and are in a logical order and reference **may** be made to hypothalamus and negative feedback • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	(direct) contact (with fungus) / touch / through the skin /surfaces		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	antifungal	fungicide / antibiotics/ *nystatin* / *terbinafine* / *itraconazole*	**(1)**

Question Number	Answer	Acceptable answers	Mark
6 (b)(i)	**C** antibiotic C		**(1)**

Question Number	Answer	Acceptable answers	Mark
6 (b)(ii)	An explanation including 3 of the following points: • lysozymes / enzymes (1) • found in tears (1) • hydrochloric acid (1) • in the stomach (1) • (chemical defence) destroy bacteria / pathogens (1)	accept lungs/saliva for tears stomach acid (1) accept viruses for pathogens Ignore references to mucus	**(3)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	An explanation of how MRSA has increased since 1993 also using the evaluation of data from the graph • the number of patients suffering from MRSA has increased / more cases of MRSA • by over 366 000 since 1993 • data quoted from the graph • ref to poor hygiene in hospitals • MRSA is a bacterium that is resistant to antibiotics • individual bacteria show variation • when a bacterial infection is treated with antibiotics those bacteria with low resistance are destroyed first • the more resistant bacteria survive • if a patient stops taking the antibiotics then the resistant bacteria will live to reproduce • the new bacteria will also be resistant to antibiotics • these bacteria will not be able to be treated with antibiotics so the number of cases continue to rise	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the graph only or the increase in bacteria only • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of the graph with a limited explanation of how bacteria continued to increase • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation (with data) using the graph of the emergence of resistant bacteria which then reproduce, linked to antibiotic treatment • most of the steps are identified and are in a logical order • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Edexcel GCSE

Centre Number	Candidate Number

Biology/Science

Unit B1: Influences on Life

Higher Tier

Thursday 1 March 2012 – Morning **Time: 1 hour**	Paper Reference **5BI1H/01**

You must have: Calculator, ruler	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 0 1 9 6 A 0 1 1 6

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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Disease

1 (a) Smoking tobacco is the cause of 9 out of 10 cases of lung cancer.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The active compound in cigarette smoke that causes lung cancer is

(1)

☒ **A** carbon dioxide

☒ **B** carbon monoxide

☒ **C** nicotine

☒ **D** tar

(ii) One part of cigarette smoke acts on receptor sites in the brain.

Explain why it can be very difficult to give up smoking.

(2)

.....

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(b) Smoking cigarettes can have an effect on reaction times.

State the group of drugs which increase the speed of reactions.

(1)

.....

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(c) Cigarette smoke contains carbon monoxide.

Explain the effect of breathing in carbon monoxide on the function of the blood.

(3)

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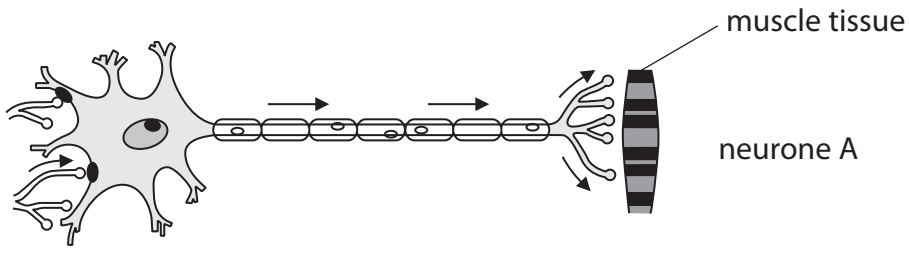
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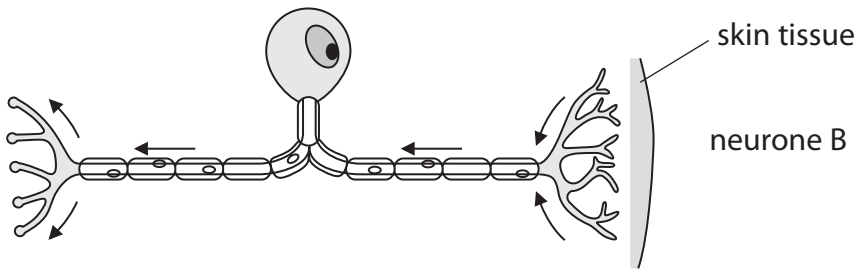
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(Total for Question 1 = 7 marks)

The nervous system

2 The diagrams show the structure of two neurones A and B.





(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) Neurone A is a

(1)

☒ **A** motor neurone

☒ **B** reflex neurone

☒ **C** relay neurone

☒ **D** sensory neurone

(ii) Neurone B sends information to the

(1)

☒ **A** brain and spinal cord

☒ **B** hormones which results in a response

☒ **C** muscle tissue

☒ **D** receptor cells in the skin

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(b) Explain how information travels along the axon of a sensory neurone.

(2)

(c) Describe the role of the myelin sheath.

(2)

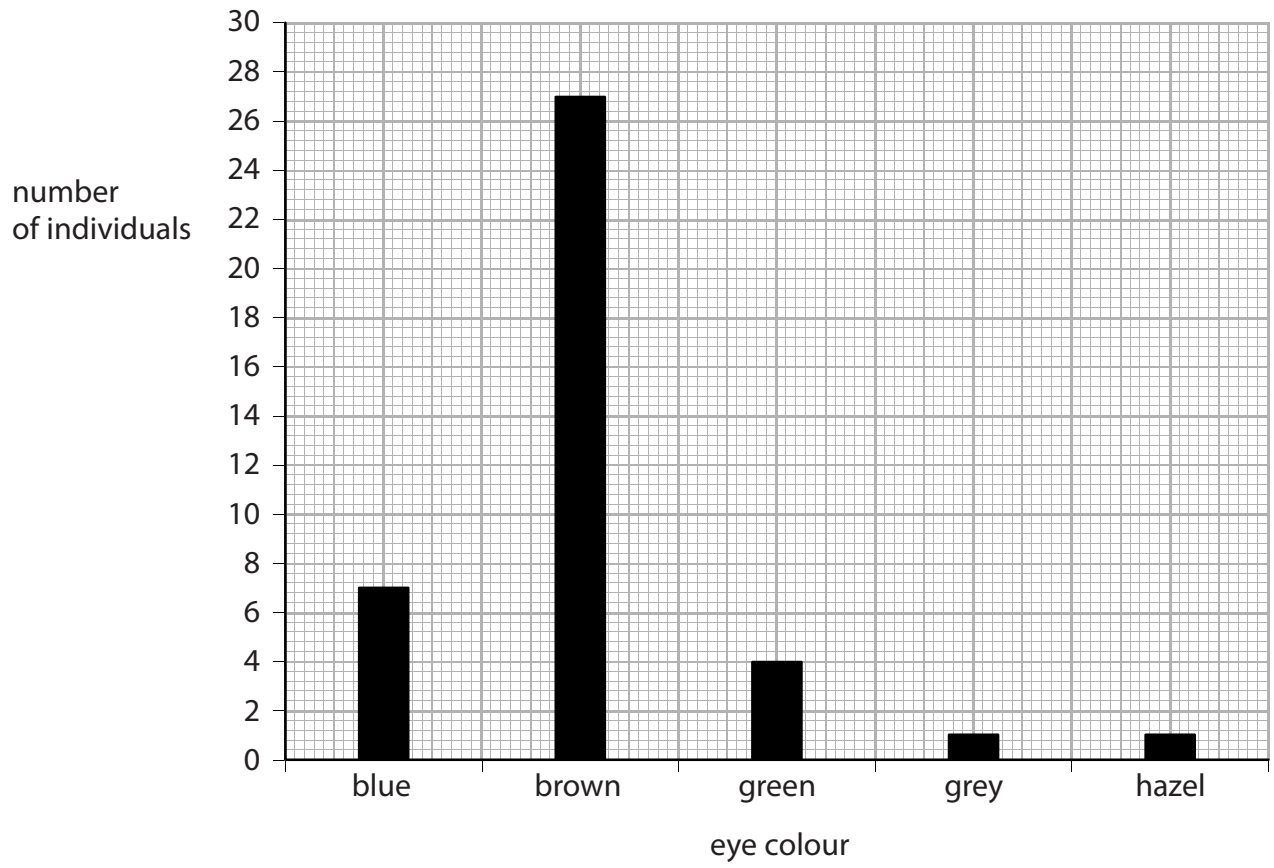
(d) Describe the pathway of a nerve impulse through a reflex arc.

(3)

(Total for Question 2 = 9 marks)

Variation

3 (a) The graph shows the variation in eye colour in a human population.



(i) How many individuals had their eye colour recorded in this human population?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 7

☒ **B** 27

☒ **C** 30

☒ **D** 40

(ii) Calculate the percentage of individuals with brown eyes in this human population.

(2)

answer = ...%

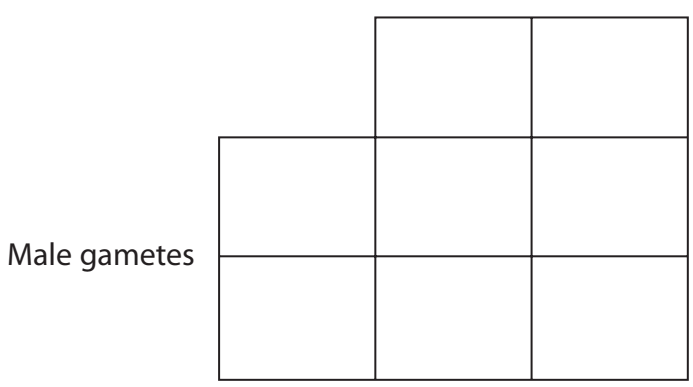
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(b) An individual's eye colour is determined by the alleles they inherit from their parents.

A female parent with the genotype **(bb)** had blue eyes and a male parent with the genotype **(Bb)** had brown eyes.

(i) Complete the Punnett square to show the gametes of the parents and the genotypes of the offspring.

(2)



(ii) If these two parents have one child, state the probability that this child would have blue eyes.

(1)

.....

(iii) Give the genetic term that describes the genotype **(bb)**.

(1)

.....

(c) Variation may arise due to the geographic isolation of a species.

Explain how geographic isolation of members of one species can lead to a new species evolving.

(3)

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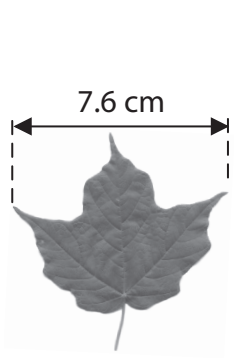
(Total for Question 3 = 10 marks)

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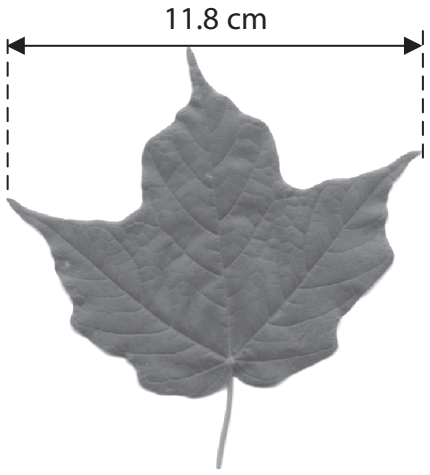
Environmental recycling

4 (a) Plant A was grown in soil with a low concentration of nitrates.
Plant B was grown in soil with a high concentration of nitrates.

Andrew measured the width of a leaf from each of the plants.



leaf from plant A



leaf from plant B

(i) Andrew removed two more of the leaves from each of the plants and measured their width.

The results are shown in the table.

plant	leaf width / cm			
	1	2	3	mean
A	7.6	7.3	7.0	7.3
B	11.8	10.3	11.2	

Calculate the mean leaf width for plant B.

(2)

answer = ...cm

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(ii) Explain the differences in the mean width of the leaves from plant A and plant B.

(2)

.....

.....

.....

.....

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Plants use nitrates to make

(1)

☒ **A** carbohydrates

☒ **B** fats

☒ **C** phosphates

☒ **D** proteins

(c) Explain how different types of bacteria act to increase nitrate concentration in the soil.

(4)

.....

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.....

(d) Name the process by which bacteria release carbon dioxide into the atmosphere.

(1)

.....

(Total for Question 4 = 10 marks)

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Classification

5 (a) Tigers are classified as vertebrates.
The binomial name for the tiger is *Panthera tigris*.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The word *Panthera* in the tiger's binomial name refers to its

(1)

☒ **A** class

☒ **B** genus

☒ **C** order

☒ **D** species

(ii) State the phylum that includes mammals such as tigers.

(1)

.....

(b) Bacteria are classified as prokaryotes.

State **two** characteristics of prokaryotes.

(2)

1 .....

.....

2 .....

.....

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(c) Explain why it is difficult to classify some living organisms.

(2)

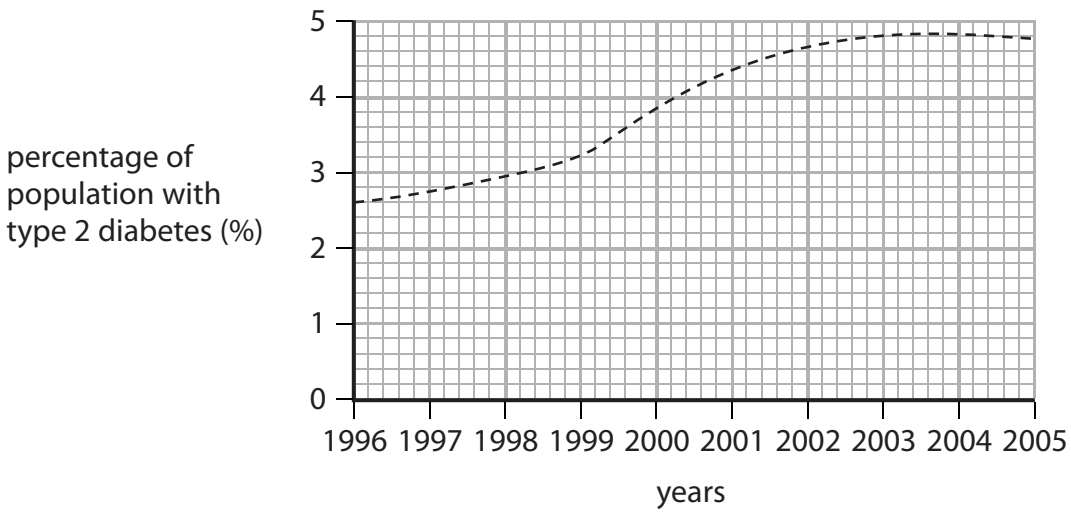
*(d) Describe how scientists classify vertebrates into different groups.

(6)

(Total for Question 5 = 12 marks)

Diabetes

6 (a) In the UK, there has been an increase in the percentage of the population with type 2 diabetes.



(i) The population of the UK between 1996 and 2005 was 60 million.

Calculate the increase in the number of people with type 2 diabetes between 1996 to 2005.

(2)

answer = ...people

(ii) Suggest **two** reasons for this increase in the number of people with type 2 diabetes.

(2)

.....

.....

.....

.....

P 4 0 1 9 6 A 0 1 2 1 6

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(b) Explain how type 2 diabetes can be controlled without the use of drugs.

(2)

*(c) Explain how blood glucose levels are controlled in people who do **not** have diabetes.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

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5BI1H/01 Mark Scheme
March 2012

Question Number	Answer	Acceptable answers	Mark
1 (a) (i)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	An explanation linking the following points • nicotine (1) • addictive / causes you to want more (1) • as the receptor sites in the brain become more used to the nicotine it has less effect / increased amounts are needed for the same effect (1)	makes you crave it	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	stimulants	**Accept** any reasonable spelling of the term e.g. stimulents	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	An explanation linking **three** of the following points • carbon monoxide binds with red blood cells (1) • containing haemoglobin (1) • this reduces the oxygen carrying capacity of the blood (1)	accept blood for red blood cells **Accept** oxyhaemoglobin less oxygen is carried in the blood **Accept** references to carboxyhaemoglobin	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	A		**(1)**

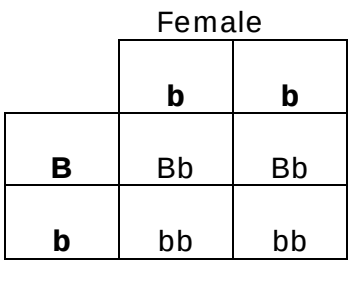
Question Number	Answer	Acceptable answers	Mark
2(b)	an explanation linking the following • from receptor (cells) / sense organ (1) • to the {brain / spinal cord / CNS / synapse / other neurone}(1) • as an <u>electrical</u> impulse (1)	Accept named sense organ <u>electrical</u> message/signal Ignore references to current	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)	a description including **two** of the following • insulates (electrical signal) (1) • the axon (1) • speeds up the impulse (1)	ignore protects / protection accept message / signal for impulse	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(d)	a description including **three** of the following • receptor cells (pick up a stimulus) (1) • sensory neurone sends a message to the spinal cord / relay neurone / CNS (1) • the message travels from the relay neurone / CNS / spinal cord to the motor neurone (1) • (this initiates a response) in the effector / muscle / gland (1) • message travels across synapse (by neurotransmitters) (1)	accept the correct nerve pathway diagram for 3 marks accept nerve for neurone	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	substitution (1) 27 ÷ 40 evaluation (1) 0.675 x 100 67.5 (%)	e.c.f from 3(a)(i) accept 68(%) for 2 marks give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	 gametes in male/female gametes headings (1) offspring genotypes (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	0.5 / 50% / 50/50 / ½ / 2/4 / 2:2 /even chance	evens	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	homozygous recessive homozygous recessive	Accept any reasonable spelling of the term Reject heterozygous	 **(1)**

Question Number	Answer	Acceptable answers	Mark
3 (c)	an explanation linking **three** of the following • speciation (1) • different geographical area may have different selection pressures / environmental conditions (1) • those individuals of a species suited /adapted / to this environment will survive and **breed** (1) • adaptations/genes passed down to the offspring • new species unable to breed with original (1)	named environmental conditions e.g. climate Accept survival of the fittest	 **(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	substitution (1) 11.8 + 10.3 + 11.2 = 33.3 evaluation (1) 33.3 / 3 = 11.1(cm) (1)	 e.c.f if substitution answer is incorrect give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	An explanation linking the following points • (plant B) leaves are larger because they have a higher concentration of nitrate (1) • (nitrates are) required for making protein / growth (1)	 mean is higher as plant has more nitrates	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	an explanation linking the following points • nitrogen fixing bacteria (1) • fix nitrogen gas for the plant (1) • decomposing bacteria / decomposers (1) • decompose / break down animal / plant matter / protein / urea (1) • into ammonia (1) • (then) nitrifying bacteria (1) • convert ammonia / nitrites into nitrates (1)	nitrogen fixing bacteria convert nitrogen into nitrates / nitrogen compounds (2)	**(4)**

Question Number	Answer	Acceptable answers	Mark
4(d)	respiration / respiring / respire decomposition /decomposing / decompose	any reasonable spelling of either term	**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (a) (i)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (a) (ii)	chordata	chordates accept any reasonable spelling of the term	**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (b)	Any **two** of the following • unicellular (1) • do not have nucleus / DNA in cytoplasm (1) • circular DNA / plasmids (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (c)	an explanation linking **two** of the following • there are variations within a species • some organisms have similar features / features that are common to more than one {group / species / kingdom}(1) • some closely related species can interbreed / breed with each other (1) • hybrids can be produced (1)	allow references to specific organisms such as the duck billed platypus / axolotl / kiwi	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(d)**	A description including some of the following • physical external characteristics of vertebrates such as fur/ feathers / smooth skin • vertebrates can be classed further through how they absorb oxygen • fish have gills to absorb oxygen from the water they swim in • mammals /reptiles / birds all have lungs to absorb oxygen • young amphibians have gills but adult amphibians have lungs / diffuse oxygen through moist skin • vertebrates can be classed further based on their reproductive method • external fertilisation in fish (water fertilisation usually) • internal fertilisation in mammals /birds • lay eggs in bird vertebrates / oviparous or whether they give birth to live young in mammalian vertebrates / viviparous • vertebrates can be classed further based on their thermoregulation • reptiles will use poikilothermic processes to regulate their body temperature • mammals/birds will use homeothermic processes to regulate their body temperature	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of one or more method of the classification of vertebrates probably limited to physical external characteristics • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of two or more methods of classification of vertebrates of which one must be thermoregulation, fertilisation, reproduction or oxygen absorption • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of two or more methods of the classification of vertebrates including either oxygen absorption methods, thermoregulation, fertilisation, reproductive methods with correct scientific terms included • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	substitution (1) 4.8 – 2.6 = 2.2 (%) evaluation (1) 2.2 x 600 000 = 1320 000	give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	Any **two** of the following points • (increase in people who are) overweight / have a high BMI / are obese (1) • (increased number of people) who do not take enough exercise (1) • increased calorie intake (1) • increase in elderly population (1)	(Increased number of people) who eat too much / eat the wrong types of food / eat too much fat / sugar / carbohydrates	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation including **two** of the following points • diet to lose weight (1) • reduce the amount of carbohydrates / glucose (1) • take more exercise so reduce blood glucose levels (1)	accept sugar for glucose	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	An explanation linking some of the following points **When blood glucose is high** • insulin is released from the pancreas • the insulin converts the excess glucose • into glycogen • which is stored in the liver • blood glucose levels are reduced **When blood glucose levels are low** • glucagon is released from the pancreas • the glucagon coverts glycogen • from the liver • into glucose • blood glucose levels are raised This is a homeostatic mechanism which maintains the correct glucose levels in the bloodstream	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of blood glucose regulation including the role of hormones, specific hormones do not need to be mentioned • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of blood glucose regulation including the role of insulin or glucagon and some of the body organs involved • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of blood glucose regulation including the role of the liver and pancreas and the methods of reducing and raising blood glucose concentrations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Edexcel GCSE

Centre Number	Candidate Number

Biology/Science

Unit B1: Influences on Life

Higher Tier

Tuesday 8 November 2011 – Afternoon **Time: 1 hour**	Paper Reference **5BI1H/01**

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 0 1 7 5 A 0 1 1 6

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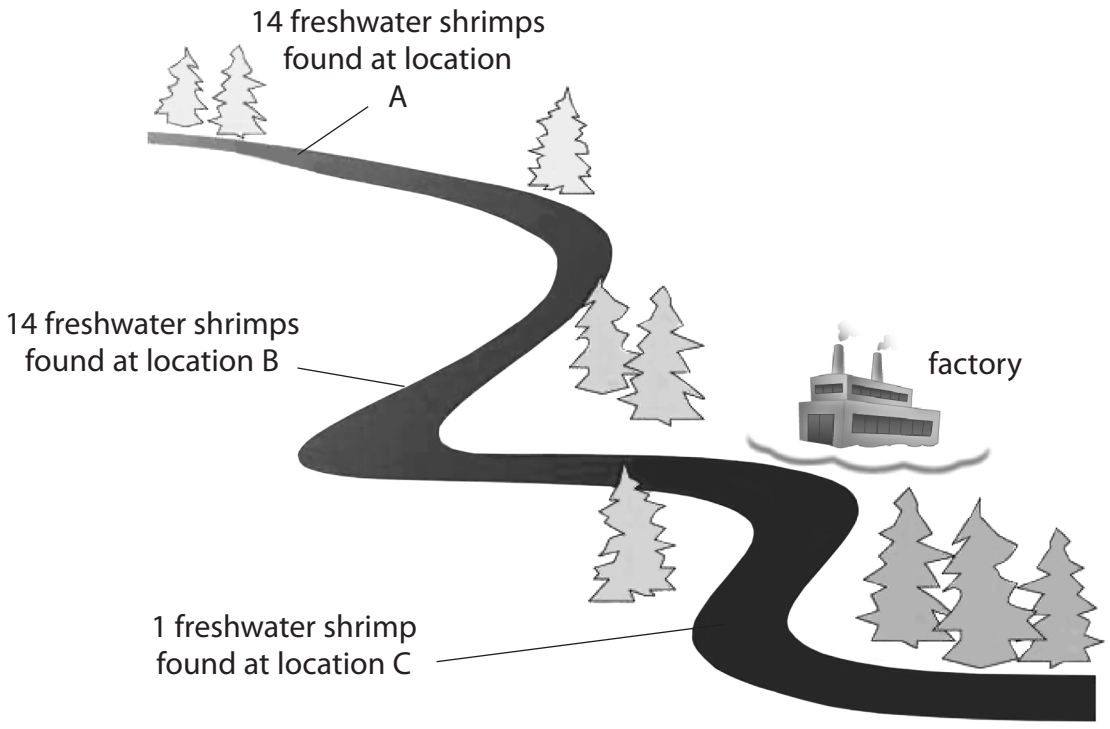
Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Water pollution

1 Catherine is an environmentalist studying water pollution in the stream shown in the diagram.

She took samples of water from locations A, B and C and recorded the number of freshwater shrimps at each location on the diagram.



(a) Explain which location in the stream is most polluted.

(2)

.....

.....

.....

.....

P 4 0 1 7 5 A 0 2 1 6

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(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Location A had other organisms present.

These organisms are likely to be

(1)

☒ **A** blackspot fungus

☒ **B** bloodworm

☒ **C** sludgeworm

☒ **D** stonefly

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The factory shown in the diagram produces nitrate fertilisers.

Some nitrate fertilisers leaked into the stream and caused

(1)

☒ **A** combustion

☒ **B** decomposition

☒ **C** eutrophication

☒ **D** nitrification

(d) Describe what will happen to the organisms in the stream when nitrates leak from the factory.

(4)

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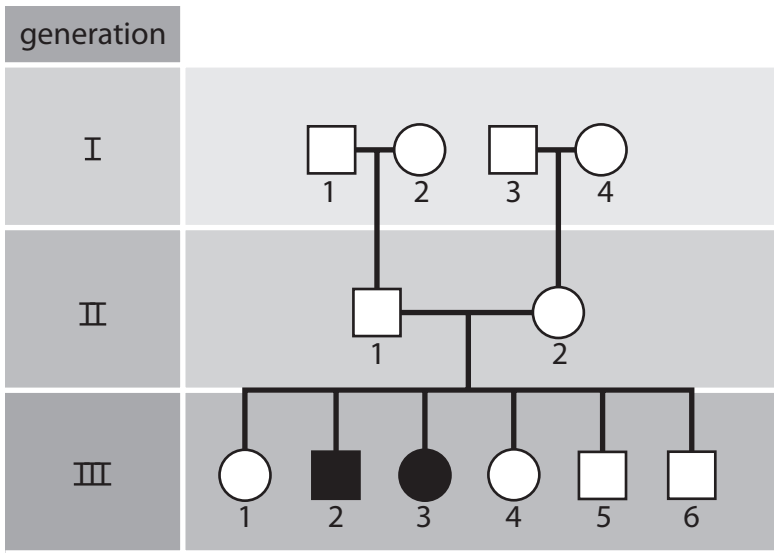
(Total for Question 1 = 8 marks)

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Monohybrid inheritance

2 Cystic fibrosis is a genetic disorder caused by recessive alleles.

The diagram shows the inheritance of cystic fibrosis in a family.



key		
female	male	
○	□	unaffected individual
●	■	affected individual

(a) (i) State the number of offspring in generation III who will have the disorder cystic fibrosis.

(1)

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

In generation III, individual 3 is

(1)

☒ **A** a carrier of the cystic fibrosis allele

☒ **B** heterozygous for cystic fibrosis

☒ **C** homozygous dominant for cystic fibrosis

☒ **D** homozygous recessive for cystic fibrosis

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(iii) Explain why both individuals in generation II must be heterozygous for cystic fibrosis.

(2)

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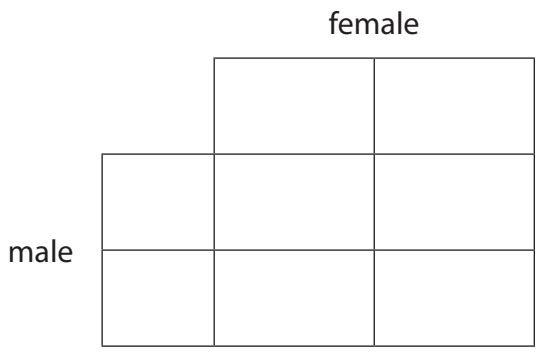
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(b) Complete the Punnett square to illustrate the inheritance of cystic fibrosis from the two heterozygous parents in generation II.

Use B for the dominant allele and b for the recessive allele.

(2)



(c) Explain why pedigree analysis would be important to the unaffected individuals in generation III.

Use percentages or ratios to help illustrate this.

(2)

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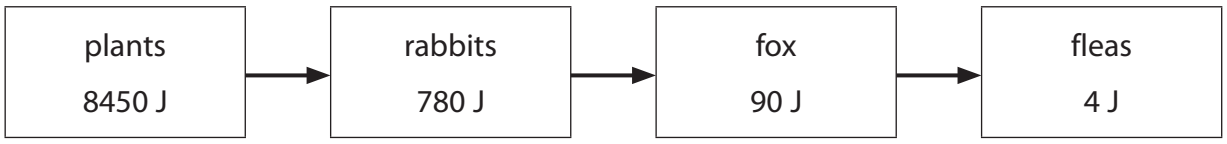
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(Total for Question 2 = 8 marks)

Energy

3 Scientists can show the relationships between organisms in a variety of ways.

This food chain shows the energy content at each trophic level.



(a) (i) Calculate the percentage of energy that is transferred from the rabbits to the fox.

(2)

answer = ...%

(ii) State **two** ways in which energy can be lost between the trophic levels of the rabbit and the fox.

(2)

1 .....

.....

2 .....

.....

P 4 0 1 7 5 A 0 6 1 6

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(b) Suggest how a farmer rearing chickens could limit energy loss from the chickens.

(2)

.....

.....

.....

.....

(c) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Fleas are parasites that feed on foxes.

Another example of parasites are

(1)

☒ **A** cleaner fish

☒ **B** lichens

☒ **C** mistletoe

☒ **D** oxpeckers

(ii) Peas and beans are known as legumes.
They form a mutualistic relationship with the bacteria in their roots.

Explain the importance of this mutualistic relationship to the legumes.

(3)

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(Total for Question 3 = 10 marks)

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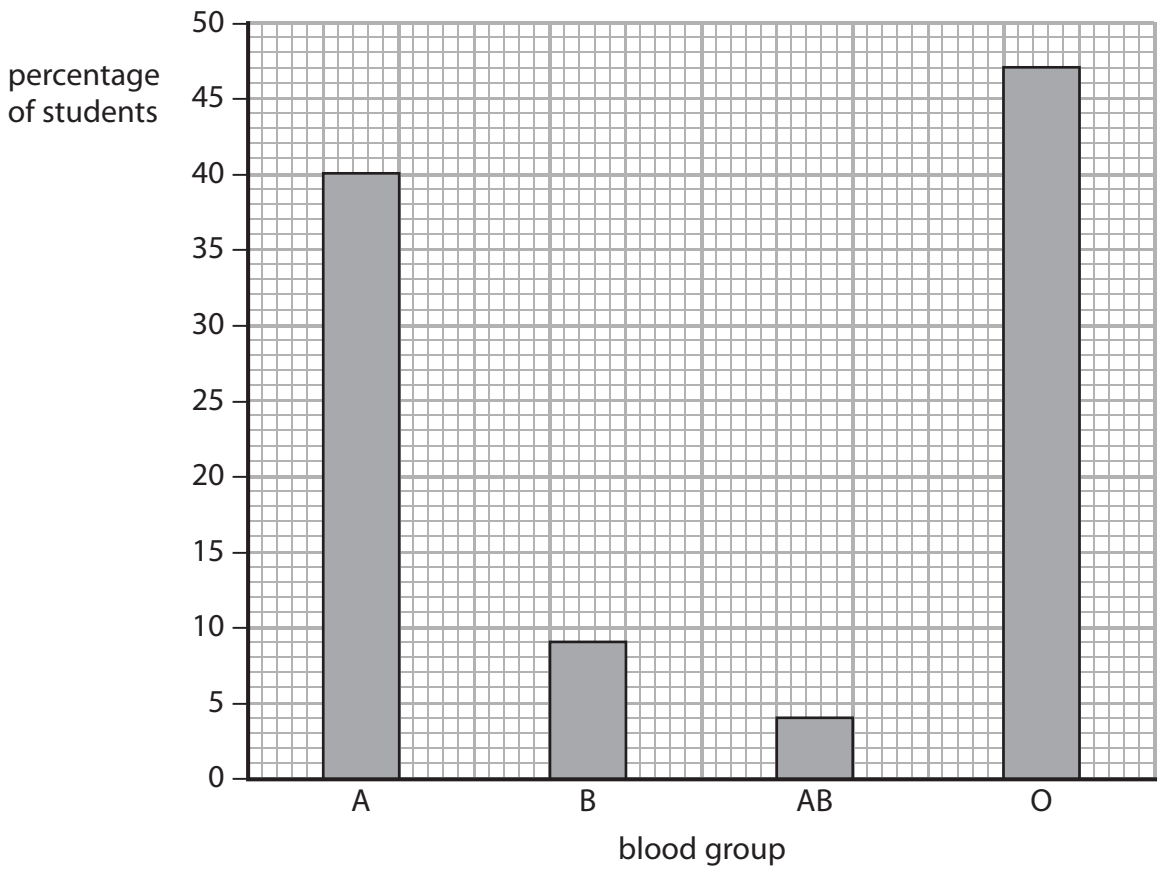
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Human variation

4 Mike was investigating variation in a school of 650 students.
He recorded the blood group and measured the heights of the students.

The graph shows the variation in blood group.



(a) (i) Calculate how many of the 650 students have blood group A.

(2)

number of students with blood group A = ...

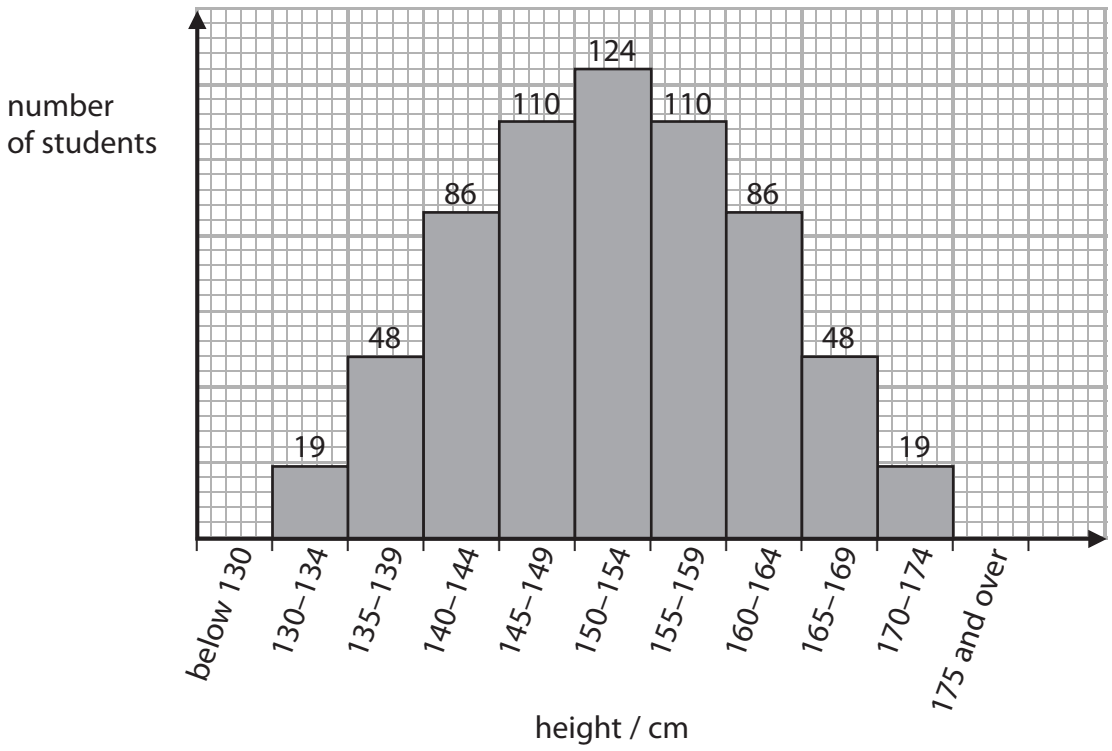
(ii) State the type of variation shown in the graph for the blood groups of students.

(1)

.....

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(b) The graph shows the variation in height.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The range in heights of the students is due to

(1)

☒ **A** environmental influences only

☒ **B** genetic influences only

☒ **C** environmental and genetic influences

☒ **D** neither environmental nor genetic influences

(ii) Describe the variation in height of these students, as shown in the graph.

(3)

P 4 0 1 7 5 A 0 1 0 1 6

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(c) Taller animals may have an evolutionary advantage.

Explain how evolution by natural selection brings about changes in a species.

(3)

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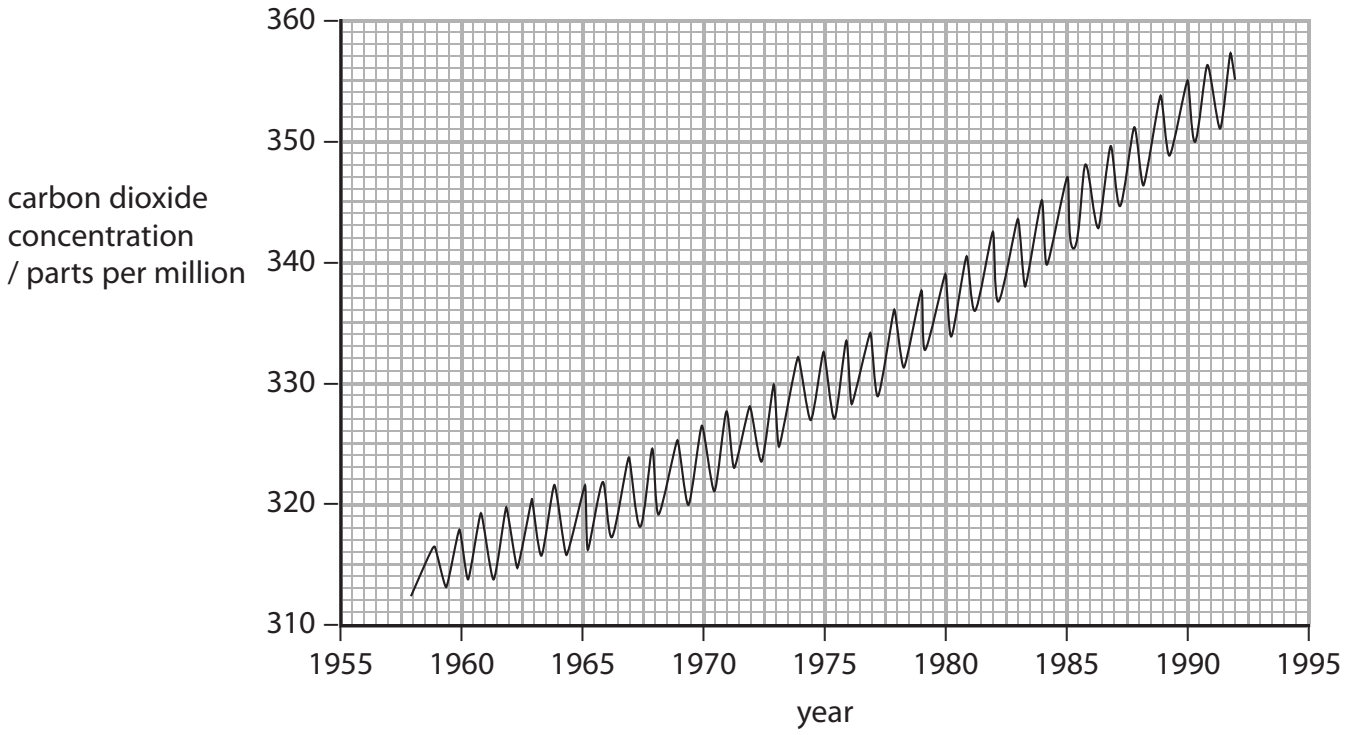
(Total for Question 4 = 10 marks)

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The carbon cycle

5 Carbon dioxide concentration in the air is thought to be changing as a result of human population increase.

The graph shows how the concentration of carbon dioxide in the atmosphere has changed in Europe between 1958 and 1992.



(a) (i) Describe the main trend shown in the graph.

(1)

.....

.....

(ii) Calculate the difference in atmospheric carbon dioxide concentration in Europe between 1980 and 1990.

(2)

answer = ... parts per million

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(iii) The carbon dioxide concentration changes during each year.

Suggest why the carbon dioxide concentration changes during a year.

(3)

*(b) Carbon is present in a wide variety of compounds in the carbon cycle.

Describe how carbon is cycled in the environment.

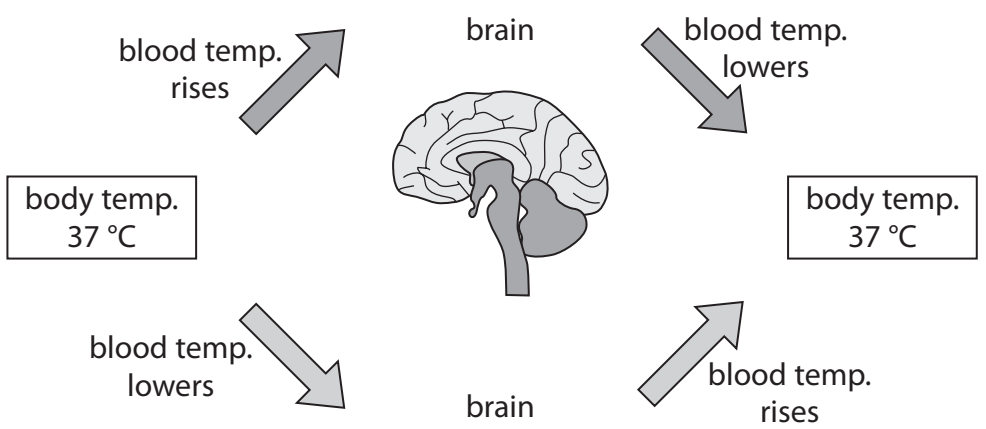
(6)

(Total for Question 5 = 12 marks)

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Thermoregulation

6 (a) The diagram shows the regulation of body temperature.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The type of control shown in the diagram is known as

(1)

☒ **A** negative feedback

☒ **B** osmoregulation

☒ **C** positive feedback

☒ **D** variation

(ii) State the part of the brain that controls body temperature.

(1)

.....

(b) Describe **one** way in which the skin helps in the control of body temperature.

(2)

.....

.....

.....

.....

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(c) Explain why humans need to maintain their body temperature at 37 °C.

(2)

*(d) Explain how changes in the volume of blood going through the skin help to maintain body temperature.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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5BI1H/01 Mark Scheme
November 2011

Question Number	Answer	Acceptable answers	Mark
1(a)	C (1) least amount of freshwater shrimps found at C (1)	Reference to freshwater shrimps as indicator species freshwater shrimps can only survive in clean water / cannot survive in polluted water more shrimps die in polluted water	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)	A description of the process linking **four** of the following points: • algae (on the surface) of the stream show rapid growth (1) • (they) block light to the photosynthesising plants below (1) • (causing) plants on the stream bed to die (1) • decomposers use up oxygen to break down these dead plants (1) • other organisms die due to lack of oxygen (1)	algal bloom occurs / large increase in growth of algae /other plants grow quickly **Accept** microorganisms / microbes / bacteria **Accept** reference to anaerobic bacteria can function in anoxic conditions - not against a current marking point	**(4)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	2 / two	(offspring) 2 and 3	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	An explanation linking **two** of the following points: • two of the offspring from generation II had CF (1) • the children with cystic fibrosis must have inherited 1 recessive allele from each parent / children must have 2 recessive alleles (1) • both parents must have 1 recessive allele / be carriers of the CF **allele** (1)	ORA if homozygous dominant then no CF offspring Ignore: references to genes ORA if homozygous recessive offspring would have CF	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	correct gametes (1) correct offspring (1) B b B BB Bb b Bb bb	Accept bB instead of Bb	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)	An explanation linking **two** of the following: • pedigree analysis will determine the likelihood that their offspring could inherit the CF allele(1) • if heterozygous there is a 50% chance (that the CF allele) will be passed on / if 2 heterozygous parents 25% chance the offspring will have CF(1) • if either parent is homozygous dominant there is 0% chance that their offspring could have the disease(1)	Accept to see if they are a carrier of the CF allele **Accept** ratios rather than percentages 2 in 4 chance	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	$\frac{90}{780}$ = 0.115 (1) x 100 = 11.5(%) (1)	**Accept** 12%	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	Any **two** from the following points • respiration (1) • excretion / egestion (1) • temperature regulation (1) • movement / exercise • not all eaten (1)	energy lost as heat	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)	Any **two** from the following points: • keep them in a warm environment (1) • restrict their movement (1) • provide {high energy / low wastage / easily digestible} food (1) • treat parasites (1)	Ignore feed more	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	An explanation linking the following points: • bacteria provides nitrates for the plants (1) • (by) nitrogen-fixation / converting nitrogen into nitrates (1) • (nitrates) provide protein / for growth (1)	**Accept** nitrogen-fixing bacteria	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	650 ÷ 100 (1) x 40 = 260 (1)	10% of 650 = 65 65 x 4 = 260	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	discontinuous (variation)	**Ignore** genetic variation (as not shown in the graph) **Accept** discrete	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	A description including the following points: • continuous variation / data (1) • normal distribution curve (1) • correct interpretation of data from the graph (1)	bell shaped curve e.g most common height range 150 – 154	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(c)	An explanation linking **three** of the following points: • most individuals within a population vary slightly from one another (1) • most organisms produce more young than will survive to adulthood / overproduction (1) • there is much competition within and between species (1) • those organisms with advantageous characteristics will survive (1) • the advantageous characteristics will be inherited / better adapted organisms are more likely to survive to reproduce (1)	taller animals outcompete smaller animals for food survival of the fittest the genes for the characteristics will be passed on / offspring will have the desired characteristics	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	increase in CO_2 concentration (over time)	positive correlation	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	355 ppm (1990) – 339 ppm (1980) (1) 16 (1)	**Accept:** tolerance 14 -18 2 marks for overall correct answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	Any **three** from the following points: • seasonal / weather changes (1) • due to less leaves on trees/less plants less photosynthesis and CO_2 removed from the atmosphere (1) • more fossil fuels / wood may be burned during colder weather (1)	Accept refs to summer / winter more photosynthesis in the summer more car usage in summer / winter	**(3)**

Question Number		Indicative Content	Mark
QWC	***5 (b)**	A description including some of the following points: • photosynthetic material/plants will remove CO_2 from the atmosphere • these plants will use the CO_2 to make glucose • plant respiration will release CO_2 into the atmosphere • animals will eat the plants which contain carbon • animals and plants will eventually die and decay due to microbial/bacterial action releasing CO_2 • the combustion/burning of fossil fuels will release CO_2 into the atmosphere • the burning of carbon based products made from trees will release CO_2 into the atmosphere	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of **one** of the processes of the carbon cycle • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of **two** of the processes of the carbon cycle including one method of adding carbon dioxide and one method of removing carbon dioxide • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of **most** of the processes of the carbon cycle that releases and removes carbon dioxide • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately to describe the carbon cycle • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	Hypothalamus	Accept alternative spellings e.g. hypothalamus / hyperthalamus	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)	A description linking **two** of the following points: • erector muscles in the skin contract (1) • cause the hair to rise to trap air close to the skin to reduce heat loss / insulates skin (1) **OR** • sweat glands release water / sweat (1) • evaporates and cools the skin (1) **OR** • (brief description of) vasodilation or vasoconstriction (1) • method of control (1)	hairs on the surface of the skin stand on end	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)	An explanation linking **two** of the following points • in order for the enzymes to be most effective / best /optimum temperature for enzymes to work (1) • for chemical reactions to happen (1) • at too high temperatures enzymes are denatured (1)	**Accept** named enzyme Accept named chemical reaction ORA at colder temperatures enzymes are less active	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	An explanation linking some of the following points: • vasodilation and vasoconstriction help control body temperature • in vasodilation more warm blood flows near the surface of the skin • as the shunt valve stops blood flowing by another route • more heat can be radiated or convected from the skin • body temperature is reduced • in vasoconstriction less blood flows near the surface of the skin • as it flows through the shunt valve • body temperature returns to normal	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of thermoregulation although the processes of vasodilation and vasoconstriction are not mentioned • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of either vasodilation or vasoconstriction this may be a description but not include the words vasodilation and vasoconstriction • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of both vasodilation and vasoconstriction including references to either the method of heat loss or the role • there is coherent flow of content and accurate use of scientific terminology to explain thermoregulation • spelling, punctuation and grammar are used with few errors	

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