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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Wednesday 6 May 2020

Morning (Time: 1 hour 45 minutes) | Paper Reference **4HB1/02**

Human Biology

Unit: 4HB1

Paper: 02

You must have:
Ruler
Calculator

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.*
- Show all the steps in any calculations and state the units.
- 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 ☒.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

1 (a) Different types of organisms cause diseases.

Diseases are transmitted in different ways.

The table lists three diseases.

Complete the table by giving the type of organism that causes each disease and the method of transmission for each disease.

(6)

Name of disease	Type of organism	Method of transmission
malaria		
poliomyelitis		
typhoid		

(b) Explain why it is not possible to treat athlete's foot using antibiotics.

(2)

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(Total for Question 1 = 8 marks)

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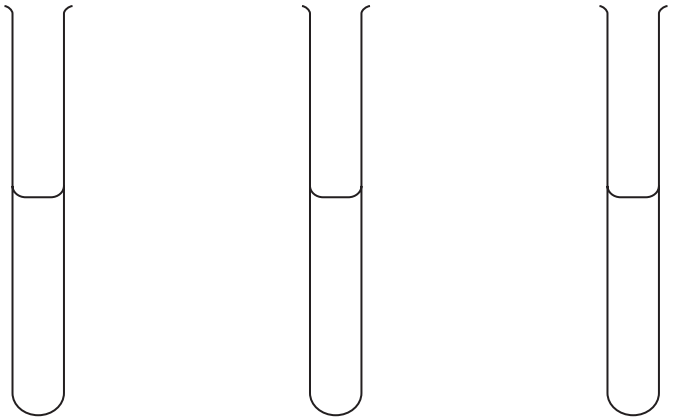
2 A student investigates the effect of bile salts on the digestion of lipids. The student uses milk as a source of lipids.

The student sets up three test tubes.



A **B** **C**

Table 1 lists the contents of each test tube.

Test tube A	Test tube B	Test tube C
5 cm^3 of milk	5 cm^3 of milk	5 cm^3 of milk
2 cm^3 of sodium hydrogencarbonate	2 cm^3 of sodium hydrogencarbonate	2 cm^3 of sodium hydrogencarbonate
6 drops of phenolphthalein	6 drops of phenolphthalein	6 drops of phenolphthalein
1 cm^3 enzyme	1 cm^3 enzyme	1 cm^3 boiled enzyme
distilled water	bile salts	bile salts

Table 1

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The student records the colour of the contents of each tube at the start of the investigation, and at 5 minute intervals for 15 minutes.

Table 2 shows the student's results.

	Colour of contents		
	Tube A	**Tube B**	**Tube C**
at start	pink	pink	pink
after 5 minutes	pink	colourless	pink
after 10 minutes	pink	colourless	pink
after 15 minutes	colourless	colourless	pink

Table 2

Phenolphthalein is pink in solutions above pH 10 and colourless in solutions below pH 8.

(a) (i) Which enzyme is used in this investigation?

(1)

☒ **A** amylase

☒ **B** carbohydrase

☒ **C** lipase

☒ **D** protease

(ii) Which chemical elements are found in lipids?

(1)

☒ **A** carbon, hydrogen and oxygen

☒ **B** carbon, hydrogen, oxygen and nitrogen

☒ **C** carbon, hydrogen, oxygen and sulfur

☒ **D** carbon, hydrogen, oxygen, nitrogen and sulfur

(iii) Where in the body are bile salts produced?

(1)

☒ **A** brain

☒ **B** duodenum

☒ **C** liver

☒ **D** pancreas

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(b) Explain the purpose of tube C.

(2)

(c) Suggest one reason for the addition of the sodium hydrogencarbonate.

(2)

(d) Describe the effect of bile salts on lipid digestion in this investigation.

(3)

(Total for Question 2 = 10 marks)

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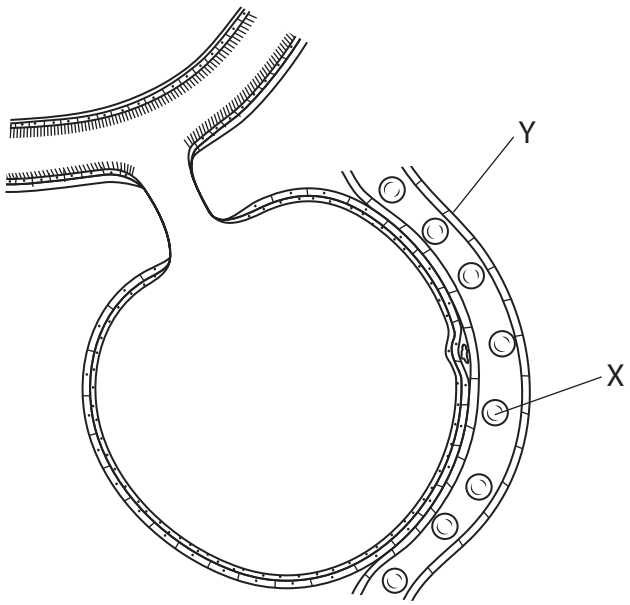
3 The diagram shows an alveolus and its blood supply.



(a) (i) What is the name of blood component X?

(1)

- ☒ **A** plasma
- ☒ **B** platelet
- ☒ **C** red blood cell
- ☒ **D** white blood cell

(ii) State three ways in which air in the alveolus differs from air in the atmosphere.

(3)

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(iii) Give three features of alveoli that allow efficient gas exchange.

(3)

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(b) Structure Y is a capillary.

Give two features in the diagram which show that structure Y is a capillary.

(2)

1 .....

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2 .....

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(c) Some people have a condition known as emphysema. One symptom of emphysema is the breakdown of elastic fibres in the lung tissue.

Suggest the effects that loss of elastic fibres have on a person's ability to breathe.

(2)

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(Total for Question 3 = 11 marks)

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4 Aspirin is the active ingredient used in some tablets to relieve pain.

Aspirin becomes acidic when it dissolves in the body. The faster aspirin dissolves, the faster it can relieve pain.

A student investigates if it is better to mix sucrose or starch with the active ingredient to make an aspirin tablet.

This is the student's method.

- add distilled water to three beakers, A, B and C
- add 1 aspirin tablet to each beaker
- add 5 g of sucrose to beaker B
- add 5 g of starch to beaker C
- measure the pH of the contents of each beaker at the start of the investigation
- measure the pH of the contents of each beaker every minute for 5 minutes

The table shows the student's results.

Beaker	pH of contents of beaker					
	at start	1 minute	2 minutes	3 minutes	4 minutes	5 minutes
A – aspirin	7.6	7.1	6.6	6.2	5.8	5.4
B – aspirin and sucrose	7.2	6.7	6.3	5.7	5.2	4.7
C – aspirin and starch	7.1	7.2	7.3	7.3	7.4	7.4

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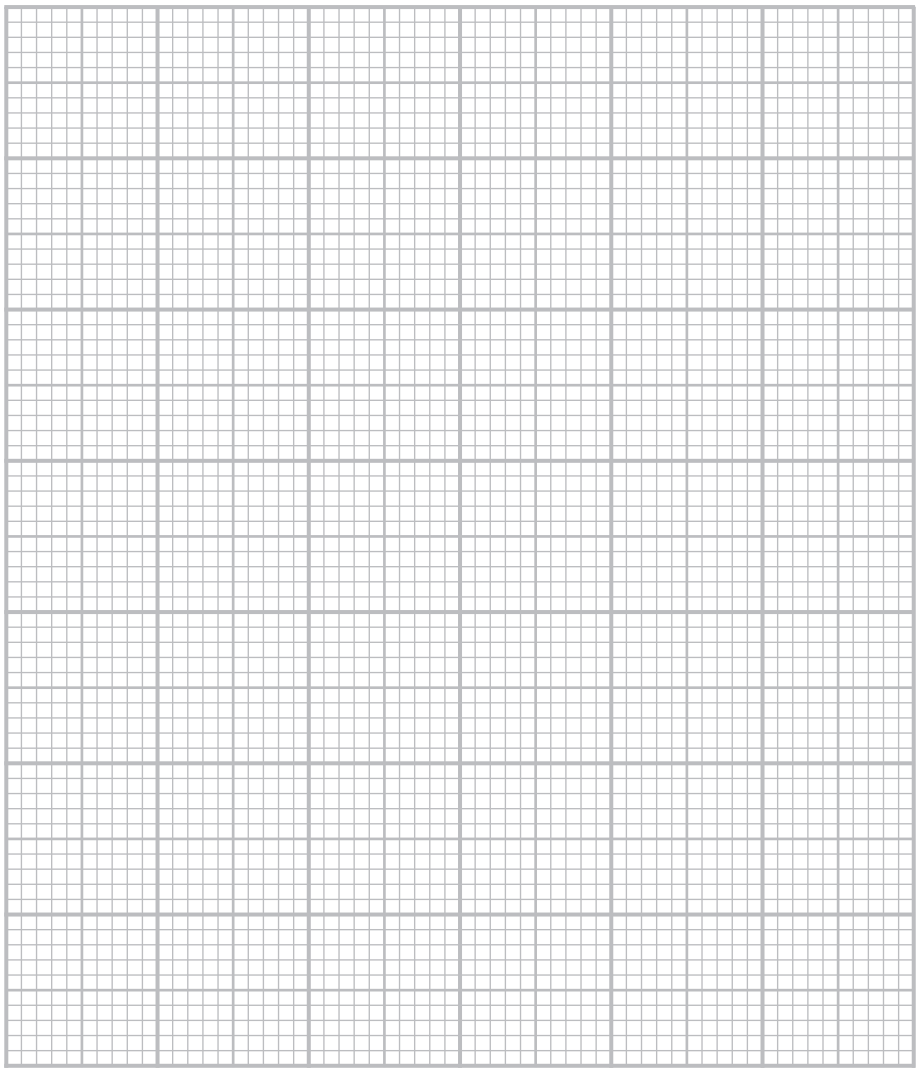
(a) (i) Plot a graph of the student's results.

Join the points with straight lines.

(5)



(ii) State two variables that should be controlled in this investigation.

(2)

1 .....

2 .....

(iii) Name the dependent variable in this investigation.

(1)

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(b) Explain how the results of this investigation could help a manufacturer improve the effectiveness of its aspirin tablets.

(3)

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(Total for Question 4 = 11 marks)

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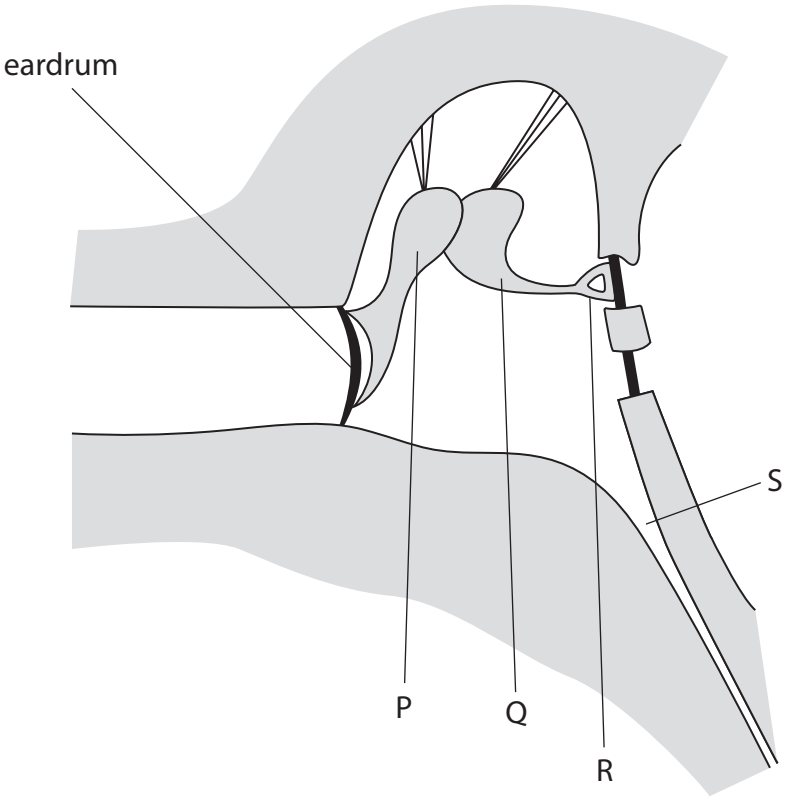
5 The diagram shows part of a human ear.



(a) (i) Give the name of structure S.

(1)

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(ii) Name three parts of the ear that are **not** shown on the diagram.

(3)

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2 .....

3 .....

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(b) (i) Describe the functions of structures P, Q and R.

(4)

(ii) What is the name of the medium directly surrounding structures P, Q and R?

(1)

- ☒ **A** air
- ☒ **B** bone
- ☒ **C** fluid
- ☒ **D** oxygen

(c) Explain the importance of structure S in the process of hearing.

(3)

(Total for Question 5 = 12 marks)

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6 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

The effects of alcohol

Humans have been drinking alcohol for thousands of years. Drinking too much alcohol over many years can cause diabetes, malnutrition and diseases of the central nervous system and the liver. One immediate side effect of drinking too much alcohol is increased urination.

Beer is about 95% water and only 5% alcohol. The liver converts that 5% of alcohol into the same volume of water and some carbon dioxide. So if a person drinks 200 cm^3 of beer (one unit), the end result is 200 cm^3 of water. However, this person will not just urinate 200 cm^3 of urine, in fact the person urinates a total of 320 cm^3 of urine. So in general each unit of alcohol makes the person urinate an extra 120 cm^3 of urine more than the normal urine output.

A person with a mass of 60 kg produces 60 cm^3 of urine an hour and a person with a mass of 80 kg produces 80 cm^3 an hour and so on. Therefore if a 60 kg person drinks 200 cm^3 of beer in an hour they will produce 60 cm^3 of urine plus 320 cm^3, making a total of 380 cm^3.

Alcohol interferes with the mechanism that regulates water levels in our body because alcohol affects a small gland called the pituitary gland. One hormone released by the pituitary gland is anti-diuretic hormone (ADH). Alcohol reduces how much ADH is released by the pituitary. Each unit of alcohol that a person drinks forces the kidneys to produce an extra 120 cm^3 of urine more than the normal output.

Logic suggests that drinking lots of water would replace the 120 cm^3 of urine produced, but it is not that simple. The body only retains half the water that a person drinks. The other half leaves the body in urine, so the person will become dehydrated even if they drink lots of water.

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(a) (i) Where in the body is the pituitary gland (line 16)?

(1)

- ☒ **A** brain
- ☒ **B** kidney
- ☒ **C** liver
- ☒ **D** pancreas

(ii) Which system includes the pituitary gland (line 16)?

(1)

- ☒ **A** digestive
- ☒ **B** endocrine
- ☒ **C** nervous
- ☒ **D** skeletal

(b) A person weighs 75 kg and drinks 400 cm^3 of beer in an hour (lines 11–14).

(i) Calculate the volume of urine produced by the person in this hour.

(3)

volume of urine = ... cm^3

(ii) Calculate the percentage increase in the volume of urine produced by this person in this hour.

(3)

percentage increase = ... %

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(c) Describe the effect of ADH on the kidney (line 17).

(2)

(d) Suggest the effects of dehydration on the blood after increased urination.

(2)

(e) Explain why half of the extra water that the person drinks still leaves the body in the urine (lines 21–24).

(3)

(Total for Question 6 = 15 marks)

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7 (a) Give two differences between whole blood and plasma.

(2)

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2 .....

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(b) Ebola is an infectious disease. One symptom of Ebola is blood loss.

The World Health Organisation (WHO) has a procedure for treating Ebola.

This is the WHO's procedure.

- find a person who has recovered from Ebola
- observe this person to make sure that they are disease free for 28 days
- take blood from this person and test the blood for other diseases
- separate the plasma from the blood
- transfer this plasma to another person who has Ebola

Explain how the WHO procedure helps to treat a person who has Ebola.

(6)

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(Total for Question 7 = 8 marks)

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8 Haemophilia is a sex-linked condition caused by a recessive allele X^h instead of the usual X^H.

Haemophilia is the result of a mutation.

(a) Explain what is meant by the term **mutation**.

(3)

(b) (i) A man without haemophilia and a woman who is a carrier of haemophilia have a child.

Draw a genetic diagram to show the possible genotypes and phenotypes of this child.

(4)

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(ii) The man and woman have a second child.

Calculate the probability that both children will have haemophilia.

(3)

(c) Explain why the man cannot be a carrier of haemophilia.

(5)

(Total for Question 8 = 15 marks)

TOTAL FOR PAPER = 90 MARKS

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