Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 10 June 2024

Afternoon (Time: 1 hour 45 minutes)

Paper reference **4HB1/02R**

Human Biology

UNIT: 4HB1
PAPER: 02R

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

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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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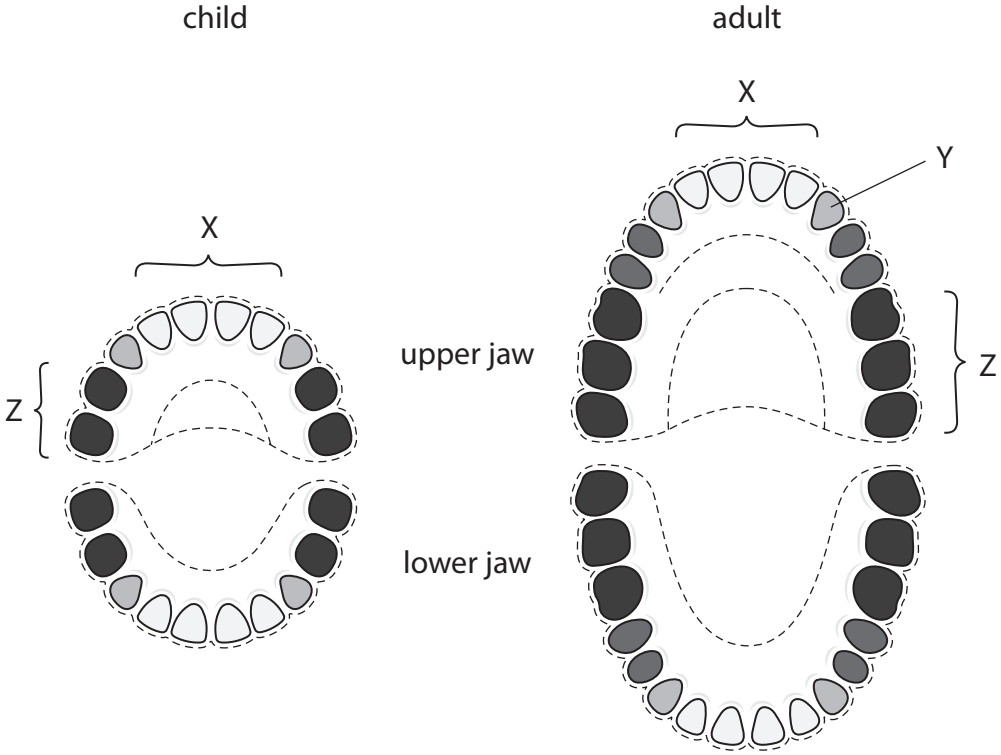
Pearson

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 ☒.

1 (a) The diagrams show the arrangement of teeth in a young child and the arrangement of teeth in an adult.



(Source: https://www.medicalnewstoday.com/articles/326754#number-of-teeth)

(i) Name the types of teeth shown by X and Z.

(2)

X .....

Z .....

(ii) State the function of the tooth labelled Y.

(1)

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.....

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(b) Digestion of food begins in the mouth.

Use the most appropriate words or numbers to complete the passage about digestion of food in the mouth.

(4)

Saliva in the mouth contains an enzyme called ..... .

This enzyme speeds up the digestion of starch to produce

..... .

The enzyme in saliva works best at pH ..... .

If the pH in the mouth was too low or too high, the digestion of carbohydrates

would ..... .

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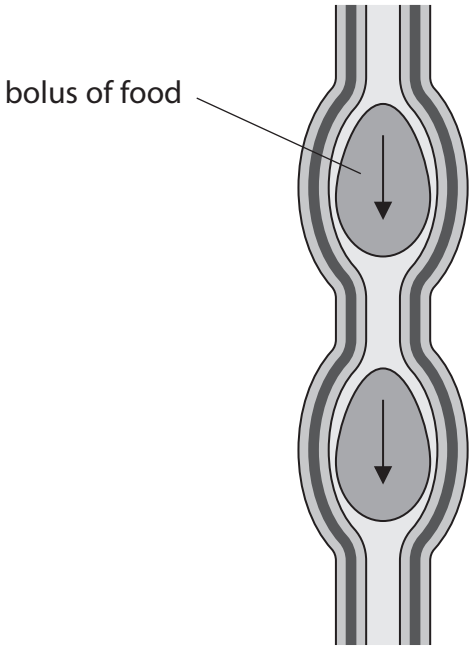
(c) The diagram shows the part of the digestive system that transports food from the mouth to the stomach.



(Source: https://www.motifolio.com/1031265.html)

(i) Name the part of the digestive system that transports food from the mouth to the stomach.

(1)

.....

(ii) Describe how the action of this part of the digestive system transports food from the mouth to the stomach.

(2)

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(Total for Question 1 = 10 marks)

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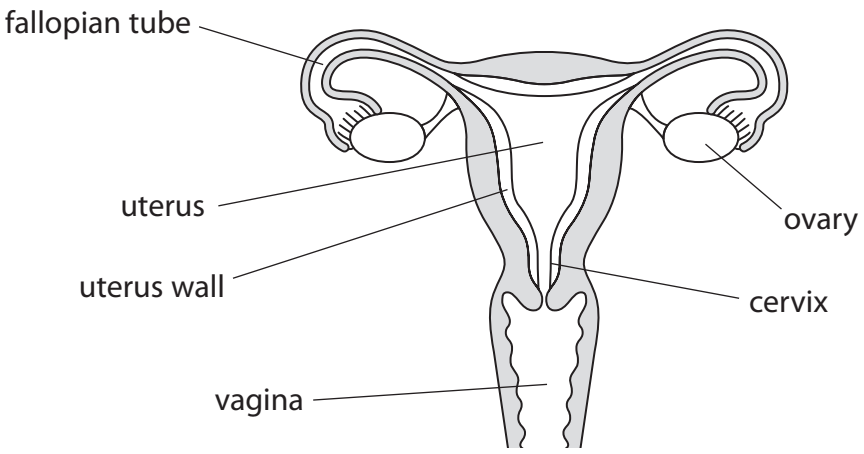
2 (a) The diagram shows the female reproductive system.



(i) Complete the table by placing one tick (✓) in each row to show the role of each part of the female reproductive system.

(3)

Part	Role		
	where sperm are deposited	**where eggs are produced**	**where fertilisation takes place**
fallopian tube			
ovary			
vagina			

(ii) Describe the action of the muscles in the uterus wall during labour.

(2)

.....

.....

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(iii) Fertilisation takes place in the female reproductive system.

Which of these describes fertilisation?

(1)

☒ **A** a sperm cell fuses with an egg cell to form a haploid cell

☒ **B** a sperm cell fuses with an egg cell to form an embryo

☒ **C** a sperm cell fuses with an egg cell to form a zygote

☒ **D** a sperm cell fuses with an egg cell to form a baby

(iv) Before fertilisation can take place, ovulation needs to occur.

Name the hormone that causes ovulation.

(1)

.....

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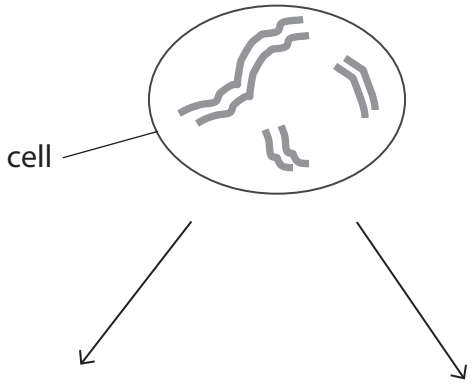
(b) Following fertilisation and during pregnancy, cell division by mitosis takes place.

The diagram shows a cell with only three pairs of chromosomes instead of a full set.



(i) Complete the diagram to show the cells formed when this cell divides by mitosis.

(2)

(ii) In humans, cell division occurs by mitosis or meiosis.

Draw one straight line from each type of cell division to the cells produced.

(2)

Type of cell division	Cells produced
	two cells, each with 23 chromosomes
mitosis	four cells, each with 46 chromosomes
meiosis	two cells, each with 46 chromosomes
	four cells, each with 23 chromosomes

(Total for Question 2 = 11 marks)

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3 (a) Polycystic kidney disease (PKD) is an inherited condition caused by a gene mutation.

PKD affects the function of the kidneys.

State what is meant by a gene mutation.

(1)

.....

.....

(b) PKD occurs when a child inherits a faulty allele from one parent.

One parent has a genotype Hh and the other parent has a genotype hh.

The parents have four children.

Draw a genetic diagram to show the possible genotypes of the four children.

(2)

(c) Some people with PKD need a kidney transplant.

Give one advantage and one disadvantage of a kidney transplant.

(2)

Advantage

.....

.....

Disadvantage

.....

.....

(Total for Question 3 = 5 marks)

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4 (a) A student does a survey of eye colour in a sample of people.

The table shows a tally of the number of people with each eye colour in the sample.

Blue	Green	Brown	Hazel	Grey
𝍸 𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 I	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 I	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	III

(i) Complete the table by giving the missing information.

(1)

Number of people with each eye colour				
Blue	**Green**	**Brown**	**Hazel**	**Grey**
25				3

(ii) Calculate the percentage of people with brown eyes in the sample.

(2)

percentage = ... %

(b) Eye colour is determined by alleles inherited from parents.

(i) Which of these gives the definition of an allele?

(1)

☒ **A** two dominant genes in a genotype

☒ **B** two recessive genes in a genotype

☒ **C** different genes in a genotype

☒ **D** alternative forms of the same gene in a genotype

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(ii) Explain why diploid cells contain two alleles for each characteristic.

(4)

(c) Cystic fibrosis is a condition that is also determined by alleles that are inherited from parents.

(i) Give the possible genotypes of two parents that have a child with cystic fibrosis.

(2)

(ii) Give one symptom of cystic fibrosis.

(1)

(Total for Question 4 = 11 marks)

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

The heart is a double-pump that is part of the human circulatory system. It helps ensure that the blood and its components reach all cells in the body.

Some components of the blood are made in the bone marrow. An average adult with a mass of 70 kg has 5.5 dm^3 of blood. About 45% of the blood is made up of different cells. There are several different types of cell in the blood but red blood cells are the most common. In males, 1.0 dm^3 of blood contains 5.9×10^{12} red blood cells. In females the same volume of blood contains 5.5×10^{12} red blood cells. Haemoglobin makes up a large part of red blood cells. This protein is vital to the function of red blood cells.

Red blood cells are transported around the body in a liquid known as plasma. Only 10% of blood plasma is made up of components that are used or produced by body cells. The rest of the plasma is made up of water. Some components of blood plasma are used by body cells in chemical reactions, some act as messengers or have a role in blood clotting and others are excreted from the body as waste.

(a) Name the main tissue that makes up the walls of the heart.

(1)

.....

(b) Explain why the heart is known as a double-pump. (Lines 1 to 2)

(3)

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(c) Red blood cells are the most common type of cell found in the blood.

Which of these are also types of cell found in the blood?

(1)

- ☒ **A** phagocytes and platelets
- ☒ **B** antibodies and hormones
- ☒ **C** lymphocytes and phagocytes
- ☒ **D** platelets and lymphocytes

(d) (i) Name a component of the blood plasma that acts as a messenger. (Lines 12 to 14)

(1)

.....

(ii) Name a component of the blood that is involved in blood clotting.

(1)

.....

(e) Calculate the number of red blood cells found in the blood of an adult male with a mass of 95 kg. (Lines 3 to 7)

Give your answer in standard form.

(3)

number of red blood cells = ...

(Total for Question 5 = 10 marks)

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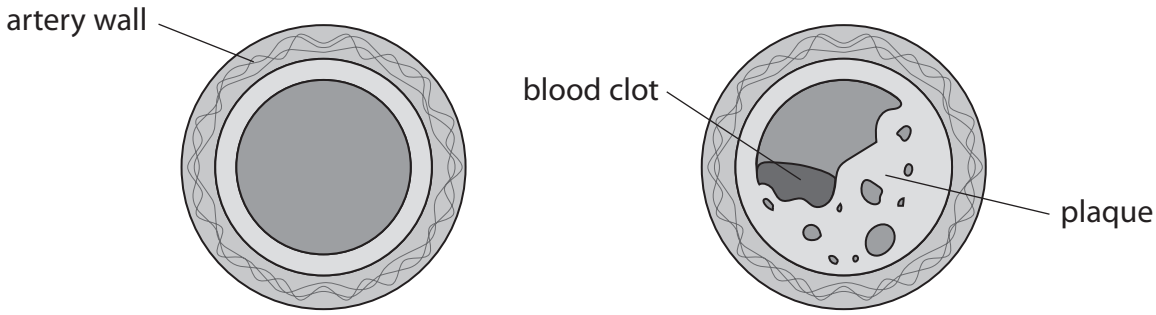
6 (a) Cholesterol is a fatty substance that can build up inside arteries forming waxy deposits called plaques.

The diagram shows a healthy artery and an artery with a plaque.



healthy artery

artery with a plaque

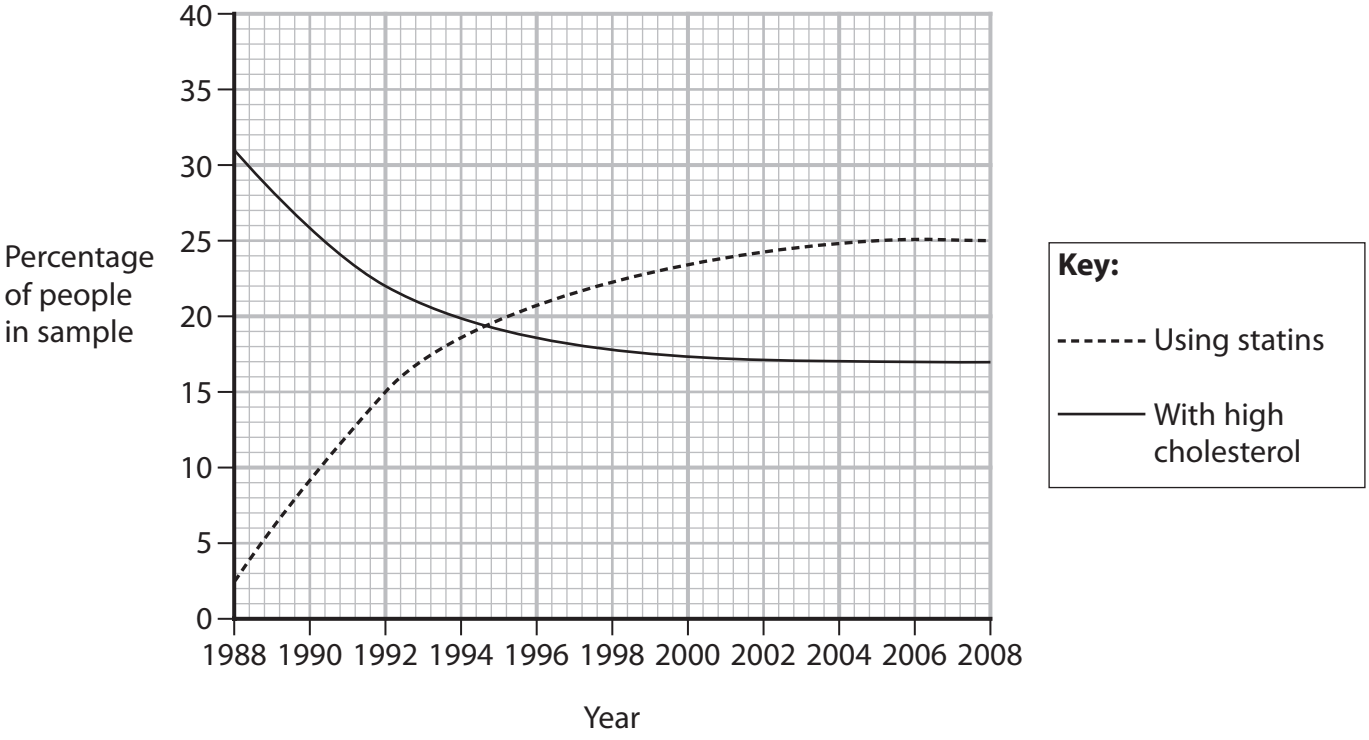
(Source: adapted from https://www.dreamstime.com/artery-plaque-blood-clot-medical-illustration-diseased-compared-to-healthy-cross-section-diagram-shows-image120895536)

Explain how plaques might affect the heart of an individual.

(4)

(b) Scientists investigated the effect of statins on cholesterol levels in a sample of people.

The graph shows the results of their investigation.



(Source: https://www.health.harvard.edu/heart-health/trends-in-high-cholesterol-and-statin-use)

(i) Give the relationship between the use of statins and the percentage of people with high cholesterol levels.

(1)

.....

.....

(ii) Calculate the ratio of the percentage of people with high cholesterol levels in 1988 compared with the percentage of people with high cholesterol levels in 2005.

Give your answer in the form of 1 : n

(3)

ratio = ...

(iii) Describe a method that scientists could use to obtain the data shown in the graph.

(5)

(iv) Give two factors the scientists need to consider to make sure that their investigation is valid.

(2)

1 .....

2 .....

(Total for Question 6 = 15 marks)

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7 (a) Aerobic and anaerobic respiration both take place during exercise.

(i) Give the word equation for anaerobic respiration.

(1)

.....

(ii) Complete and balance the chemical symbol equation for aerobic respiration.

(2)

$C_6H_{12}O_6$ + ... ⟶ ..... + ... CO_2

(iii) A student investigates the rate of carbon dioxide production during exercise and at rest.

This is the equipment they use.

- four pieces of glass tubing
- two boiling tubes
- two rubber bungs
- mouthpiece
- limewater

Draw a diagram to show how the student should set up the equipment to carry out the investigation.

(2)

(iv) Describe how a student could use this equipment and a timer to compare the rate of carbon dioxide production during exercise and at rest.

(4)

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(b) Aerobic and anaerobic respiration both produce ATP.

Describe the role of ATP in energy transfer during exercise.

(5)

(Total for Question 7 = 14 marks)

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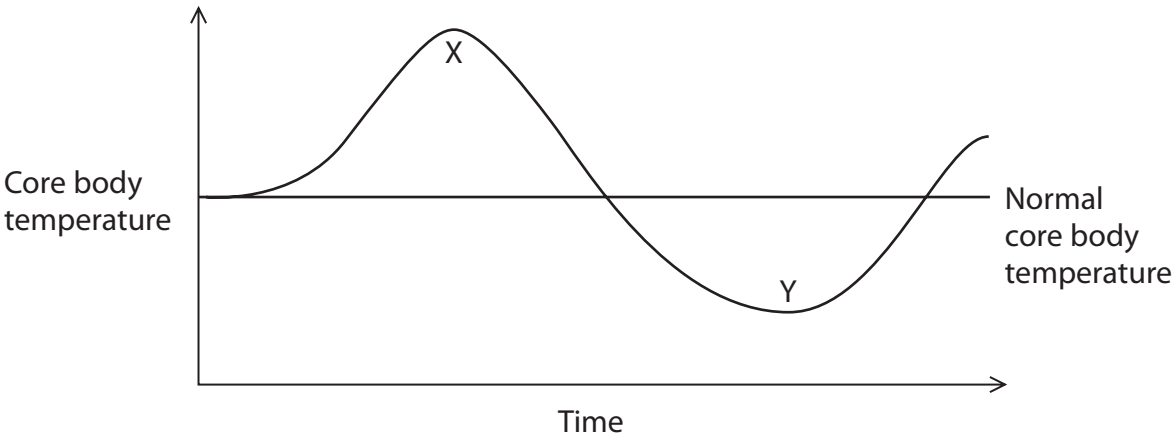
8 (a) Insulin is a hormone which helps to regulate the concentration of glucose in the blood.

Explain the role of insulin in regulating the concentration of glucose in the blood.

(3)

(b) The normal core body temperature of a human is 37 °C.

The graph shows how body temperature changes during one hour.



(i) Sweating can occur at point X on the graph.

Explain one other body process that occurs at point X to change body temperature.

(3)

(ii) Name one body process that occurs at point Y on the graph to change body temperature.

(1)

(iii) Explain why the control of body temperature is an example of negative feedback.

(2)

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(c) Hypothermia is a condition where the core body temperature drops below 35 °C.

Explain why it is important to increase the core body temperature of people with hypothermia to within the normal range.

(5)

(Total for Question 8 = 14 marks)

TOTAL FOR PAPER = 90 MARKS

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