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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)

Thursday 2 November 2023

Morning (Time: 1 hour 45 minutes)

Paper reference **4HB1/01**

Human Biology

UNIT: 4HB1
PAPER: 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.*
- 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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Answer ALL questions. Write your answers in the spaces provided.

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 table gives components of the blood and their features.

Complete the table by putting a tick (✓) in the box if the blood component shows the feature.

(5)

Feature	Blood component				
	red blood cell	phagocyte	lymphocyte	platelet	plasma
transports oxygen					
contains haemoglobin					
is a fluid					
produces antibodies					
engulfs pathogens					

(b) Explain why it is important that blood clots when the skin is cut open.

(4)

(Total for Question 1 = 9 marks)

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2 To find out if a person has diabetes, they can be given a glucose tolerance test.

This is how the test is done.

- the person does not eat for 12 hours
- after the 12 hours, blood glucose levels are measured
- the person is then given a solution of glucose to drink
- the blood glucose levels of the person are measured every 30 minutes for 3 hours

The table shows the results for a person without diabetes and a person with diabetes.

Time in minutes	Blood glucose levels in mg per 100 cm^3	
	person without diabetes	person with diabetes
0	65	110
30	120	215
60	130	230
90	95	200
120	80	190
150	65	180
180	65	170

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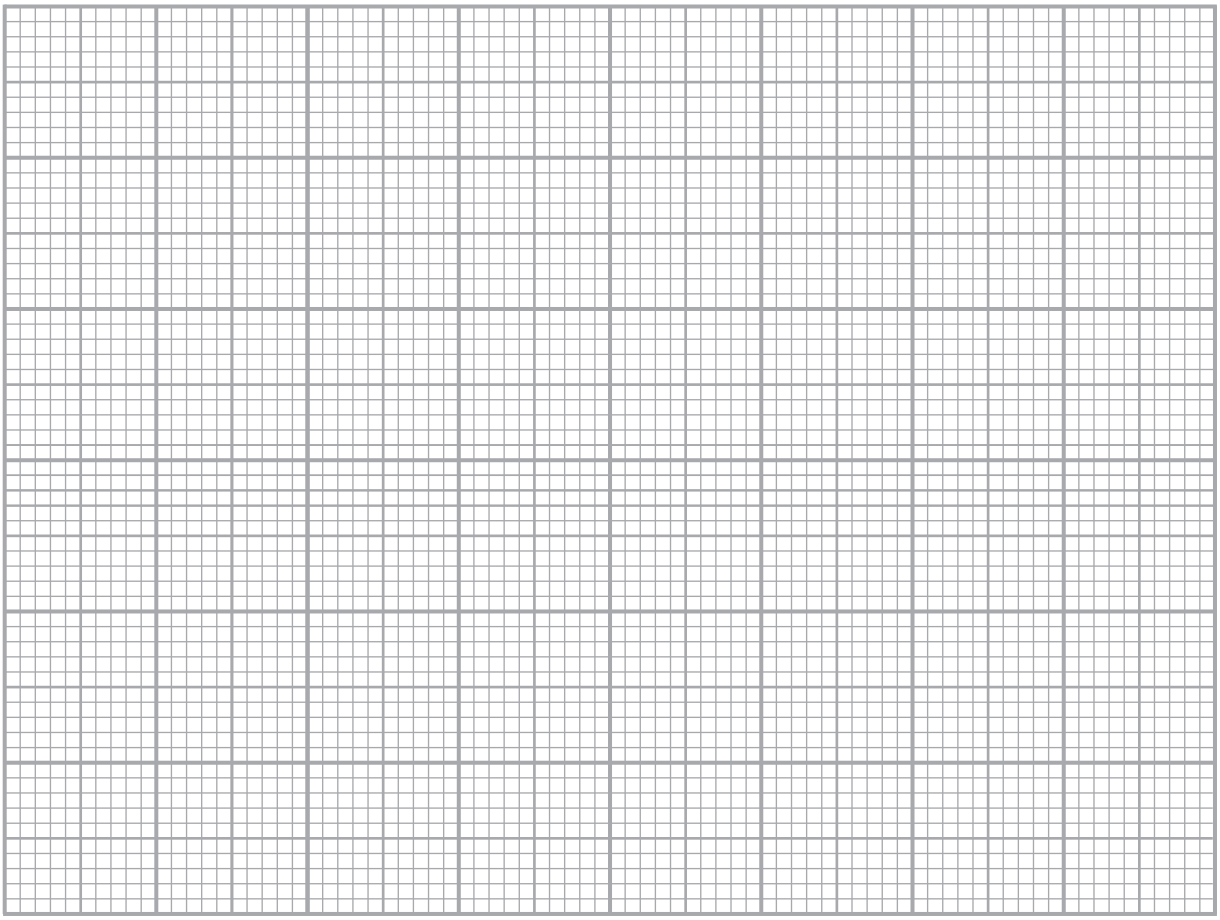
(a) (i) Plot the results on the grid.

Join the points with straight lines.

(6)



(ii) Determine the difference between the highest and lowest blood glucose levels for each person.

(2)

without diabetes = ... mg per 100 cm^3

with diabetes = ... mg per 100 cm^3

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(iii) Give **three** differences between the glucose levels for the two people during the three hours.

(3)

1 .....

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2 .....

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3 .....

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(b) One symptom of diabetes is glucose in the urine.

Describe how a sample of urine could be tested safely for glucose.

(5)

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(Total for Question 2 = 16 marks)

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3 The table shows the flow of blood to different organs in a person at rest and during exercise.

	Blood flow in cm^3 per minute	
	at rest	during exercise
Heart	250	750
Skeletal muscles	1000	12 500
Skin	400	1900
Gut	1400	600
Brain	750	750
Total flow	5600	17 500

(a) (i) Give the ratio of the blood flow to the heart when at rest and during exercise.

Give your answer in the form 1 : n

(2)

Ratio = ... : .....

(ii) Calculate the percentage increase in the total flow of blood between rest and exercise.

Give your answer to two significant figures.

(3)

percentage increase = ... %

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(iii) Explain why the total blood flow at rest is greater than the flow to the heart, skeletal muscle, skin, gut and brain added together.

(3)

(b) (i) Describe the main changes between the blood flow values at rest and during exercise.

(3)

(ii) Explain the change in blood flow rate to the skin when at rest and during exercise.

(4)

(Total for Question 3 = 15 marks)

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4 The mass of DNA in a body cell changes during the cell cycle.

(a) (i) Which structure in a cell contains DNA?

(1)

- ☒ **A** chromosome
- ☒ **B** endoplasmic reticulum
- ☒ **C** cell membrane
- ☒ **D** ribosome

(ii) Name **one** other type of nucleic acid.

(1)

.....

(iii) Give **three** differences between DNA and the nucleic acid that you have named in (a)(ii).

(3)

Differences	DNA	Named nucleic acid
1		
2		
3		

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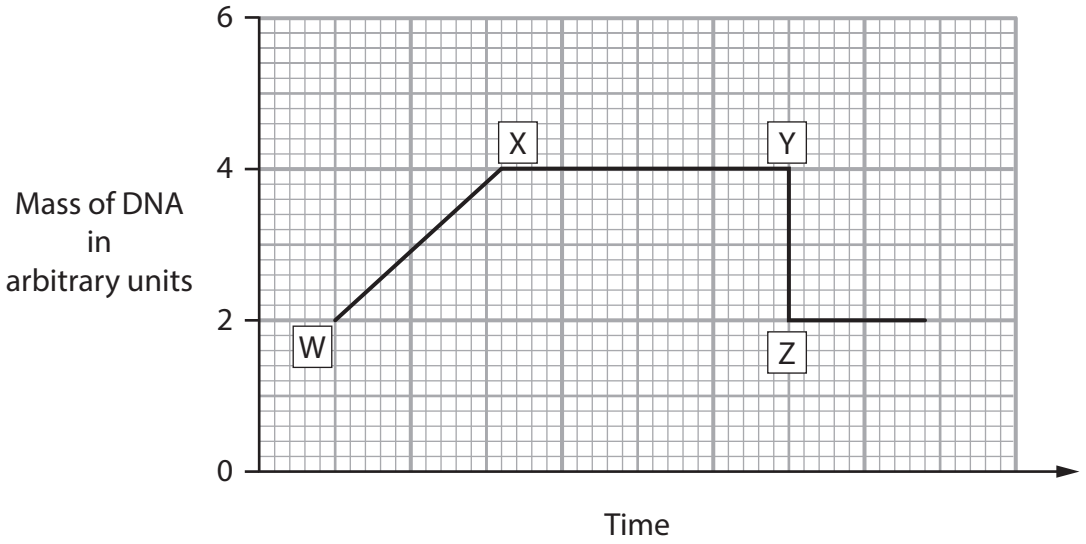
(b) The graph shows the changes in the mass of DNA in a body cell, during mitosis.



(i) Describe the process that produces the change in the mass of DNA between points W and X.

(4)

(ii) Describe what is happening in the cell between points Y and Z.

(2)

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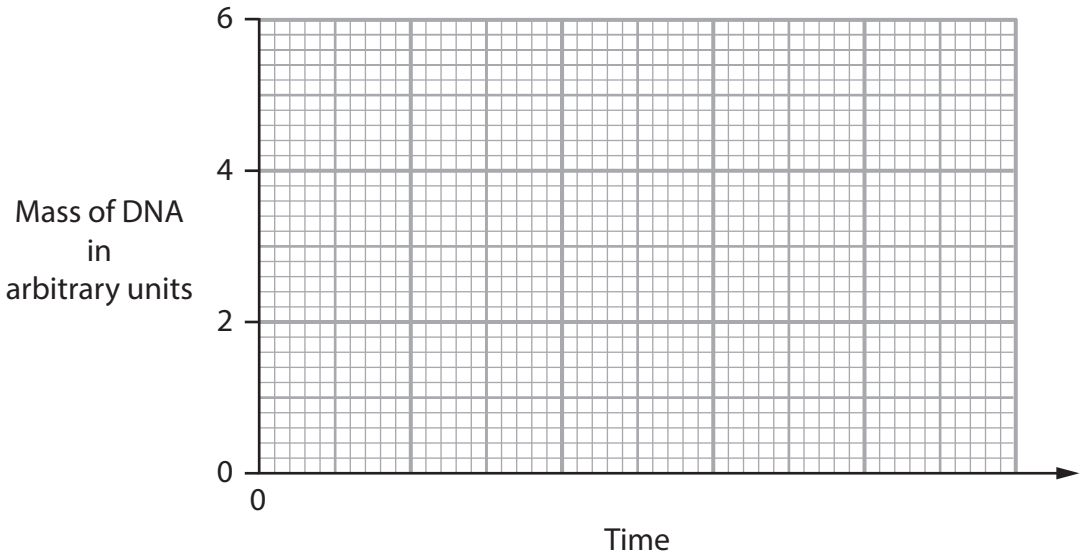
(iii) The production of gametes involves the process of meiosis.

On the grid draw a line to show the changes in the mass of DNA during meiosis.

(3)



(Total for Question 4 = 14 marks)

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5 DNA codes for the production of proteins in cells.

(a) The DNA code is read, three bases at a time. There are four different bases.

Calculate how many different three base codes are available.

(2)

number of codes = ...

(b) (i) Explain how a mutation in DNA can cause a change in the phenotype of a cell.

(3)

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(ii) State **one** factor that can cause mutation.

(1)

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(iii) A mutation can change the shape of an enzyme molecule.

Explain why this may change how the enzyme works.

(2)

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(iv) State why some mutations have no effect on the phenotype of an organism.

(1)

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(Total for Question 5 = 9 marks)

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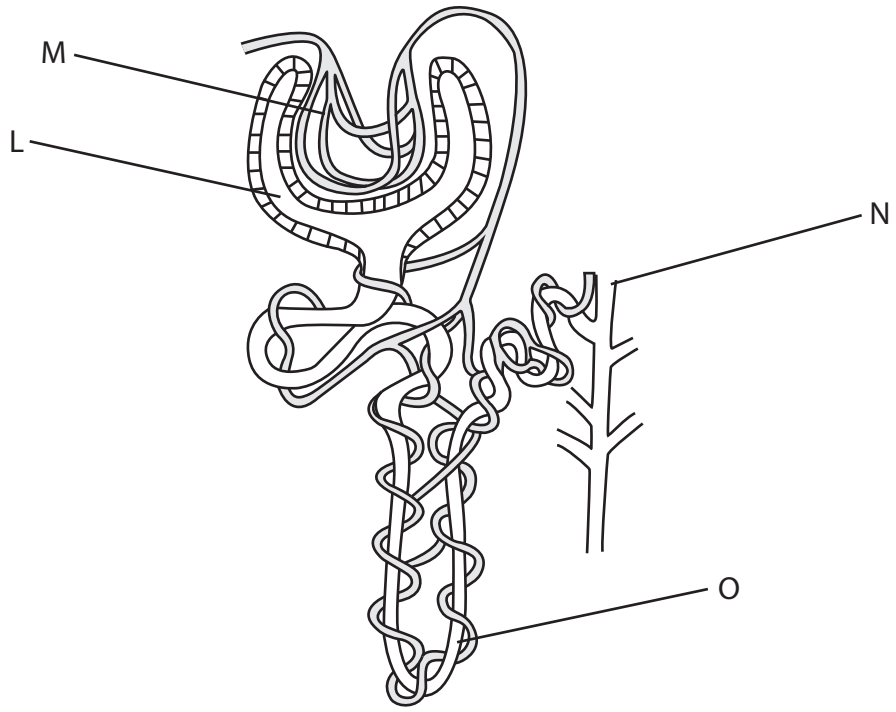
6 The diagram shows a kidney tubule.



(a) Name structures L, M, N, and O.

(4)

L .....

M .....

N .....

O .....

(b) (i) Describe the process that causes fluid to be formed in L.

(3)

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(ii) Name **two** components of the blood that do not pass into L.

(2)

1 .....

2 .....

(iii) Label, with the letter G, the part of the kidney tubule where most of the glucose is reabsorbed.

(1)

(c) Explain why the volume of urine a person produces on a hot day is less than the volume of urine the same person produces on a cold day.

(5)

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(Total for Question 6 = 15 marks)

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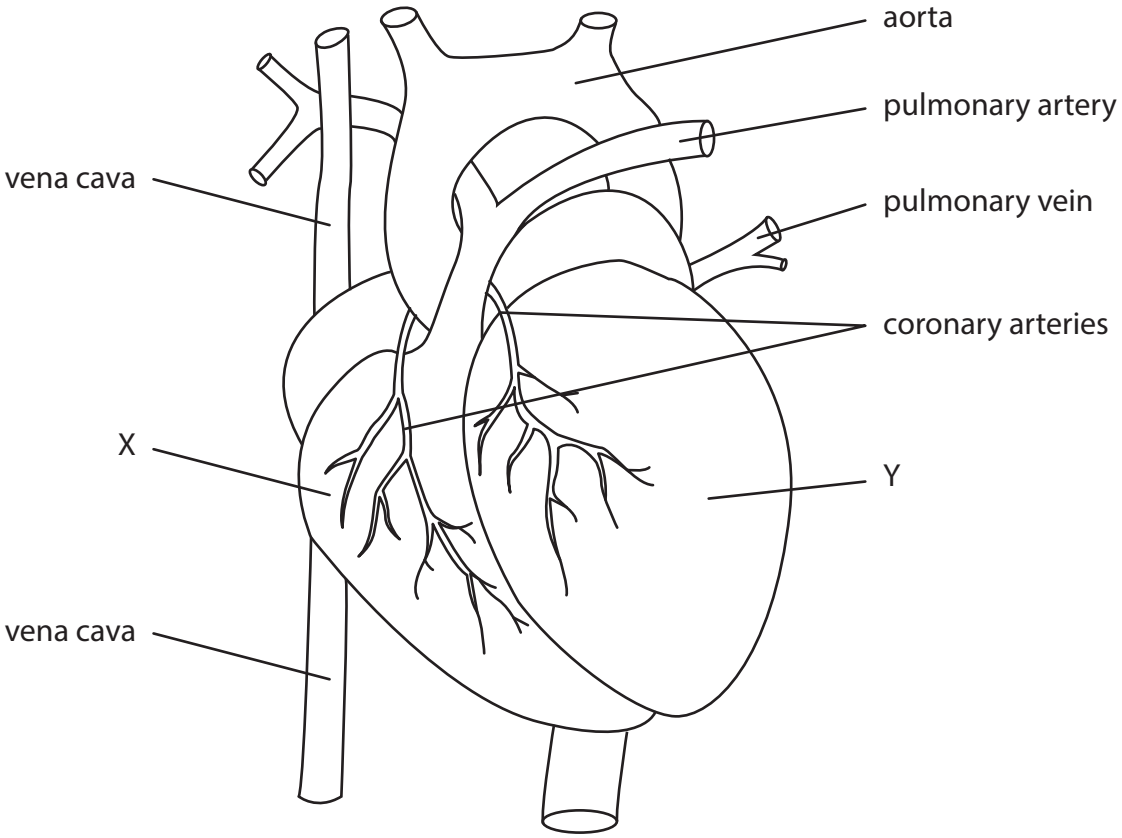
7 The diagram shows the heart as seen from the front.



(a) The vena cava carries deoxygenated blood.

Name a different blood vessel, shown on the diagram, that also carries deoxygenated blood.

(1)

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(b) Blood chambers X and Y have walls that are different in thickness.

Explain this difference.

(5)

(c) The coronary arteries can become blocked.

Explain the effect of this blockage on the functioning of the heart.

(3)

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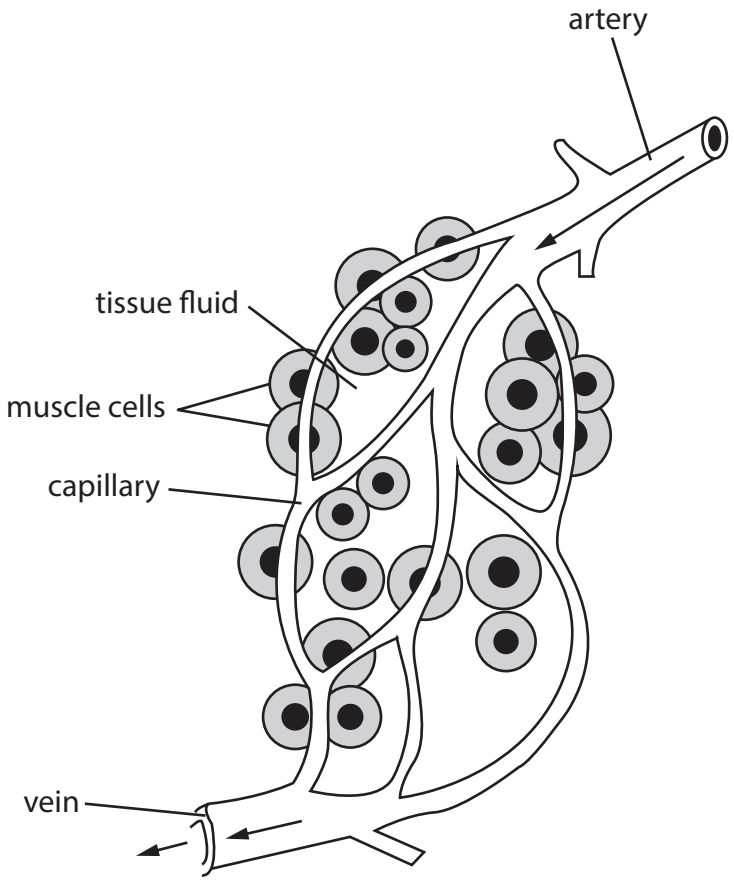
(d) The diagram shows a capillary bed.



Use the diagram to explain the function of the tissue fluid.

(3)

(Total for Question 7 = 12 marks)

TOTAL FOR PAPER = 90 MARKS

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