

Please check the examination details below before entering your candidate information

Candidates surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE (9–1)

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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Q:1/1/1/



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 diagram shows part of a molecule of DNA.



- (i) Structure X is the backbone of the DNA molecule.

Which of these form part of the backbone of DNA?

(1)

- ☐ **A** amino acids
- ☐ **B** bases
- ☐ **C** proteins
- ☐ **D** sugars

- (ii) What name is given to the structures labelled Y?

(1)

- ☐ **A** amino acids
- ☐ **B** bases
- ☐ **C** proteins
- ☐ **D** sugars



(iii) Describe how the two backbones of the DNA molecule are joined together.

(2)

(iv) State the name of the part of the cell where most of the DNA is found.

(1)

(b) DNA is a nucleic acid.

RNA is another type of nucleic acid.

(i) Give two differences between the structures of DNA and RNA.

(2)

1

2

(ii) There are different types of RNA.

Which of these are two types of RNA?

(1)

- ☐ **A** mRNA and pRNA
- ☐ **B** dRNA and tRNA
- ☐ **C** dRNA and pRNA
- ☐ **D** mRNA and tRNA

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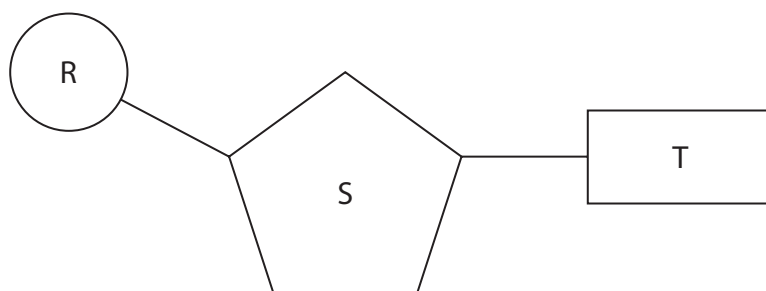
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(c) DNA is formed from molecules called nucleotides.

The diagram shows a single nucleotide.



Name the parts of the nucleotide labelled R, S and T.

(3)

R

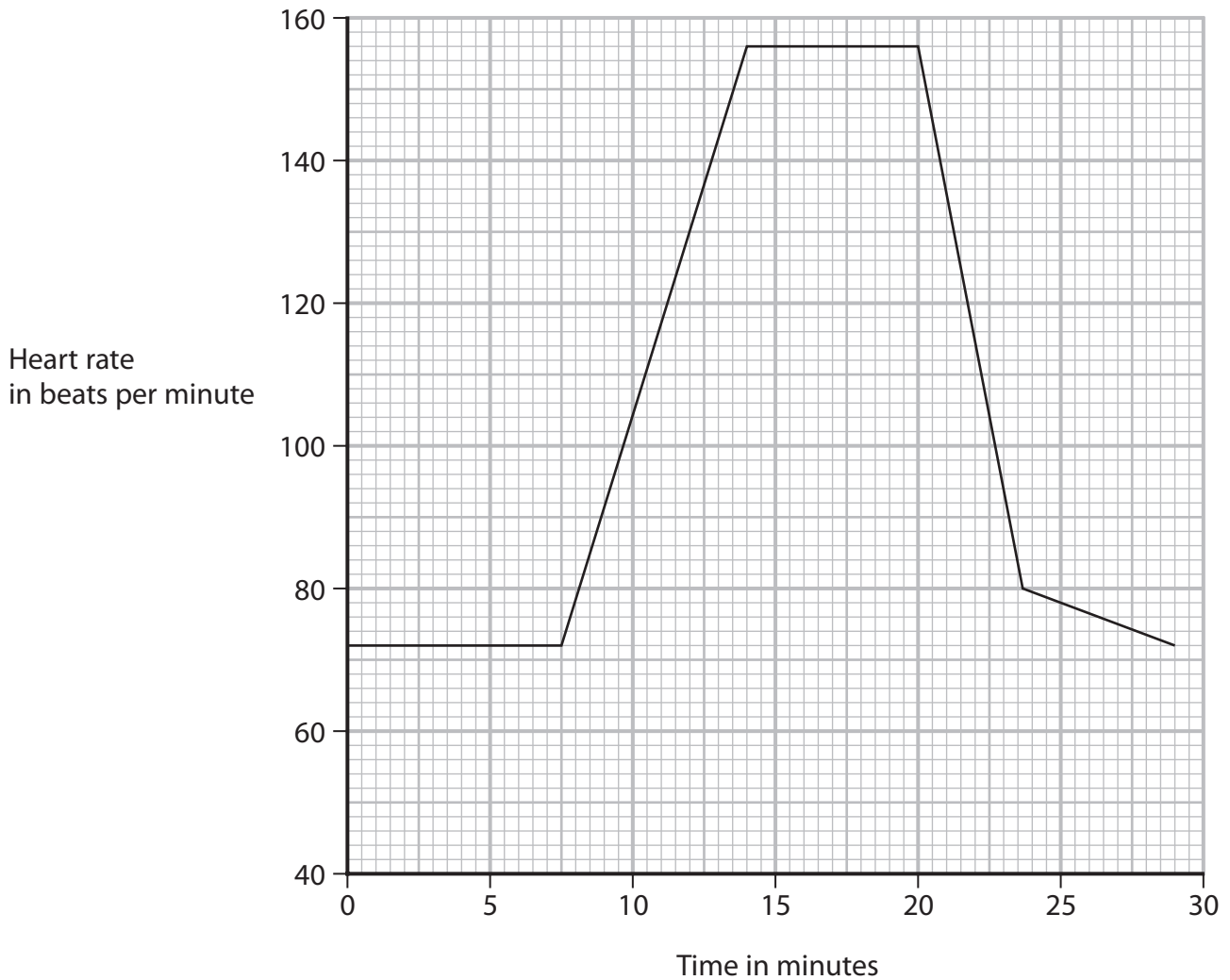
S

T

(Total for Question 1 = 11 marks)



- 2 (a) The graph shows how a person's heart rate changes with exercise.



- (i) Determine the difference between the maximum heart rate and the resting heart rate.

(2)

difference = beats per minute

- (ii) Which of these is the time taken for this person to recover from the exercise?

(1)

- ☐ A 4 minutes
- ☐ B 6 minutes
- ☐ C 9 minutes
- ☐ D 15 minutes



- (iii) Complete the passage about what happens in the body during exercise using the correct words.

(4)

During exercise gas moves from the lungs into the blood by a process called This gas is needed by cells for respiration which releases energy. Also during exercise, the amount of urine produced as water is lost in sweat.

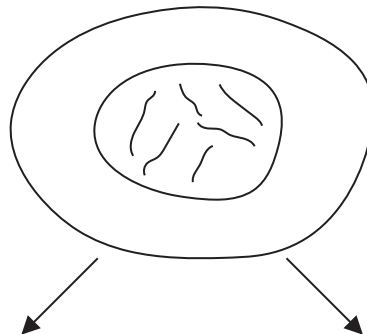
- (b) (i) During exercise, body cells get damaged.

Body cells are replaced by a process called mitosis.

The diagram represents one body cell but shows only 6 of the 46 chromosomes.

Complete the diagram to show the new body cells produced from this cell by mitosis.

(2)



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(ii) Mitosis takes place in four stages.

Which of these gives the stage of mitosis where chromosomes align at the equator of the cell?

(1)

- ☐ **A** anaphase
- ☐ **B** metaphase
- ☐ **C** prophase
- ☐ **D** telophase

(Total for Question 2 = 10 marks)

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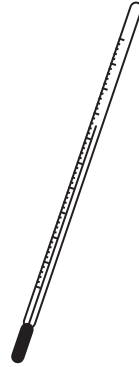
3 (a) The diagram shows some equipment that can be used to investigate the energy content of different foods.



mounted
needle



measuring
cylinder



thermometer



test tube

(i) Describe how the equipment can be used to investigate the energy content of different foods.

(5)

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(ii) Name two variables that need to be controlled in the investigation.

(2)

1

2

(iii) Give two safety precautions needed for this investigation.

(2)

1

2

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- (b) Different people have different energy requirements.

The table shows the daily energy requirements in kilocalories (kcal) of males and females of different ages.

Daily Energy Requirement in kcal

Age of adults in years	Males	Females
19–24	2772	2175
25–34	2749	2175
35–44	2629	2103
45–54	2581	2103
55–64	2581	2079
65–74	2342	1912
75 and over	2294	1840

(Source: adapted from https://propranolols.blogspot.com/2020/02/daily-nutritional-requirements-for_9.html)

- (i) Describe the patterns in the energy requirements for males and for females.

(2)

.....

.....

.....

.....

- (ii) Which of these gives a reason for the difference between the energy required by 25-year-old males and the energy required by 25-year-old females?

(1)

- ☐ **A** females use more muscle mass than males
- ☐ **B** females eat less than males
- ☐ **C** males eat less than females
- ☐ **D** males use more muscle mass than females

- (iii) Calculate the percentage difference in the energy requirement of males compared with females in the age range of 35–44 years.

(3)

percentage difference = %

(Total for Question 3 = 15 marks)

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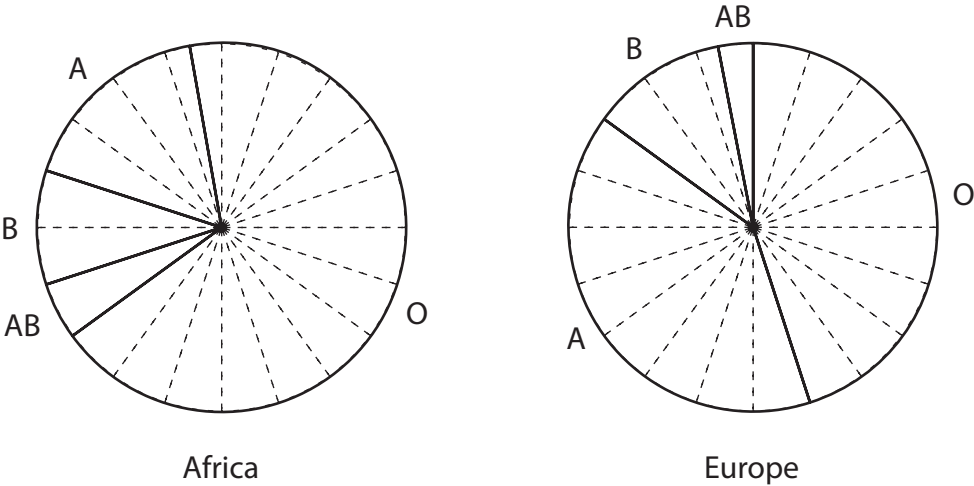
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4 (a) Humans belong to one of four blood groups.

These blood groups are A, B, AB and O.

The pie charts show estimates of the percentages of people from Africa and the percentages of people from Europe in each blood group.



(i) Complete the tables to give the percentage of each blood group.

Some information has been given.

(2)

Africa

Blood group	Percentage of blood group
O	68
A	
B	
AB	5

Europe

Blood group	Percentage of blood group
O	45
A	
B	12
AB	

(ii) Some people need a blood transfusion.

Explain why people with blood group A cannot receive a blood transfusion from people with blood group B.

(3)

(iii) A male with the genotype $I^A I^O$ and a female with the genotype $I^B I^O$ have a child with the genotype $I^O I^O$.

Draw a genetic diagram to show how the child inherits the genotype $I^O I^O$.

(3)

(iv) Determine the probability that a child from these parents will inherit the blood group AB.

(1)

probability =

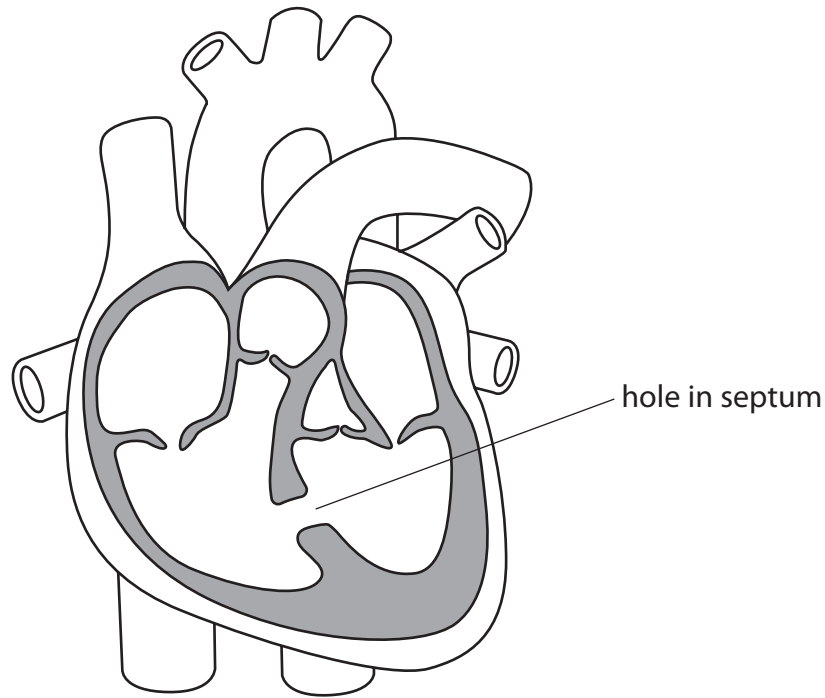


(b) The heart pumps the blood around the body.

The diagram shows a human heart.

This heart has a hole in the septum.

This means that blood from the left side of the heart mixes with blood from the right side.



Explain why a person with a hole in their heart breathes at a greater rate than a person with a healthy heart.

(4)

(Total for Question 4 = 13 marks)

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- 5 (a) There is a difference in the volume of urine produced on a hot day and the volume of urine produced on a cold day.

Design an investigation to determine the difference in the volume of urine produced on a hot day and the volume of urine produced on a cold day.

Include experimental details in your answer and write in full sentences.

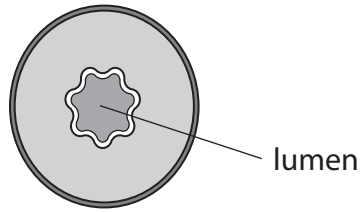
(4)

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(b) The diagram shows a cross-section of a blood vessel in the skin on a cold day.



Explain the changes in this blood vessel on a hot day.

(3)

(c) Describe how ADH regulates the volume of water in the body on a hot day.

(4)

(Total for Question 5 = 11 marks)

6 Describe how bacteria can be genetically modified to produce human insulin.

(6)

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(Total for Question 6 = 6 marks)



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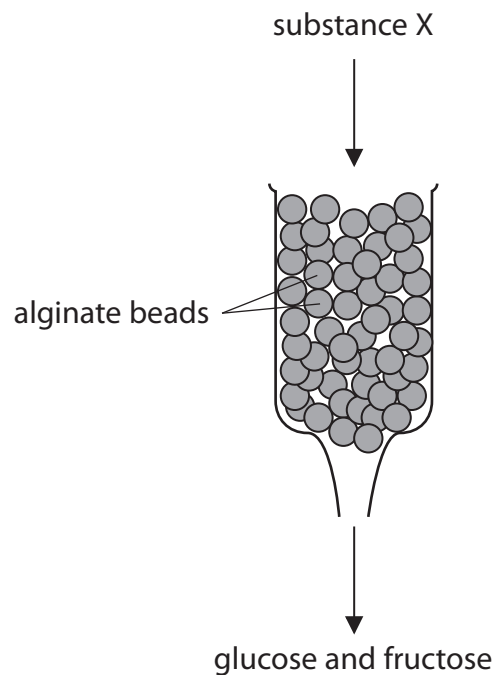


7 (a) Industrial processes can use immobilised enzymes.

- (i) Give one reason why using immobilised enzymes can cost less money than using enzymes that are not immobilised.

(1)

- (ii) The diagram shows the apparatus used to produce glucose and fructose using immobilised enzymes attached to alginate beads.



Name substance X.

(1)

- (iii) Describe how to prepare alginate beads.

(3)

(b) Which process is involved in the conversion of glucose into glycogen in the human body?

(1)

- ☐ **A** glucagon is released from the pancreas and travels to the liver
- ☐ **B** insulin is released from the pancreas and travels to the liver
- ☐ **C** glucagon is released from the liver and travels to the pancreas
- ☐ **D** insulin is released from the liver and travels to the pancreas

(c) (i) The total population of the United Kingdom is 66.65 million.

Diabetes affects 6.0% of this population.

Calculate the number of people with diabetes in the United Kingdom.

(2)

number of people = million

(ii) Surveys were carried out in different areas of the United Kingdom.

These surveys collected data on the number of people in each area with diabetes.

The information collected is shown in the box.

38	62	51	96	49	78	82	91	65
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Determine the median number of people with diabetes.

(2)

median =

(Total for Question 7 = 10 marks)

- 8 Discuss the advantages and disadvantages of the use of embryonic and adult stem cells in medical research.

(6)

embryonic stem cells

adult stem cells

(Total for Question 8 = 6 marks)

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9 In England, 31% of men and 26% of women have high blood pressure.

(a) Explain how medication can be used to treat people with high blood pressure.

(4)

(b) (i) Describe what is meant by systolic blood pressure.

(2)

(ii) Describe what is meant by diastolic blood pressure.

(2)

(Total for Question 9 = 8 marks)

TOTAL FOR PAPER = 90 MARKS



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