Pearson Edexcel International Advanced Level

Friday 10 October 2025

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WBI11/01A**

Biology

International Advanced Subsidiary/Advanced Level

UNIT 1: Molecules, Diet, Transport and Health

Question Paper

You must have: Answer Booklet (sent separately)
Scientific calculator, ruler, HB pencil
Do not return this question paper with the answer book.

Turn over ▶

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M:1/1/1/1/1/1/

P 8 7 4 2 5 A

Pearson

Answer ALL questions. Write your answers in the Answer Booklet.

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

1 Two types of polynucleotide, DNA and RNA, are found in the body.

(a) Read through the following description of DNA.

Complete the description by writing the most appropriate word or words on the dotted lines in the Answer Booklet.

(3)

The mononucleotides that join together to form DNA consist of a base, a

. and a sugar.

The mononucleotides are joined together by bonds

to form a strand of DNA.

(b) Two types of RNA are messenger RNA (mRNA) and transfer RNA (tRNA).

The table shows some features of RNA.

For each feature, put **one** cross ☒ in the appropriate box in the Answer Booklet, in each row, to show the features that are present in these types of RNA.

(2)

Feature	Types of RNA			
	both mRNA and tRNA	**mRNA only**	**tRNA only**	**neither mRNA nor tRNA**
single-stranded				
folded				

(Total for Question 1 = 5 marks)

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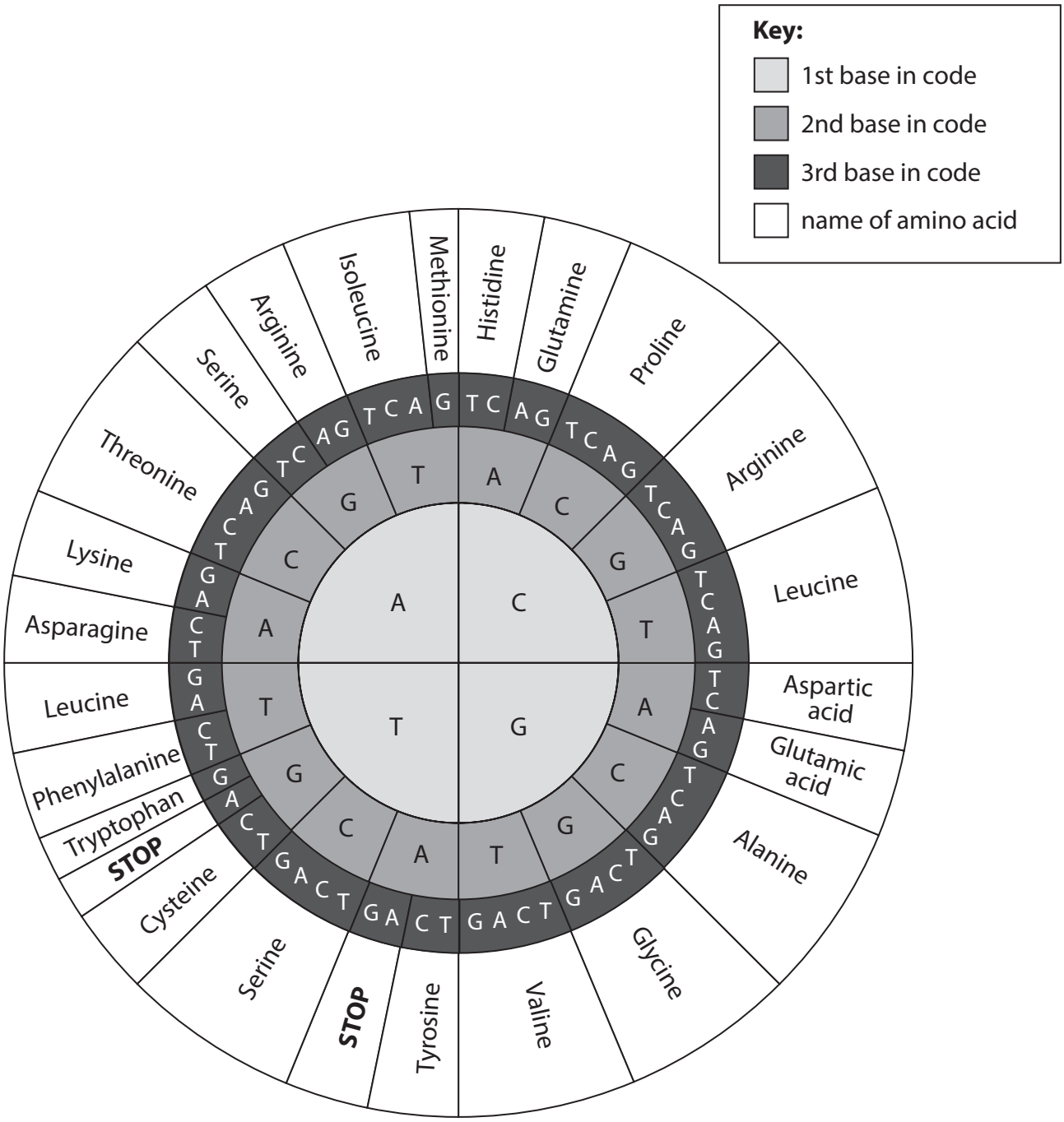
2 The nature of the genetic code is important in determining the sequence of amino acids in a polypeptide chain.

The diagram shows the genetic codes for each amino acid and the stop codons found in human DNA.



(a) Which is a genetic code for leucine?

(1)

A ATG

B GTT

C TTA

D TTT

(b) The diagram shows the sequence of bases in part of a DNA template (antisense) strand for serine and arginine.

DNA template strand	T	C	T	A	G	A
mRNA						

(i) Complete the diagram in the Answer Booklet, to show the sequence of bases in the mRNA molecule formed during protein synthesis.

(1)

(ii) Give the sequence of bases that would be found on the anticodon of a **tRNA** molecule that would bind to the first codon in this mRNA molecule.

(1)

(c) Explain why each amino acid is coded for by **three** bases.

(2)

(d) The table shows the amino acid sequences of three peptides, A, B and C.

Peptide	**Position of amino acid in the peptide**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
A	cys	tyr	ile	gln	asn	cys	pro	arg	gly
B	cys	tyr	phe	gln	asn	cys	pro	arg	gly
C	cys	tyr	phe	gln	asn	cys	pro	lys	gly

Compare and contrast the amino acid sequences in these three peptides.

(3)

(Total for Question 2 = 8 marks)

3 Enzymes are biological catalysts that increase the rate of chemical reactions in the body.

(a) Which of the following statements are true for enzymes?

(1)

1. Only found inside cells
2. Lower the activation energy of a chemical reaction
3. Consist of carbon, hydrogen and oxygen atoms only

A 2 only

B 3 only

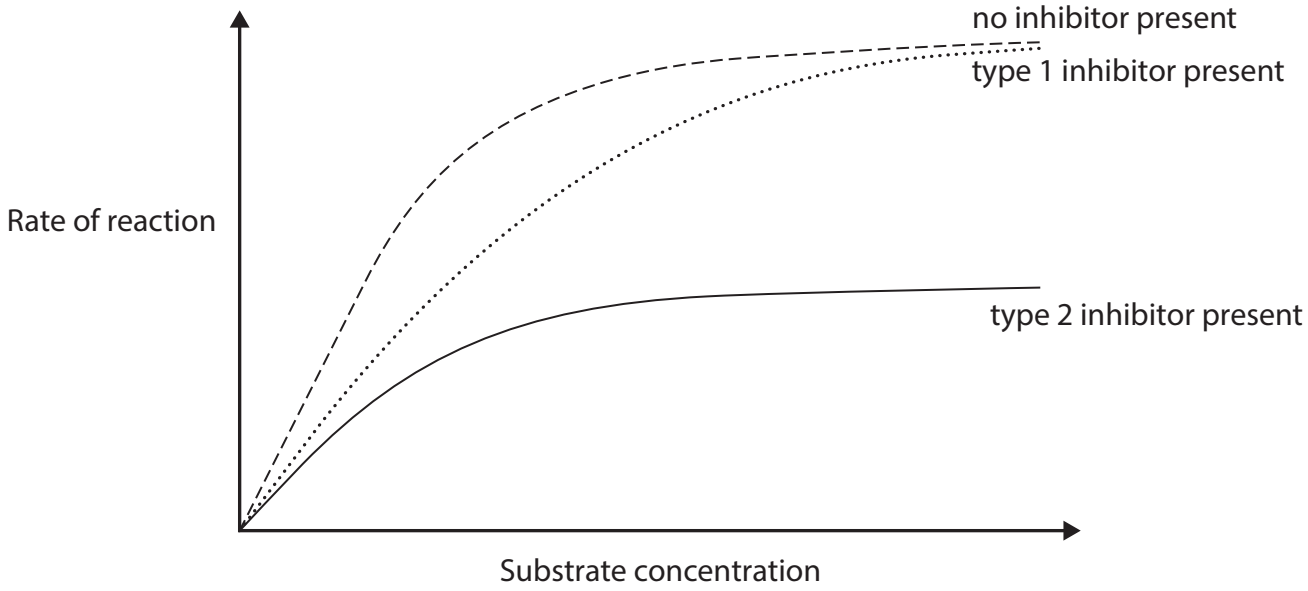
C 1 and 2 only

D 1 and 3 only

(b) Some chemicals inhibit enzyme reactions.

The graph shows the effect of substrate concentration on the rate of reaction of an enzyme.

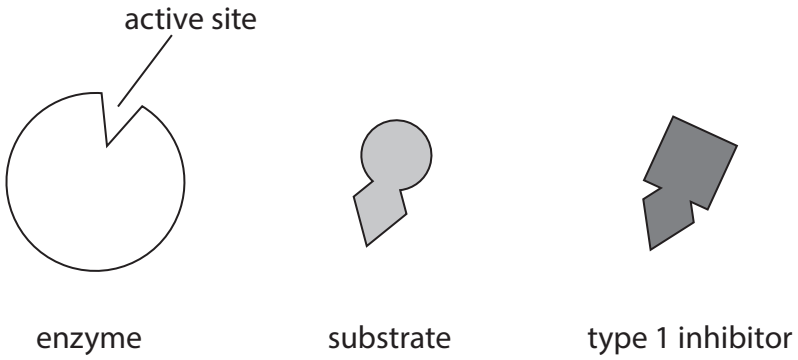
It also shows the effect of two types of inhibitor on the rate of this reaction.



(i) Describe **two** differences in the effects of these two types of inhibitor on the rate of this reaction.

(2)

(ii) The diagram shows the enzyme, its substrate and a type 1 inhibitor.

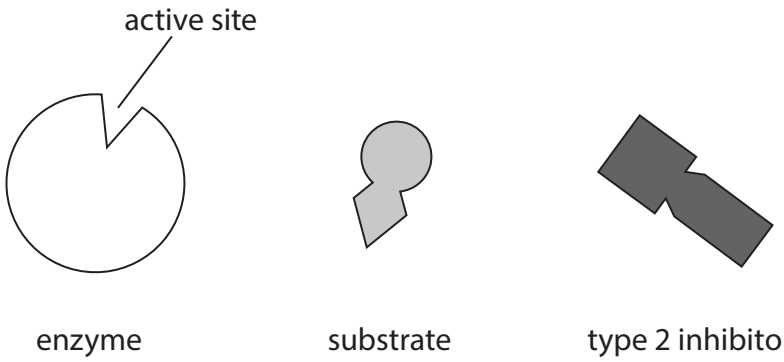


Explain how a type 1 inhibitor affects the rate of this reaction.

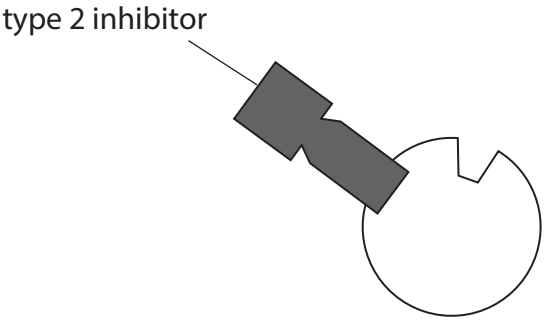
Use the information in the diagram to support your answer.

(3)

(iii) The first diagram shows the enzyme, its substrate and a type 2 inhibitor.



The second diagram shows the type 2 inhibitor attached to this enzyme.



Explain how a type 2 inhibitor affects the rate of this reaction.

Use the information in both of these diagrams to support your answer.

(2)

(Total for Question 3 = 8 marks)

4 One role of haemoglobin is to transport oxygen in the blood.

(a) Haemoglobin is a protein.

(i) The table shows some features of the secondary and tertiary (three-dimensional) structures of proteins.

For each feature, put **one** cross ☒ in the appropriate box in the Answer Booklet, in each row, to show whether these features **can be present in** these structures of proteins.

(2)

Feature	Structures of proteins			
	both secondary and tertiary	**secondary only**	**tertiary only**	**neither secondary nor tertiary**
peptide bonds				
beta (β) pleated folding				

(ii) Explain **two** ways in which the structure of haemoglobin enables it to transport oxygen in the blood.

(2)

(b) The tops of the Andes mountains in Peru are between 4 800 m and 5 400 m above sea level.

Llamas are adapted for living at these high altitudes.

Camels live at lower altitudes than llamas.

The photographs show a llama and a camel.

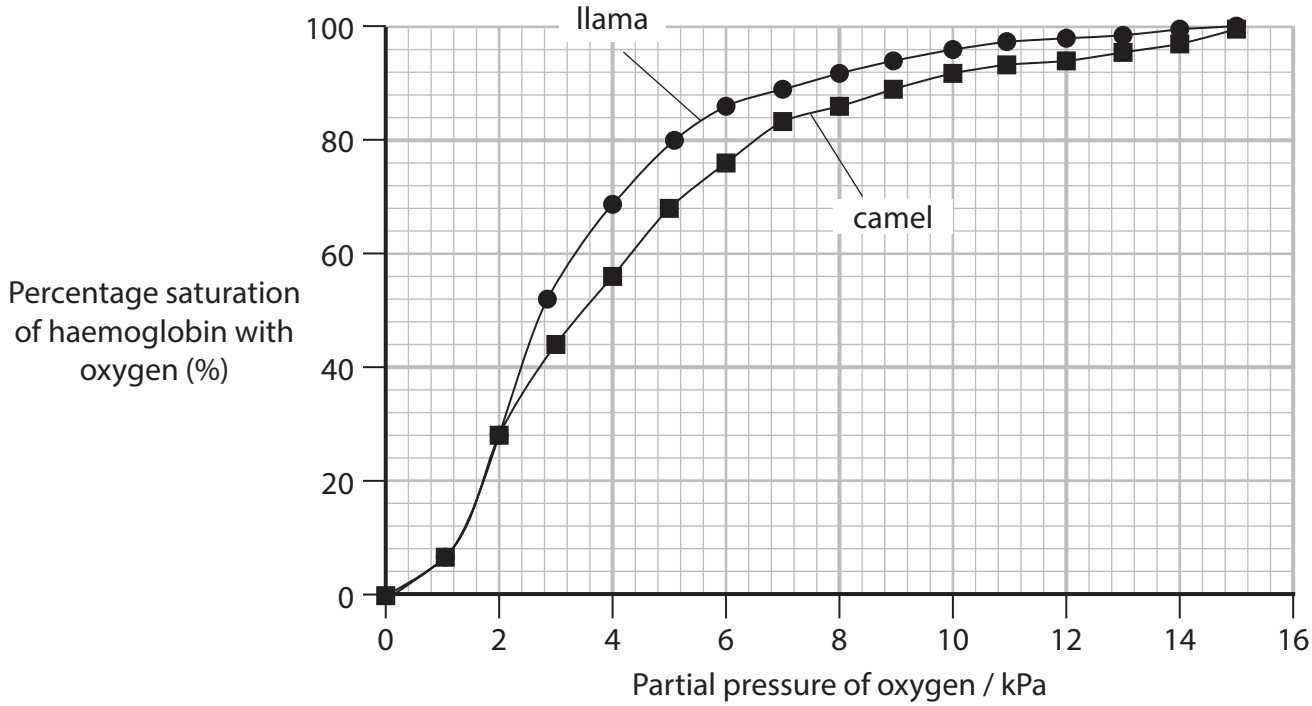
(Source: © Don Mammoser / Alamy Stock Photo)

Llama

(Source: © Itsik Marom / Alamy Stock Photo)

Camel

The graph shows the oxygen dissociation curves of haemoglobin of a llama and a camel.



The table shows the partial pressure of oxygen in the atmosphere at different altitudes.

Altitude / metres above sea level	Partial pressure of oxygen in the atmosphere / kPa
2 000	16.8
3 000	14.7
4 000	13.1
5 000	11.3
6 000	9.9

Deduce why llamas are able to live at higher altitudes than camels.

Use the information in the graph and the table to support your answer.

(4)

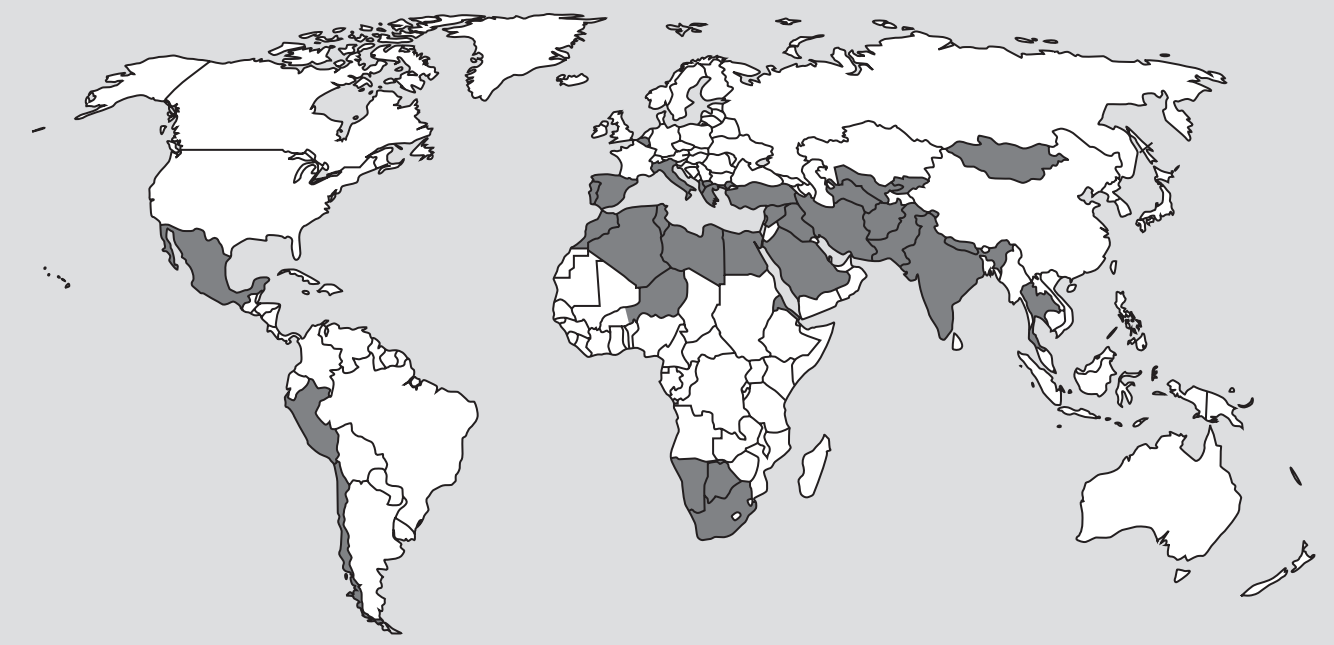
(Total for Question 4 = 8 marks)

5 There are many water-stressed countries in the world, mostly in the Middle East, North Africa and South Asia.

Water-stressed countries have a shortage of fresh water needed for humans, animals and crops.

Fresh water can be produced from sea water by desalination processes.

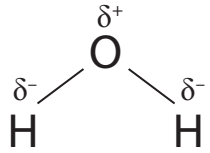
The map shows the most water-stressed countries (shaded) in the world.



(a) Which is the structure of a water molecule?

(1)

A



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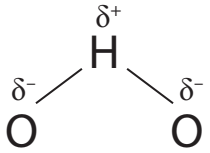

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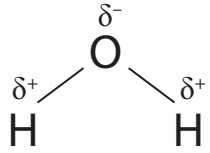

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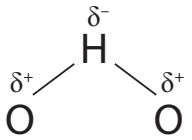


(b) The estimate of the volume of water on Earth is 1.4×10^{12} km^3.

Fresh water makes up 2.5% of this volume.

90% of this fresh water is not available as it is frozen in ice caps and glaciers.

Calculate the volume of **available** fresh water on Earth.

Give your answer in standard form.

(2)

(c) The global demand for water is expected to rise to about 6 000 km^3 by 2050.

Suggest **one** reason for an increase in the global demand for water.

(1)

(d) Sea water is a salt solution.

Salt has positively-charged sodium ions (Na^+) and negatively-charged chloride ions (Cl^-).

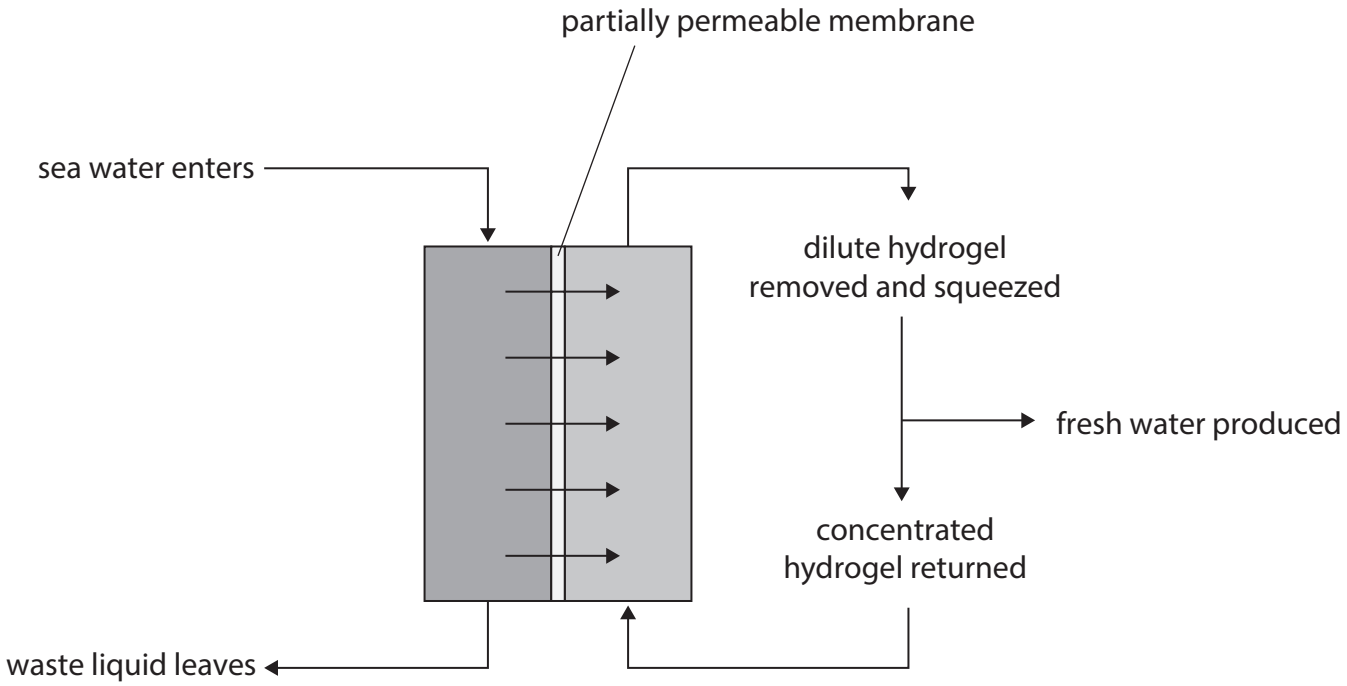
Explain why salt can dissolve in water.

(2)

(e) One method of desalination is forward osmosis desalination using a hydrogel.

Hydrogels are made of large molecules that can absorb water because they have a low water potential.

The diagram shows the process of forward osmosis desalination.



Explain how forward osmosis desalination produces fresh water.

Use the information in the diagram to support your answer.

(4)

(Total for Question 5 = 10 marks)

6 The structures of polysaccharides, disaccharides and monosaccharides relate to their roles in living organisms. They are all types of carbohydrate.

(a) The table shows the main type of carbohydrate present in some foods.

Food	Main type of carbohydrate present
jackfruit	glucose
rice	starch
sugar cane	sucrose
sweet potato (cooked)	maltose
watermelon	fructose

(i) Which row of the table shows an example of a polysaccharide, a disaccharide and a monosaccharide?

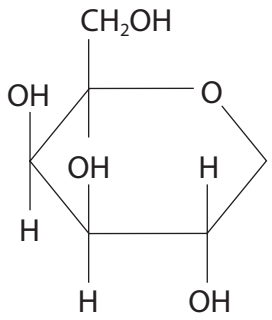
(1)

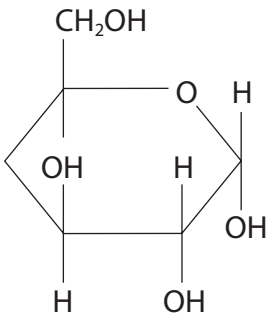
	Polysaccharide	Disaccharide	Monosaccharide
A	fructose	maltose	sucrose
B	maltose	sucrose	fructose
C	starch	maltose	sucrose
D	starch	sucrose	fructose

(ii) Lactose is a disaccharide composed of galactose and glucose.

Complete the diagram in the Answer Booklet, to show a molecule of lactose.

(2)





(iii) Glycogen is another carbohydrate.

Describe the structure of glycogen.

(2)

(b) The graph shows how the blood glucose level of a person changes during one day.

Calculate the maximum change in blood glucose level after the first meal is eaten.

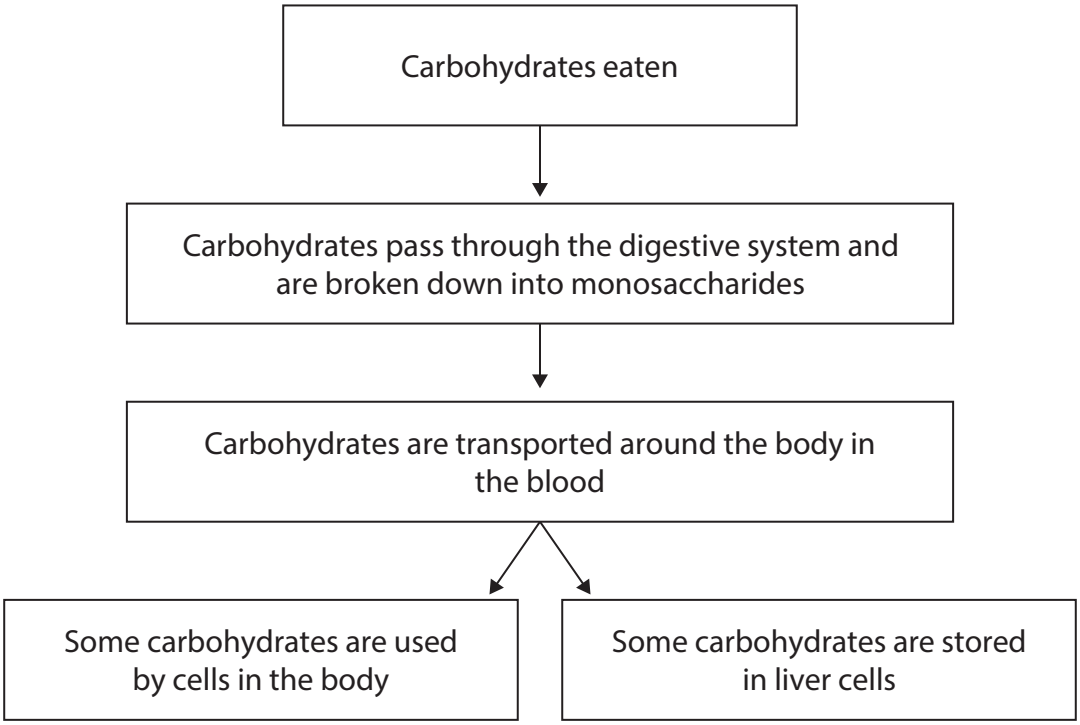
Give your answer to **one** significant figure **with suitable units**.

(2)

*(c) Carbohydrate metabolism includes the group of chemical reactions that break down carbohydrates.

Some of these reactions convert one type of carbohydrate into another type.

The flowchart shows what happens to some of the carbohydrates that we eat.



Explain how carbohydrates are metabolised, transported and used in the cells of the body and stored in liver cells.

Use the information in the question and your own knowledge of the structures, roles and properties of carbohydrates and transport mechanisms.

(6)

(Total for Question 6 = 13 marks)

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7 Cystic fibrosis (CF) is a recessive genetic disorder caused by mutations in the CFTR-gene.

(a) In 2022, there were approximately 70 000 people with CF in the world.

The world population was approximately 8×10^9 people.

(i) Suggest **two** reasons why these values are only approximations.

(2)

(ii) Estimate the probability of a person in 2022 having CF.

(1)

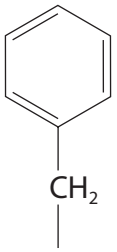
(b) One mutation results in a CFTR protein that is missing a **single** amino acid.

The missing amino acid is phenylalanine.

(i) Explain how a mutation can result in a CFTR protein missing a single phenylalanine.

(2)

(ii) The diagram shows the R group for phenylalanine.



Complete the diagram in the Answer Booklet, to show the amino acid phenylalanine.

(3)

(c) Cystic fibrosis can affect the functioning of the reproductive systems in both males and females, causing infertility.

(i) Some females with CF have thickened mucus in their reproductive tract.

Explain how a mutation in the CF-gene can result in infertility in these women.

(3)

(ii) Mutations in the CFTR-gene can result in the production of sperm cells that are not able to fertilise an egg cell.

In some male carriers of CF, only half the sperm cells are healthy and able to fertilise an egg cell.

Explain why male carriers of CF have a mixture of healthy sperm cells and sperm cells that are not able to fertilise an egg cell.

(3)

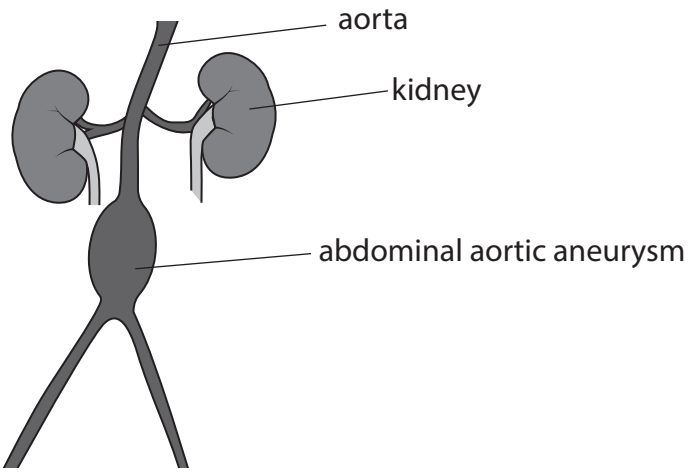
(Total for Question 7 = 14 marks)

8 An abdominal aortic aneurysm (AAA) is a swelling of the aorta in the abdomen due to weakening of the wall of the aorta.

Patients with an AAA frequently have atherosclerosis.

An AAA can be fatal if the aorta bursts causing internal bleeding.

The diagram shows an AAA.

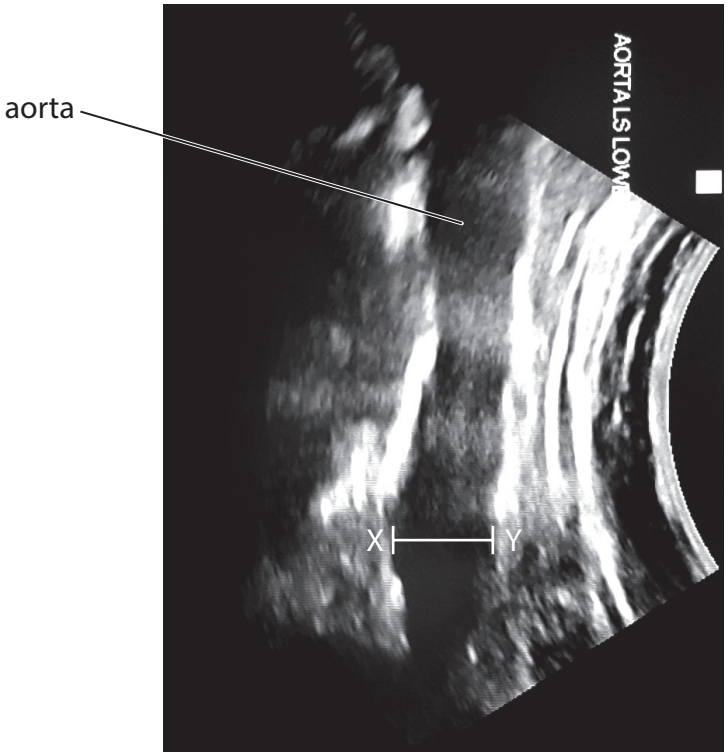


(a) Explain how a healthy aorta is protected from bursting.

(2)

(b) The presence of an AAA can be detected by scanning the abdomen.

The image shows a scan of a healthy abdominal aorta.



(i) The diameter of this aorta, between X and Y, is 17.3 mm.

Using the image in the answer booklet, calculate the magnification of the image.

Give your answer to a suitable number of decimal places.

(2)

(ii) An aorta with a diameter greater than 5.5 cm is classed as a large AAA.

Calculate how many times wider this large AAA is than the aorta with a diameter of 17.3 mm.

Give your answer to **three** significant figures.

(1)

(iii) A screening programme found that 1 in 92 men had an AAA and 1 in 1 000 men had a large AAA.

Calculate the proportion of AAA that are large AAA.

(1)

(c) The effect of drug D on AAA and atherosclerosis in mice was investigated by scientists.

(i) Drug D is an antioxidant.

Suggest why the scientists thought that drug D might be effective against AAA.

(2)

*(ii) The scientists used four groups of mice in this investigation.

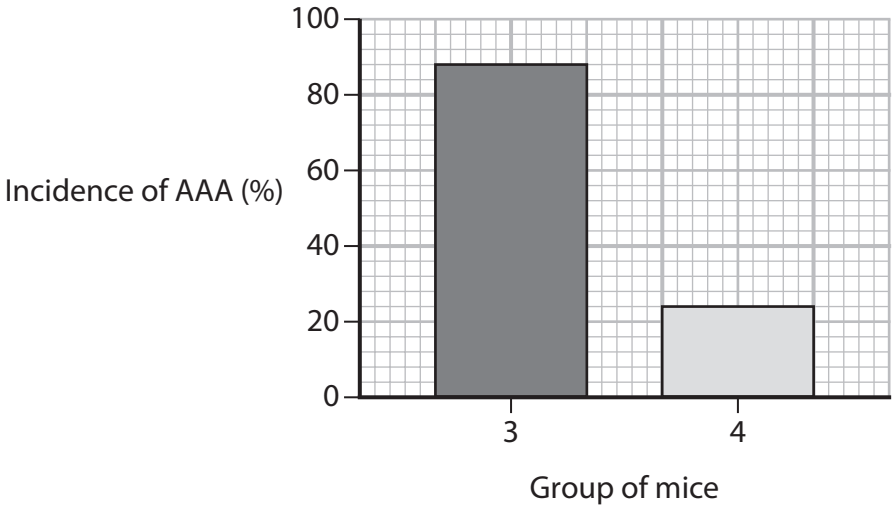
The table shows details of the injections and treatments given to these groups of mice.

Group	Injection given to mice	Treatment with drug D
1	salt solution	no
2	salt solution	yes
3	chemical C	no
4	chemical C	yes

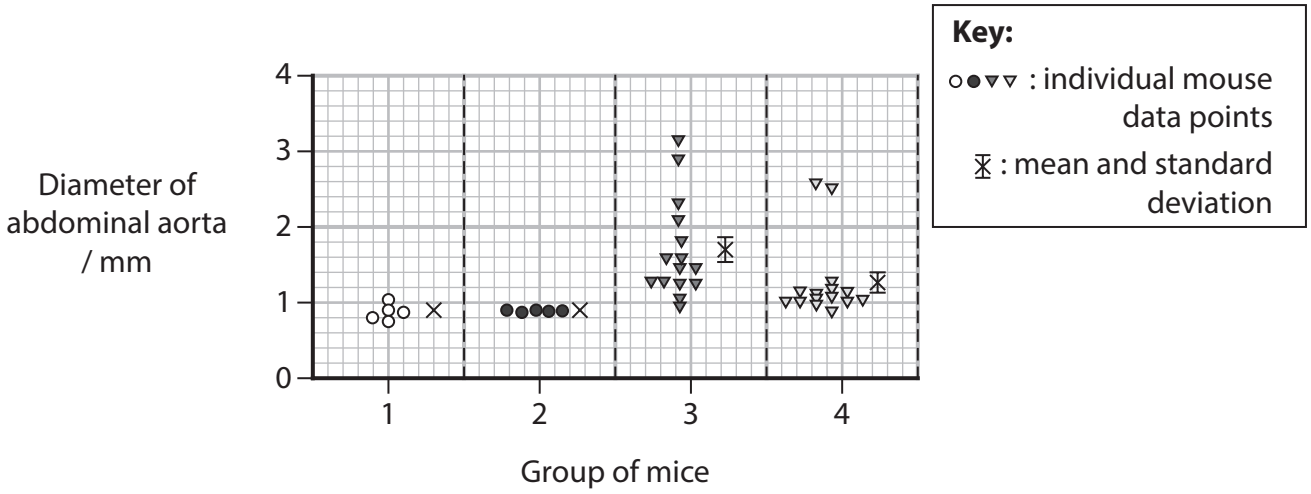
An injection of chemical C induces AAA and atherosclerosis in mice.

The graphs show some of the results from this investigation.

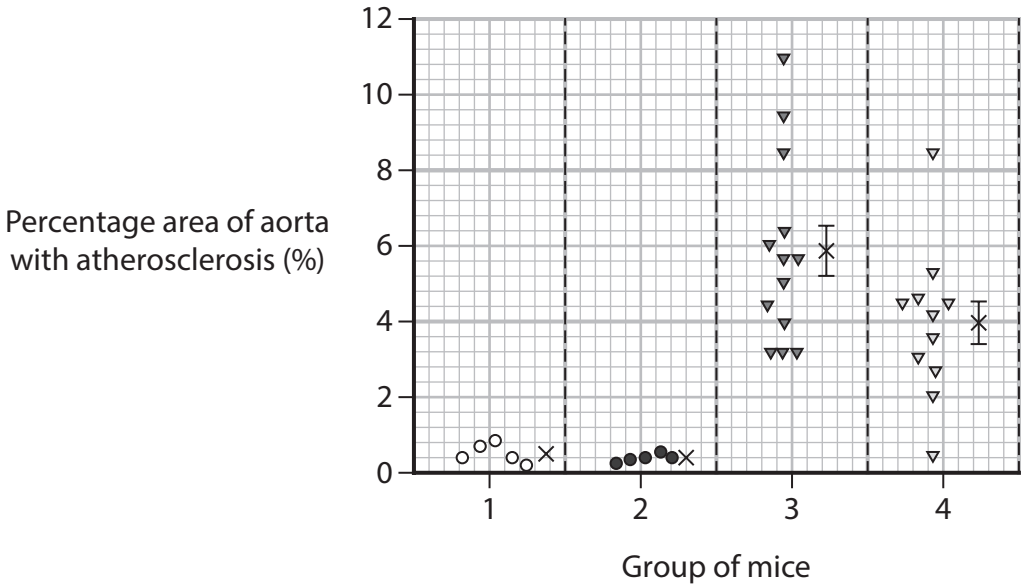
Graph 1 : Effect of treatment with drug D on the incidence of AAA



Graph 2 : Effect of treatment with drug D on the diameter of the abdominal aorta



Graph 3 : Effect of treatment with drug D on the percentage area of aorta with atherosclerosis



Comment on the effects of the injections and treatments used in this investigation.

(6)

(Total for Question 8 = 14 marks)

TOTAL FOR PAPER = 80 MARKS

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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 Advanced Level

Friday 10 October 2025

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WBI11/01A**

Biology

International Advanced Subsidiary/Advanced Level
UNIT 1: Molecules, Diet, Transport and Health
Answer Book

You must have:
Question paper (sent separately)
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **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.*
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points you make are related or follow on from each other where appropriate.

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. 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)

(3)

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(b)

(2)

	☒	☒	☒	☒
	☒	☒	☒	☒

(Total for Question 1 = 5 marks)

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2

(a)

(1)

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

(b)

(i)

mRNA | | | | | | |

(1)

(ii)

(1)

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(c)

(2)

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(d)

(3)

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3

(a)

(1)

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

(b)

(i)

(2)

1 .....

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(ii)

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4

(a)

(i)

(2)

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	☒	☒	☒	☒

(ii)

(2)

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(b)

(4)

(Total for Question 4 = 8 marks)

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5

(a)

(1)

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

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(b)

(2)

Answer ..... km^3

(c)

(1)

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(d)

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(e)

(4)

(Total for Question 5 = 10 marks)

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6

(a)

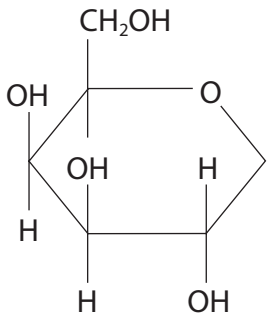
(i)

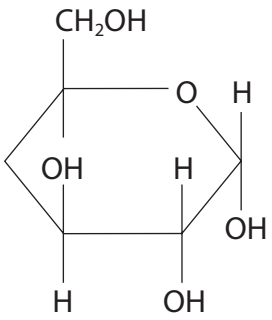
(1)

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

(ii)

(2)





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(iii)

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(b)

(2)

Answer ..... Units .....

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*(c)

(6)

(Total for Question 6 = 13 marks)

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7

(a)

(i)

(2)

1 .....

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(ii)

(1)

Answer .....

(b)

(i)

(2)

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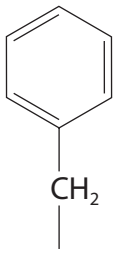
(ii)



(3)

(c)

(i)

(3)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

(ii)

(3)

(Total for Question 7 = 14 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

8

(a)

(2)

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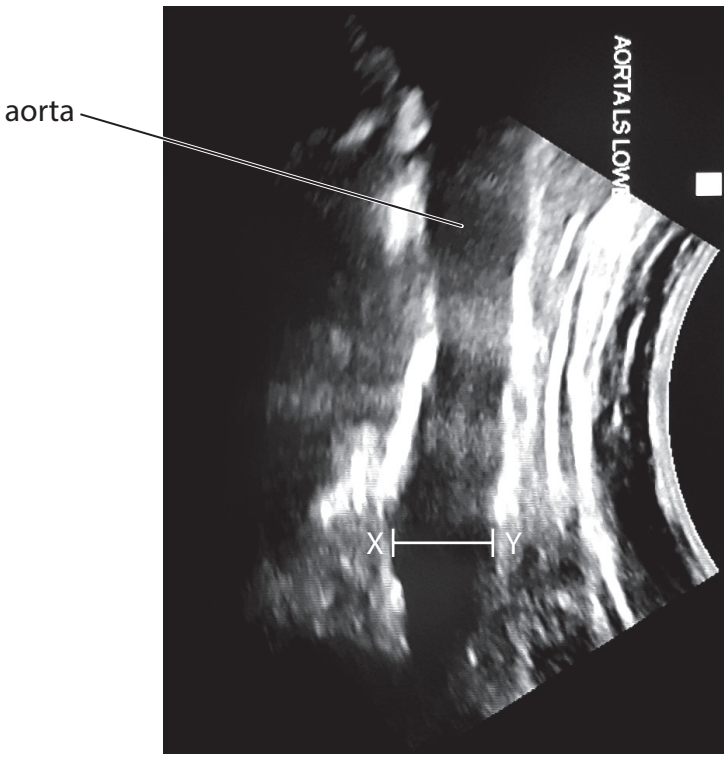
(b)



(i)

(2)

Answer .....

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

(ii)

(1)

Answer .....

(iii)

(1)

Answer .....

(c)

(i)

(2)

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

*(ii)

(6)

(Total for Question 8 = 14 marks)

TOTAL FOR PAPER = 80 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA