Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 8 October 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **WBI11/01**

Biology

International Advanced Subsidiary / Advanced Level
Unit 1: Molecules, Diet, Transport and Health

You must have:
Scientific calculator, ruler, HB pencil

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 your working in calculations and include units where appropriate.**

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 that 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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P 6 2 7 9 2 R A 0 1 2 8

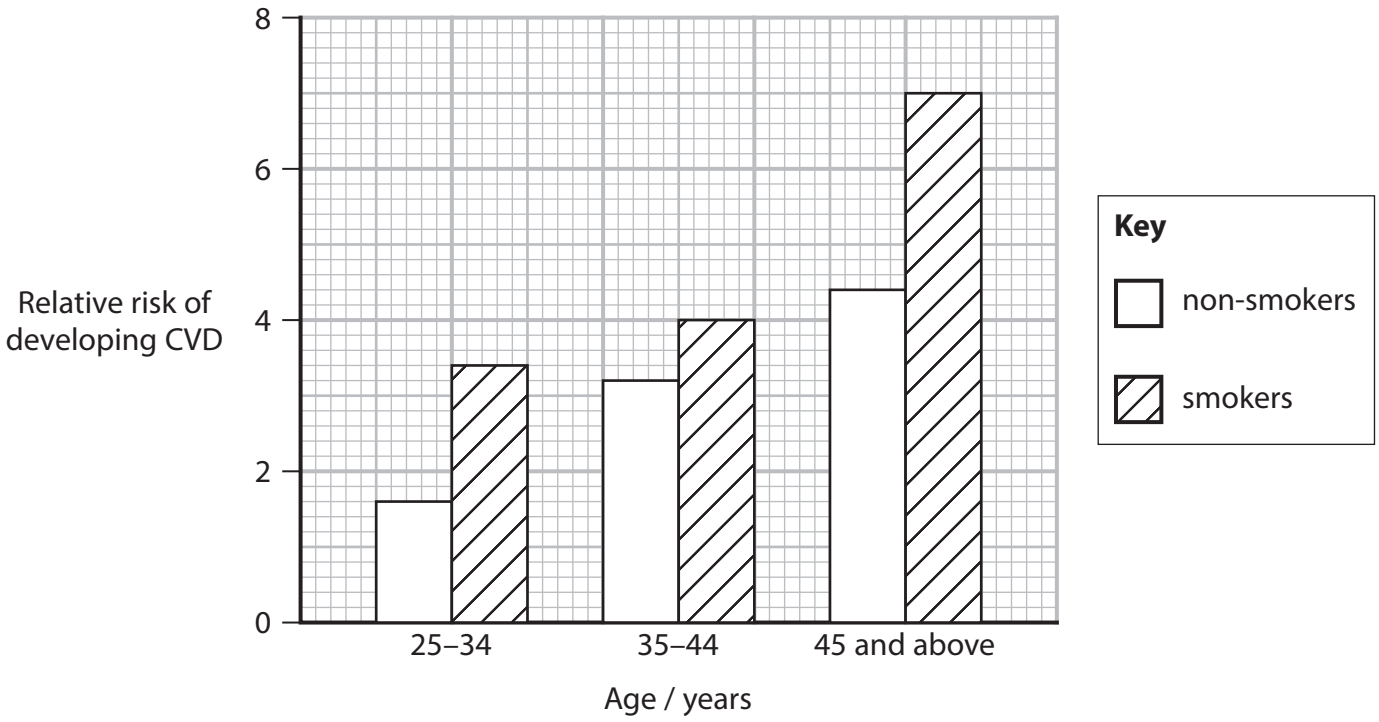
Pearson

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 The graph shows the relative risk of developing cardiovascular disease (CVD) for non-smokers and for smokers.



(a) (i) Describe the conclusions that can be made about the risk factors for CVD.

Use the information in the graph to support your answer.

(2)

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(ii) The information shown in this graph was collected more than 25 years ago.

Explain how this graph might appear if it showed data collected last year.

(2)

(b) The number of people in the world who die from CVD each year is 17.7 million.

This is 31% of all total deaths.

How many deaths are there in the world each year?

(1)

☒ **A** 0.571×10^6

☒ **B** 5.71×10^6

☒ **C** 57.1×10^6

☒ **D** 571.00×10^6

(Total for Question 1 = 5 marks)

2 Rabbits can have brown fur or white fur.

A heterozygous rabbit will have brown fur.

(a) Draw a genetic diagram to show the genotypes and corresponding phenotypes of the baby rabbits produced if two heterozygous rabbits were bred together.

(3)

(b) A number of heterozygous pairs of rabbits were bred together and produced 284 baby rabbits.

Calculate the expected number of homozygous brown rabbits, heterozygous brown rabbits and white rabbits produced.

(3)

Number of homozygous brown rabbits .....

Number of heterozygous brown rabbits.....

Number of white rabbits.....

(Total for Question 2 = 6 marks)

3 Haemophilia A is an inherited genetic disorder.

Haemophilia A results in the blood not being able to clot.

(a) The table gives some information about blood clotting components.

Complete the table by filling in the empty boxes with either the name of the component, the role of the component or the solubility of the component.

(6)

Name	Role	Solubility
thromboplastin	.....	soluble
.....	catalyses the conversion of fibrinogen into fibrin	.....
fibrin	1	.....

(b) Haemophilia A is inherited in a similar way to red-green colour blindness.

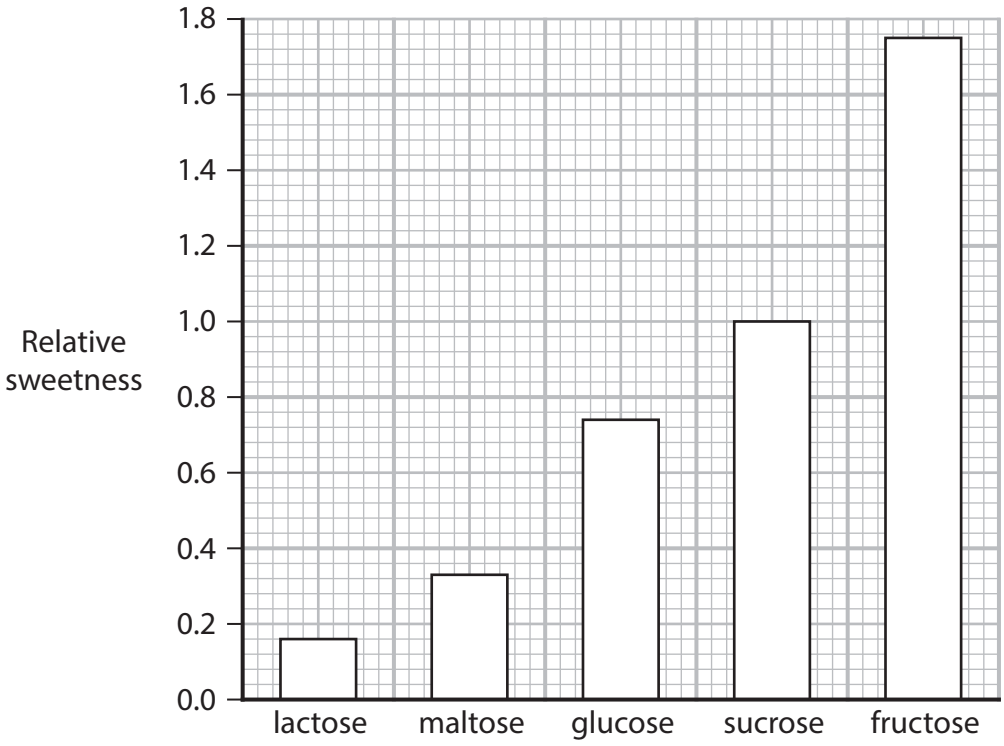
Explain why more males than females are affected with haemophilia A.

(3)

(Total for Question 3 = 9 marks)

4 Carbohydrates are important molecules in living organisms.

(a) The graph shows the relative sweetness of some monosaccharides and some disaccharides.



(i) Which row in the table gives the correct number of monosaccharides and disaccharides shown in this graph?

(1)

	Number of monosaccharides	Number of disaccharides
☒ **A**	1	4
☒ **B**	2	3
☒ **C**	3	2
☒ **D**	4	1

(ii) Which bond joins two monosaccharides together to form a disaccharide?

(1)

☒ **A** ester

☒ **B** glycosidic

☒ **C** hydrogen

☒ **D** phosphodiester

(iii) State **two** conclusions that can be made about the relative sweetness of monosaccharides and of disaccharides.

(2)

1 .....

.....

.....

2 .....

.....

.....

(iv) Devise an investigation that a student could carry out to confirm the data shown in the graph.

(3)

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(b) Amylose and amylopectin are components of starch.

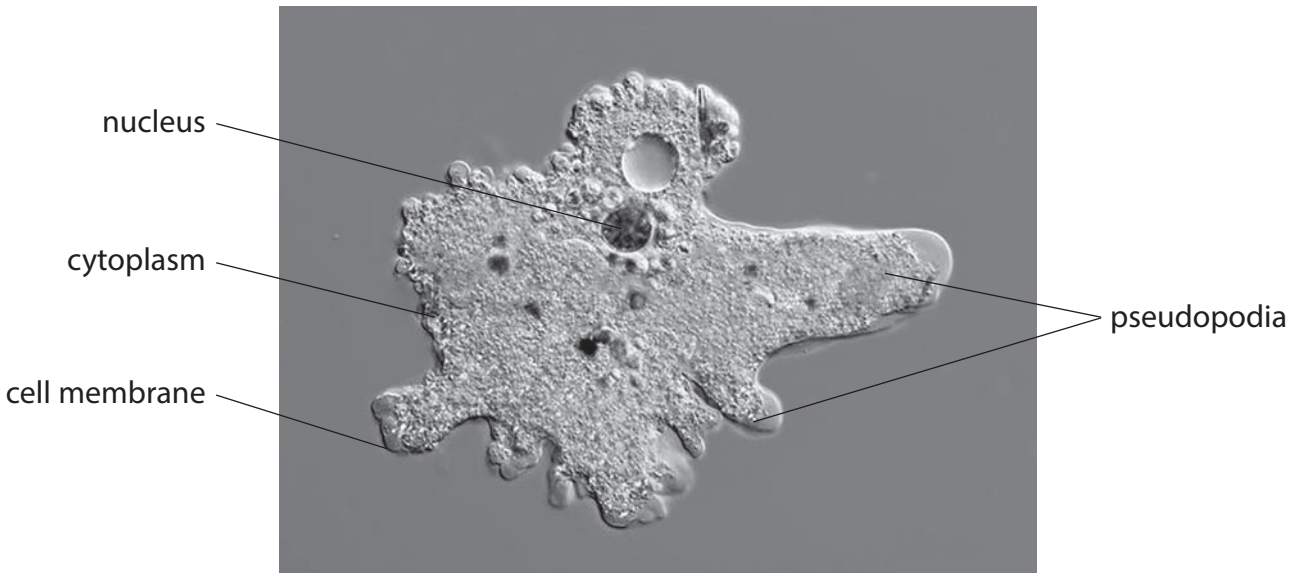
Compare and contrast the structure of amylose with the structure of amylopectin.

(3)

(Total for Question 4 = 10 marks)

5 An amoeba is a single-celled organism that lives in water.

The photograph shows an amoeba, as seen using a light microscope.



Substances in the water can enter the amoeba by a variety of transport mechanisms.

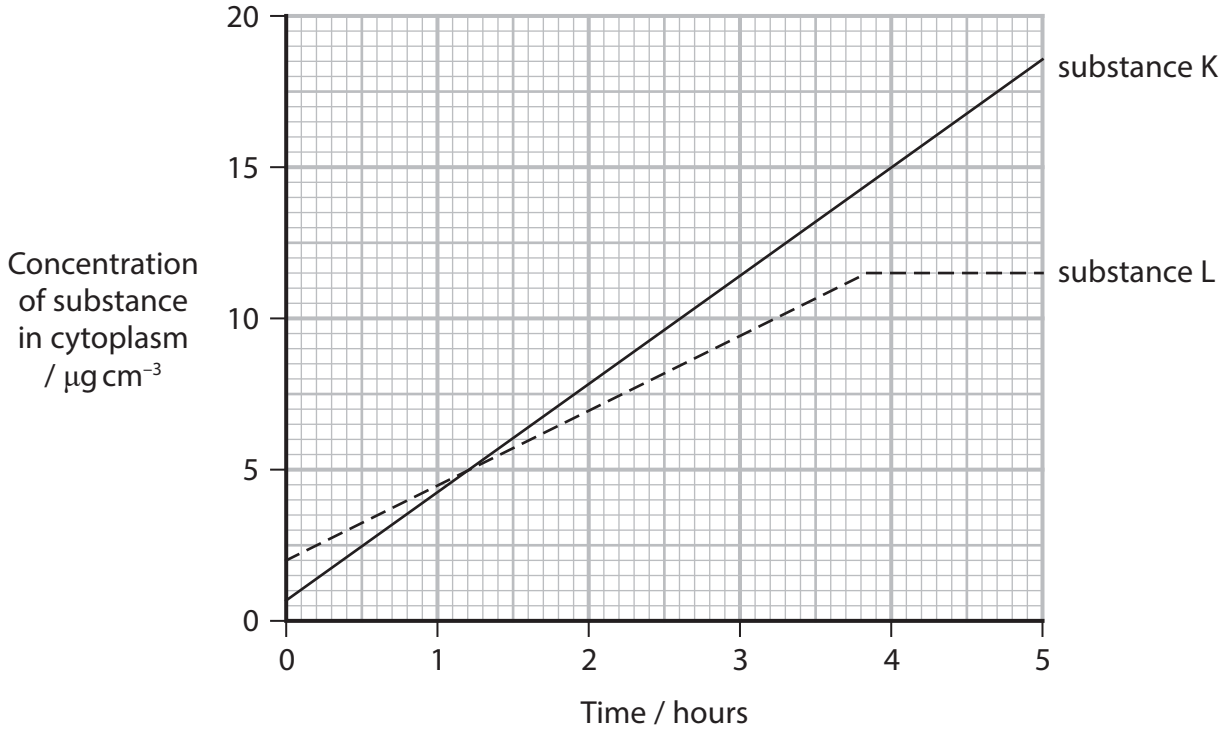
(a) The table shows some features of transport mechanisms.

Which feature is true for active transport only, facilitated diffusion only, both active transport and facilitated diffusion, or not true for both active transport and facilitated diffusion?

(3)

Feature	Transport mechanism			
	active transport only	**facilitated diffusion only**	**both active transport and facilitated diffusion**	**not true for both active transport and facilitated diffusion**
passive process	☒	☒	☒	☒
membrane proteins involved	☒	☒	☒	☒
direction of transport can be up the concentration gradient	☒	☒	☒	☒

(b) The graph shows the uptake of two substances, substance K and substance L, into the cytoplasm of an amoeba in water at a temperature of 18 °C.



(i) Explain the differences in the uptake of substance K and substance L.

(2)

(ii) On the graph, draw a line to show the uptake of substance L at 10 °C.

(2)

(c) Pseudopodia are formed by cytoplasm flowing towards the membrane and changing its shape.

(i) Explain why the membrane is able to change its shape when cytoplasm flows towards it.

(2)

(ii) Explain how the uptake of substances would be affected if the amoeba increased its number of pseudopodia.

(2)

(Total for Question 5 = 11 marks)

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6 Errors in DNA replication can give rise to mutations.

The diagram shows the bases in a length of DNA.

Length of DNA	A	T	G	C	T	C	A	T	T	T	A	C	C	A	T	C	G	A
Base number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

The table shows the genetic code for the amino acids.

Genetic code	Amino acid	Genetic code	Amino acid	Genetic code	Amino acid	Genetic code	Amino acid
AAA AAG	Lysine	CAA CAG	Glutamine	GAA GAG	Glutamic acid	TAC TAT	Tyrosine
AAC AAT	Asparagine	CAT CAC	Histidine	GAC GAT	Aspartic acid	TCA TCC TCG TCT	Serine
ACA ACC ACG ACT	Threonine	CCA CCC CCG CCT	Proline	GCA GCC GCG GCT	Alanine	TGG	Tryptophan
AGA AGG	Arginine	CGA CGC CGG CGT	Arginine	GGA GGC GGG GGT	Glycine	TGC TGT	Cysteine
AGC AGT	Serine	CTA CTC CTG CTT	Leucine	GTA GTC GTG GTT	Valine	TTA TTG	Leucine
ATA ATC ATT	Isoleucine					TTC TTT	Phenylalanine
ATG	Methionine						

The genetic codes TAA, TAG and TGA are stop codons.

(a) State the sequence of the first four amino acids coded for by this length of DNA.

(1)

.....

(b) A change in a single base can cause a change in the amino acid sequence produced in protein synthesis.

(i) Name the type of each mutation described below.

(2)

Base number 3 becomes cytosine (C) .....

Base number 6 becomes number 5 in the sequence .....

Base number 9 becomes number 10 in the sequence .....

*(ii) Explain the possible effects of these three types of mutation on the amino acid sequence coded for by this length of DNA.

Use the information in the table to support your answer.

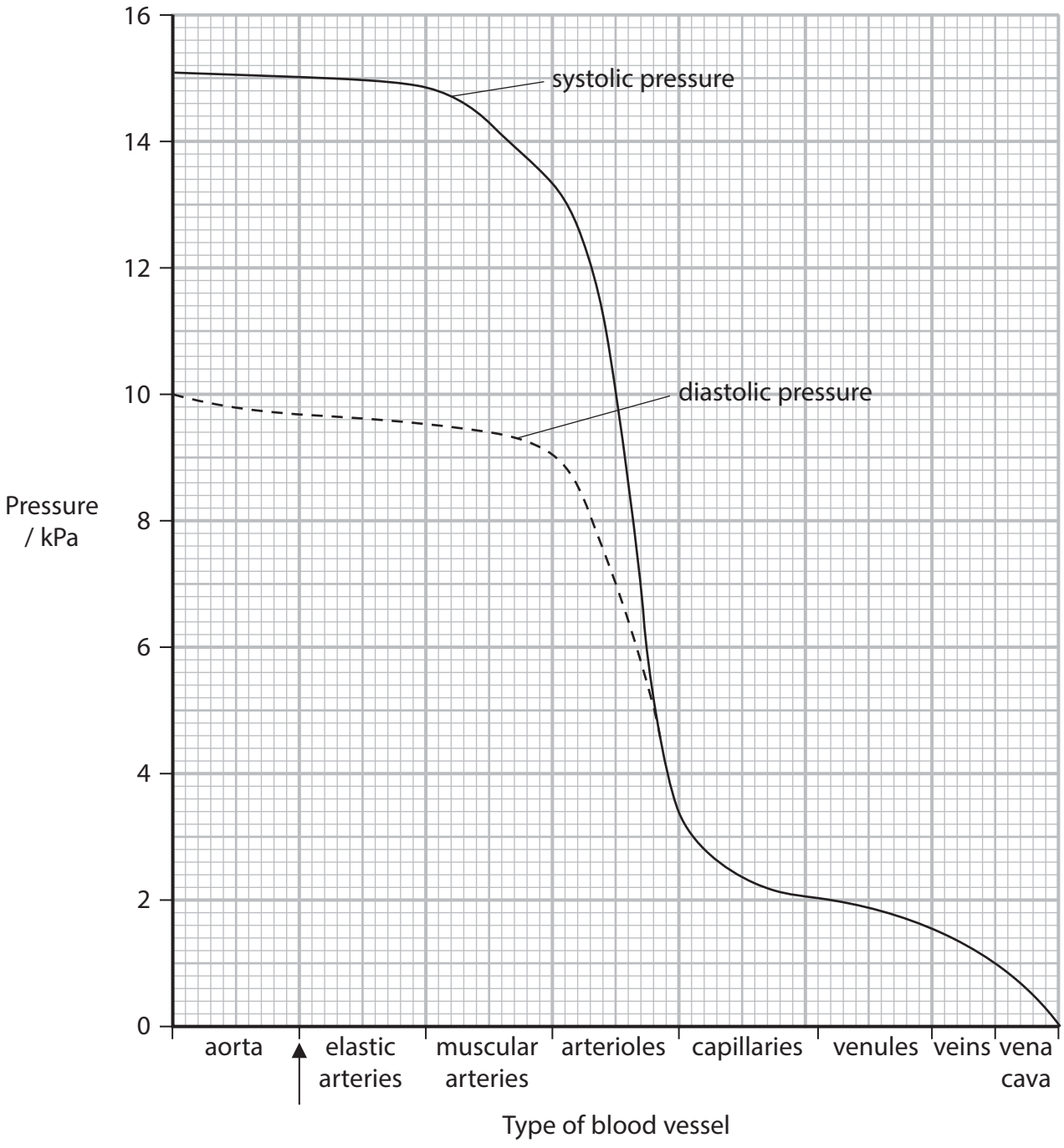
(6)

(Total for Question 6 = 9 marks)

7 Blood flow and blood pressure are affected by a number of factors.

Abnormal blood flow and abnormal blood pressure affect the health of a person.

(a) The graph shows the systolic pressure and the diastolic pressure as blood flows through human blood vessels.



(i) Pulse pressure is the difference between systolic pressure and diastolic pressure.

In a healthy person, pulse pressure should be at least 25% of the systolic pressure.

Determine whether this person is healthy, using the point indicated by the arrow on the *x*-axis of the graph.

(2)

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(ii) The mean arterial pressure (MAP) can be approximated using the formula

$$\text{MAP} = \text{diastolic blood pressure} + \frac{(\text{systolic blood pressure} - \text{diastolic blood pressure})}{3}$$

Estimate the MAP in the elastic arteries for this person.

(2)

Answer ..... kPa

(iii) If the mean arterial pressure (MAP) value is less than 8 kPa, the force pushing the blood through the vessels will be too low.

Explain how a low MAP could affect a person.

(2)

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(b) Blood flow depends on the change in pressure (ΔP), the radius of the blood vessel lumen (r), the length of the blood vessel (λ) and the viscosity of the blood (η).

Blood flow can be calculated using the formula

$$\text{Blood flow} = \frac{\pi \Delta P r^4}{8 \eta \lambda}$$

Blood flow can also be calculated using the formula

$$\text{Blood flow} = \frac{\Delta P}{\text{resistance}}$$

(i) Which formula can be used to calculate resistance?

(1)

☒ **A** $\frac{8\eta\lambda}{\pi\Delta Pr^4}$

☒ **B** $\frac{\pi\Delta Pr^4}{8\eta\lambda}$

☒ **C** $\frac{\pi r^4}{8\eta\lambda}$

☒ **D** $\frac{8\eta\lambda}{\pi r^4}$

(ii) A change in which factor has the biggest effect on resistance?

(1)

☒ **A** blood pressure

☒ **B** length of the blood vessel

☒ **C** radius of the blood vessel lumen

☒ **D** thickness of the blood vessel wall

(iii) Explain how arteries are adapted to reduce resistance to blood flow.

(2)

(c) Blood vessels can expand to accommodate increased blood flow. This is known as compliance.

(i) Explain how arteries are adapted to accommodate sudden increases in blood flow.

(2)

(ii) Explain why a reduction in the compliance of a blood vessel can lead to cardiovascular disease (CVD).

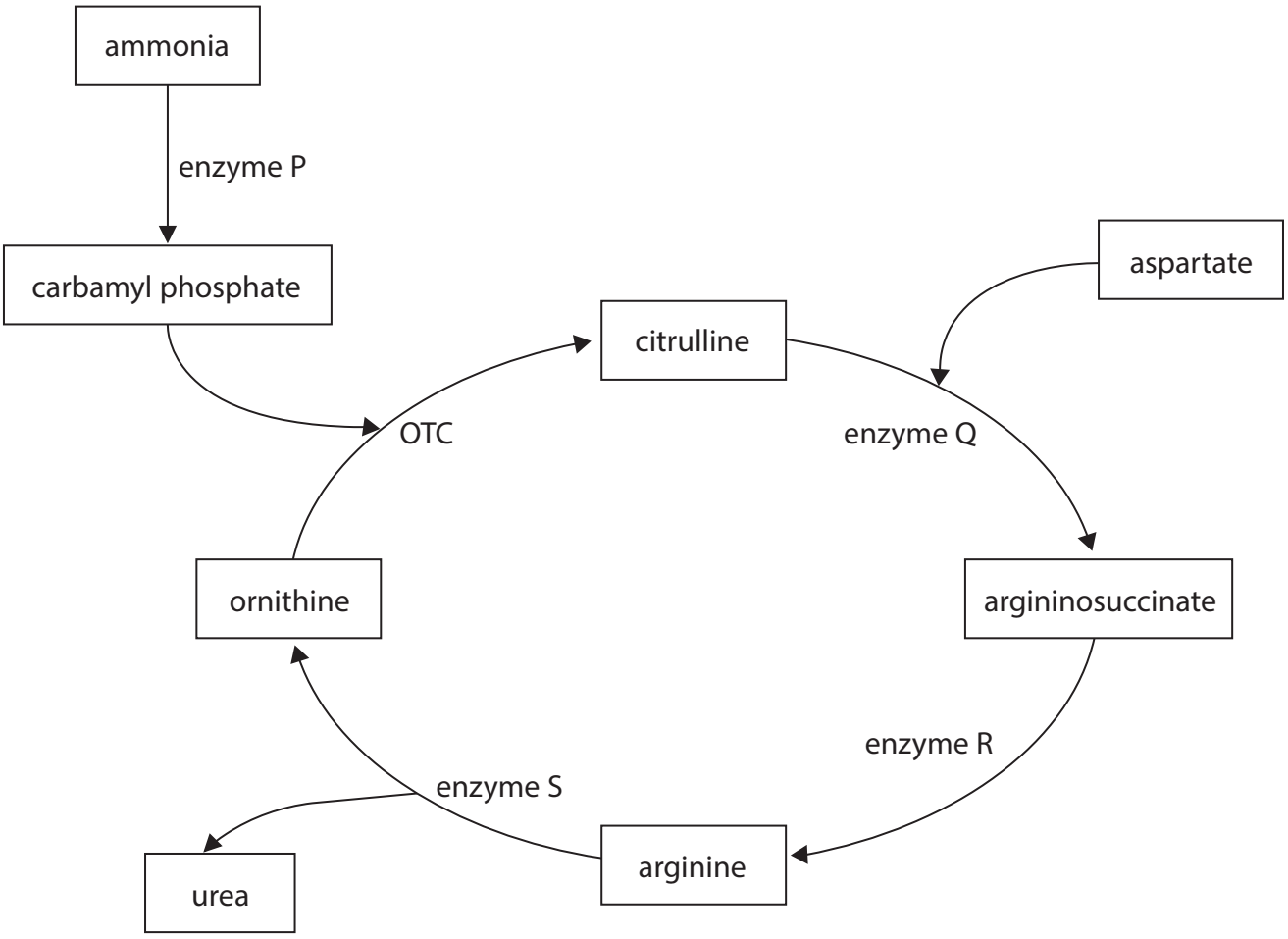
(3)

(Total for Question 7 = 15 marks)

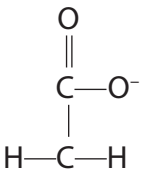
8 The amino acid aspartate is converted into the amino acid arginine in the urea cycle.

The urea cycle involves several enzymes and takes place in the liver.

The diagram shows part of the urea cycle.



(a) The R group of aspartate is



Draw the structure of the amino acid aspartate.

(3)

(b) Explain why several enzymes are involved in the urea cycle.

(3)

(c) Ornithine transcarbamylase (OTC) is one enzyme involved in the urea cycle.

Ornithine transcarbamylase deficiency is an inherited genetic disorder.

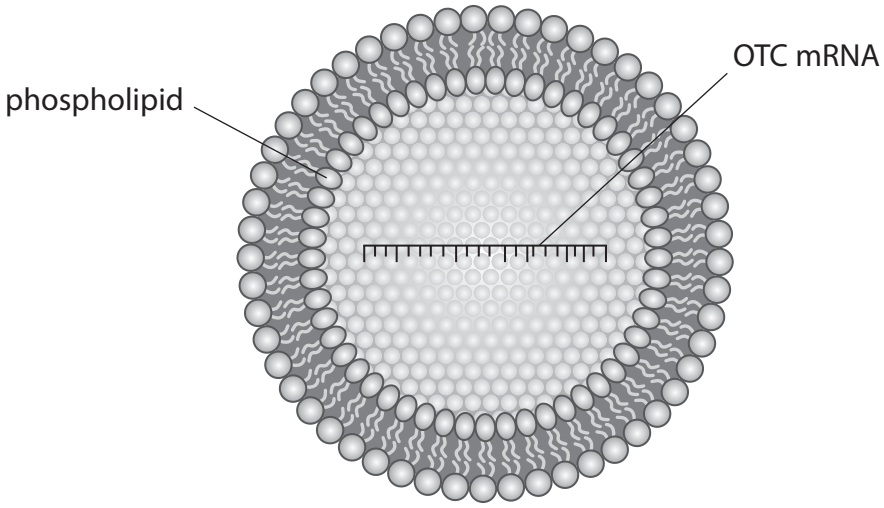
(i) Suggest how a person can be shown to have this disorder.

(3)

*(ii) Targeted mRNA therapy is being developed to treat OTC deficiency in mice.

Targeted mRNA therapy involves injecting mice with phospholipid particles containing OTC mRNA.

These particles, shown in the diagram, target liver cells.



The table shows the results of one study using these particles.

Mice	Concentration of ammonia in blood plasma / μmol dm^{-3}
normal without treatment	50
with OTC deficiency and without treatment	240
with OTC deficiency and with treatment	40

Explain how this treatment works.

Use the information in the diagram of the urea cycle, the diagram of the particle and the table of results to support your answer.

(6)

(Total for Question 8 = 15 marks)

TOTAL FOR PAPER = 80 MARKS

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