Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Advanced Subsidiary
Unit 1: Lifestyle, Transport, Genes and Health

Monday 8 January 2018 – Morning
Time: 1 hour 30 minutes

Paper Reference
WBI01/01

You must have:
Calculator, HB pencil, 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.*

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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 5 1 8 5 6 A 0 1 2 4

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 During the cardiac cycle, muscles in the atria and ventricles contract and relax.

(a) The table below shows the pressures in the aorta, left atrium and left ventricle at three different times, **P**, **Q** and **R**, in the cardiac cycle.

Time in the cardiac cycle	Pressure / kPa		
	Aorta	Left atrium	Left ventricle
P	9.0	4.0	2.5
Q	10	0.5	0
R	12.5	0.5	12.5

(i) Put a cross (☒) in the box to complete the following sentence.

At time **Q**, the heart is

(1)

☒ **A** hypertensive

☒ **B** in atrial systole

☒ **C** in diastole

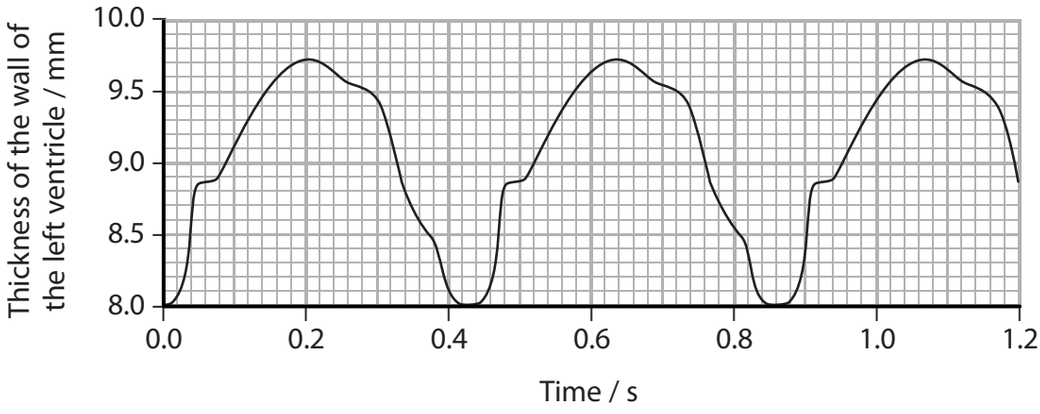
☒ **D** in ventricular systole

(ii) Put a cross (☒) in the box next to the row in the table that correctly describes the heart valves at time **P**.

(1)

		Atrioventricular valves	Semilunar valves
☒	**A**	Closed	Closed
☒	**B**	Closed	Open
☒	**C**	Open	Closed
☒	**D**	Open	Open

(b) The graph below shows the change in thickness of the wall of the left ventricle during the cardiac cycle.



(i) Using the information in the graph, calculate the heart rate in beats per minute.

Show your working.

(2)

Answer ..... bpm

(ii) Name the blood vessel through which blood leaves the left ventricle.

(1)

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(c) Explain why many animals need a heart.

(2)

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(Total for Question 1 = 7 marks)

2 All living organisms need to exchange gases with their environment.

(a) Explain how a concentration gradient is maintained through gas exchange surfaces in human lungs.

(3)

*(b) Cystic fibrosis is a genetic condition that affects gas exchange in humans.

Explain how cystic fibrosis affects gas exchange.

(5)

(c) Somatic gene therapy may be used to treat people with cystic fibrosis.

However, some scientists hope to use germ line gene therapy to treat people with cystic fibrosis.

Compare somatic gene therapy and germ line gene therapy.

(3)

(Total for Question 2 = 11 marks)

3 Lipids are transported in the blood as lipoproteins.

(a) The table below shows some information about lipoproteins.

Type of lipoprotein	Density / g cm^{-3}	Protein (%)	Triglyceride (%)	Cholesterol (%)	Phospholipids (%)
chylomicron	< 0.95	1–2	85–88	1	8
VLDL	0.98	5–12	50–55	8–10	8–10
IDL	1.00	10–12	24–30	8–10	25–27
LDL	1.04	20–22	10–15	8–10	20–28
HDL	1.12	55	3–15	2–10	26–46

Put a cross (☒) in the box that completes each of the following sentences.

(i) The density of lipoproteins is inversely proportional to the percentage of

(1)

☒ **A** cholesterol

☒ **B** phospholipid

☒ **C** protein

☒ **D** triglyceride

(ii) The density of HDL is

(1)

☒ **A** 1.12% less than IDL

☒ **B** 1.12% more than IDL

☒ **C** 12% less than IDL

☒ **D** 12% more than IDL

(b) The table below shows the incidence of cardiovascular disease (CVD) for groups of people with different blood cholesterol concentrations and systolic blood pressures.

Systolic blood pressure / kPa	Incidence of CVD per 100 000		
	Blood cholesterol concentration / mg 100 cm^{-3}		
	<200	200–239	>239
<17.3	222	780	1676
17.3 to 18.5	556	1139	2123
18.6 to 21.2	716	2221	3841
>21.2	3926	7349	8212

(i) Using the information in the table, describe the relationship between systolic blood pressure, blood cholesterol concentration and the incidence of CVD.

(3)

(ii) High blood pressure may cause atherosclerosis.

Describe how the development of atherosclerosis can result in CVD.

(4)

(iii) Suggest **two** treatments for the group of people with the greatest risk of CVD.

Give **one** risk for each treatment.

(4)

Treatment 1 .....

Risk .....

.....

Treatment 2 .....

Risk .....

.....

(Total for Question 3 = 13 marks)

4 Blood plasma contains many different proteins.

The table below shows information about proteins found in blood plasma.

Protein	Concentration in blood plasma / g dm^{-3}
albumin	40
globulins	25
fibrinogen	3
all other proteins	2

(a) Describe how amino acids join together to form proteins.

(3)

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(b) Fibrinogen is the third most abundant type of protein in blood plasma.

(i) Using the information in the table, calculate the percentage of blood plasma protein that is fibrinogen.

Show your working.

(2)

..... %

(ii) Describe the role of fibrinogen in the blood clotting process.

(2)

(c) Albumin is a soluble protein.

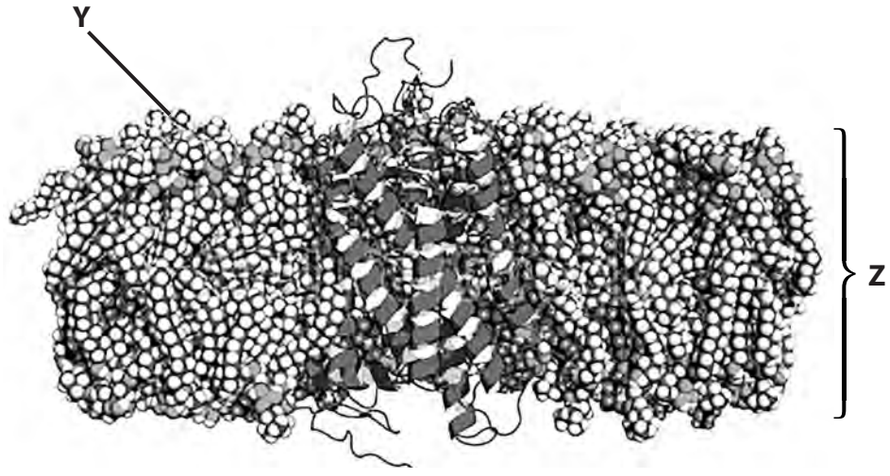
Describe how this property is related to the primary structure of albumin.

(4)

(Total for Question 4 = 11 marks)

5 All cells are surrounded by a cell membrane.

The diagram below shows a model of a section through a muscle cell membrane.



Magnification × 4 000 000

(a) Put a cross (☒) in the box that completes each of the following sentences.

(i) The surface of this membrane, labelled **Y**, is occupied by

(1)

☒ **A** hydrophilic fatty acid chains

☒ **B** hydrophilic phosphate groups

☒ **C** hydrophobic fatty acid chains

☒ **D** hydrophobic phosphate groups

(ii) The model represents a membrane with a thickness (**Z**) of

(1)

☒ **A** 4 mm

☒ **B** 4 nm

☒ **C** 10 mm

☒ **D** 10 nm

(b) One role of cell membranes is to control the movement of substances into and out of cells.

The table below shows the concentrations of some substances inside the muscle cells and outside the muscle cells in the extracellular fluid.

Substance	Nature of the substance	Concentration inside the cells / mmol dm^{-3}	Concentration outside the cells / mmol dm^{-3}
oxygen	small non-polar molecule	11.0×10^{-6}	37.0×10^{-6}
potassium	small ion	120.0	4.5
glucose	large polar molecule	0.1	10.0

Use the information in the table to answer each of the following.

(i) Explain how oxygen enters a muscle cell.

(2)

(ii) Explain why the movement of potassium ions into a muscle cell requires ATP.

(2)

(iii) Explain how glucose moves into a muscle cell.

(2)

(Total for Question 5 = 8 marks)

6 Spinal muscular atrophy is a genetic condition caused by a mutation in the SMN1 gene.

(a) The diagram below shows part of the genetic code for the SMN1 gene.

A	G	T	G	G	C	T	A	T	C	A	T

(i) Explain what is meant by the term **gene**.

(2)

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(ii) Put a cross (☒) in the box to complete the following sentence.

The maximum number of amino acids coded for by this part of the SMN1 gene is

(1)

☒ **A** 3

☒ **B** 4

☒ **C** 6

☒ **D** 12

(iii) **One** of the adenine bases (A) is replaced by guanine (G) in a mutation of the SMN1 gene sequence shown.

Put a cross (☒) in the box next to the mRNA sequence produced from this mutation.

(1)

☒ **A** T C U C C G U C U G T U

☒ **B** T C U C C G U T U G T U

☒ **C** U C A C C G A C A G U A

☒ **D** U C A C C G A U A G U A

(b) Spinal muscular atrophy (SMA) is a recessive condition.

Two people, unaffected by SMA, would like to have children.

One of these people has a family history of SMA, the other does not.

(i) Using genetic diagrams, explain how you could determine the probability of these people having a child who is a carrier for SMA.

(4)

(ii) Name the prenatal test that uses cells removed from the placenta to screen for the presence of SMA.

(1)

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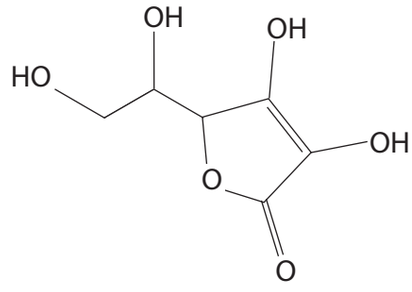
(Total for Question 6 = 9 marks)

7 Vitamin C is soluble in water.

(a) The diagram below shows the structure of vitamin C.



Using the information in the diagram, suggest why vitamin C is soluble in water.

(2)

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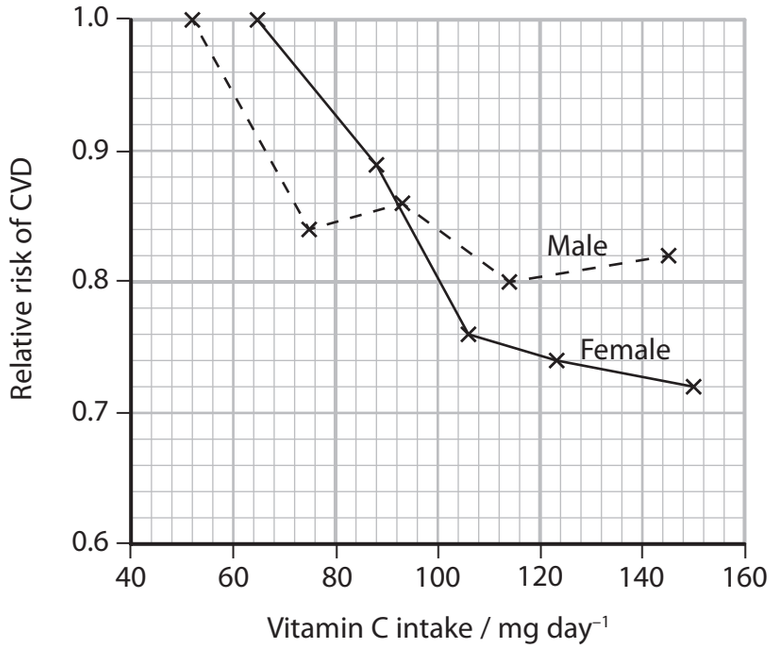
(b) The relationship between vitamin C in the diet and the relative risk of cardiovascular disease (CVD) has been investigated.

The graph below shows the results of one investigation.



Compare the relationship between vitamin C intake and the relative risk of CVD in men and women.

(3)

*(c) As part of this study, scientists determined the concentration of vitamin C in different fruits.

Describe how you would make a valid comparison of the vitamin C concentration of different fruits.

(5)

(Total for Question 7 = 10 marks)

8 Glucose is stored in muscle cells as glycogen.

(a) Describe how glycogen is formed from glucose.

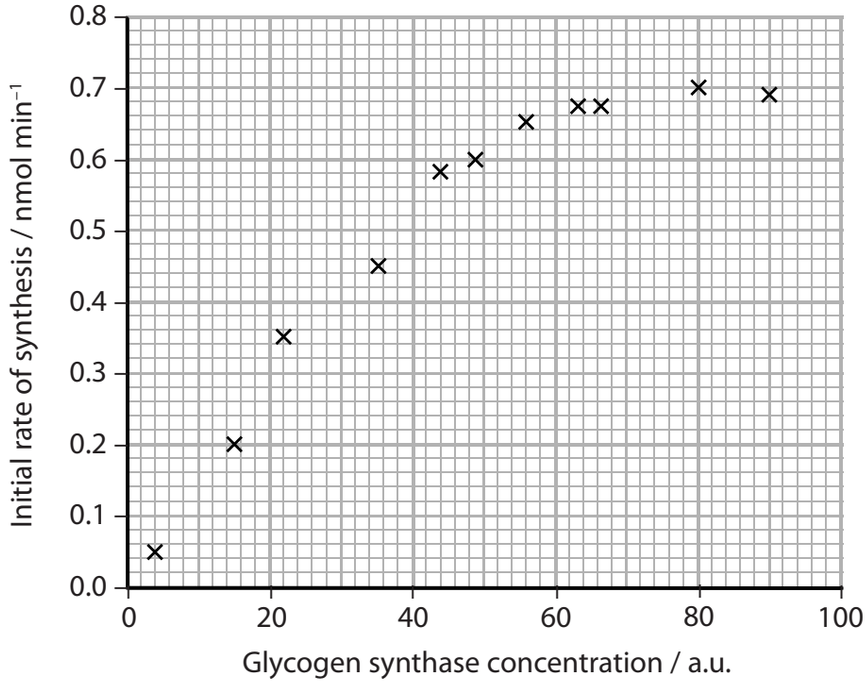
(3)

(b) Explain why energy is stored in the form of glycogen in muscle cells.

(2)

(c) Glycogen synthase is an enzyme involved in the formation of glycogen in muscle cells.

The graph below shows the results from an investigation into the effect of glycogen synthase concentration on the initial rate of synthesis of glycogen.



(i) Using the information in the graph, describe the effect of glycogen synthase concentration on the initial rate of glycogen synthesis.

(2)

(ii) Using the information in the graph, explain the effect of glycogen synthase concentration on the initial rate of this reaction.

(4)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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