

Write your name here

Surname

Other names

**Pearson**  
**Edexcel GCE**

Centre Number

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Candidate Number

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# Biology

**Advanced Subsidiary**

**Unit 1: Lifestyle, Transport, Genes and Health**

Wednesday 21 May 2014 – Morning

**Time: 1 hour 30 minutes**

Paper Reference

**6BI01/01R**

**You do not need any other materials.**

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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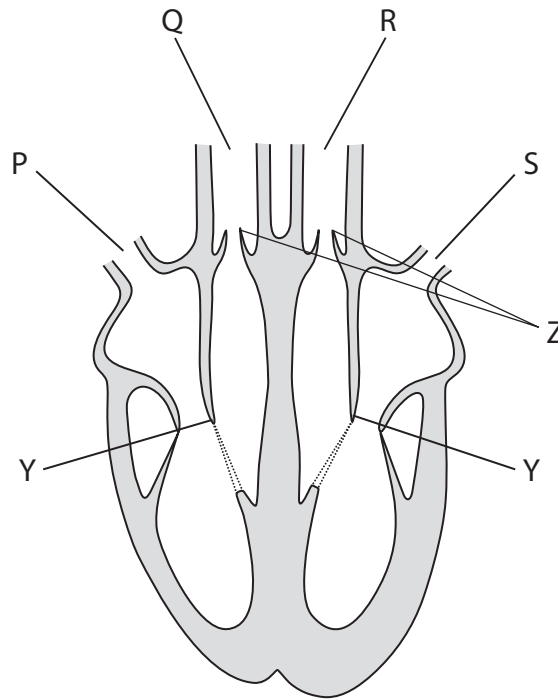


**PEARSON**

Answer ALL questions.

Some questions must be answered with a cross . 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 diagram below shows a section of a human heart and blood vessels P, Q, R and S.



- (a) (i) Place a cross  in the box next to the letter that shows the pulmonary artery. (1)

- A blood vessel P
- B blood vessel Q
- C blood vessel R
- D blood vessel S

- (ii) Place a cross  in the box next to the letter that shows the sequence of blood flow through these blood vessels. (1)

- A  $P \rightarrow Q \rightarrow S \rightarrow R$
- B  $Q \rightarrow P \rightarrow R \rightarrow S$
- C  $R \rightarrow S \rightarrow P \rightarrow Q$
- D  $S \rightarrow R \rightarrow Q \rightarrow P$



(b) Explain the difference in thickness of the wall of the **right atrium** and the wall of the **right ventricle**.

(3)

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(c) During the cardiac cycle, the valves labelled **Y** and **Z** on the diagram may be open or closed.

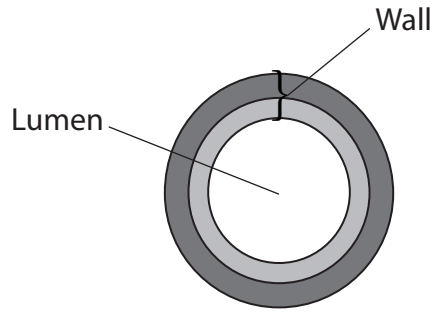
For each stage of the cardiac cycle, if the valves are open, place a tick (✓) in the appropriate box and if the valves are closed, place a cross (✗) in the appropriate box.

(2)

Stage of cardiac cycle	Y valves	Z valves
Atrial systole		
Diastole		



(d) The diagram below shows a cross-section of an artery.



(i) The diameter of the lumen of this artery is 1.9 mm.

Calculate the cross-sectional area of the lumen. Show your working.

The area of a circle is calculated using the formula  $\pi r^2$ , where  $r$  is the radius of the circle and  $\pi = 3.14$ .

(2)

Answer ..... mm<sup>2</sup>

(ii) Explain how the structure of an artery is related to its functions.

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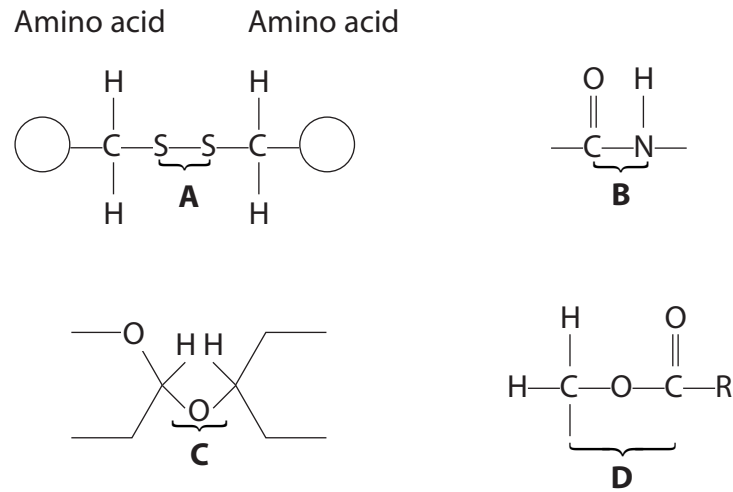
**(Total for Question 1 = 12 marks)**



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- 2 (a) The diagrams below show four different bonds, A, B, C, and D, found in biological molecules.



Place a cross ☒ in the box to complete each of the following statements.

- (i) The bond which occurs in a triglyceride molecule is

(1)

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

- (ii) The bond which may occur in the tertiary, but not the primary, structure of a protein is

(1)

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



(iii) The peptide bond is

(1)

A

B

C

D

(iv) The ester bond is

(1)

A

B

C

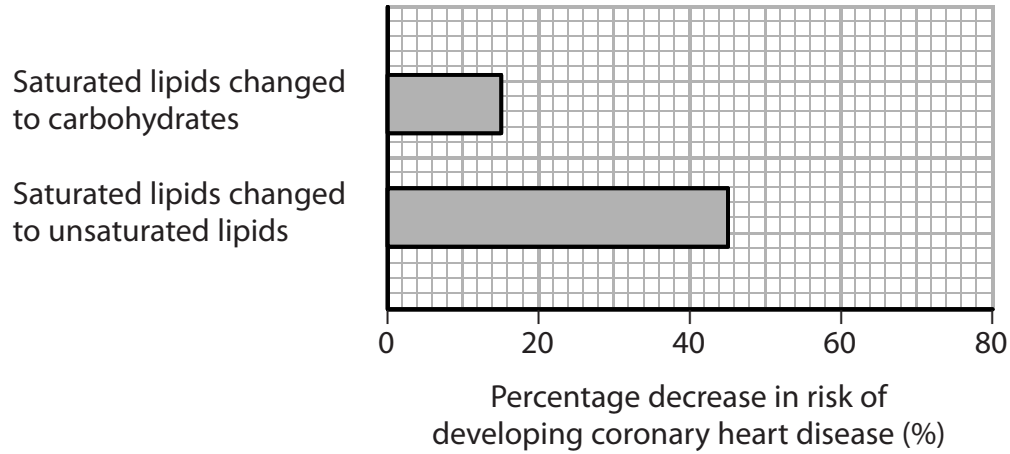
D



(b) Adult volunteers took part in an investigation to find out the effect of dietary changes on their risk of developing coronary heart disease.

In this investigation, 5% of the volunteers' energy intake was changed from one food source to another. The volunteers' total energy intake remained constant.

The graph below shows the results of this investigation.



(i) Suggest why it was necessary to ensure that their total energy intake remained constant.

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(ii) Using the information in the graph and your own knowledge, suggest an explanation for the results of this investigation.

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**(Total for Question 2 = 9 marks)**



3 The diagram below shows the sequence of bases in a short length of mRNA.

A	U	G	G	C	C	U	C	G	A	U	A	A	C	G	G	C	C	A	C	C	A	U	C
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(a) (i) Place a cross ☒ in the box next to the letter that shows the DNA sequence which is complementary to the **first four** of these bases.

(1)

A T A C C

B T U C C

C U A C C

D U T C C

(ii) State the maximum number of amino acids coded for by this length of mRNA.

(1)

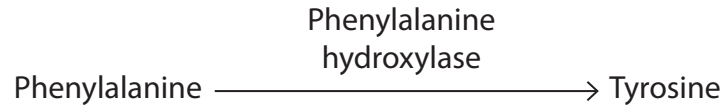
(b) Name the process by which mRNA is formed in the nucleus.

(1)



(c) Phenylalanine is an amino acid found in many proteins in the human diet.

In most people it is converted to the amino acid tyrosine by an enzyme, as shown in the diagram below.



Phenylketonuria is the result of a gene mutation.

People with phenylketonuria cannot convert phenylalanine to tyrosine.

Explain why people with this gene mutation cannot convert phenylalanine to tyrosine. (4)

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(d) Explain why a gene mutation involving the replacement of one base with another has less effect than the loss of a base.

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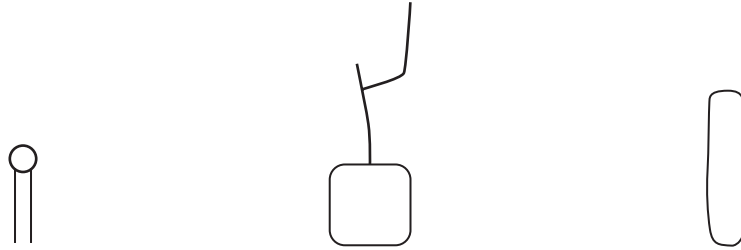
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**(Total for Question 3 = 9 marks)**



4 The cell surface membrane is involved in the transport of materials into and out of the cell.

The symbols below represent some of the components of a cell surface membrane.



(a) Using these three symbols and your own knowledge, in the space below draw a diagram to show the structure of a cell surface membrane.

(3)



(b) The table below gives statements relating to the processes of diffusion, facilitated diffusion and active transport.

For each process, place a tick (✓) in the box if the statement applies to that process.

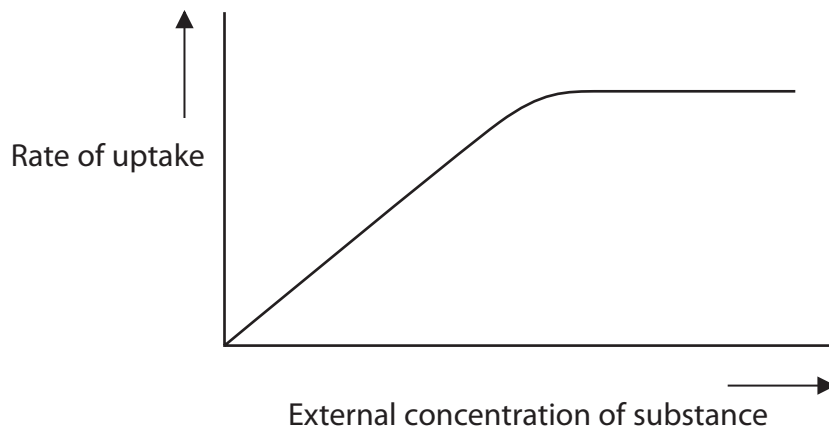
Place a cross (✗) in the box if the statement does not apply to the process.

(3)

Statement	Process		
	Diffusion	Facilitated diffusion	Active Transport
ATP is required			
Membrane proteins are involved			
Direction of transport is always down a concentration gradient			



(c) The graph below shows the rate of uptake of a substance by facilitated diffusion into a cell.



Using the information in the graph, explain why the rate of uptake changes.

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**(Total for Question 4 = 8 marks)**



5 (a) Some foods and drinks contain plant statins.

Explain the benefits of plant statins to human health.

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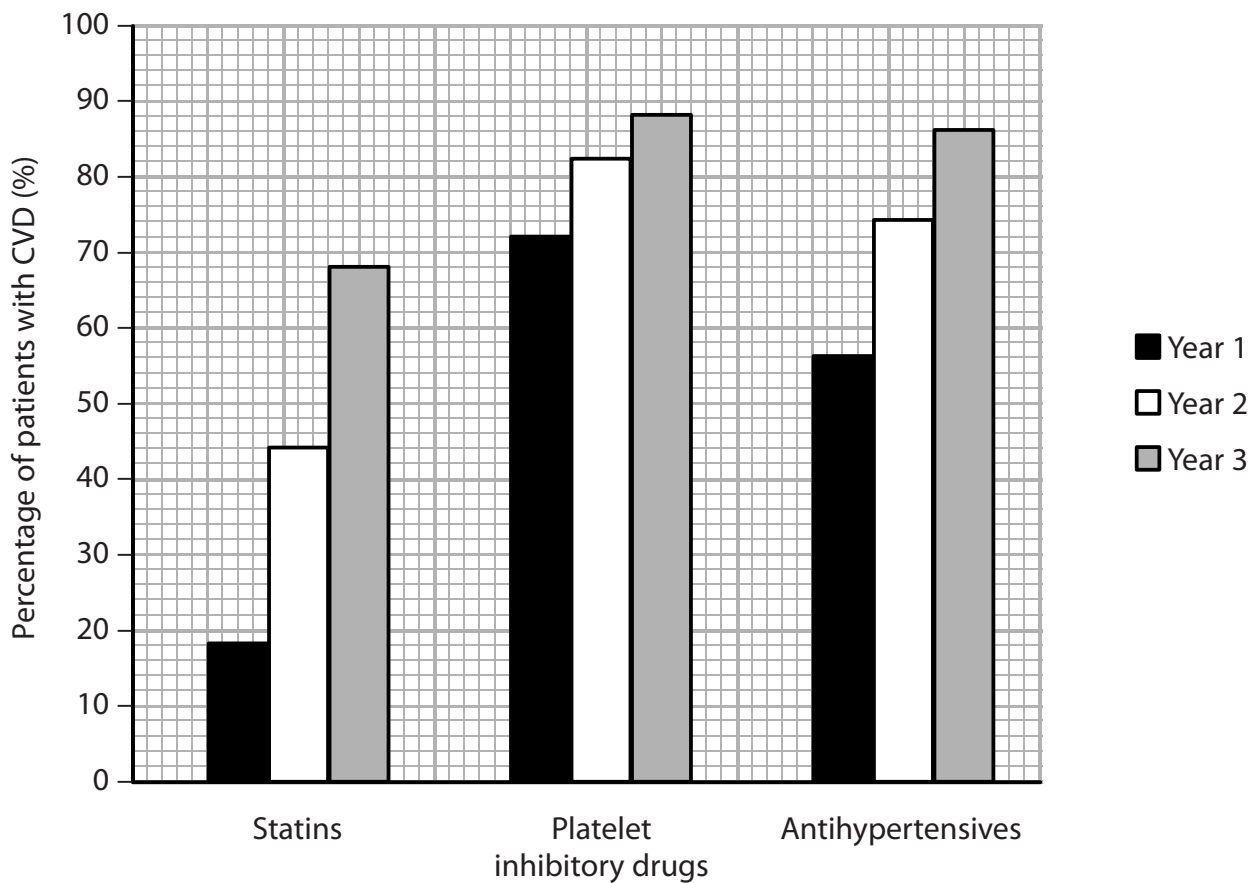
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(b) In a three-year study, the percentage of patients with CVD (cardiovascular disease) who were using different types of drugs was recorded.

The graph below shows the results of this study.





(i) Suggest why there was an increase in the percentage of patients taking statins over the three years of the study.

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(ii) Using the information in the graph, compare the change in the use of platelet inhibitory drugs with the change in the use of antihypertensives, over the three years of this study.

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(c) Explain why patients with CVD would take each of the following drugs.

(i) Platelet inhibitory drugs such as aspirin

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(ii) Antihypertensives such as beta-blockers

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**(Total for Question 5 = 11 marks)**



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6 The cell vacuoles of beetroot (*Beta vulgaris*) contain the red pigment betalain.

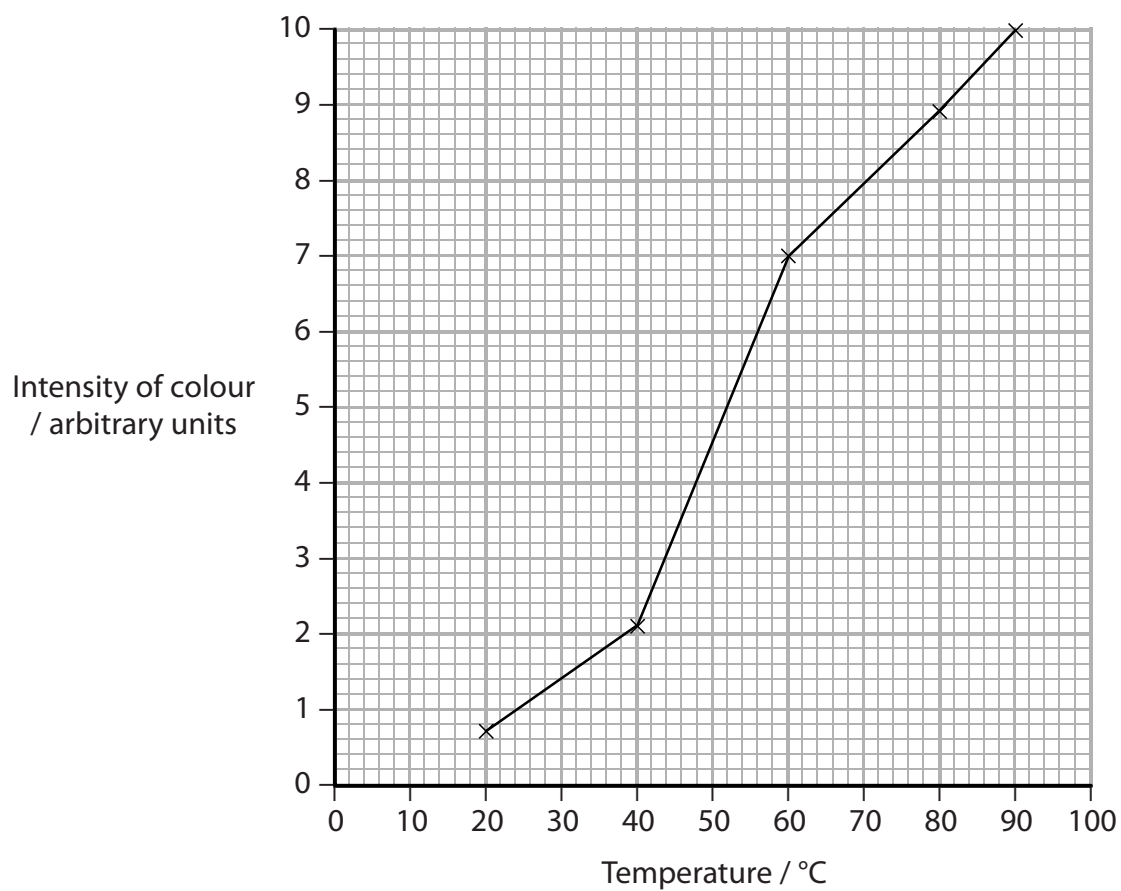
A student investigated the effect of temperature on the permeability of beetroot cell membranes.

In this investigation, five pieces of beetroot were used. One piece of beetroot was left in 10 cm<sup>3</sup> of distilled water for 20 minutes at 20 °C.

After 20 minutes, the piece of beetroot was removed and the intensity of the colour of the water was measured using a colorimeter.

This was repeated with the other pieces of beetroot using water temperatures of 40 °C, 60 °C, 80 °C and 90 °C.

(a) The student's results are shown in the graph below.



(i) Using the information in the graph, describe the effect of temperature on the permeability of the cell membranes.

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(ii) Using the information in the graph and your knowledge of membrane structure, explain the effect of temperature on the cell membranes.

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7 Researchers collected data to study the relationship between the time spent watching television and coronary heart disease (CHD).

A total of 12 608 men and women, aged between 45 and 79 years, took part. None of them had previously had a stroke or heart attack.

(a) The table below shows the categories in the questionnaire that each person completed.

Categories	
smoking	family history of CHD
alcohol intake	sleep duration
total energy intake	physical activity
medication	time spent watching television

(i) Suggest why people who had not had strokes or heart attacks were selected for this study.

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(ii) Suggest why people were asked to provide the researchers with information based on the categories shown in the table.

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(b) The table below shows the types of data that were collected for each person by health professionals.

height and body mass	blood pressure	HDL cholesterol
waist circumference	plasma triglycerides	LDL cholesterol

(i) Suggest why these data were collected.

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(ii) Suggest why these data might be considered to be more accurate than the information in the questionnaire.

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(c) This study was funded by the government and charities supporting research into heart diseases and strokes.

Suggest why it was important that none of the funding came from drug companies or television manufacturers.

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(d) The researchers carried out the study over a period of 10 years.

They found that there was a positive correlation between the number of hours spent watching television and the risk of developing coronary heart disease.

A journalist wrote an article about the results of this study with the title 'Watching television causes heart disease'.

Is this statement valid? Give an explanation for your answer.

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**(Total for Question 7 = 13 marks)**





(b) Describe **one** way in which gene therapy could be used to treat cystic fibrosis.

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**(Total for Question 8 = 8 marks)**

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**TOTAL FOR PAPER = 80 MARKS**



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