

Write your name here

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Other names

**Pearson Edexcel**  
**Level 3 GCE**

Centre Number

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Candidate Number

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# Biology A (Salters Nuffield)

**Advanced Subsidiary**

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

Sample Assessment Material for first teaching September 2015

**Time: 1 hour 30 minutes**

Paper Reference

**8BN0/01**

**You may need a ruler, a pencil and a calculator.**

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.
- Show your working in any calculation questions and include units in your answer where appropriate.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You may use a scientific calculator.
- 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.

## 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.*

## 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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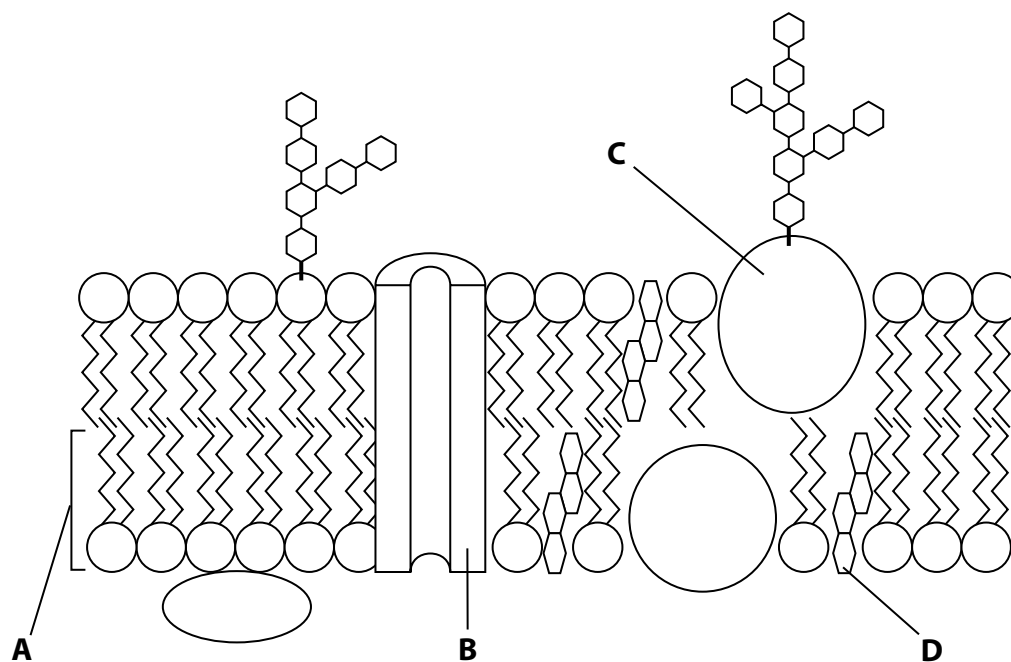
**Answer ALL questions.**

**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** Cell membranes are involved in the transport of molecules.

The diagram shows the structure of a cell membrane.



(a) Which letter in the diagram labels a phospholipid?

(1)

- A
- B
- C
- D

(b) Which of the following statements is true about a phospholipid?

(1)

- A it has a hydrophobic tail of three fatty acids
- B it has a hydrophilic tail of three fatty acids
- C it has a hydrophobic tail of two fatty acids
- D it has a hydrophilic tail of two fatty acids

(c) Describe how the structure labelled **B** is involved in passive transport.

(3)

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**(Total for Question 1 = 5 marks)**

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**2** A student investigated the effect of caffeine on human heart rate.

Three males of the same age were given cups of coffee containing caffeine. Their heart rates were measured 10 minutes after drinking the coffee.

Two hours later they were given cups of coffee with no caffeine and after 10 minutes their heart rates were measured.

The results are shown in the table.

Male	Heart rate / beats min <sup>-1</sup>	
	Coffee containing caffeine	Coffee with no caffeine
1	75	72
2	78	71
3	70	70
Mean $\pm$ sd	74 $\pm$ 4	71 $\pm$ 1

(a) The student concluded that caffeine increases human heart rate.

Analyse the data to explain why these results may not support the conclusion.

(3)

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(b) Describe how this investigation could be improved.

(3)

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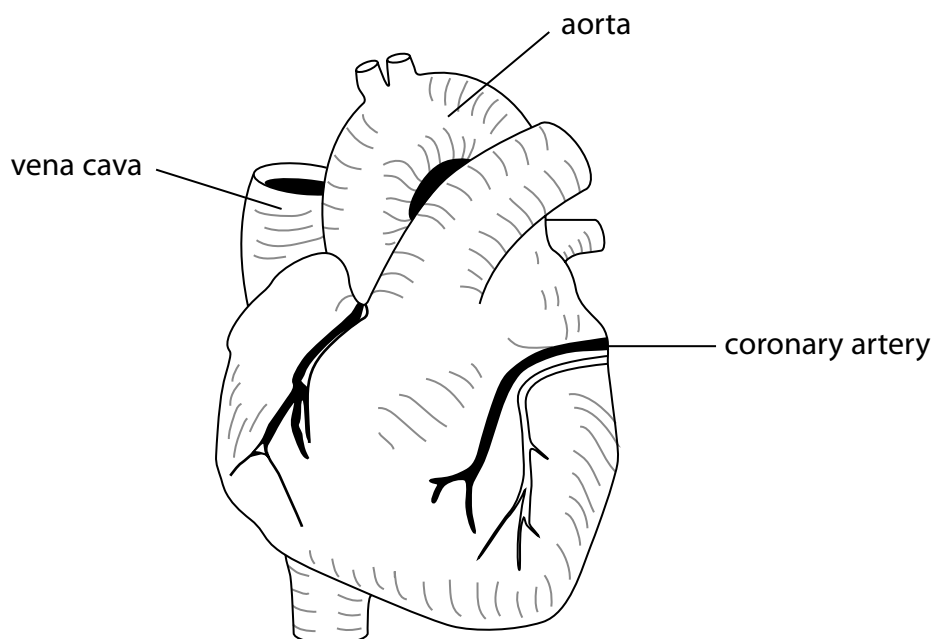
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**(Total for Question 2 = 6 marks)**

3 A student studied the external view of a mammalian heart, as shown in the diagram.



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(a) The student wanted to compare the size of the aorta and the vena cava of this heart.

She determined the cross-sectional area of the aorta, which was  $72.22 \text{ mm}^2$ .

She also measured the diameter of the vena cava which was  $17.0 \text{ mm}$ .

(i) Calculate the difference in the cross-sectional area of the vena cava and the aorta. (2)

Answer .....  $\text{mm}^2$

(ii) The student also compared the thickness of the aorta wall of this heart with the thickness of the aorta wall in a giraffe. The thickness of the aorta wall in this heart is 3 mm and in a giraffe it is 15 mm.

Give one reason why the aorta wall in a giraffe is much thicker. (1)

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(b) Blood clots can reduce the cross-sectional area of arteries and lead to cardiovascular disease (CVD).

Thromboplastin is a catalyst in the blood clotting process.

(i) Which of the following shows the reaction catalysed by thromboplastin? (1)

- A fibrinogen converted to fibrin
- B fibrin converted to fibrinogen
- C prothrombin converted to thrombin
- D thrombin converted to prothrombin

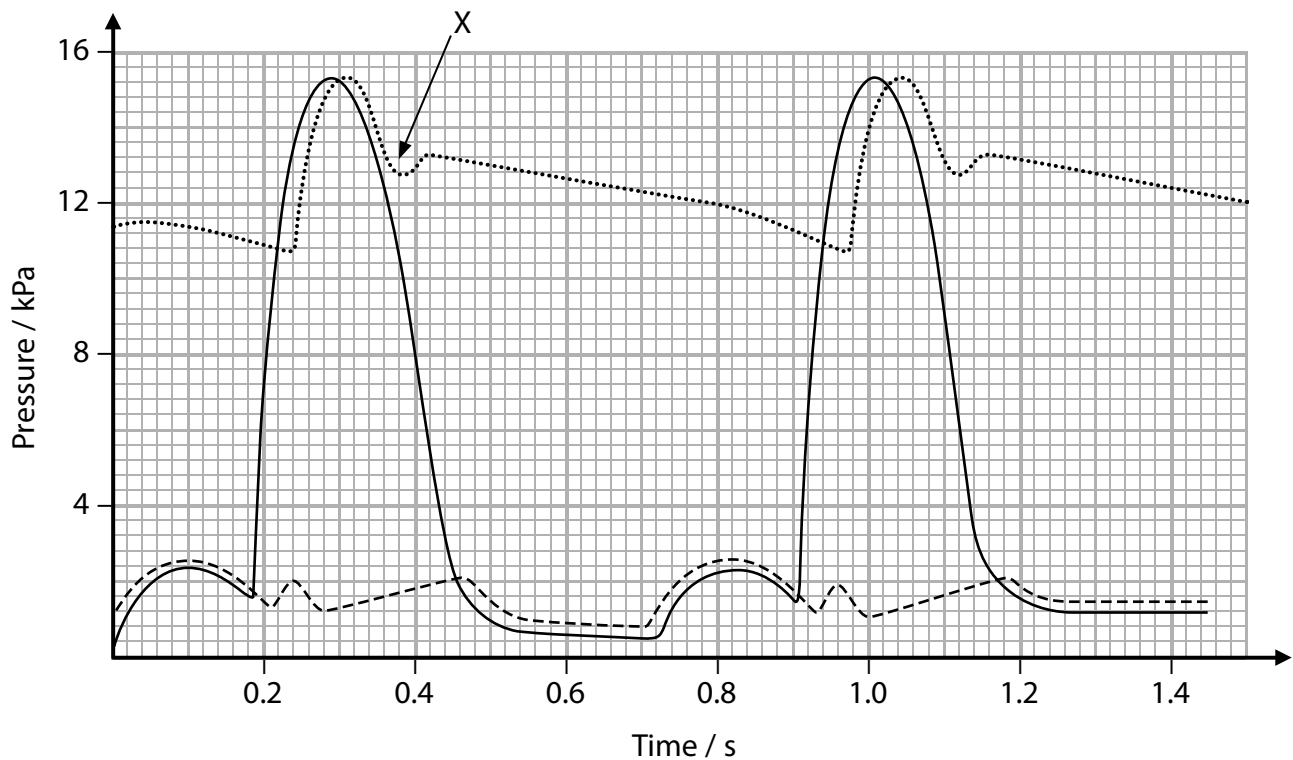
(ii) Which of the following shows the ions involved in the blood clotting process? (1)

- A calcium
- B iron
- C nitrate
- D sodium

**(Total for Question 3 = 5 marks)**

- 4 During the cardiac cycle, there are pressure changes in the left atrium, left ventricle and aorta.

The graph shows these pressure changes in the left atrium, left ventricle and aorta of a person.



Key	
.....	aorta
————	left ventricle
-----	left atrium

- (a) (i) Which time period corresponds with ventricular systole?

(1)

- A 0.52 to 0.72
- B 0.72 to 0.92
- C 0.92 to 1.20
- D 0.24 to 0.98

- (ii) Which of the following is occurring in the heart at 1.0 second on the graph?

(1)

- A semilunar valve is closed and atrioventricular valve is closed
- B semilunar valve is closed and atrioventricular valve is open
- C semilunar valve is open and atrioventricular valve is closed
- D semilunar valve is open and atrioventricular valve is open



(iii) Use the information on the graph to calculate the heart rate of this person. (2)

Answer ..... beats per minute

(b) When the heart valves close, they make a sound. This sound can be detected and recorded.

(i) State a time from the graph when the sound of an atrioventricular valve closing would be detected. (1)

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(ii) Explain why the atrioventricular valves need to close. (2)

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**(Total for Question 4 = 7 marks)**

5 The diagram shows a shrew, a small mammal.



Source: <http://museum2.utep.edu/archive/mammals/DDshrew.htm>

Different species of shrew have different mean body masses. An investigation was carried out to find the relationship between mean body mass and oxygen consumption during respiration.

The table below gives the results for five species of shrew.

Species of shrew	Mean body mass / g	Oxygen consumed during respiration / $\text{cm}^3 \text{g}^{-1} \text{h}^{-1}$
<i>Sorex cinereus</i>	2.5	10.8
<i>Sorex vagrans</i>	4.5	8.6
<i>Sorex montereyensis</i>	6.5	7.2
<i>Sorex sonomae</i>	11.5	5.2
<i>Blarina brevicauda</i>	20.0	4.0

(a) Analyse the data to explain the correlation between body mass and oxygen consumption.

(3)

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(b) (i) Calculate the oxygen consumed in one day by one *Sorex cinereus* shrew. (2)

Answer .....cm<sup>3</sup>

(ii) Explain why the oxygen consumption was measured per gram per hour. (2)

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(c) Mammals, such as shrews, need lungs that provide efficient gas exchange. Explain how the lungs of mammals are adapted for efficient gas exchange. (3)

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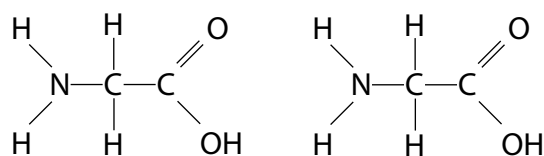
**(Total for Question 5 = 10 marks)**

6 (a) Proteins, such as collagen, are made from amino acids joined together.

(i) Which of the following is the name of the bond used to join amino acids together? (1)

- A ester
- B glycosidic
- C peptide
- D phosphodiester

(ii) This diagram shows the structure of two amino acids that can be joined together by a reaction.



Draw a diagram to show the products of this reaction.

(2)

(iii) Which of the following is the R group in these amino acids?

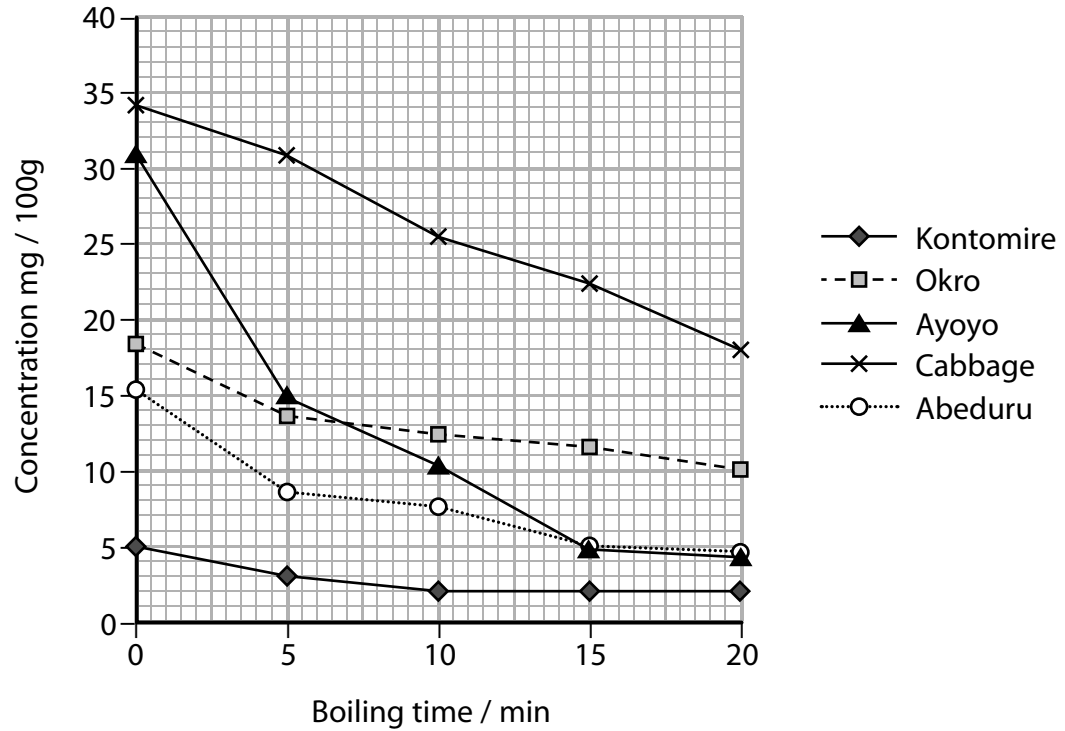
(1)

- A COOH
- B NH<sub>2</sub>
- C H
- D OH

(b) Vitamin C is important in the growth and repair of skin tissue because it helps in the synthesis of a protein called collagen.

For this reason, the food given to hospital patients after surgery should contain vitamin C to help their recovery. A hospital chef suggested that the cooking time of vegetables affects their vitamin C content.

An investigation was carried out on the effect of cooking time on the vitamin C content of five different vegetables. The results are shown in the graph.



(i) Analyse the data to explain the effect of cooking time on the vitamin C content in vegetables.

(3)

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(ii) Analyse the data to conclude which of the vegetables should be given to patients recovering from surgery.

(2)

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**(Total for Question 6 = 9 marks)**

**7** Amniocentesis and chorionic villus sampling are methods used in prenatal tests.

(a) Compare and contrast the procedures used in amniocentesis and in chorionic villus sampling to obtain fetal cells in prenatal tests.

(3)

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(b) A woman is 12 weeks pregnant and wants to use one of these prenatal tests.

Explain the issues she needs to consider before deciding which prenatal test to use.

(4)

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

8 LDL cholesterol found in plasma binds to receptor proteins and is taken into cells by endocytosis.

A gene found on chromosome 19 is responsible for making LDL receptor proteins in human cell membranes.

\*(a) Familial hypercholesterolaemia (**F**) is an inherited condition.

The recessive allele (**f**) makes normal LDL receptor proteins.

The dominant allele (**F**) makes LDL receptor proteins that do not function.

Explain why people who inherit the dominant allele have an increased risk of dying early.

(6)

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(b) Very few people have the homozygous dominant genotype for F1  
The heterozygous genotype is more common and affects 1 in 500 people.

In women with F1 30% will develop coronary heart disease if untreated.

In men with F1 50% will develop coronary heart disease if untreated.

Calculate the number of women who will develop coronary heart disease, as a consequence of F1 in a population of 60 million, with equal numbers of men and women.

(2)

Answer .....

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

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9 Cystic fibrosis is a disorder caused by a gene mutation.

(a) Explain **one** treatment used to reduce the lung symptoms of people with cystic fibrosis. (2)

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(b) One mutation causes a change in the primary structure of CFTR, a membrane transport protein.

(i) Explain why this change in the primary structure would result in the CFTR protein being non-functional. (3)

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(ii) Another mutation reduces the quantity of CFTR protein in membranes.

Explain the effects of having smaller quantities of CFTR protein in membranes.

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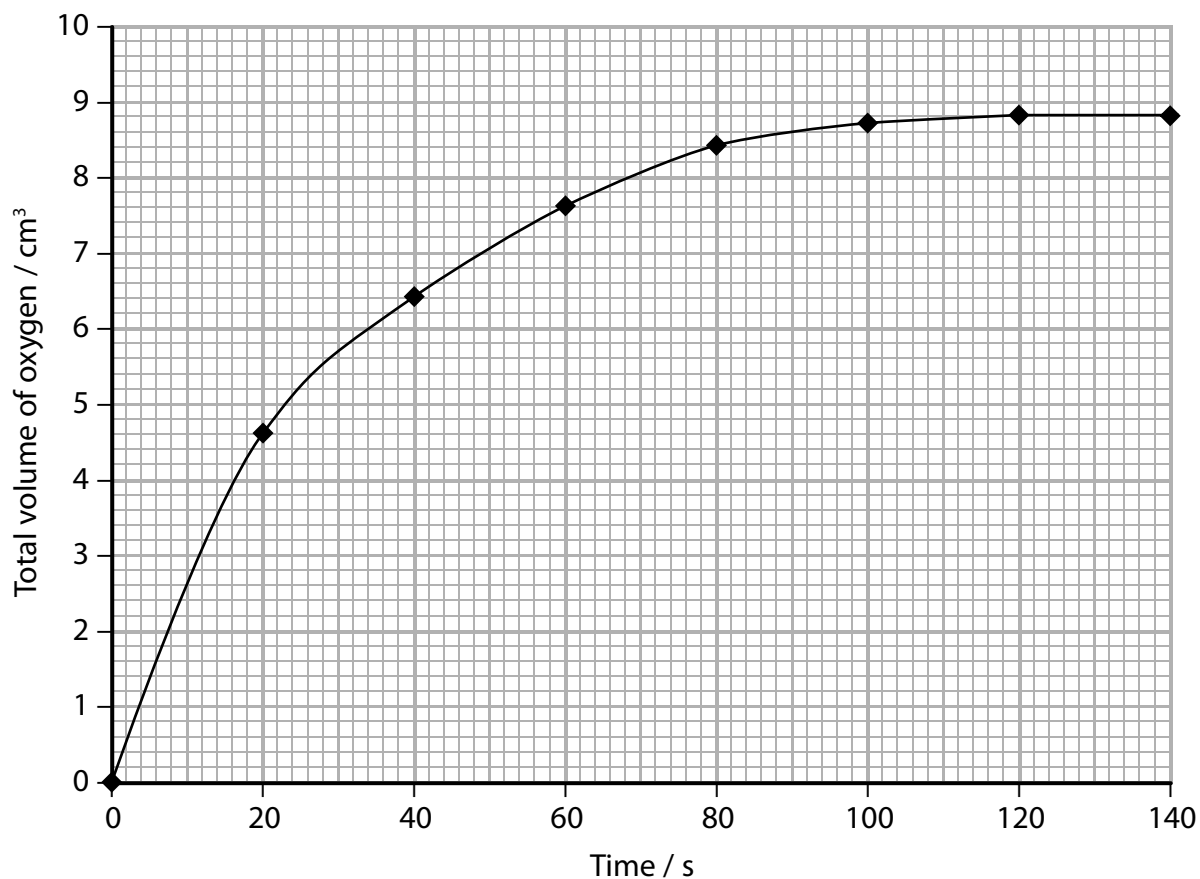
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**(Total for Question 9 = 10 marks)**

**10** Catalase is an enzyme present in many tissues of most living organisms, but can be found in high concentrations in liver cells. Its role is to break hydrogen peroxide down into oxygen and water. Hydrogen peroxide is produced by cells and is very harmful if it is not broken down.

A student carried out an investigation into the action of catalase. Some liver was chopped into small pieces, and added to hydrogen peroxide. The volume of oxygen gas produced was recorded and a graph was drawn.



(a) (i) Calculate the initial rate of reaction.

(3)

Answer .....

(ii) Analyse the graph to explain the change in the total volume of oxygen produced over the course of reaction.

(4)

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(iii) Draw on the graph the line you would expect if the student repeated the investigation with the same concentration of hydrogen peroxide but with double the mass of liver.

(2)

(b) Describe how transcription is involved in the synthesis of an enzyme.

(4)

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**(Total for Question 10 = 13 marks)**

**TOTAL FOR PAPER = 80 MARKS**

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