Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 3 GCE

Time 1 hour 30 minutes

Paper reference **8BN0/01**

Biology A (Salters Nuffield)

Advanced Subsidiary

PAPER 1: Lifestyle, Transport, Genes and Health

You must have:
Scientific 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.
- **Show all your working out** in calculations and **include units** where appropriate.
- 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.*
- 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.

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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Q:1/1/1/1/1/

P 6 9 4 9 4 A 0 1 3 2

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) The diagram shows part of a mRNA base sequence.

A	U	G	C	U	A	G	G	C	A	C	G	U	A	U	A	C	G	G	G	C

(i) Give the sequence of the first **six** bases of the DNA that was transcribed to give this mRNA sequence.

(1)

.....

(ii) Give the maximum number of amino acids that would be in the part of the polypeptide chain produced from this mRNA base sequence.

(1)

.....

(iii) Give the maximum number of different tRNA molecules that would be needed to produce the polypeptide chain produced from this base sequence.

(1)

.....

(b) Describe the role of mRNA in protein synthesis.

(3)

(Total for Question 1 = 6 marks)

2 Vitamin C can be found in fruits and vegetables.

The vitamin C content of four fruits was sampled on the day of picking and one week after picking.

The results are shown in the table.

Fruit	Vitamin C / mg per 100 g of fruit	
	Day of picking	One week after picking
Apple	27	7
Guava	70	53
Pineapple	53	28
Orange	75	52

(a) (i) Calculate the percentage decrease in the vitamin C content of the pineapple to one decimal place.

(1)

..... %

(ii) Plot these data in a suitable graphical form.

(4)

(b) (i) Complete the table to show the details of a reagent that could be used to show if vitamin C was present.

(2)

Reagent name	Colour change observed if vitamin C present
	from ..... to .....

(ii) State and justify **one** variable that should have been controlled when the fruits were stored after picking.

(2)

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(Total for Question 2 = 9 marks)

3 Organisms contain carbohydrates, lipids and proteins.

Monosaccharides, disaccharides and polysaccharides are carbohydrates.

(a) (i) Which carbohydrate is a component of glycogen?

(1)

- ☒ **A** fructose
- ☒ **B** galactose
- ☒ **C** glucose
- ☒ **D** ribose

(ii) Which carbohydrate is a disaccharide made of only one type of monosaccharide?

(1)

- ☒ **A** galactose
- ☒ **B** lactose
- ☒ **C** maltose
- ☒ **D** sucrose

(iii) Which polysaccharide contains only 1,4 glycosidic bonds?

(1)

- ☒ **A** amylose
- ☒ **B** amylopectin
- ☒ **C** glycogen
- ☒ **D** starch

(b) Proteins can contain several types of bond and different sequences of amino acids.

(i) How many of the following types of bond can be made when a protein is formed?

- disulfide
- hydrogen
- ionic
- peptide

(1)

☒ **A** one

☒ **B** two

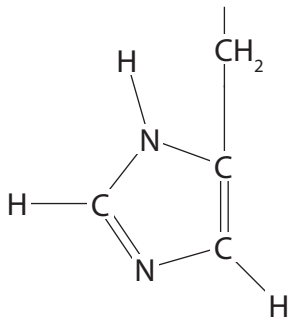
☒ **C** three

☒ **D** four

(ii) The diagram shows a complete R group.

Complete the diagram to show the position of this R group in an amino acid.

(3)



(c) The relationship between daily energy intake and body mass index (BMI) in adult females was investigated.

The body mass index was calculated for each female at the start and end of the investigation.

Three females starting with a BMI of 22.0 were given the same exercise plan.

Female 1 was given a diet containing 7560 kJ a day for a month.

Female 2 was given a diet containing 8400 kJ a day for a month.

Female 3 was given a diet containing 9240 kJ a day for a month.

The recommended daily energy intake for a human female is 8400 kJ a day.

(i) Female 1 had a height of 157 cm. Her BMI at the start of the investigation was calculated using the following formula.

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

Calculate the mass of female 1 in kg.

(1)

..... kg

(ii) Explain what is likely to happen to the BMI values for the females in this investigation.

(2)

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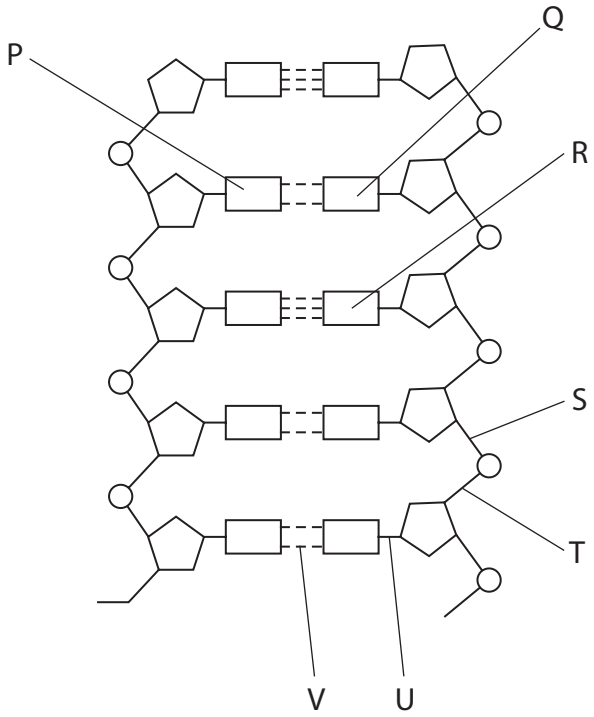
(Total for Question 3 = 10 marks)

4 Cells contain polynucleotides.

Two of these polynucleotides are DNA and tRNA.

(a) The diagram shows part of a DNA double helix.



(i) The whole DNA double helix contains 24% of base P.

Which of the following would be the percentage of base R in the whole DNA double helix?

(1)

☒ **A** 24%

☒ **B** 26%

☒ **C** 48%

☒ **D** 52%

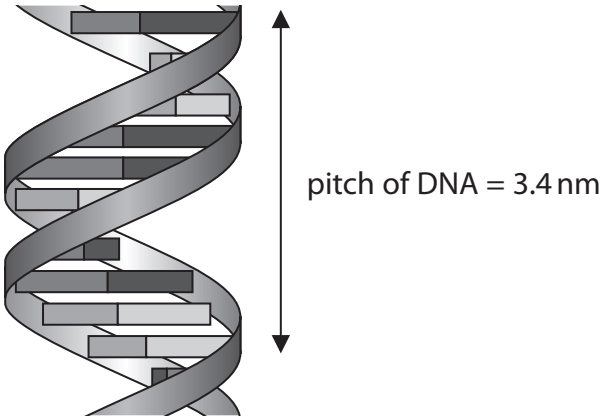
(ii) There are three types of bond labelled in this diagram: glycosidic, hydrogen and phosphodiester.

Which row shows the types of bond labelled in the diagram?

(1)

		S and T	U	V
☒	**A**	phosphodiester	glycosidic	hydrogen
☒	**B**	phosphodiester	hydrogen	glycosidic
☒	**C**	glycosidic	phosphodiester	hydrogen
☒	**D**	glycosidic	hydrogen	phosphodiester

(b) The diagram shows part of a DNA double helix.



The whole DNA double helix has a length of 212 pitches.

(i) Calculate how many bases there would be in the whole DNA double helix.

(1)

- ☒ **A** 10
- ☒ **B** 20
- ☒ **C** 2120
- ☒ **D** 4240

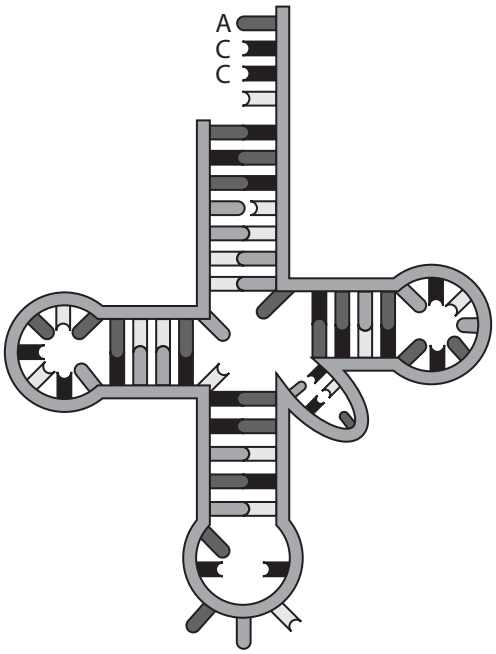
(ii) Calculate the length, in micrometres (μm), of the whole DNA double helix.

Give your answer to two significant figures.

(2)

..... μm

(c) The diagram shows a tRNA molecule.



Compare and contrast the structure of a DNA double helix with the structure of tRNA.

(4)

(Total for Question 4 = 9 marks)

5 Cystic fibrosis can result from mutations in the CFTR gene.

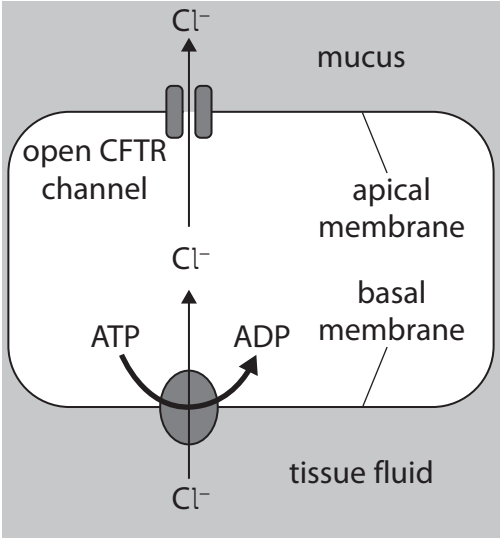
These mutations affect the function of the CFTR protein channel in the epithelial cells of several organ systems, including the respiratory system.

(a) Name another organ system that would be affected by a CFTR gene mutation.

(1)

.....

(b) The diagram shows part of the process that occurs when there is a functioning CFTR protein channel in the membrane of an epithelial cell.



(i) Explain how chloride ions move through the two membranes labelled in the diagram.

(4)

Basal membrane

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.....

.....

Apical membrane

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.....

.....

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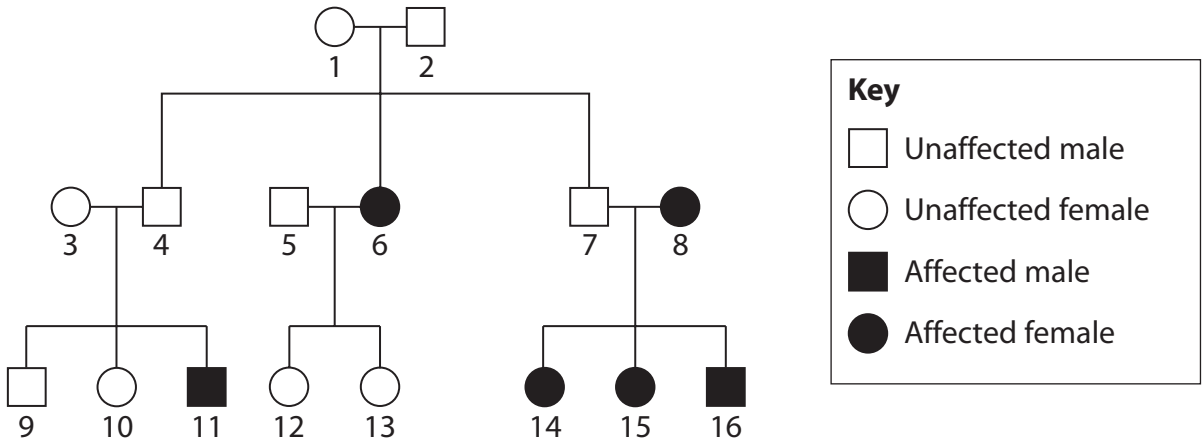
(ii) The movement of the chloride ions into the mucus would cause the movement of water molecules.

Explain the direction of movement of the water molecules.

(3)

(c) The diagram below shows the inheritance of cystic fibrosis in a family.



(i) Which of these individuals are heterozygous for this condition?

(1)

☒ **A** 3 and 4

☒ **B** 5 and 6

☒ **C** 10 and 11

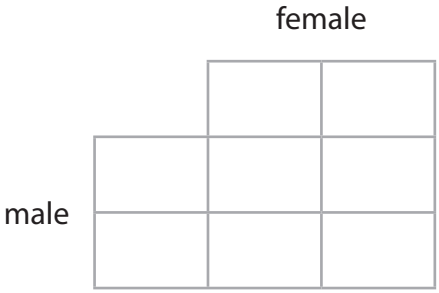
☒ **D** 15 and 16

(ii) Individual 15 plans to have a child with a male who is heterozygous for the cystic fibrosis gene.

Complete the Punnett square to show the possible genotypes of the child.

Use **A** for the dominant allele and **a** for the recessive allele.

(1)



(iii) Individual 12 is pregnant. She has been advised to have a genetic screening test for cystic fibrosis.

Give the name of the prenatal genetic screening test that would be carried out in her tenth week of pregnancy.

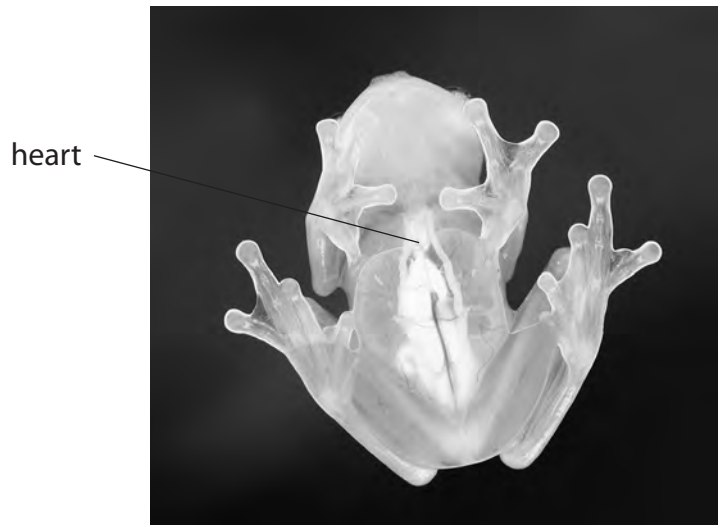
(1)

(iv) Discuss the ethical issues relating to the use of genetic screening during pregnancy.

(3)

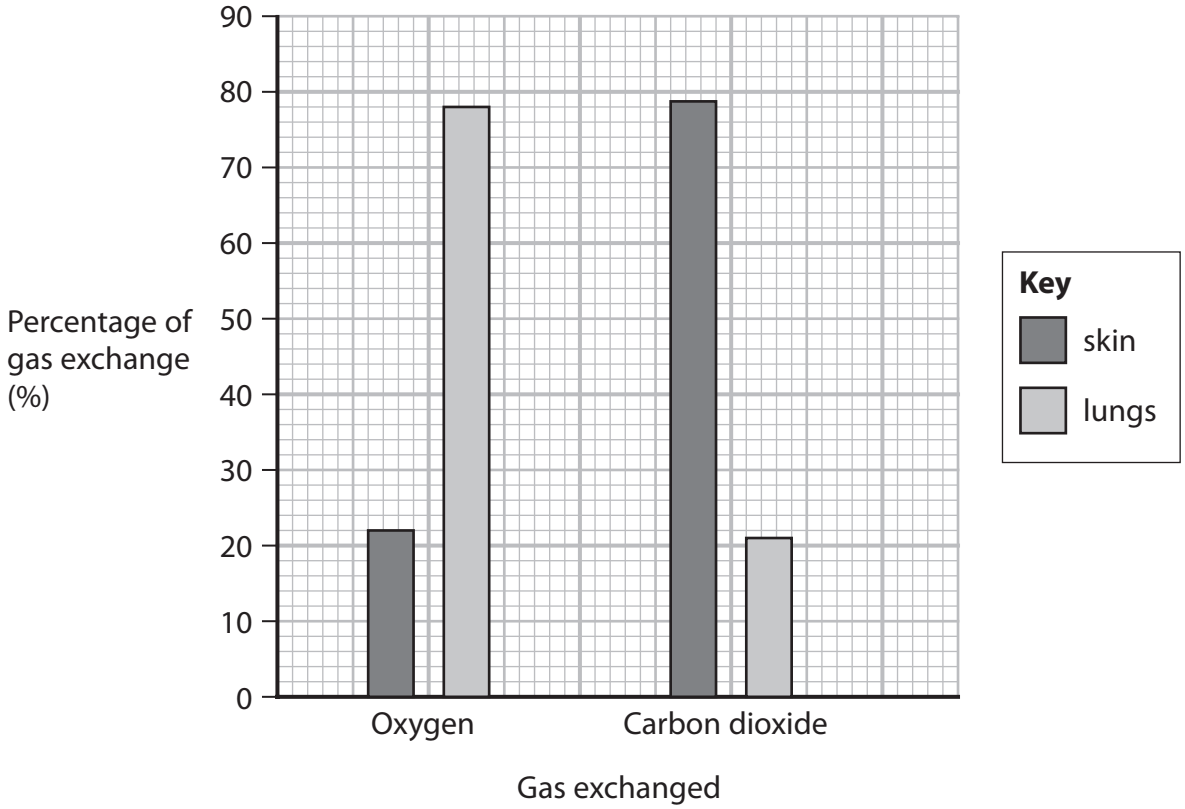
(Total for Question 5 = 14 marks)

6 The photograph shows a type of frog (*Nymphargus bejaranoi*) from South America. The bones and organs of this frog are visible through the skin on the underside of the body. The adult frogs of this species are approximately 25 mm in length.



(Source: © Rick & Nora Bowers / Alamy Stock Photo)

This frog can exchange gases across the surfaces of both the skin and the lungs. A scientist investigated the percentage of the gases exchanged at each surface. The graph shows the results of this investigation.



(a) Deduce why the skin and the lungs of this frog are involved in the exchange of oxygen.

(2)

(b) The aorta of this frog contains a semilunar valve and elastic fibres.

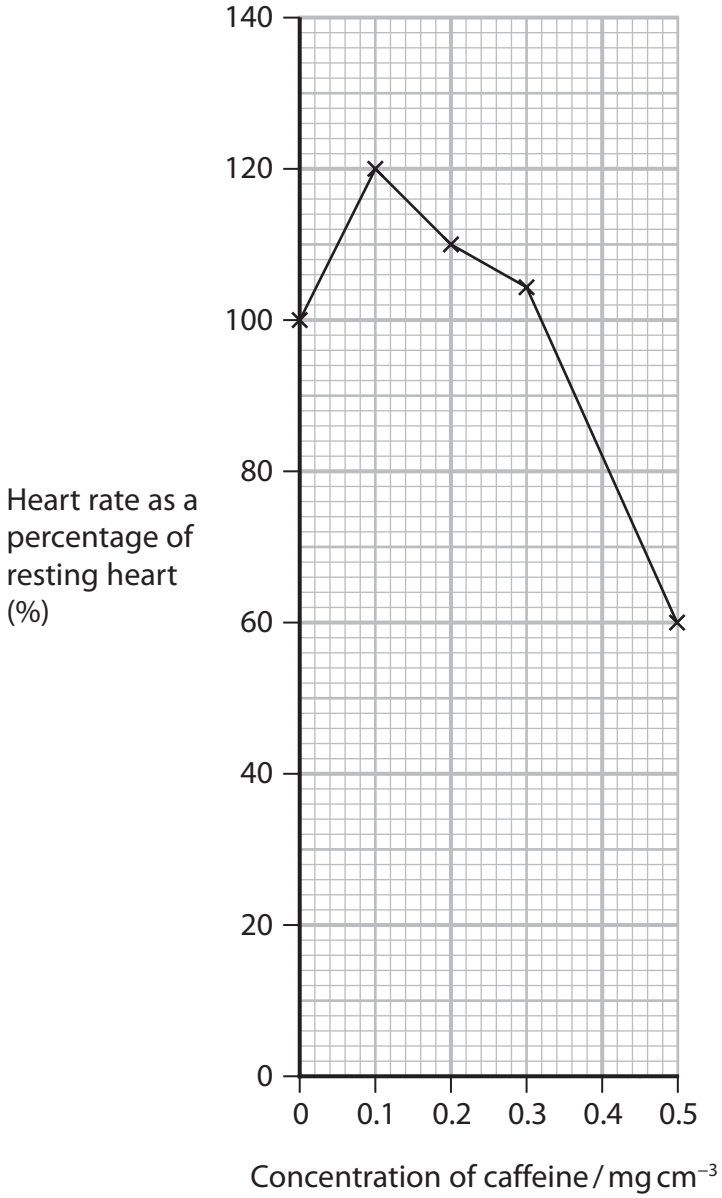
(i) Explain the function of the semilunar valve in the aorta.

(2)

(ii) Explain the function of the elastic fibres in the aorta.

(2)

(c) The effect of caffeine concentration on the heart rate of one of these frogs was investigated.



(i) Explain the advantages of using this type of frog for this investigation.

(2)

(ii) A student concluded that a caffeine concentration of 0.1 mg cm^{-3} would cause the largest increase in heart rate in every species of frog.

Discuss the validity of this conclusion.

(4)

(Total for Question 6 = 12 marks)

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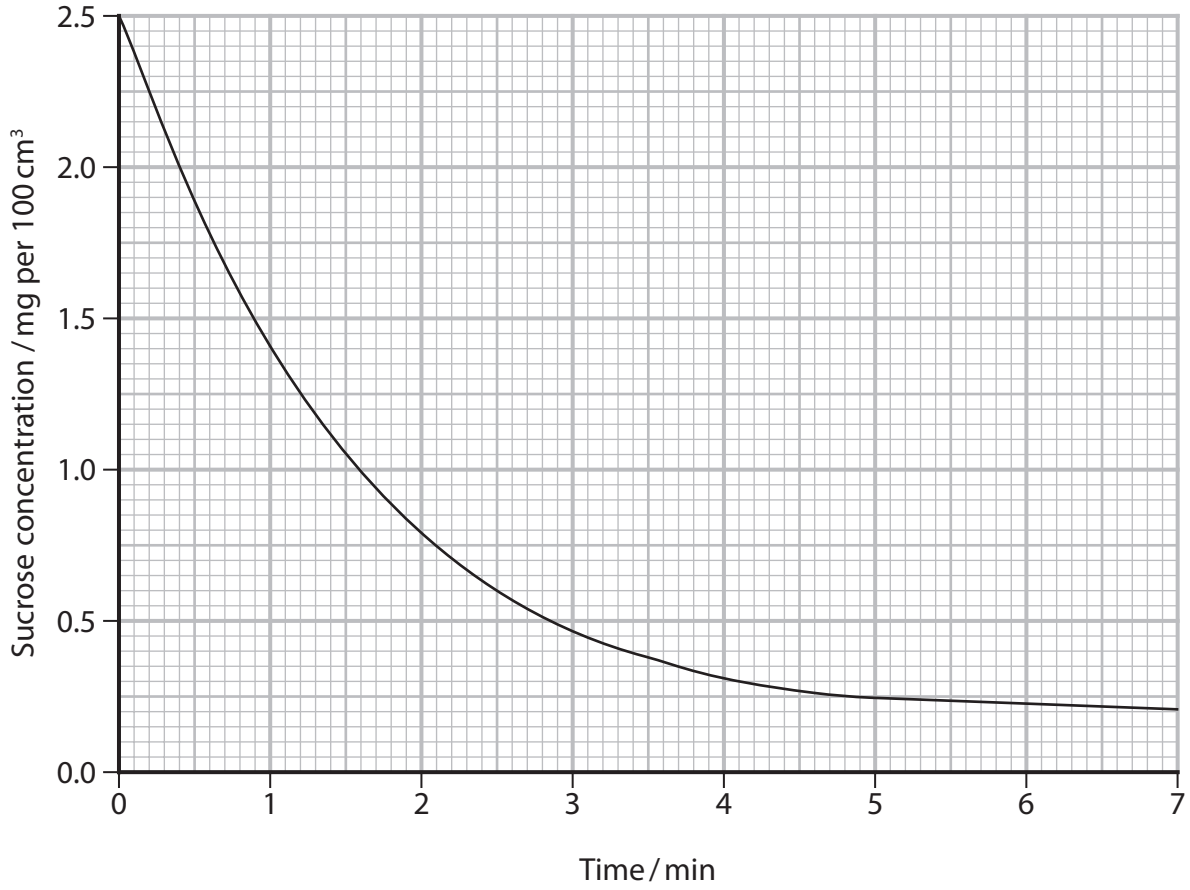
7 The disaccharide sucrose is hydrolysed by the enzyme sucrase.

The graph shows the change in sucrose concentration in the presence of sucrase.



(a) Calculate the initial rate of reaction from this graph.

Give your answer to one decimal place.

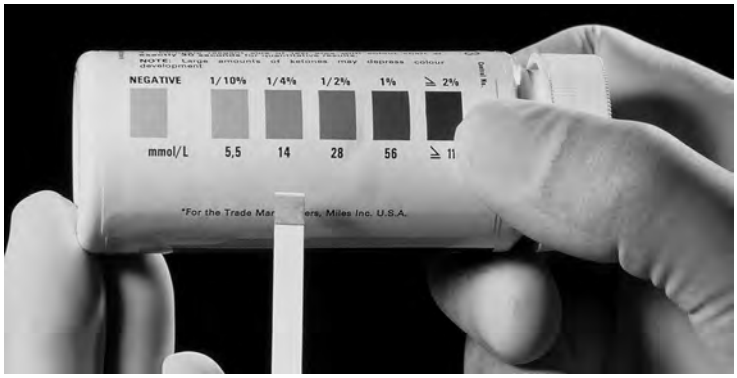
(2)

..... mg per 100 cm^3 min^{-1}

(b) The effect of sucrose concentration on the initial rate of reaction was investigated.

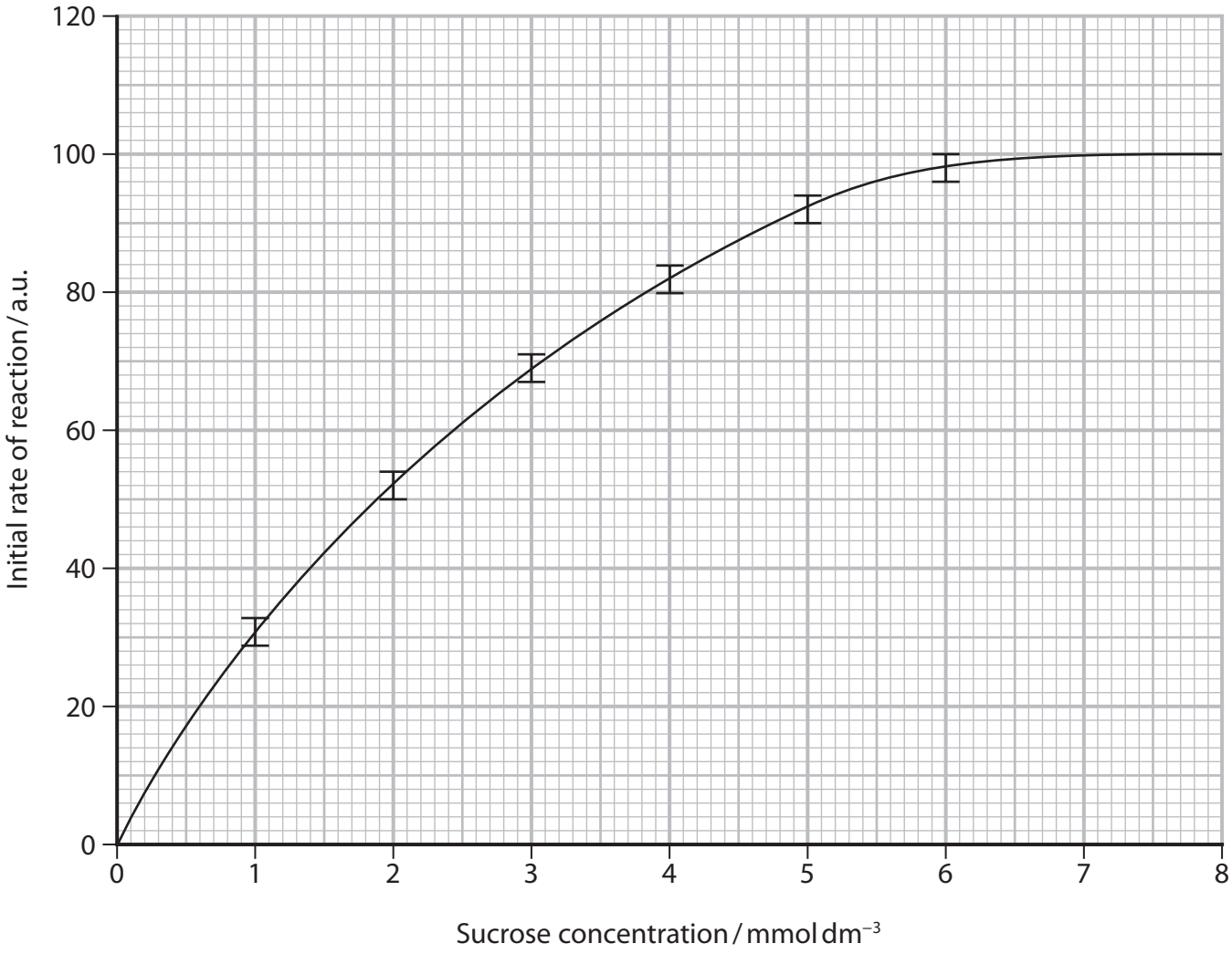
A solution containing 2% sucrase was added to sucrose solutions of different concentrations.

The photograph shows strips that can be used to test for glucose concentration.



(Source: © SATURN STILLS/SCIENCE PHOTO LIBRARY)

The graph shows the results of this investigation.

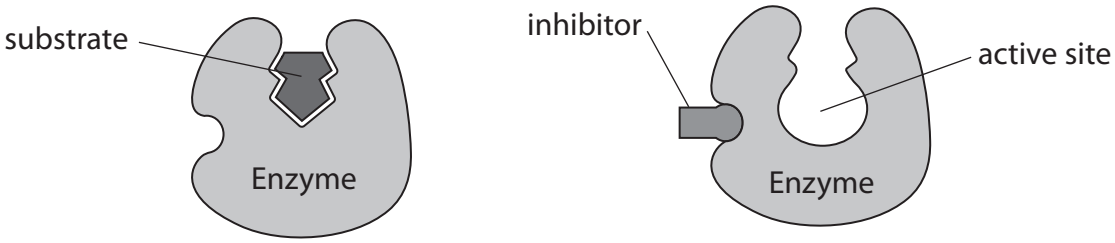


Explain how to carry out a valid investigation to collect the data shown in the graph.

(6)

(c) The rate of a reaction, controlled by an enzyme, can be affected by an enzyme inhibitor.

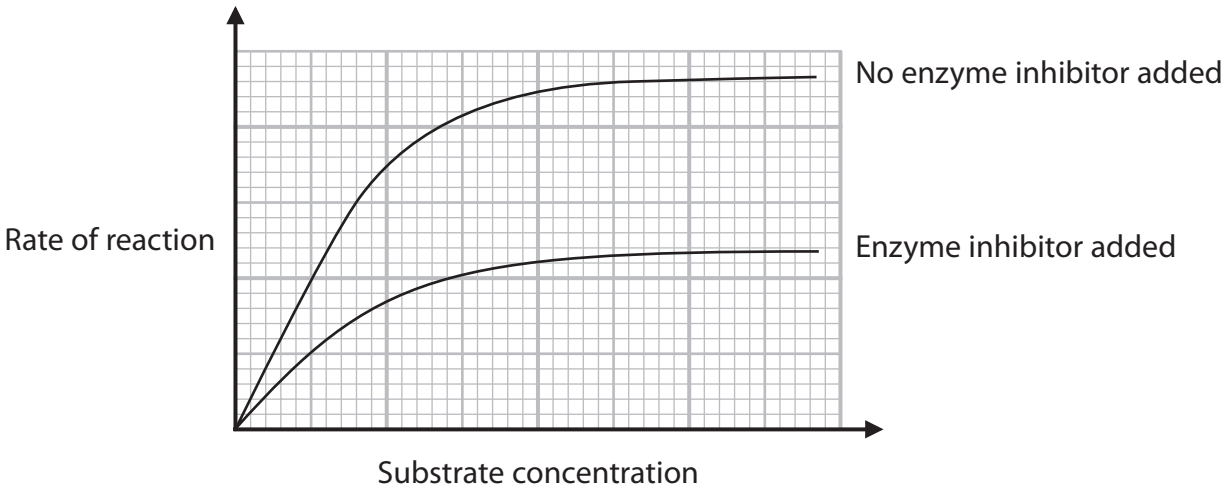
An enzyme inhibitor can change the shape of an enzyme as shown in the diagram.



The effect of this enzyme inhibitor on the rate of reaction was investigated.

The concentration of enzyme was controlled.

The graph shows the rate of reaction with and without the enzyme inhibitor.



Explain why the inhibitor has decreased the maximum rate of reaction.

(2)

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(Total for Question 7 = 10 marks)

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8 Antihypertensive drugs can be used to reduce blood pressure.

(a) In an investigation, the most effective treatment for patients with high blood pressure was determined.

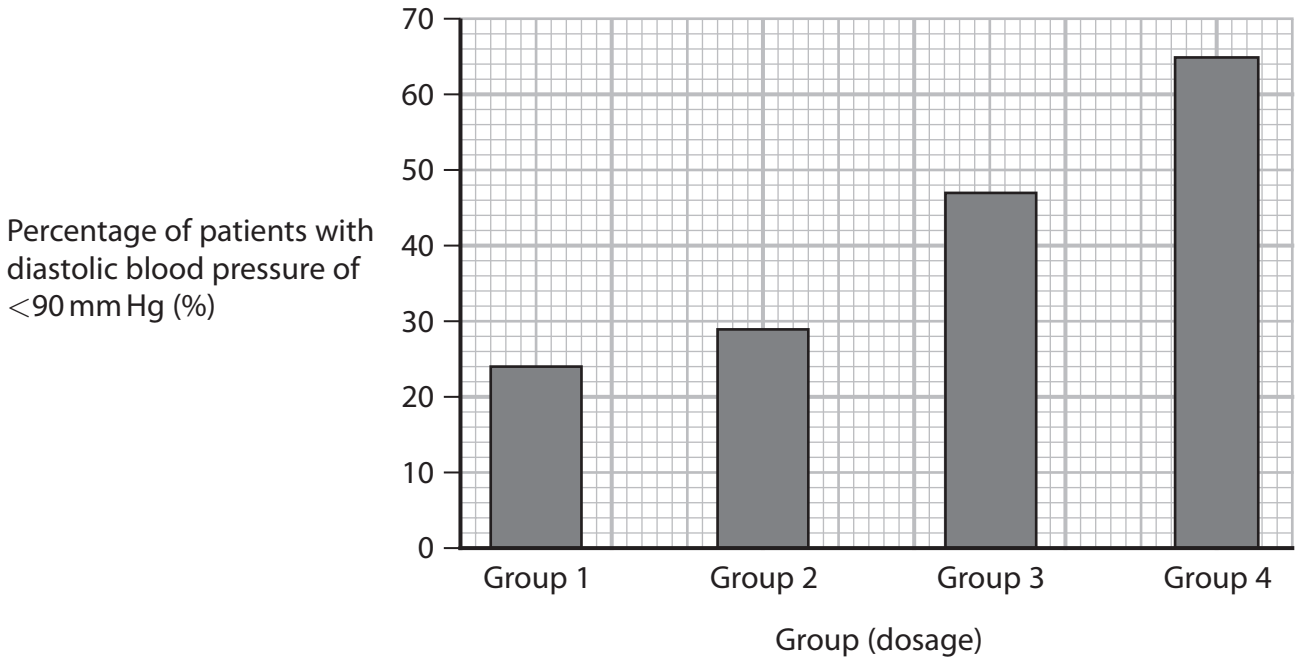
Patients with diastolic blood pressure of more than 90 mm Hg were separated into four equal sized groups.

Each group received a different treatment for a month:

- Group 1 received a placebo
- Group 2 received drug H
- Group 3 received drug B
- Group 4 received both drug B and drug H.

At the end of the treatment, their blood pressure was measured again.

The graph shows the results of this investigation.



(i) State what is meant by the term **diastole**.

(1)

(ii) Determine the effectiveness of the two drugs used in this investigation.

Use the information in the graph to support your answer.

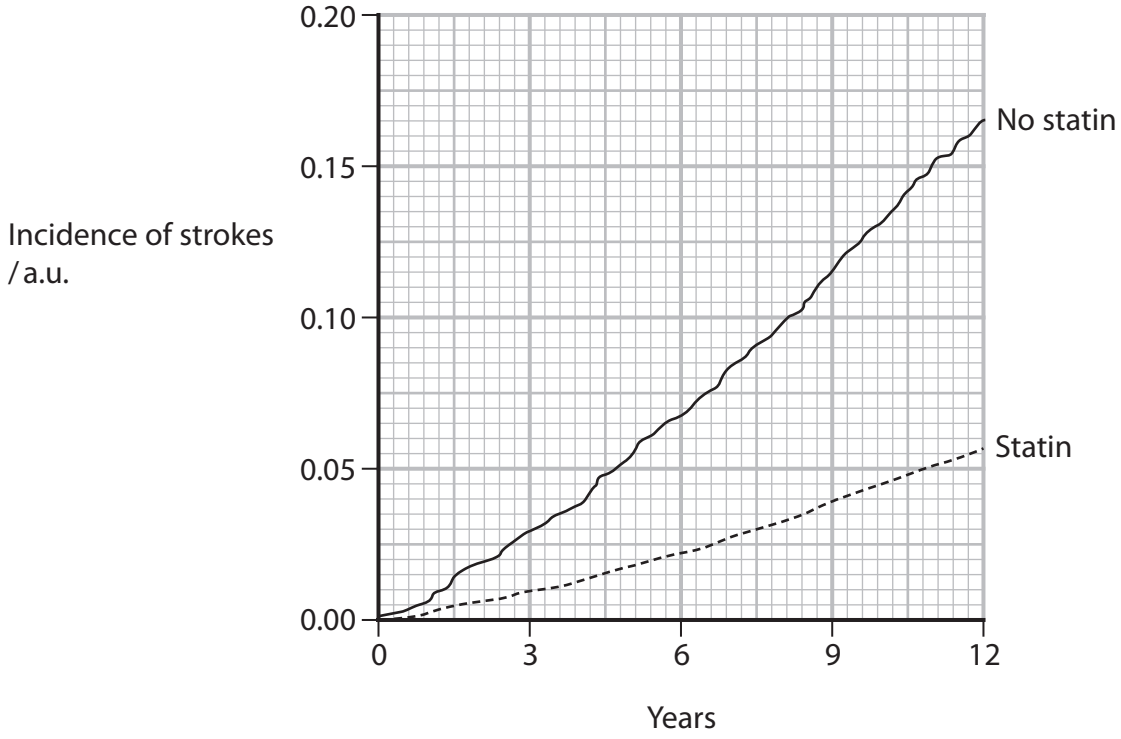
(3)

*(b) Heart attacks and strokes can occur when an artery is blocked. The risk of this can be reduced by treatment with antihypertensives, statins and anticoagulants.

The graphs show results from two separate investigations using statins and anticoagulants.

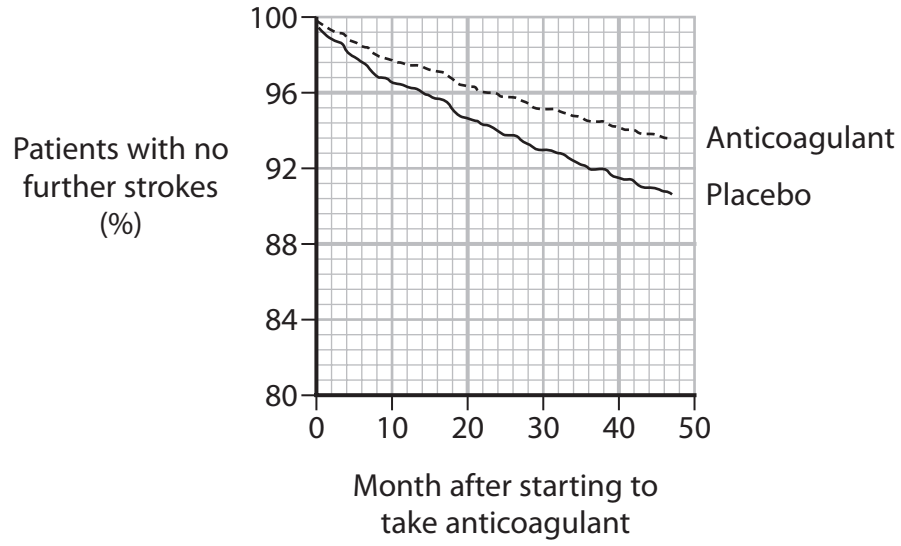
Graph A shows the incidence of stroke in people in the 12 years after starting to take statins compared with a control group.

Graph A



Graph B shows the percentage of people who have no further strokes in the 50 months after starting to take an anticoagulant compared with a control group.

Graph B



Discuss the benefits and risks of using antihypertensives, statins and anticoagulants to treat cardiovascular disease (CVD).

(6)

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(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS

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