Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary

Unit 1: Lifestyle, Transport, Genes and Health

Tuesday 25 May 2010 – Morning **Time: 1 hour 30 minutes**	Paper Reference **6BI01/01**

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 on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*
- 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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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 The questions below refer to some important biological molecules.
Place a cross (☒) in the most appropriate box that describes the structure or role of these biological molecules.

(a) Disaccharides can be split by

(1)

☒ **A** hydrolysis of glycosidic bonds

☒ **B** condensation of glycosidic bonds

☒ **C** hydrolysis of ester bonds

☒ **D** condensation of ester bonds

(b) Amylose is an example of a

(1)

☒ **A** monosaccharide

☒ **B** disaccharide

☒ **C** polysaccharide

☒ **D** trisaccharide

(c) The role of starch is to

(1)

☒ **A** be a source of energy to plants

☒ **B** store energy in all living organisms

☒ **C** store energy in plants

☒ **D** store energy in animals

(d) Proteins are polymers of amino acids joined by peptide bonds formed between the

(1)

☒ **A** R groups

☒ **B** R group and the amino group

☒ **C** R group and the carboxyl group

☒ **D** carboxyl group and the amino group

(e) The three-dimensional structure of a protein is held together by

(1)

☒ **A** peptide, hydrogen and ionic bonds

☒ **B** hydrogen, ester and ionic bonds

☒ **C** disulphide bridges and ester bonds

☒ **D** disulphide bridges, hydrogen and ionic bonds

(f) DNA consists of mononucleotides joined together by bonds between

(1)

☒ **A** two pentose sugars

☒ **B** one ribose sugar and one phosphate group

☒ **C** one deoxyribose sugar and one phosphate group

☒ **D** two phosphate groups

(g) Water is described as a dipolar molecule because it has a

(1)

☒ **A** positively charged hydrogen end and a negatively charged oxygen end

☒ **B** positively charged hydrogen end and a positively charged oxygen end

☒ **C** negatively charged hydrogen end and a negatively charged oxygen end

☒ **D** negatively charged hydrogen end and a positively charged oxygen end

(Total for Question 1 = 7 marks)

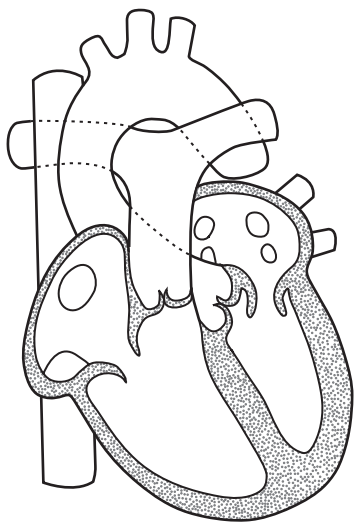
2 (a) Read through the following passage about the heart and its major blood vessels, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The mammalian heart consists of four chambers, two upper chambers called ..... and two lower chambers called ventricles.

The ..... carries oxygenated blood away from the ..... ventricle to the cells of the body and the pulmonary ..... carries deoxygenated blood to the lungs. The ..... returns deoxygenated blood back to the heart from the body.

(b) The diagram below shows the structure of the heart.



Suggest which stage of the cardiac cycle is shown in the diagram and give a reason for your answer.

(2)

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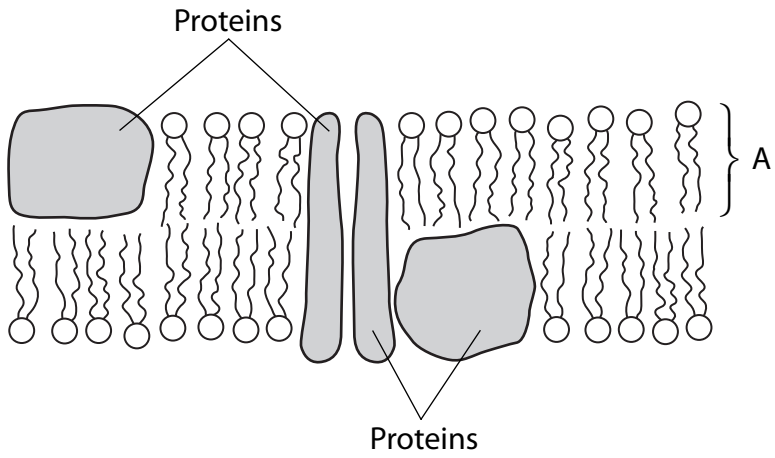
(Total for Question 2 = 7 marks)

3 The fluid mosaic model describes the structure and properties of cell membranes.

(a) The diagram below shows the structure of a cell membrane based on this model.



(i) Name the molecule labelled A and describe its structure.

(3)

Name .....

Structure .....

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(ii) Explain how the properties of molecule A contribute to the structure of the cell membrane.

(3)

(b) Some proteins in the cell membrane are involved in active transport and facilitated diffusion. Describe the role of proteins in these cell transport mechanisms.

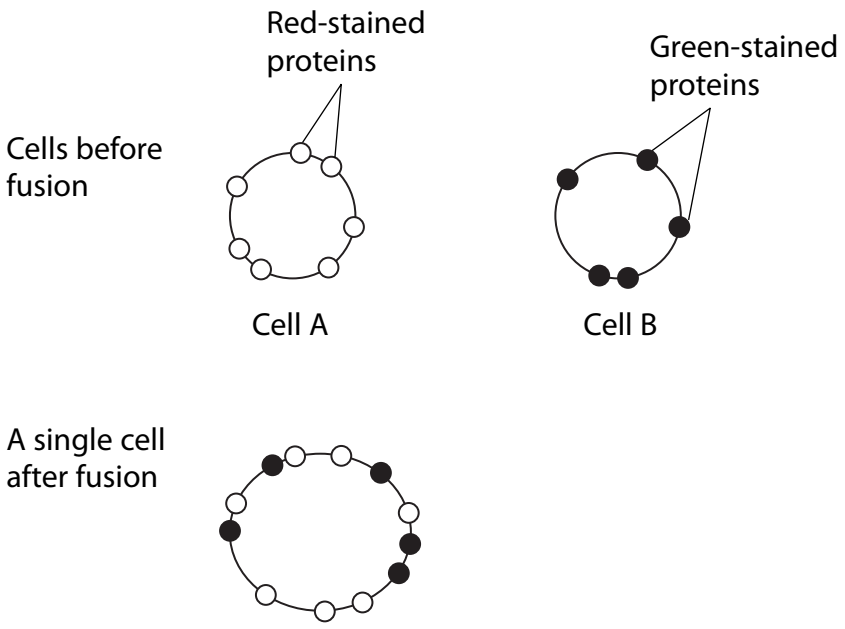
(3)

Active transport

Facilitated diffusion

(c) In an investigation into the properties of the cell membrane, the proteins in the membranes of two cells, A and B, were stained using different dyes. The proteins of one cell were stained green and the proteins of the other cell were stained red. The cells were then fused (merged together) to form a single cell.

The diagram below shows the distribution of the proteins in the cell membranes before and after fusion.



(i) Describe the distribution of the proteins in this single cell after fusion.

(2)

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(ii) Describe how the results of this investigation can be explained by the fluid mosaic model.

(2)

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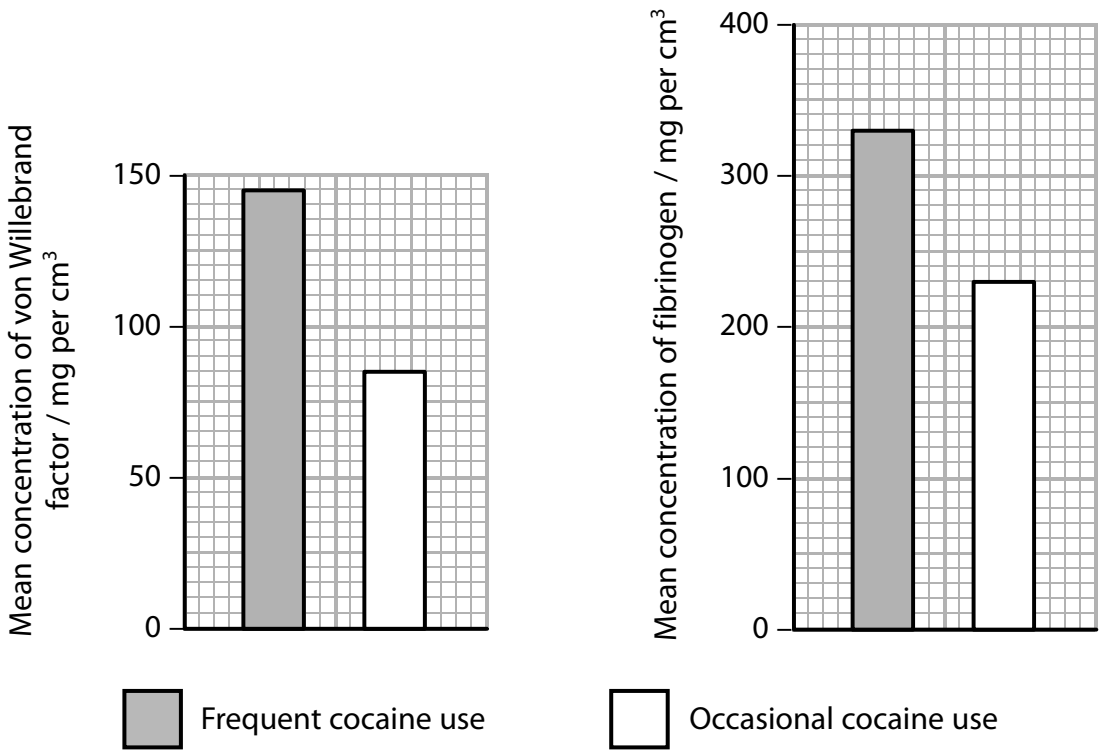
(Total for Question 3 = 13 marks)

4 Cocaine use increases the risk of a heart attack.
Cocaine also affects the levels of a number of blood components, including von Willebrand factor and fibrinogen. These two components are involved in blood clotting.

(a) The normal range for von Willebrand factor is 50 to 150 mg per cm^3 and for fibrinogen is 150 to 300 mg per cm^3.
The graphs below show the effects of frequent and occasional cocaine use on the mean concentration of von Willebrand factor and fibrinogen in the blood.



(i) Describe the effects of frequent and occasional cocaine use on the mean concentrations of von Willebrand factor and fibrinogen in the blood.

(3)

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(ii) Using the information given, explain why conclusions cannot be made about the effect of occasional cocaine use on the concentrations of these blood components.

(1)

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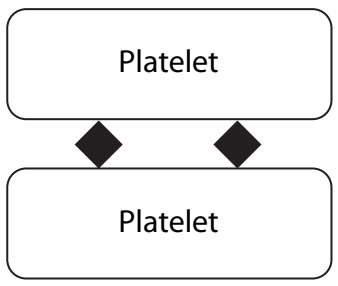
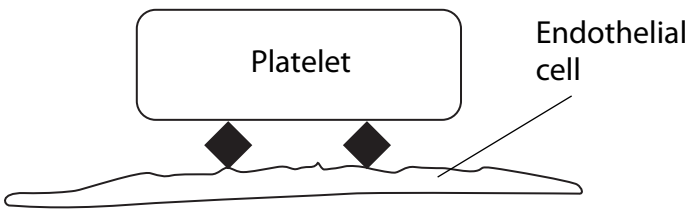
*(b) The diagram below shows two functions of von Willebrand factor.



Platelets stick together



Platelets stick to endothelial cells lining blood vessels

von Willebrand factor

Using the information in this diagram and your own knowledge of the blood clotting process, suggest why frequent cocaine use could increase the risk of a blood clot forming.

(4)

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(c) It has been suggested that there is a correlation between the change in the concentrations of fibrinogen in the blood and the increased risk of heart disease due to cocaine use. Explain why this suggestion is valid.

(2)

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(Total for Question 4 = 10 marks)

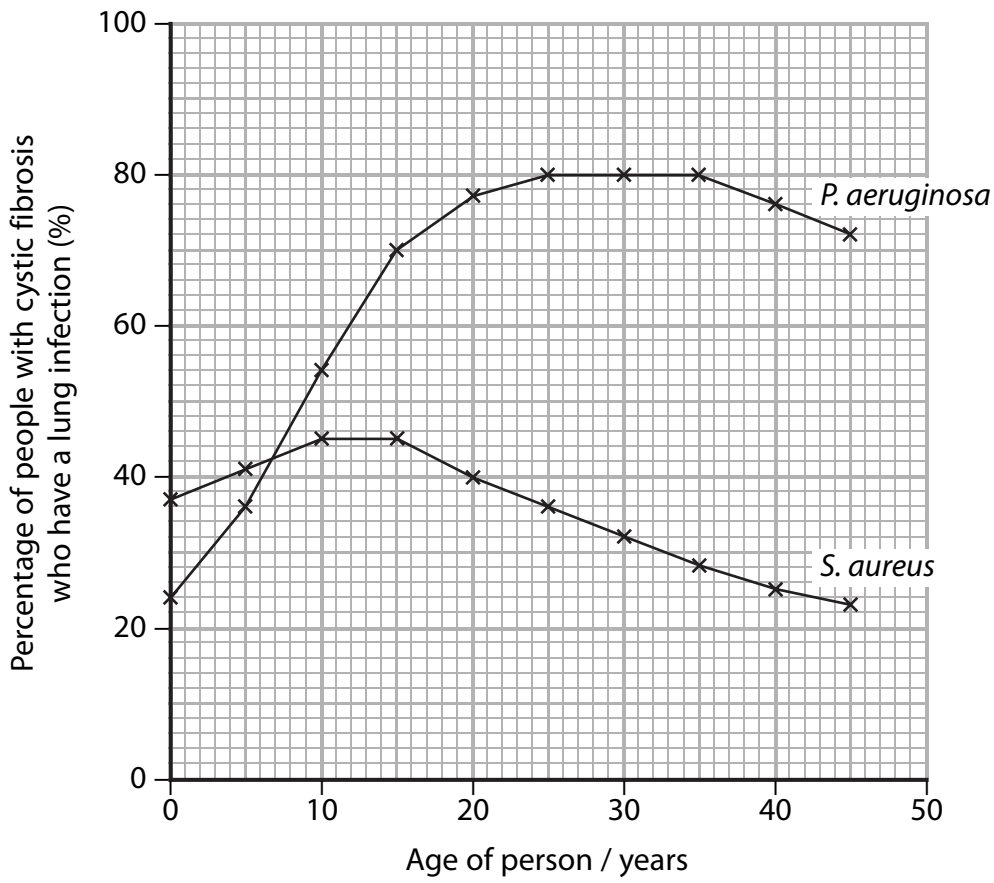
5 Cystic fibrosis is a genetic disease that can affect many body systems, including the respiratory system.

*(a) Explain how a gene mutation causes a build up of mucus in the respiratory system of a person with cystic fibrosis.

(5)

(b) Lung infections can be caused by bacteria such as *P. aeruginosa* and *S. aureus*. People with cystic fibrosis may develop these lung infections.

The graph below shows the relationship between the percentage of people with cystic fibrosis who have a lung infection and the age of the person.



(i) Suggest why people with cystic fibrosis are more likely to suffer from these lung infections than people without cystic fibrosis.

(2)

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(ii) Using the information in the graph, describe the relationship between the age of a person and the incidence of a lung infection due to *P. aeruginosa*.

(3)

(iii) Using the information in the graph, give **two** differences between the percentages of people with infections due to *P. aeruginosa* and infections due to *S. aureus*.

(2)

1

2

(Total for Question 5 = 12 marks)

6 Enzymes are biological catalysts that change the activation energy of chemical reactions.

(a) Explain the meaning of the terms **biological catalyst** and **activation energy**.

(4)

Biological catalyst .....

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Activation energy .....

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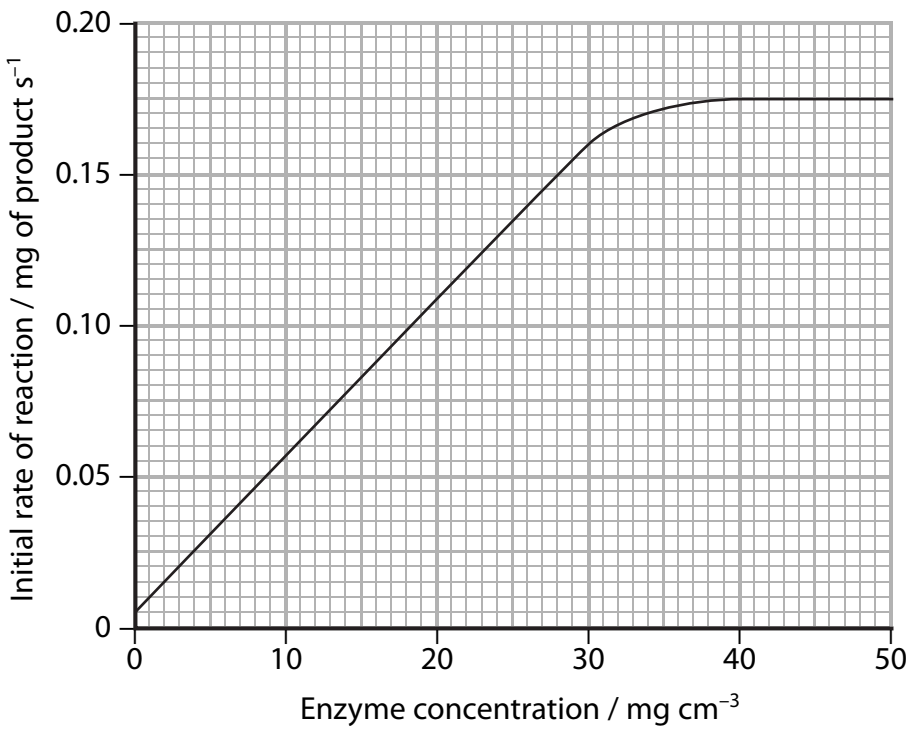
(b) The graph below shows the results of an investigation into the effect of enzyme concentration on the initial rate of this reaction.



Explain why it is necessary to measure the **initial rate** of reaction when investigating the effect of enzyme concentration on the rate of reaction.

(2)

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(c) In this investigation, the substrate concentration was a factor that was kept constant.
Suggest **two** other factors that should be kept constant. For each factor, state how it can be kept constant.

(4)

Factor 1 .....

How the factor can be kept constant .....

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Factor 2 .....

How the factor can be kept constant .....

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(Total for Question 6 = 10 marks)

7 Plant statins are used in the treatment of cardiovascular disease (CVD). Some fungi can produce chemicals that can be used as statins. One example is a chemical referred to as drug S.

One study into the effect of drug S on the health of people taking it involved 20 000 people and ran for a period of 5 years. One group of people was given drug S and the other group was given a placebo. Each group had 10 000 people in it.

The table below shows some of the findings from this study.

Event	Percentage of people (%)	
	Taking drug S	Taking the placebo
Death	12.9	14.7
CVD	8.7	11.8
Stroke	4.3	5.7

(a) (i) Name **two** factors that increase the risk of CVD.

(1)

1 .....

2 .....

(ii) Suggest why it was necessary to have so many people involved in this study.

(2)

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(b) Suggest what the placebo could be in this study.

(1)

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(c) Suggest why this study had to run for a number of years.

(1)

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(d) Using the data in the table, what is the evidence that drug S is safe for people to take?

(2)

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(e) (i) Calculate how many more people given the placebo had CVD compared with those given drug S.

(3)

Answer .....

(ii) Explain why drug S could be a potential statin.

(1)

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(Total for Question 7 = 11 marks)

8 Some types of cancer lead to the production of tumours (a group of rapidly-dividing cancer cells).

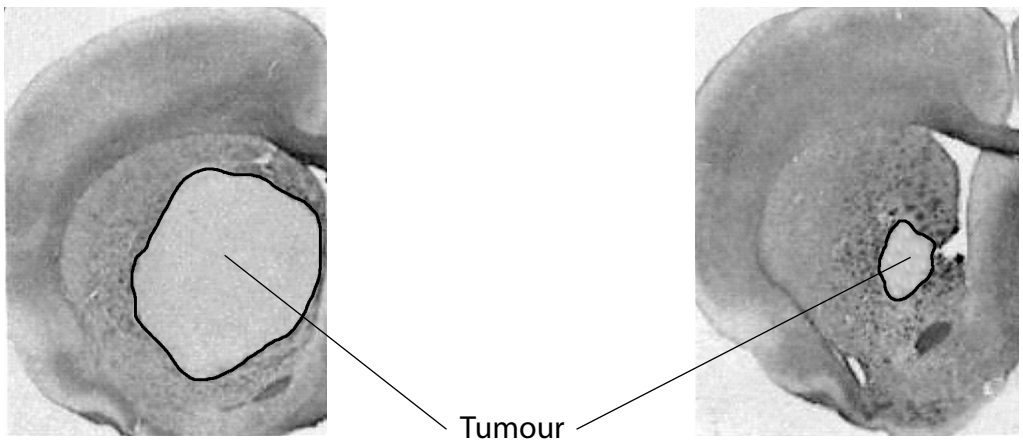
Gene therapy has the potential to cure a number of human diseases, including cancer. At present, research into gene therapy relies on animal models of diseases.

(a) In one investigation, brain tumours were induced in two groups of rats.
One group of rats was given gene therapy and the other group of rats acted as a control.

The photographs below show the appearance of a tumour in the brain of a control rat and in a rat given gene therapy.
Both photographs have the same magnification.

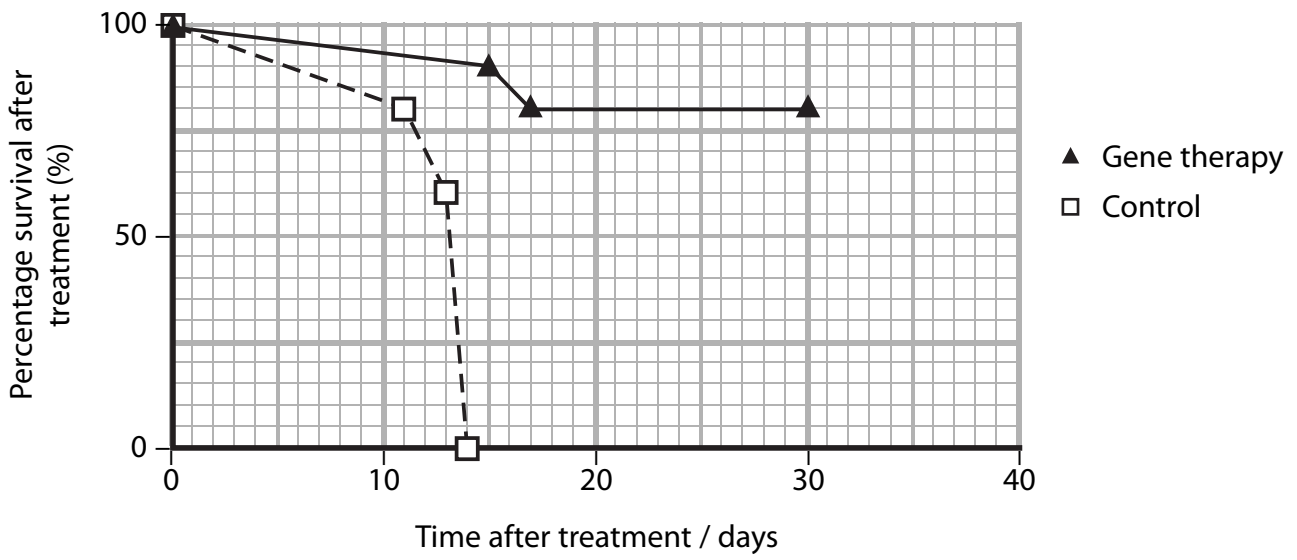
Brain of control rat

Brain of rat receiving gene therapy



Magnification ×10

The graph below shows the percentage survival after treatment of the rats in the two groups.



Using the information shown in the photographs and in the graph, describe the effects of gene therapy on these rats.

(3)

(b) Cancer can cause a lot of pain. Pain can be reduced by a chemical called endorphin that is made by cells in the brain and spinal cord. Endorphin reduces the activity of neurones that carry impulses from pain receptors.

Gene therapy has been used in rats to increase the tolerance to pain. Viruses, containing a gene coding for endorphin, were developed. These viruses were injected into the spinal cords of a group of rats. The level of tolerance to pain was tested in these rats and in the rats in a control group.

(i) Describe the role of the viruses in this investigation.

(2)

(ii) Suggest why the injection was made into the spinal cord.

(1)

QUESTION 8 CONTINUES ON THE NEXT PAGE

(iii) Suggest why a gene coding for an endorphin was used in this investigation.

(1)

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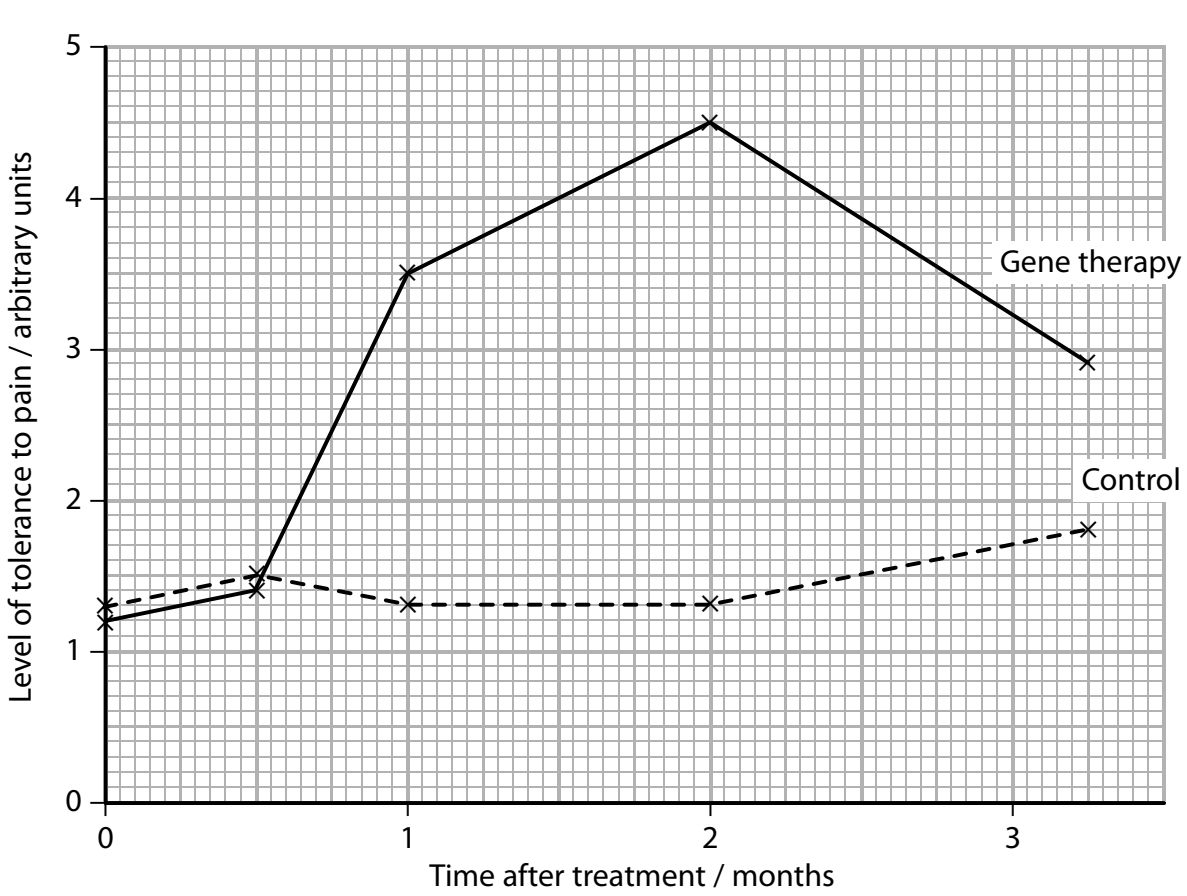
(iv) The results of this investigation are shown in the graph below.



Using the information in the graph, compare the levels of tolerance to pain in the rats given gene therapy with the control group.

(3)

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(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS