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Edexcel GCE

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

Thursday 8 January 2009 – Morning Time: 1 hour 15 minutes	Paper Reference 6BI01/01
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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.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- 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.

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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 Read through the following passage that describes the process of blood clotting, then write on the dotted lines the most appropriate word or words to complete the passage.

(6)

A blood clot may form when a blood vessel wall becomes damaged.

Cell fragments called stick to the wall of the damaged

blood vessel forming a plug. A series of chemical changes occur in the blood,

resulting in being converted into thrombin.

Thrombin is an that catalyses the conversion

of into long insoluble strands of

..... . These strands form a mesh that trap

..... to form the clot.

(Total for Question 1 = 6 marks)



2 Transcription and translation are two main stages in protein synthesis.

(a) Complete the table below by writing the word **transcription** or **translation** next to the appropriate statement about protein synthesis.

(5)

Statement	Stage of protein synthesis
Ribosomes are involved	
DNA acts as a template	
tRNA is involved	
Peptide bonds are made	
mRNA is made	

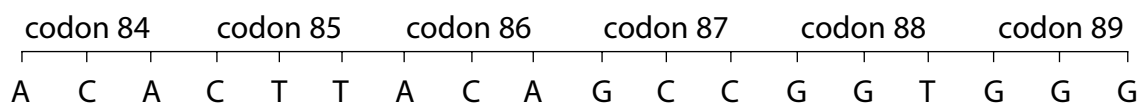


N 3 4 4 0 6 A 0 3 2 4

(b) The table below shows some amino acids and their corresponding DNA triplet codons. The DNA triplet codons for a stop signal are also shown.

Amino acid / stop signal	DNA triplet codons
Proline	GGT GGG GGA
Alanine	CGG CGA CGT CGC
Cysteine	ACA ACG
Serine	AGG AGA AGT AGC
Leucine	GAA GAG GAT GAC
Arginine	GCA GCG GCT GCC
Glutamine	CTT CTC
Glycine	CCT CCG CCA CCC
Threonine	TGC TGA TGT TGG
Stop signal	ATT ATC ACT

The diagram below shows part of a DNA molecule.



(i) Place a cross ☒ in the box next to the amino acid coded for by codon 85.

(1)

Leucine

Glutamine

Glycine

Serine

(ii) Place a cross ☒ in the box next to the sequence of amino acids found in the polypeptide chain that is coded for by this part of the DNA strand.

(1)

cysteine glutamine cysteine arginine proline proline

threonine leucine threonine alanine glycine glycine

cysteine glutamine cysteine arginine glycine glycine

cysteine proline cysteine arginine proline proline



- (iii) If codon 89 coded for the last amino acid in the polypeptide chain, place a cross in the box next to codon 90.

(1)

GGG ATC TAG AGT

- (iv) Place a cross in the box next to the sequence of bases on a molecule of messenger RNA (mRNA) synthesised from this part of the DNA molecule.

(1)

ACACTTACAGCCGGTGGG TGTGAATGTCGGCCACCC UGUGAAUGUCGGCCACCC AGACUUAGACGGCCUGGG

- (v) Place a cross in the box next to the statement that best describes what the polypeptide chain would be like if the 90th codon was ACT and the 91st codon was CTT on the DNA molecule.

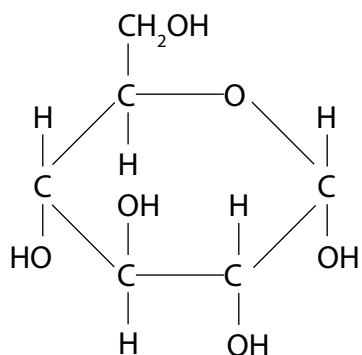
(1)

The polypeptide chain would be no more than 89 amino acids long The 89th amino acid would be threonine and the 90th amino acid would be leucine The polypeptide chain would be more than 90 amino acids long The polypeptide chain would be more than 91 amino acids long **(Total for Question 2 = 10 marks)**

N 3 4 4 0 6 A 0 5 2 4

3 Starch is a storage carbohydrate found in plants. Starch is composed of many α -glucose molecules that bond together by condensation reactions.

(a) The diagram below shows the structure of α -glucose.



(i) In the space below, draw a diagram to show the products formed when two α -glucose molecules join together by means of a condensation reaction to form maltose.

(3)

(ii) Name the bond that joins the two α -glucose molecules together.

(1)



(b) Describe the structure of starch and explain why this structure makes it a suitable molecule for storing energy.

(4)

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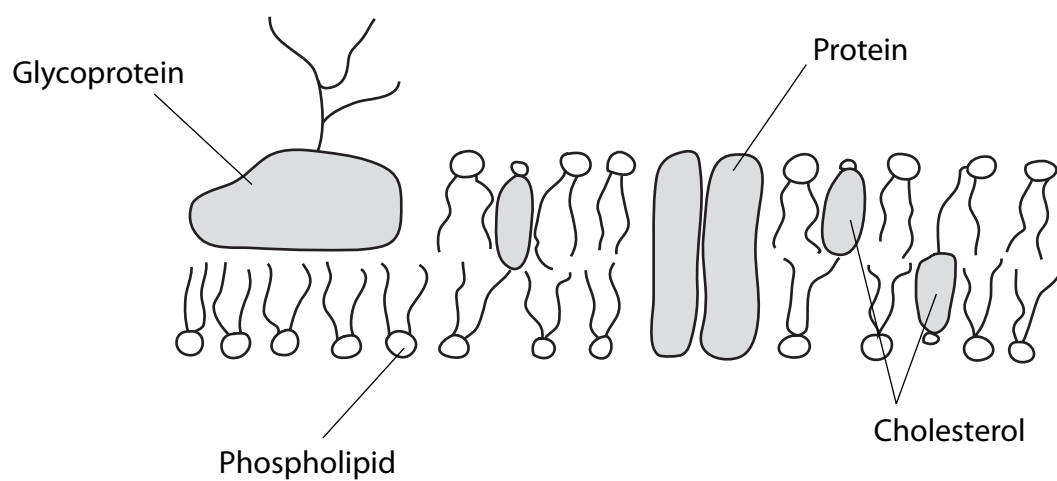
(Total for Question 3 = 8 marks)



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4 The diagram below represents the structure of the cell surface membrane.



(a) Explain why the phospholipid molecules form a bilayer.

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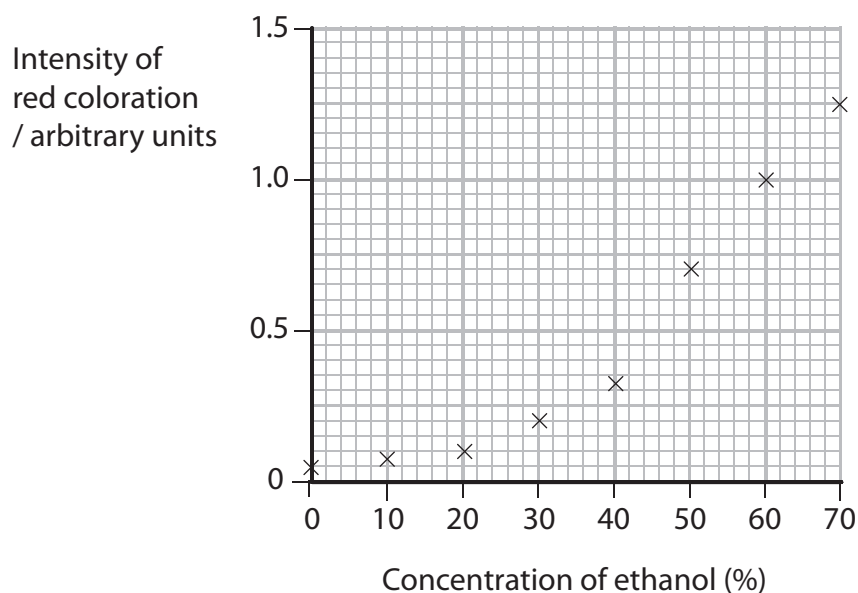
N 3 4 4 0 6 A 0 9 2 4

- (b) A student carried out an experiment to investigate the effect of alcohol concentration on the permeability of beetroot membranes. Beetroot is a root vegetable that appears red because the vacuoles in their cells contain a water-soluble red pigment. This pigment cannot pass through membranes.

Eight pieces of beetroot were cut. One piece of beetroot was placed into a tube containing 15 cm^3 of water and left for 15 minutes. The procedure was repeated for seven different concentrations of ethanol.

After 15 minutes, each piece of beetroot was removed from the tubes and a sample of the fluid removed and placed in a colorimeter. The colorimeter was used to determine the intensity of red coloration of the fluid.

The results of the investigation are shown in the graph below.



- (i) Suggest **two** variables, other than those stated above, which should be kept constant during this experiment.

(2)

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(ii) There was some red coloration in the tube containing only water. Suggest an explanation for this.

(2)

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(iii) Describe what the student should have done to reduce the red coloration in the tube containing only water.

(1)

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(c) The graph on page 10 shows that ethanol has an effect on the permeability of beetroot.

(i) State the effect that the ethanol concentration has on the intensity of the red coloration.

(1)

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(ii) Suggest an explanation for this effect.

(2)

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(Total for Question 4 = 11 marks)



5 (a) In the space below, draw a labelled diagram to show the structure of an artery. (3)

(b) Explain how the structure of an artery relates to its function. (2)

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(c) Give **two** differences between the structure of a vein and the structure of a capillary. (2)

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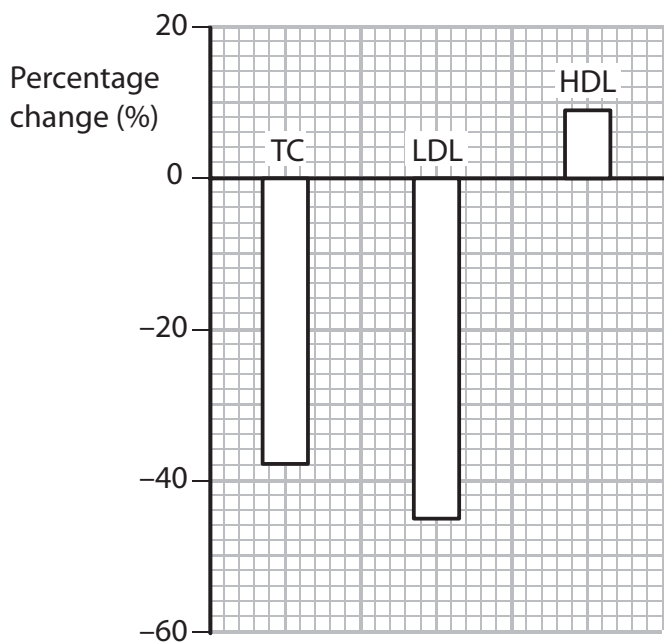
(Total for Question 5 = 7 marks)



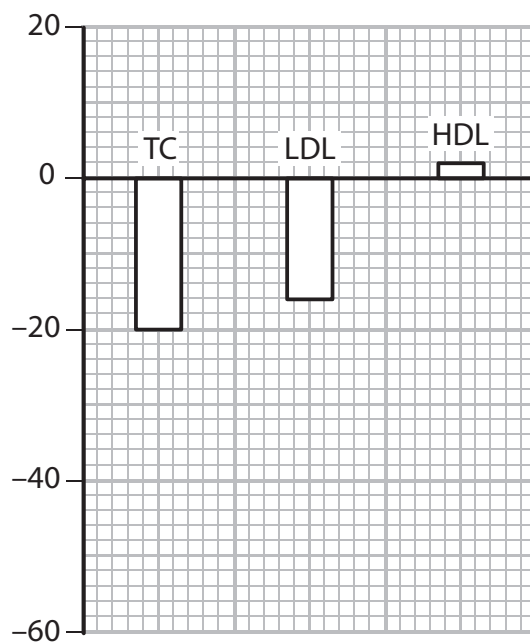
6 High blood cholesterol levels are associated with an increased risk of developing cardiovascular disease (CVD). There are cholesterol-reducing drugs available to lower this risk.

(a) Two groups of patients were treated with a different type of cholesterol-reducing drug, Drug A or Drug B.

The graphs below show the percentage changes of total cholesterol (TC), low-density lipoproteins (LDL) and high-density lipoproteins (HDL) in the blood of these patients, after treatment.



Patients treated with Drug A



Patients treated with Drug B

(i) Compare the effects of Drug A and Drug B on the percentage changes in total cholesterol (TC), LDL and HDL in the blood of these two groups of patients.

(3)

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(ii) The enzyme HMG-CoA reductase catalyses the synthesis of cholesterol. When this enzyme is active, there are fewer LDL receptors on liver cells. These receptors are needed to remove LDL from the blood.

Statins are a group of cholesterol-reducing drugs that act by inhibiting this enzyme. Suggest which of the two drugs, Drug A or Drug B, is more likely to be a statin. Give reasons for your answer.

(3)

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(b) State **two** risks of treatments using statins.

(2)

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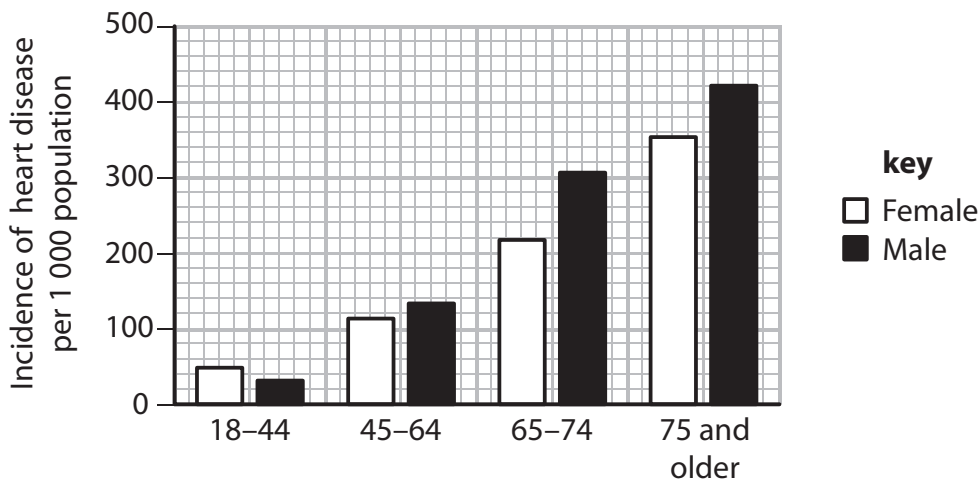
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(c) Age and gender are two other factors that may influence the development of heart disease in an individual.

The graph below shows the results of a survey in America, on the incidence of heart disease in adults aged 18 and older.



(i) Using the information in the graph, describe how the incidence of heart disease is affected by age and gender.

(3)

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(ii) Calculate the increased risk that a man who is 75 or older has of developing heart disease, compared to a man aged between 18 and 44 years old.

(2)

Answer

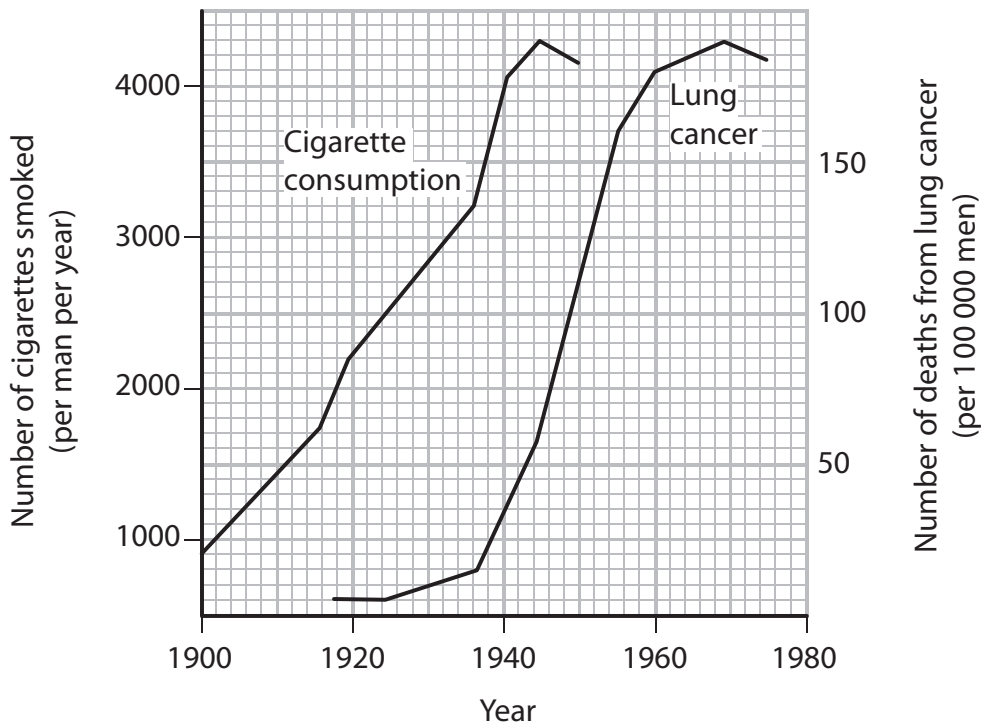
(Total for Question 6 = 13 marks)



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- 7 A study was carried out into the number of cigarettes smoked by men per year and the number of deaths from lung cancer. The graph below shows the results of this study.



- (a) Describe the changes in the number of deaths from lung cancer between 1920 and 1975.

(3)

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(b) The results of this study indicate that there is a correlation between cigarette smoking and lung cancer.

(i) Explain the meaning of the term **correlation**.

(1)

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(ii) Describe the evidence shown in this graph that suggests there is a correlation between cigarette smoking and the number of deaths from lung cancer.

(2)

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(iii) Give **two** additional pieces of information that would increase the **validity** of any conclusions made from this study.

(2)

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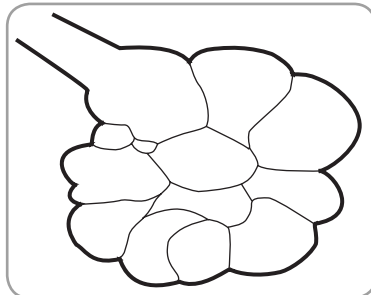
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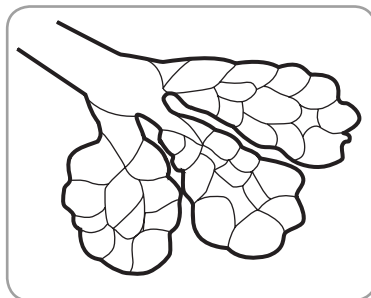
(c) Emphysema is another lung disease associated with cigarette smoking. One symptom of emphysema is shortness of breath. This is due to the damage to the alveoli and destruction of capillaries surrounding the alveoli.

The diagram below show alveoli from a lung of a person with emphysema and some alveoli from a healthy person.

Alveoli from a lung of a person with emphysema



Alveoli from a healthy person



Use your knowledge of the structure of the lung and its adaptations for gas exchange to explain why a person with emphysema has problems with gas exchange.

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(Total for Question 7 = 12 marks)

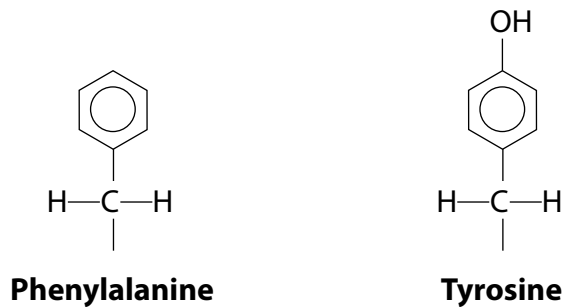


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8 Phenylketonuria is a recessive genetic disorder characterised by a lack of the enzyme phenylalanine hydroxylase. When there is an excess of phenylalanine in the diet, this enzyme converts the amino acid phenylalanine into the amino acid tyrosine.

(a) The diagram below shows the structure of the R group of phenylalanine and tyrosine.



(i) In the space below draw a diagram to show the structure of the amino acid phenylalanine.

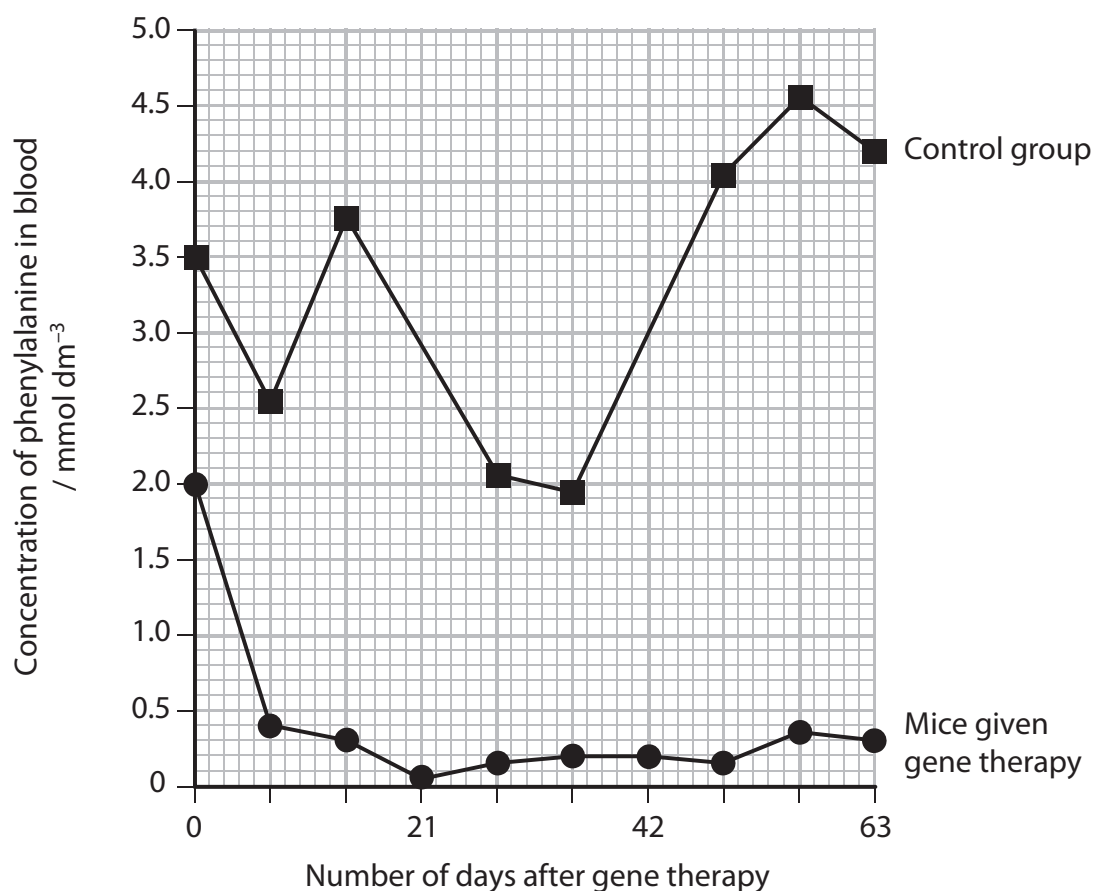
(3)



- (ii) The enzyme phenylalanine hydroxylase converts its substrate, phenylalanine, into the product, tyrosine. Using the information shown in the diagram and your knowledge of the mechanism of action of enzymes, suggest how this reaction takes place.

(4)

- (b) A number of investigations have been carried out into the use of somatic gene therapy to treat mice that have phenylketonuria. The graph below shows the results of one such investigation.



(i) Use the graph to describe the effect that gene therapy has on the phenylalanine concentration in the blood of these mice.

(2)

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(ii) Describe how somatic gene therapy may have been carried out to treat phenylketonuria in these mice.

(3)

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(iii) Suggest what treatment the control group of mice may have been given in this investigation.

(1)

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(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS



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