

Write your name here

Surname

Other names

Centre Number

Candidate Number

**Edexcel GCE****Biology**  
**Advanced Subsidiary****You must have:**

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.
- 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 ►

**PEARSON**

**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** Nucleic acids, DNA and RNA, are very important molecules in living organisms. Messenger RNA (mRNA) and transfer RNA (tRNA) are involved in the synthesis of proteins.

For each of the statements (a) to (f), put a cross ☒ in the box that corresponds to the correct statement.

(a) DNA and RNA are polynucleotides composed of mononucleotides joined by (1)

- A** catabolic reactions
- B** condensation reactions
- C** hydrolysis reactions
- D** redox reactions

(b) The mononucleotides of RNA consist of a phosphate joined to the sugar (1)

- A** deoxyribose
- B** dextrose
- C** ribose
- D** ribulose

(c) The mononucleotides in mRNA are joined together by (1)

- A** disulphide bridges
- B** glycosidic bonds
- C** hydrogen bonds
- D** phosphodiester bonds



(d) The bases in RNA are

(1)

- A** adenine, cytosine, guanine and thymine
- B** adenine, cytosine, guanine and uracil
- C** adenine, guanine, thymine and uracil
- D** cytosine, guanine, thymine and uracil

(e) DNA is a double stranded molecule twisted into

(1)

- A** a beta-pleated sheet
- B** a double helix
- C** a triple helix
- D** an alpha helix

(f) The two DNA strands are held together by

(1)

- A** disulphide bridges
- B** glycosidic links
- C** hydrogen bonds
- D** phosphodiester bonds



(g) Describe the role of each of the following in protein synthesis.

(4)

mRNA .....

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tRNA .....

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**(Total for Question 1 = 10 marks)**



**2** Carbohydrates are important components of our diets.

(a) Distinguish between the structures of each of the following pairs of carbohydrate molecules.

(i) Monosaccharides and disaccharides

(2)

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(ii) Amylose and amylopectin

(2)

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(b) Explain why a diet consisting of a high proportion of carbohydrates could lead to obesity.

(2)

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





(b) Giraffes are very tall mammals found roaming the plains of Africa.  
Two giraffes are shown in the photograph below.



Using the information in the photograph and your own knowledge, explain the importance of the heart and circulation to the giraffe.

(4)

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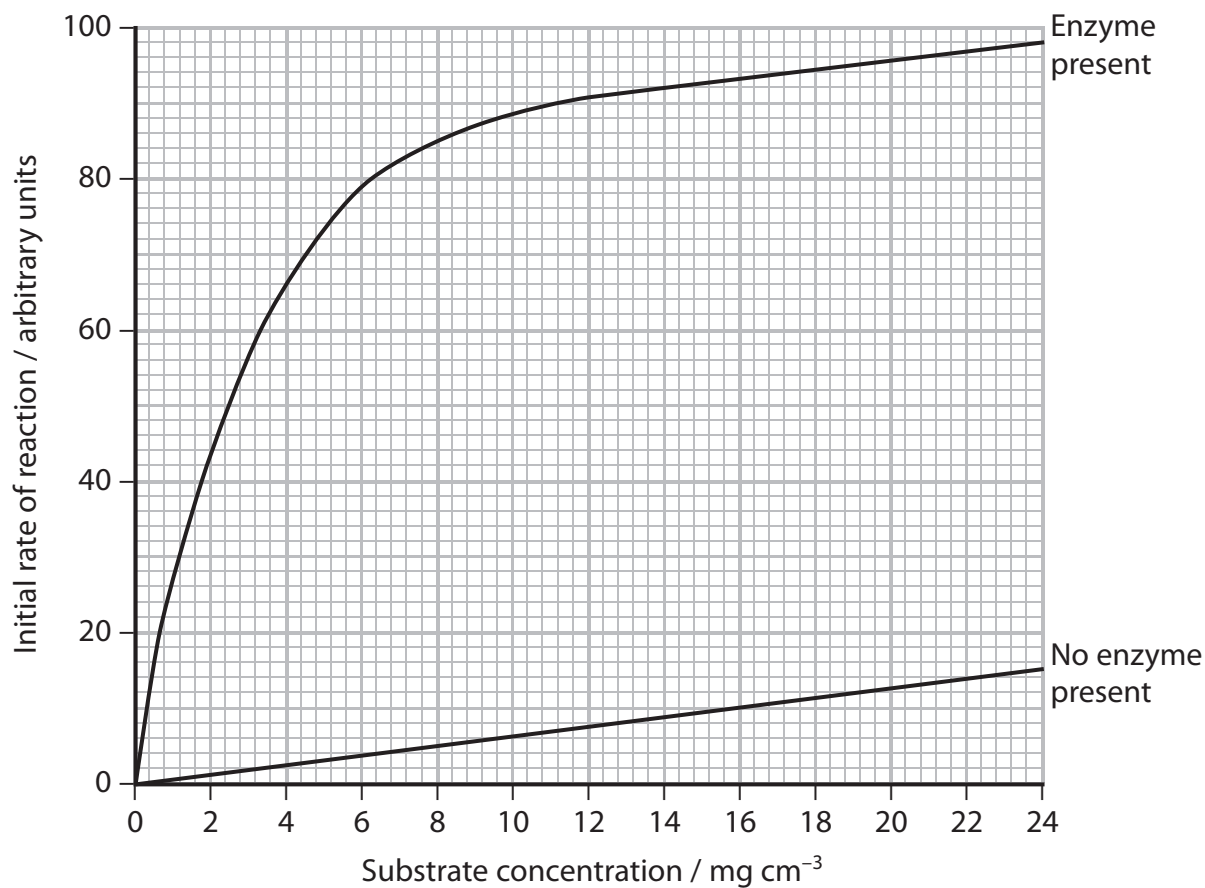
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**(Total for Question 3 = 9 marks)**



4 Enzymes are biological catalysts. They are involved in many chemical reactions in the body, including the digestion of lipids.

(a) The graph below shows the effect of an enzyme on the initial rate of reaction at different concentrations of the substrate.



Describe the effects that the enzyme had on this reaction.

(2)

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(b) Lipases are enzymes that are involved in the breakdown of lipids, such as triglycerides.

(i) Name the bond broken by lipases.

(1)

(ii) Name **two** products formed from the breakdown of triglycerides by lipases.

(2)

1 .....

2 .....

(iii) Suggest what effect the breakdown of triglycerides could have on the pH of a reaction mixture.

(1)

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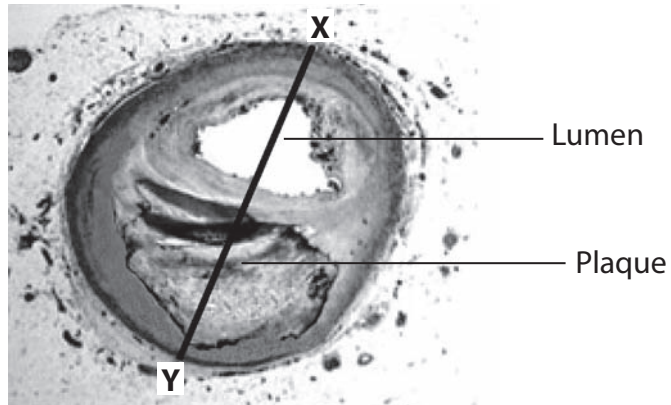
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- 5 Cardiovascular disease (CVD) is responsible for many deaths. One cause of CVD is atherosclerosis.

The photograph below shows a section through an artery with a plaque (atheroma) from a patient with CVD.



- (a) Calculate the increase in the thickness of the artery wall where the plaque is located. Take your measurements along the line labelled X and Y. Show your working.

(3)

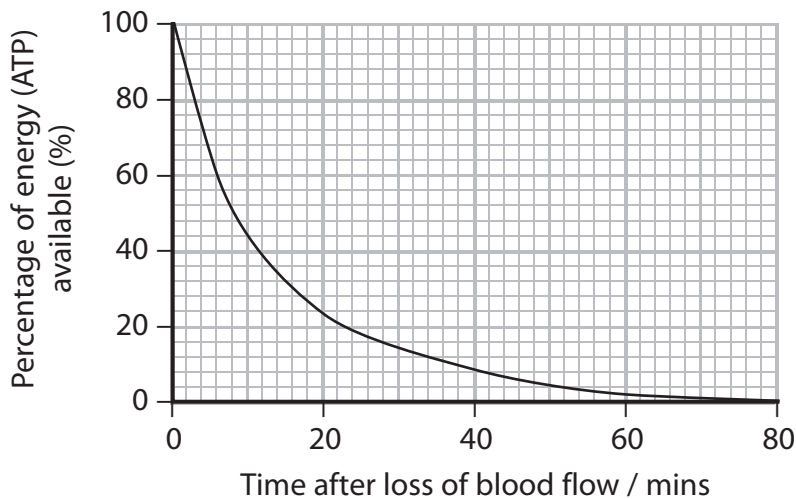
Answer .....



- (b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



- (i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

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(ii) Suggest why there are changes to the available energy (ATP) in the heart muscle cells following the loss of blood flow.

(2)

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(iii) About 8 minutes after the loss of blood flow, the heart muscle cells no longer contract. After about 20 minutes, the heart muscle cells begin to die.

Using the information in the graph and your own knowledge, suggest explanations for the timings of these two events.

(3)

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(iv) If blood flow is restored within 30 minutes, most heart muscle cells will eventually recover. Suggest an explanation for this recovery.

(2)

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**(Total for Question 5 = 12 marks)**



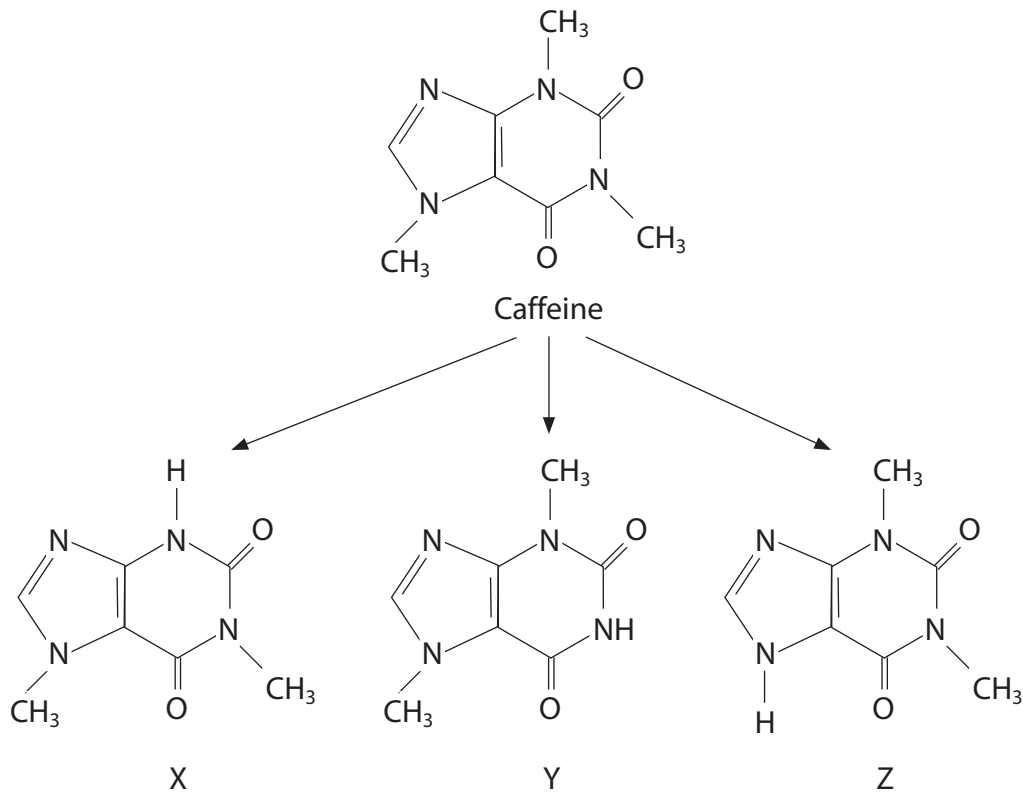
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- 6 Caffeine is a drug frequently consumed in a number of drinks such as coffee, cola, hot chocolate and tea.

Caffeine is broken down in the liver by a group of enzymes called cytochrome P450 oxidase.

- (a) The diagram below shows the structure of caffeine and its three breakdown products, X, Y and Z.



- (i) Using the information in the diagram, give **two** reasons why caffeine is **not** an amino acid.

(2)

1 .....

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2 .....

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(ii) Using the information in the diagram, state **two** differences between the breakdown products.

(2)

1 .....

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2 .....

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(iii) Using the information in the diagram and your own knowledge of enzyme action, suggest why cytochrome P450 oxidase consists of more than one type of enzyme.

(3)

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(b) A student decided to investigate the concentration of caffeine in four drinks: coffee, cola, hot chocolate and tea.

The student's results are shown in the table below.

Drink	Volume of drink	Caffeine content / mg
coffee	200 cm <sup>3</sup>	135
cola	1 can	80
hot chocolate	200 cm <sup>3</sup>	10
tea	1 cup	50

The student made two conclusions from these results.

**Conclusion 1** "Different drinks have different concentrations of caffeine."

**Conclusion 2** "Coffee has the highest concentration of caffeine."

Comment on the validity of these conclusions. Give reasons for your answer.

(3)

Conclusion 1 .....

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Conclusion 2 .....

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**(Total for Question 6 = 10 marks)**



**7** A large number of doctors routinely prescribe drugs to treat patients who are over 80 and have high blood pressure.

(a) (i) Give the name of the type of drug that is used to treat high blood pressure.

(1)

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs.

(2)



(b) A study was carried out to investigate the benefit of treating patients who are over 80 and have high blood pressure.

Patients were randomly put into one of two groups, A and B. Each group contained 2000 patients.

Patients in group A were given two tablets each containing a different drug.

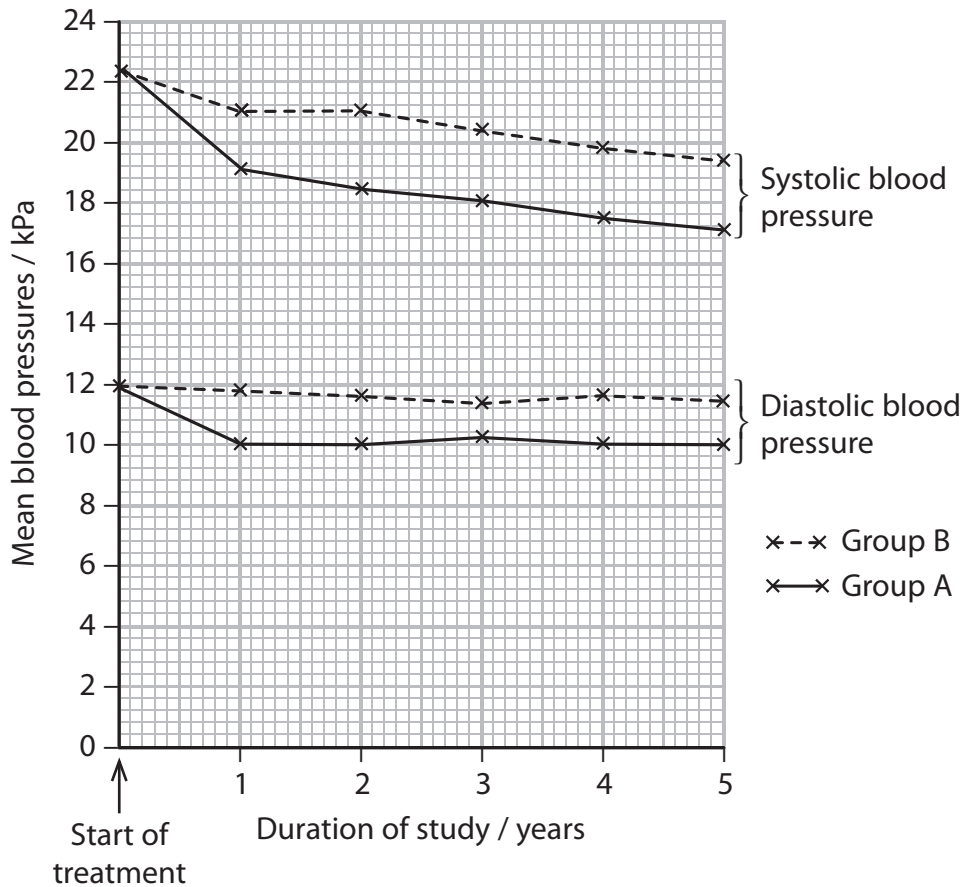
Patients in group B were given two tablets neither of which contained a drug.

The systolic and the diastolic pressure of each patient was measured. The systolic pressure is the maximum pressure when the heart contracts and the diastolic pressure is the minimum pressure when the heart relaxes.

The blood pressure of all patients was recorded over a period of five years.

The mean pressures were then calculated.

The graph below shows the results of this study.



(i) Explain why the patients in group B were given two tablets that had no drugs in them.

(2)

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(ii) Using the information in the graph, describe the results of this study.

(3)

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(iii) Suggest why both the systolic and diastolic blood pressures were recorded in this study.

(1)

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(iv) Suggest what else could have been recorded in this study to provide more evidence of other benefits of treating these patients with the drugs.

(1)

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**(Total for Question 7 = 10 marks)**



**8** Cystic fibrosis and albinism are examples of recessive genetic disorders. Krabbe disease is another example of a recessive genetic disorder. Krabbe disease is caused by mutations in the GALC gene, resulting in a deficiency of an enzyme called galactocerebrosidase.

(a) Explain the meaning of each of the following terms.

(i) Mutation

(2)

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(ii) Recessive

(1)

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(b) Suggest how a mutation in the GALC gene could result in a change in the enzyme galactocerebrosidase.

(3)

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(c) Two parents are both carriers of the recessive allele for Krabbe disease.

In the space below, draw a genetic diagram to show the possible genotypes and phenotypes of their children.

Use the genetic diagram to find the probability of these parents having a child with Krabbe disease.

(5)

Probability .....

(d) State how these parents could determine whether or not their unborn child has Krabbe disease.

(1)

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**(Total for Question 8 = 12 marks)**

**TOTAL FOR PAPER = 80 MARKS**



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