Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

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

Tuesday 21 May 2013 – Afternoon
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 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 ▶

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P 3 9 8 8 4 A 0 1 2 4

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 (a) Read through the following passage on the blood clotting process, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The blood clotting process starts when cell fragments called .....

release molecules of ..... . These molecules

are ..... which catalyse the conversion of .....

into ..... , in the presence of calcium ions. As a result, fibrinogen

is converted into fibrin and blood cells are trapped to form the clot.

(b) Fibrinogen and fibrin are both proteins.

A protein consists of a chain of amino acids joined together by bonds.

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

(3)

(ii) Name the covalent bond that joins the amino acids into a chain.

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(iii) Suggest **two** differences between fibrinogen and fibrin.

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(Total for Question 1 = 11 marks)

2 DNA is a very important molecule in living organisms as it carries the genetic code. Before a cell divides, the DNA molecule replicates so that each resulting daughter cell is genetically identical to the original parent cell.

(a) Explain the nature of the genetic code.

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*(b) Describe the process of DNA replication.

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(Total for Question 2 = 7 marks)

3 Lipoprotein lipase is a biological catalyst and is involved in the hydrolysis of triglycerides.

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

(i) A catalyst

(1)

☐ **A** decreases the rate of reaction by increasing the activation energy

☐ **B** decreases the rate of reaction by reducing the activation energy

☐ **C** increases the rate of reaction by increasing the activation energy

☐ **D** increases the rate of reaction by reducing the activation energy

(ii) Hydrolysis results in bonds between glycerol and a fatty acid

(1)

☐ **A** being broken and water being formed

☐ **B** being broken and water being used

☐ **C** being formed and water being formed

☐ **D** being formed and water being used

(iii) A triglyceride is made from

(1)

☐ **A** one glycerol and one fatty acid

☐ **B** one glycerol and three fatty acids

☐ **C** three glycerols and one fatty acid

☐ **D** three glycerols and three fatty acids

(iv) A type of bond found in a triglyceride is

(1)

☐ **A** an ester bond

☐ **B** a glycosidic bond

☐ **C** a hydrogen bond

☐ **D** a phosphodiester bond

(b) Some people have a mutation in the gene coding for lipoprotein lipase.

The table below shows the mean concentration of some types of lipid in the blood of people without the mutation and in the blood of people with the mutation.

Type of lipid	**Mean concentration of lipid in blood / mg dm^{-3}**	
	People without the mutation	**People with the mutation**
Triglyceride	102	93
LDL cholesterol	121	111
HDL cholesterol	48	49
Total cholesterol	186	179

It has been suggested that people with this mutation may be more at risk of developing cardiovascular disease (CVD).

(i) Give **two** reasons why the information in the table does **not** support this suggestion.

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(ii) Name the type of drug that could be given to people with this mutation, to reduce the risk of developing CVD.

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(iii) State **one** health risk associated with using this type of drug.

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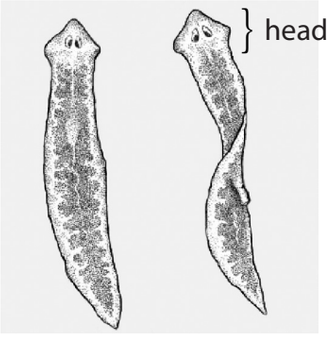
(Total for Question 3 = 8 marks)

4 Some species of flatworm are found in freshwater streams.
Flatworms obtain oxygen from the water through the surface of their bodies.
The diagram below shows the structure of flatworms.



Flatworms

Magnification ×10

(a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

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(b) The table below shows the relationship between the temperature of water and the solubility of oxygen in water.

Temperature of water / °C	**Solubility of oxygen in water / mg dm^{-3}**
0	14.6
5	12.8
10	11.3
15	10.2
20	9.2
25	8.6
30	7.5
35	6.9
40	6.4

(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

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(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15 °C .

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(c) Flatworms do not have a heart or a circulatory system.

Explain why many animals need a heart and a circulatory system.

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(Total for Question 4 = 11 marks)

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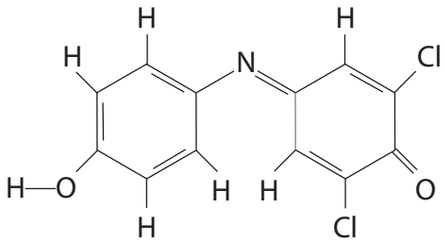
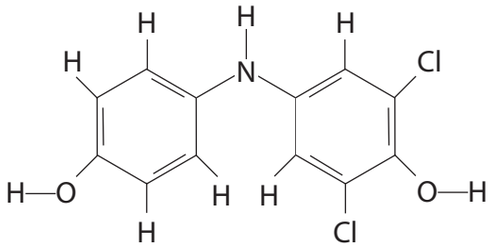
5 The concentration of vitamin C in a solution can be determined using the chemical DCPIP.
DCPIP is blue when it is in its oxidised form and colourless when it is in its reduced form.

(a) The diagrams below show the structure of DCPIP in its oxidised form and in its reduced form.



Oxidised DCPIP



Reduced DCPIP

(i) Using the diagram, describe **two** differences between the structure of oxidised DCPIP and reduced DCPIP.

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(ii) Suggest why these differences occur when DCPIP is used to determine the concentration of vitamin C.

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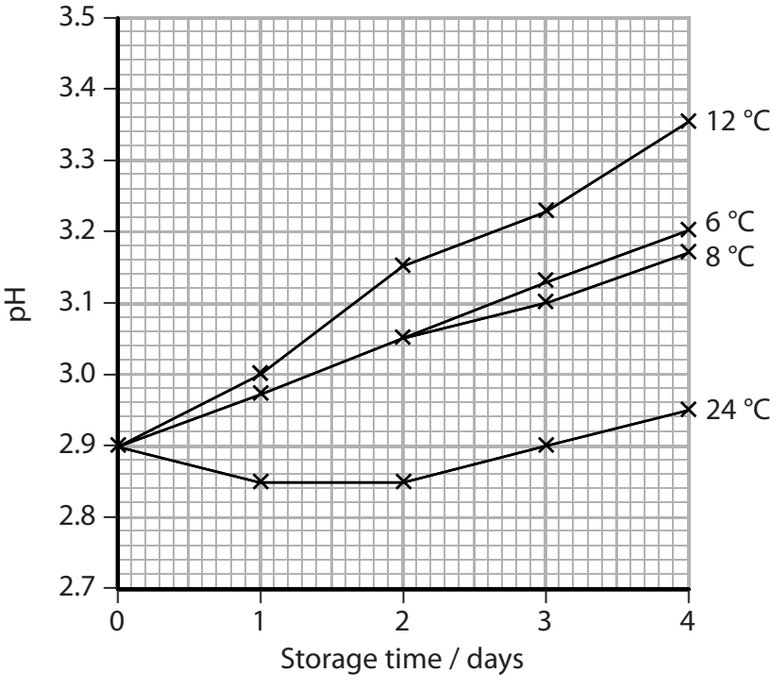
(b) Mangaba fruit is produced by a tropical plant native to Brazil.
As this fruit is a good source of protein and vitamins, it is important to study changes that take place in the fruit after picking.

The photograph below shows mangaba fruit.

Magnification × 0.2

A study was carried out to measure the changes in pH of mangaba fruit at different storage temperatures. Mangaba fruits were picked and stored at four different temperatures for four days. Each day the pH of the fruits was measured.

The graph below shows the results of this study.



P 3 9 8 8 4 A 0 1 2 2 4

(i) Using the information in the graph, describe the effects of storage temperature on the pH of mangaba fruits during this four-day storage period.

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*(ii) Describe an experiment that could be carried out to compare the changes in the vitamin C content of the mangaba fruit stored at 6 °C and 8 °C.

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(Total for Question 5 = 11 marks)

6 The structure and properties of the cell membrane control which molecules can move into or out of the cell.

(a) The phospholipid bilayer plays an important role in this control of movement of molecules.

Explain why the phospholipid molecules form a bilayer.

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(b) The table below describes four methods by which molecules or ions can move through the cell membrane.

Description of method	Method by which molecules or ions can move through the cell membrane			
	A	B	C	D
The direction of movement is from a higher concentration to a lower concentration of the molecule	✓	✗	✓	✓
ATP required	✗	✓	✗	✗
Membrane proteins involved	✓ or ✗	✓	✓	✗
A molecule or ion transported by this method	water	sodium ions	glucose	oxygen

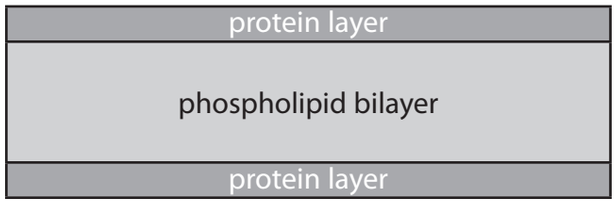
Identify the method of movement by placing a cross ☒ in the correct box in the table below.

(3)

Method of movement	A	B	C	D
Active transport	☐	☐	☐	☐
Facilitated diffusion	☐	☐	☐	☐
Osmosis	☐	☐	☐	☐

(c) The fluid mosaic model explains our current knowledge of the structure and properties of cell membranes. This model was developed from the Davson-Danielli model.

The diagram below shows the Davson-Danielli model of membrane structure.



(i) Use the information in the diagram to compare the Davson-Danielli model with the fluid mosaic model.

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(ii) Explain why the Davson-Danielli model does not support our current knowledge of how molecules can move through the cell membrane.

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(Total for Question 6 = 10 marks)

7 Cystic fibrosis is a genetic disease caused by mutations in the CFTR gene.
This disease can be classified according to the effect of the different gene mutations on the CFTR protein.

The table below shows the classification of cystic fibrosis.

Class	Effect on the CFTR protein
I	CFTR protein is not synthesised.
II	CFTR protein is mis-folded and is not found in the correct location.
III	CFTR protein is mis-folded and is found in the correct location, but does not function properly.
IV	CFTR protein has a faulty opening.
V	CFTR protein is synthesised in smaller quantities than normal.
VI	CFTR protein breaks down quickly after it is synthesised.

(a) For class I cystic fibrosis, suggest how a mutation in the CFTR gene could result in no CFTR protein being synthesised.

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(b) Class II cystic fibrosis results from the CFTR protein being located in the wrong place.

Describe the correct location for the CFTR protein.

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(c) The mutation causing class III cystic fibrosis results in a change in the primary structure of the CFTR protein.

Explain why this would result in the CFTR protein being mis-folded.

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(d) For class IV cystic fibrosis, explain why a faulty opening of the CFTR protein would affect the functioning of this protein.

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(e) For a person with class V cystic fibrosis, describe the effect of having smaller quantities of CFTR protein.

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(f) For class VI cystic fibrosis, suggest how the CFTR protein is broken down.

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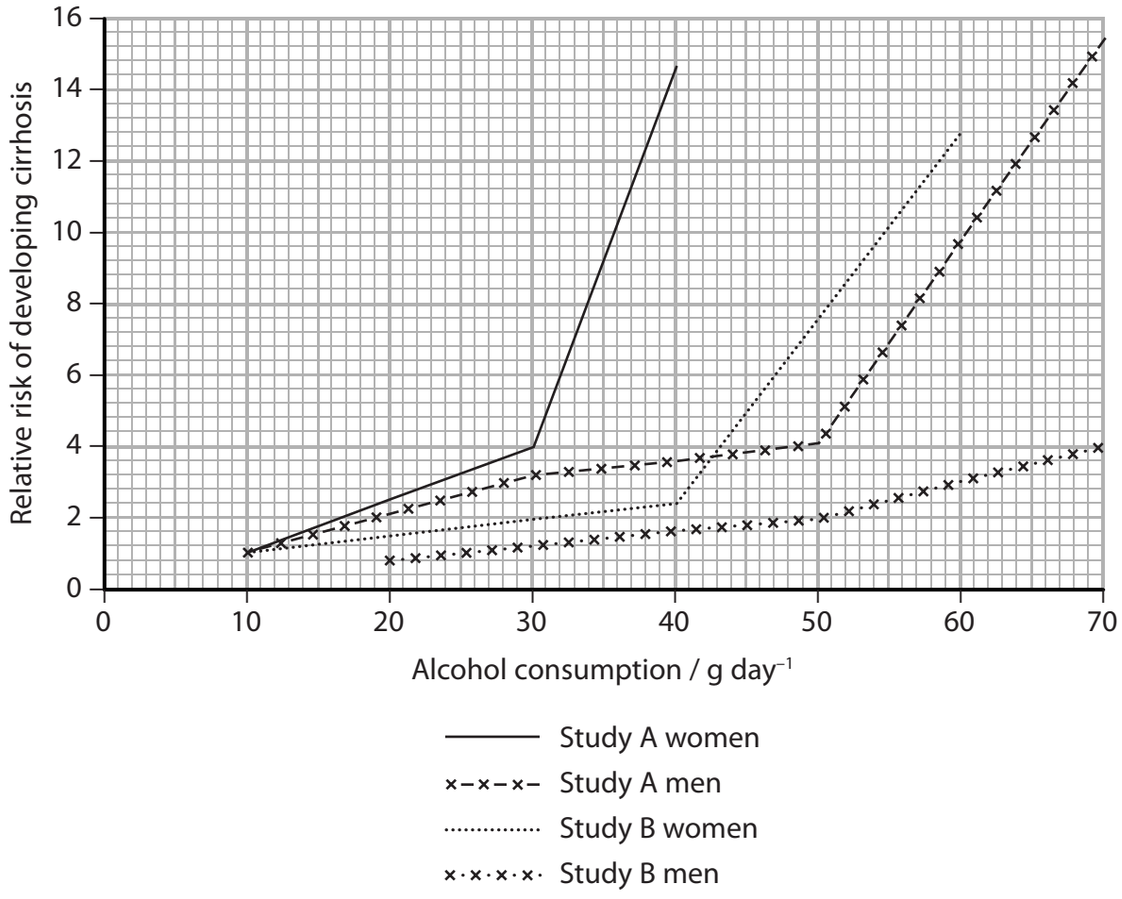
(Total for Question 7 = 12 marks)

8 Cirrhosis is a disease of the liver that is associated with alcohol abuse.

Two studies, study A and study B, were carried out to determine the relative risk of developing cirrhosis in relation to the mass of alcohol consumed each day by men and women.

The graph below shows the results of these two studies.



(a) The results of these studies indicate that there is a correlation between alcohol consumption and cirrhosis.

Explain how these results indicate that there is a **correlation** between alcohol consumption and cirrhosis.

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(b) (i) Using the information in the graph, compare the results for women in studies A and B.

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(ii) Suggest **two** reasons for the differences between the results for women in these two studies.

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(c) Describe the evidence shown in the graph that suggests that the risk of developing cirrhosis depends on gender.

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(d) Comment on the reliability of these results.

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(e) It is possible that the men and women in these studies underestimated their alcohol consumption.

Suggest **one** reason for this.

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(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS

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