Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary

Unit 1: Lifestyle, Transport, Genes and Health

Tuesday 11 January 2011 – 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 with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

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 Cardiovascular diseases are very common in the Western World.

(a) Many cardiovascular diseases result from atherosclerosis.

Place a cross ☒ in the box next to the correct word or words to complete each of the following statements.

(i) Atherosclerosis usually results from the formation of plaques inside

(1)

☒ **A** arteries

☒ **B** capillaries

☒ **C** veins

☒ **D** ventricles

(ii) The plaques begin to form after damage to

(1)

☒ **A** endothelial cells

☒ **B** epidermal cells

☒ **C** red blood cells

☒ **D** white blood cells

(iii) These cells may be damaged due to

(1)

☒ **A** blood flowing slowly under low pressure

☒ **B** blood flowing quickly under low pressure

☒ **C** blood flowing slowly under high pressure

☒ **D** blood flowing quickly under high pressure

(iv) The plaque consists of

(1)

☒ **A** carbohydrate deposits

☒ **B** fatty deposits

☒ **C** plasma deposits

☒ **D** protein deposits

(v) The presence of a plaque in the vessels supplying blood to the brain could result in

(1)

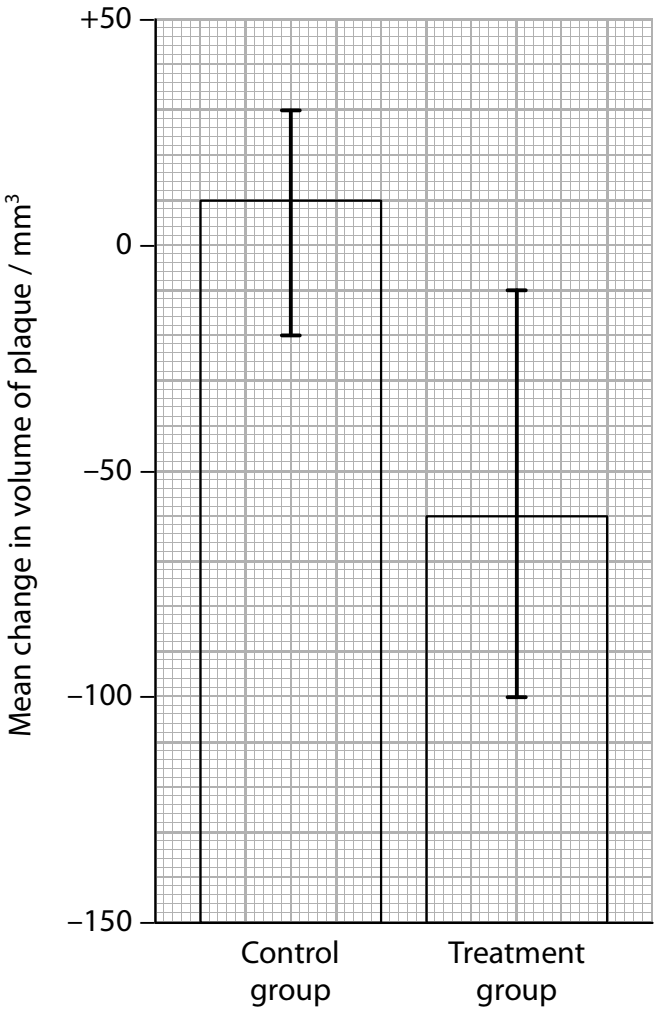
- ☒ **A** cancer
- ☒ **B** a heart attack
- ☒ **C** kidney damage
- ☒ **D** a stroke

(b) A clinical trial was carried out to investigate the effect of a drug on the volume of plaques in patients with atherosclerosis.

Forty patients with atherosclerosis were divided into two groups of twenty. Each patient had the volume of their plaque determined. One group was the control group and the treatment group took the drug daily for two months.

At the end of the two months, the volume of the plaque in each patient was determined again. The mean change in volume of the plaque was calculated.

The results of the clinical trial are shown in the graph below.



(i) Using the information in the graph, describe what the results of this trial show.

(2)

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(ii) Suggest **two** reasons why the results of this trial do **not** indicate that this drug could be useful in treating patients with atherosclerosis.

(2)

1 .....

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2 .....

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(Total for Question 1 = 9 marks)

2 Blood is carried around the body of many animals in different types of blood vessels. The structures of these blood vessels relate to their function.

(a) The table below refers to the structure of capillaries and veins. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box.

(3)

Type of blood vessel	Valves present along the length of the vessel	Wall consists of a single layer of cells	Endothelial cells present
Capillary			
Vein			

(b) Semilunar valves and elastic fibres are found in the aorta.
For each of these structures, describe its location in the aorta and explain its function.

Semilunar valves

(3)

Location .....

Function .....

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Elastic fibres

(3)

Location .....

Function .....

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.....

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(Total for Question 2 = 9 marks)

3 Read through the following passage on the structure of DNA, then write on the dotted lines the most appropriate word or words to complete the passage.

(8)

A DNA molecule consists of two strands of mononucleotides. Each of these strands is twisted around the other, forming a ..... .

Each mononucleotide consists of a pentose sugar called ..... , a base and a ..... . In each strand, the mononucleotides are held together by ..... bonds.

The two strands are held together by complementary base pairing. Adenine bonds with ..... and cytosine bonds with ..... .

The name of the bond that forms between these bases is a ..... bond. A DNA molecule that is composed of 34% adenine will be composed of ..... % cytosine.

(Total for Question 3 = 8 marks)

4 Many animals have a heart and circulatory system.

(a) Give **one** reason why many animals have a circulatory system.

(1)

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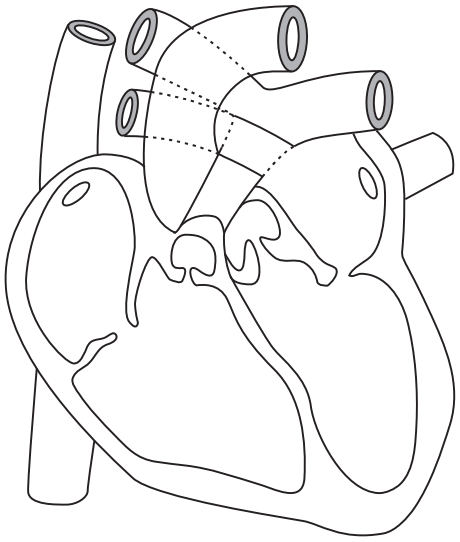
(b) The diagram below shows a section through a mammalian heart.

On the diagram, draw arrows to show the flow of blood into and through the right side of the heart during one beat of the heart.

Right side



Left side

(3)

(c) Explain why a mammalian heart is divided into a right side and a left side.

(2)

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(Total for Question 4 = 6 marks)

5 Thalassaemia is the name of a group of inherited blood disorders that affect the body's ability to produce haemoglobin in red blood cells. Red blood cells are produced in bone marrow.

Oxygen in the lungs binds to haemoglobin and is carried to the cells of the body to be used in respiration.

Beta thalassaemia is the result of a mutation in the gene coding for the β chain of haemoglobin. If a person inherits gene mutations from both parents, this person will show symptoms of anaemia and will require blood transfusions. Symptoms of anaemia include tiredness and breathlessness.

*(a) Using the information given above and your knowledge of gene mutation, suggest why a person with beta thalassaemia has symptoms of anaemia.

(4)

(b) If the phenotypes of the parents are known, the probabilities of having a child with beta thalassaemia, an unaffected child or a child who is a carrier, can be calculated.

Complete the table below to show the results of these calculations.

(4)

Parent 1	Parent 2	Probability of having a child with beta thalassaemia	Probability of having an unaffected child	Probability of having a child who is a carrier
Unaffected	carrier	no chance	50%	50%
Carrier	carrier			
Unaffected	has beta thalassaemia			
Carrier	has beta thalassaemia	50%	no chance	50%

(c) Gene therapy could potentially be used to treat beta thalassaemia.

Suggest how gene therapy could be carried out to treat this disorder.

(4)

(Total for Question 5 = 12 marks)

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6 The size and solubility of molecules has an effect on their ability to be taken up by cells.

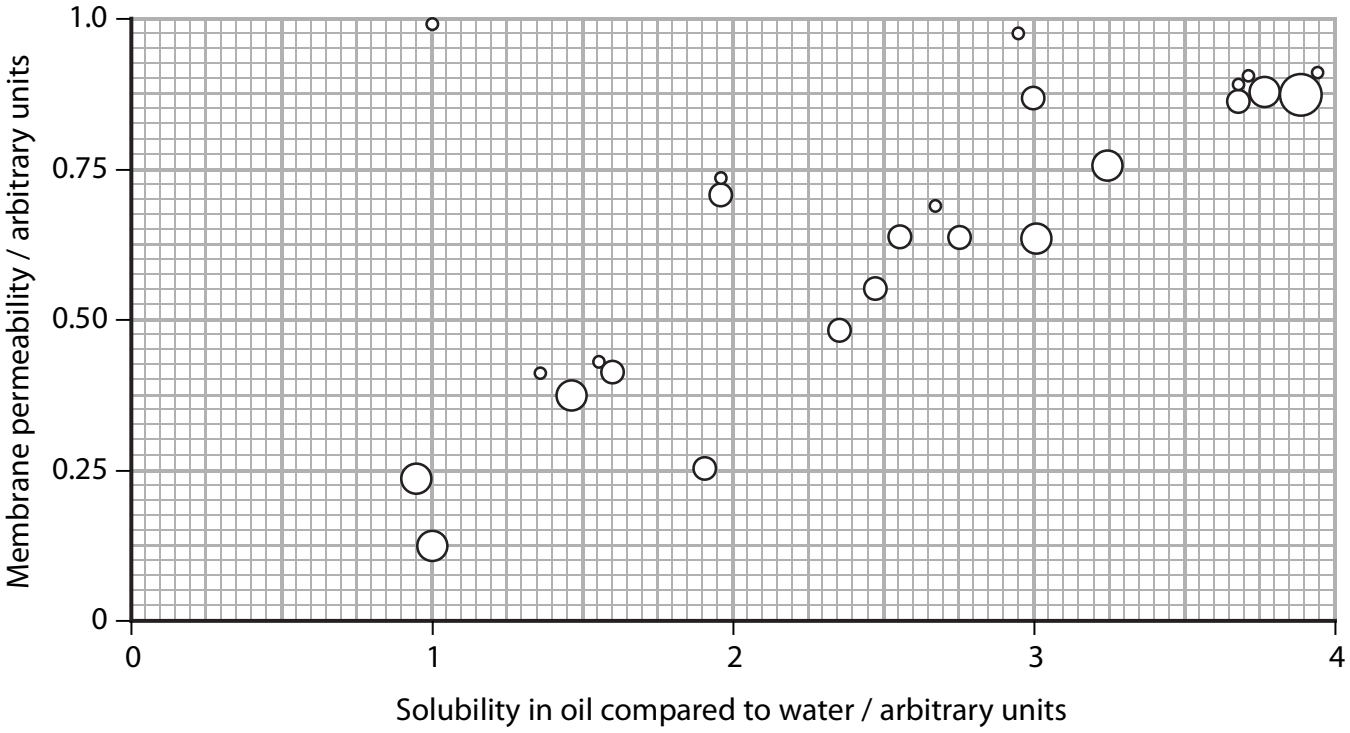
*(a) Describe an experiment you have carried out to investigate the permeability of cell membranes.

(5)

(b) An investigation was carried out into the permeability of a cell membrane to a number of different non-polar, organic molecules. The molecules differed in their size and in their solubility in oil compared with their solubility in water.
The higher the solubility, the more soluble the molecule is in oil compared with water.

The graph below shows the results of this investigation.

The size of the circle drawn on the graph indicates the size of the molecule; the larger the circle, the larger the molecule.



(i) Describe what relationship, if any, there is between the permeability of this cell membrane and the **size** of the molecules.

(1)

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(ii) Describe what relationship, if any, there is between the permeability of this cell membrane and the **solubility** of the molecules in oil compared with water.

(1)

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(iii) Water is able to diffuse through a cell membrane, even though it is a polar molecule.

On the graph, draw a circle, labelled W, to indicate the permeability of the cell membrane to water. The size of the circle should represent the size of the water molecule.

(2)

(iv) Use your knowledge of the structure and properties of cell membranes to explain the results of this investigation.

(3)

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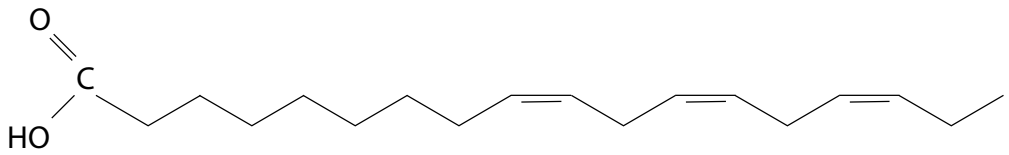
(Total for Question 6 = 12 marks)

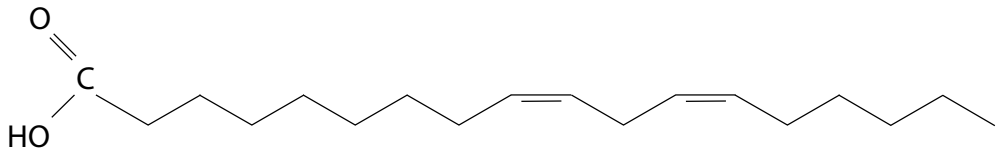
7 Some fatty acids are classed as essential fatty acids. These fatty acids need to be included in our diet, because the human metabolism cannot synthesise them. Omega 3 and omega 6 are two examples of essential fatty acids.

(a) The diagrams below represent the structures of the fatty acids omega 3 and omega 6.

Omega 3



Omega 6



(i) Using the diagram of omega 3 above, describe its structure.

(2)

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(ii) Give **one** difference between the structure of omega 3 and the structure of omega 6.

(1)

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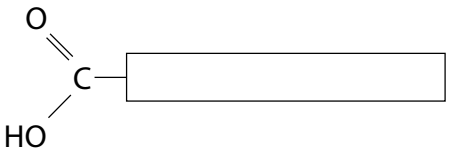
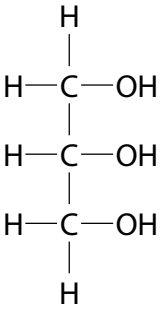
(iii) The diagram below shows a more simplified structure of omega 3.



A glycerol molecule is drawn below. Use these diagrams to show how **one** omega 3 molecule bonds to the glycerol molecule, by means of a condensation reaction, during the synthesis of a triglyceride.

(3)

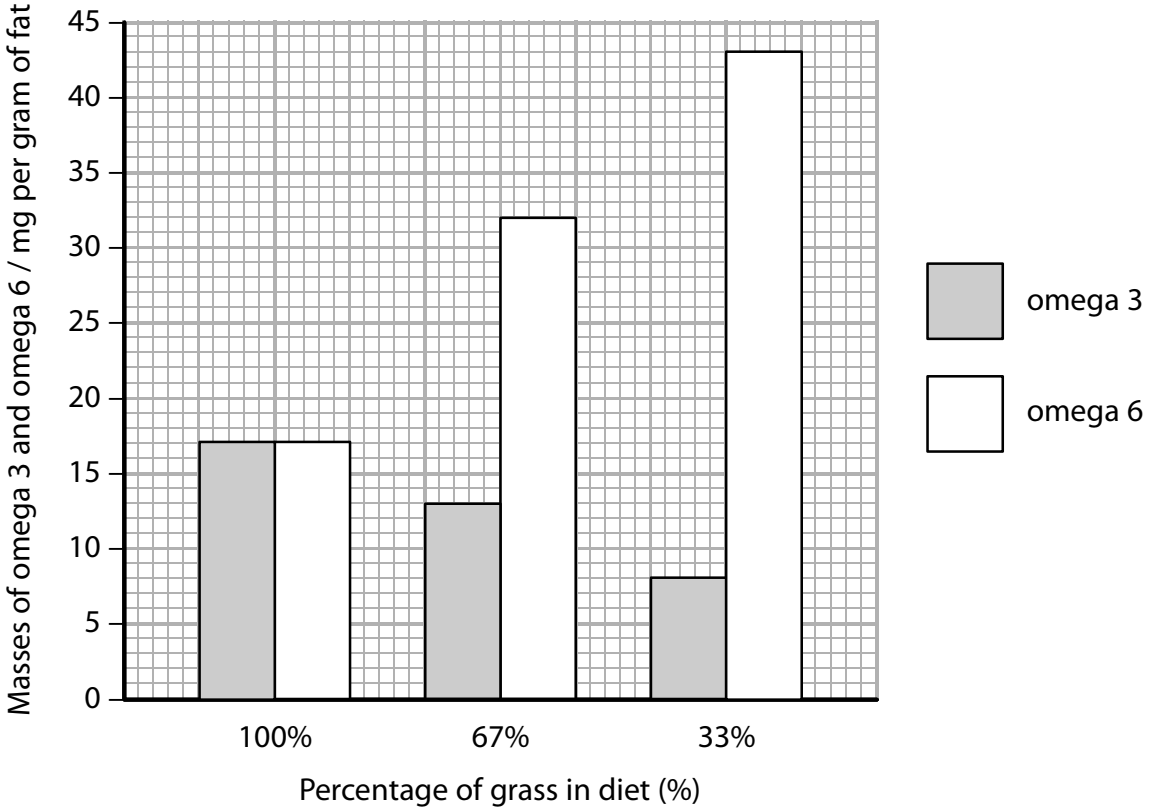


(b) Omega 3 and omega 6 are both present in animal fats.

The proportion of omega 3 and omega 6 in animal fat has been shown to depend on the diet of the animals.

In an investigation, the masses of omega 3 and omega 6, per gram of fat, were determined in the fat from cows fed on a diet containing 100%, 67% or 33% grass.

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



Describe what effect the percentage grass content of a cow's diet has on the proportion of omega 3 and omega 6 in its fat.

(3)

(c) A high ratio of omega 6 to omega 3 has been linked to an increased risk of cardiovascular disease (CVD).

(i) High blood pressure is another factor that increases the risk of CVD.

Give **two** other dietary factors that increase the risk of CVD.

(1)

1 .....

2 .....

(ii) Omega 3 has been shown to lower blood pressure. Antihypertensives can also be used to lower blood pressure.

State **one** risk of using antihypertensives.

(1)

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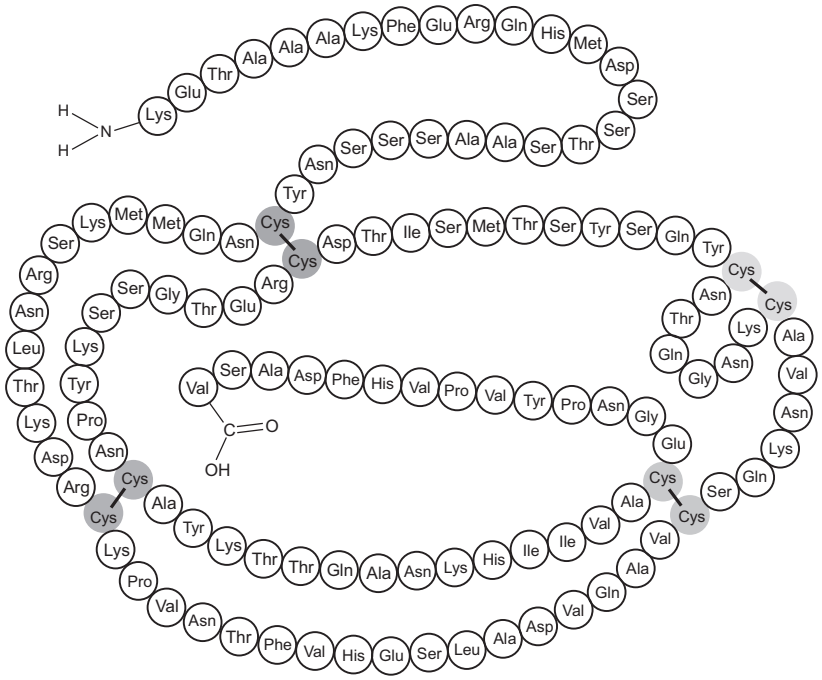
(Total for Question 7 = 11 marks)

8 Enzymes, messenger RNA (mRNA) and transfer RNA (tRNA) are involved in the synthesis of proteins.

(a) The diagram below represents the structure of an enzyme.
Each circle represents an amino acid.



(i) An enzyme is a protein and has a primary structure.
Explain the meaning of the term **primary structure**.

(2)

(ii) Using the diagram and your own knowledge of enzymes, explain the importance of the primary structure of an enzyme to its function.

(5)

(b) Describe the roles of messenger RNA (mRNA) and transfer RNA (tRNA) in protein synthesis.

(i) Messenger RNA

(3)

(ii) Transfer RNA

(3)

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS

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