Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number	Candidate Number

Biology

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

Thursday 25 May 2017 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
6BI01/01

You must have:
Calculator, HB pencil, 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 ▶

P53548A

1/1/1/1/

P 5 3 5 4 8 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 Cigarette smoke contains substances that increase the risk of the formation of blood clots and of developing cardiovascular disease (CVD).

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

(i) Blood clotting is needed to reduce

(1)

☒ **A** atherosclerosis

☒ **B** blood pressure

☒ **C** infection

☒ **D** obesity

(ii) Platelets are

(1)

☒ **A** antibodies

☒ **B** antioxidants

☒ **C** cell fragments

☒ **D** enzymes

(iii) Fibrin is

(1)

☒ **A** a soluble protein

☒ **B** an amino acid

☒ **C** an enzyme

☒ **D** an insoluble protein

(iv) Thrombin is

(1)

☒ **A** a cell fragment

☒ **B** a fibrous protein

☒ **C** an enzyme

☒ **D** an organelle

(b) Cigarette smoke contains nicotine. Nicotine is a vasoconstrictor that reduces the diameter of some blood vessels.

(i) Using this information, explain why smoking increases the risk of developing cardiovascular disease (CVD).

(3)

(ii) Name one type of drug that would be useful for treating a smoker at risk of developing CVD and explain how it works to prevent CVD.

(3)

Type of drug .....

How it works to prevent CVD .....

(Total for Question 1 = 10 marks)

2 Amylase is an enzyme that catalyses the breakdown of starch to maltose.

(a) (i) Name the type of chemical reaction catalysed by amylase.

(1)

.....

(ii) Name the bond in the starch molecule that is broken by amylase.

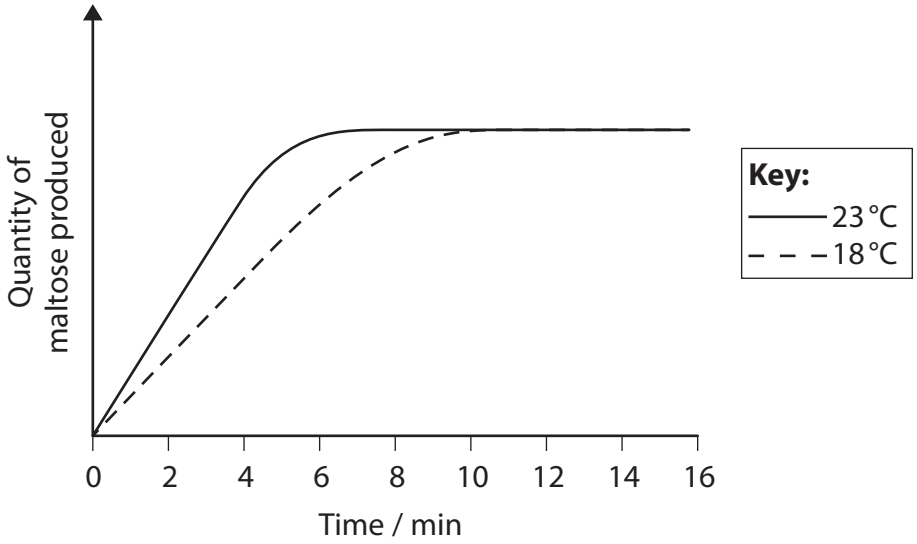
(1)

.....

(b) The effect of temperature on the breakdown of starch by amylase was investigated.

The quantity of maltose produced was measured during the course of two experiments: one carried out at 18 °C and the other at 23 °C.

The graph below shows the results of this investigation.



(i) State why the quantity of maltose produced became constant in this investigation.

(1)

.....

.....

.....

.....

(ii) Explain why, in the first four minutes of this investigation, more maltose was produced at 23 °C than at 18 °C.

(2)

(iii) On the graph, draw the curve you would expect to obtain if the experiment at 23 °C is repeated with an increased amylase concentration.

(2)

(iv) Describe how the effect of amylase concentration on the breakdown of starch at 23 °C could be investigated.

(4)

(Total for Question 2 = 11 marks)

3 Active transport and facilitated diffusion are two ways in which some molecules can move through cell membranes.

(a) State **one** difference and **one** similarity between active transport and facilitated diffusion.

(2)

Difference .....

.....

.....

Similarity .....

.....

.....

(b) Vitamin C and vitamin D are essential for human health.

Vitamin C is water-soluble. Vitamin D is lipid-soluble.

Explain how the structure of the cell surface membrane affects how each of these vitamins passes through the membrane.

(4)

Vitamin C

.....

.....

.....

.....

.....

.....

Vitamin D

.....

.....

.....

.....

.....

.....

(c) High concentrations of sodium chloride in blood plasma can damage red blood cells.

Explain the effects on red blood cells of high concentrations of sodium chloride in blood plasma.

(3)

(Total for Question 3 = 9 marks)

4 The mammalian lung is adapted for efficient gas exchange.

Describe how each of the following features assists in producing an efficient gaseous exchange system.

(a) The lungs are composed of many alveoli. Each alveolus has a wall 0.1 μm thick.

(2)

(b) The alveoli are ventilated.

(2)

(c) A dense network of capillaries covers the outside of each alveolus.

(3)

(Total for Question 4 = 7 marks)

BLANK PAGE

5 The molecules DNA and RNA are involved in protein synthesis.

(a) (i) Name the sugar in DNA.

(1)

.....

(ii) State how many carbon atoms are present in the sugar in DNA.

(1)

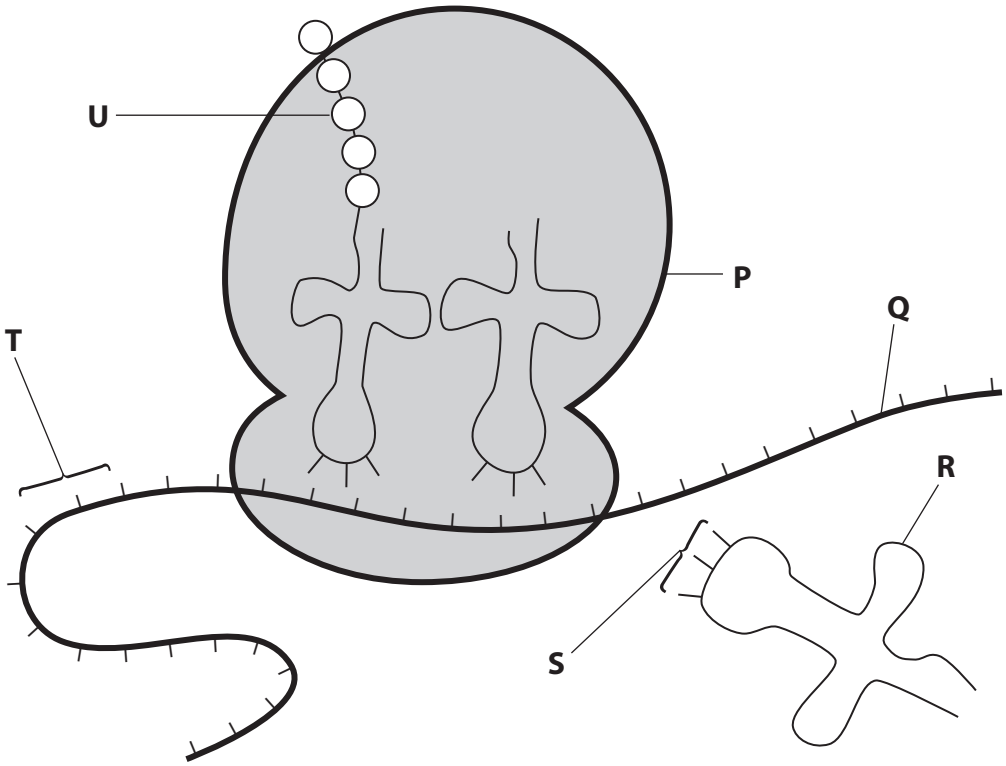
.....

(iii) Name the nitrogenous base that is present in DNA but not in RNA.

(1)

.....

(b) The diagram below shows part of the process of protein synthesis.



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

(i) mRNA is represented on the diagram by the

(1)

☒ **A** letter P

☒ **B** letter Q

☒ **C** letter R

☒ **D** letter S

(ii) The anticodon is represented on the diagram by the

(1)

☒ **A** letter Q

☒ **B** letter R

☒ **C** letter S

☒ **D** letter T

(iii) The bonds linking the structures labelled **U** are called

(1)

- ☒ **A** amino bonds
- ☒ **B** hydrogen bonds
- ☒ **C** peptide bonds
- ☒ **D** phosphodiester bonds

(iv) Name the stage of protein synthesis illustrated in this diagram.

(1)

*(c) Explain how the sequence of bases in DNA determines the primary structure of a protein.

(4)

(Total for Question 5 = 11 marks)

6 Haemoglobin contains four polypeptide chains, two α chains and two β chains. Haemoglobin has the amino acid glutamic acid at position 6 in each β chain.

The R group for glutamic acid is $—CH_2—CH_2—COOH$

(a) Draw a structural diagram of the amino acid glutamic acid.

(3)

(b) Sickle-cell haemoglobin is another form of haemoglobin that causes sickle-cell anaemia. Sickle-cell haemoglobin has the amino acid valine at position 6 in each β chain.

The R group for valine is $—CH—(CH_3)_2$

The diagram below shows the first seven amino acids in the β chains of haemoglobin and sickle-cell haemoglobin.

Haemoglobin β chain

Valine	Histidine	Leucine	Threonine	Proline	Glutamic acid	Glutamic acid

Sickle-cell haemoglobin β chain

Valine	Histidine	Leucine	Threonine	Proline	Valine	Glutamic acid

(i) Using the information given, suggest why sickle-cell anaemia could be caused by a mutation in a single DNA base.

(2)

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Explain why the change in the amino acid at position 6 in the β chains changes the properties of the haemoglobin molecule.

(3)

(c) Sickle-cell haemoglobin can cause red blood cells to become sickle-shaped.

This can cause blockages in capillaries that result in pain in muscle tissue.

(i) Suggest why capillaries, rather than arteries, are more likely to be blocked in a person with sickle-cell anaemia.

(1)

(ii) Suggest why a person with sickle-cell anaemia experiences pain in muscle tissues.

(3)

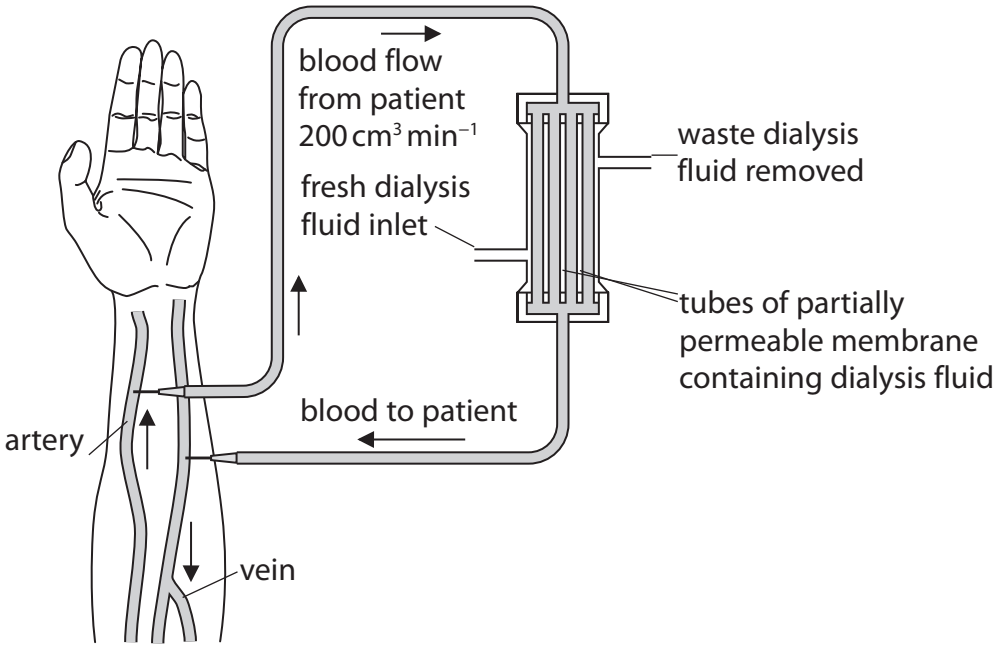
(Total for Question 6 = 12 marks)

7 Patients with kidney failure may be treated with a dialysis machine.

This removes excess water and solutes, such as urea, from their blood.

A dialysis machine includes a partially permeable membrane and dialysis fluid. This fluid consists of water with controlled concentrations of salts and glucose.

(a) The diagram below shows a dialysis machine in use.



(i) The rate of blood flow through the dialysis machine is 200 $cm^3\ min^{-1}$.

Calculate how long it would take this dialysis machine to process 5 dm^3 of blood.

Show your working.

(2)

.....minutes

(ii) Name the process that removes urea from the blood of the patient during dialysis.

(1)

(iii) Suggest why fresh dialysis fluid is added and waste dialysis fluid is removed during this procedure.

(2)

(b) Patients with kidney failure often have raised lipid levels in their blood.

Explain why raised lipid levels in the blood may increase the risk of developing cardiovascular disease (CVD) for these patients.

(4)

(Total for Question 7 = 9 marks)

8 The recommended daily amount of nutrients required by a person depends on a number of factors.

The table below shows some of the recommended daily mean energy requirements for different people.

Gender	Age range / years	Activity level	Mean energy requirement /MJ per day
Male	0 to 1	Moderately active	3.3
Male	3 to 4	Moderately active	6.5
Male	9 to 11	Moderately active	9.5
Male	15 to 17	Moderately active	12.0
Male	18 to 34	Moderately active	12.0
Male	18 to 34	Very active	14.0
Male	35 to 64	Moderately active	11.5
Male	35 to 64	Very active	14.0
Male	65 to 74	Moderately active	10.0
Male	75 and over	Moderately active	9.0

Gender	Age range / years	Activity level	Mean energy requirement /MJ per day
Female	0 to 1	Moderately active	3.0
Female	3 to 4	Moderately active	6.3
Female	9 to 11	Moderately active	8.5
Female	15 to 17	Moderately active	9.0
Female	18 to 54	Moderately active	9.0
Female	18 to 54	Very active	10.5
Female	55 to 74	Moderately active	8.0
Female	75 and over	Moderately active	7.0

(a) Calculate the percentage change in the mean energy requirements per day for moderately active females between the age ranges 15 to 17 years and 75 years and over.

Show your working.

(2)

.....%

*(b) Using information from the tables, describe and explain how energy requirements change with age.

(5)

(c) Using the information from the tables, suggest the consequences for moderately active children, aged 9 to 11, who have an energy intake of 10.0 MJ per day.

(4)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

BLANK PAGE

BLANK PAGE