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 21 May 2015 – 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 4 5 0 6 7 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 One function of DNA is to act as a template for the synthesis of messenger RNA.

(a) State what is meant by the term **template** for the synthesis of messenger RNA.

(1)

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(b) Place a cross ☒ in the box to complete each of the following statements.

(i) DNA and mRNA both

(1)

☒ **A** contain ribose

☒ **B** contain thymine

☒ **C** have a double helix structure

☒ **D** have a sugar-phosphate chain

(ii) One advantage of DNA having two complementary strands is that

(1)

☒ **A** diploid cells can inherit DNA from both parents

☒ **B** hydrolysis of DNA is faster

☒ **C** semi-conservative replication is possible

☒ **D** transcription and replication can occur at the same time

(iii) Analysis of a sample of DNA found that 40% of the nucleotides contained cytosine. In the same sample of DNA the percentage of nucleotides containing adenine would be

(1)

☒ **A** 10%

☒ **B** 20%

☒ **C** 40%

☒ **D** 60%

(c) The DNA base sequence for part of a gene is shown below.

A	C	T	T	T	C	G	C	C	C	G	A

Write the mRNA base sequence produced from this sequence of bases.

(2)

(d) Describe **three** differences between the processes of replication and transcription of DNA.

(3)

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3 .....

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(Total for Question 1 = 9 marks)

2 The photograph below shows a cleft iris, a rare condition in humans. Cleft iris may be due to the inheritance of recessive alleles.

Magnification ×1

(a) Explain the meaning of the term **recessive allele**.

(3)

(b) (i) In the space below, draw a genetic diagram to show the genotypes and phenotypes of a man with cleft iris and a woman who is heterozygous for this condition, and all their possible children.

(4)

(ii) State the probability that the first child of these parents will have a cleft iris.

(1)

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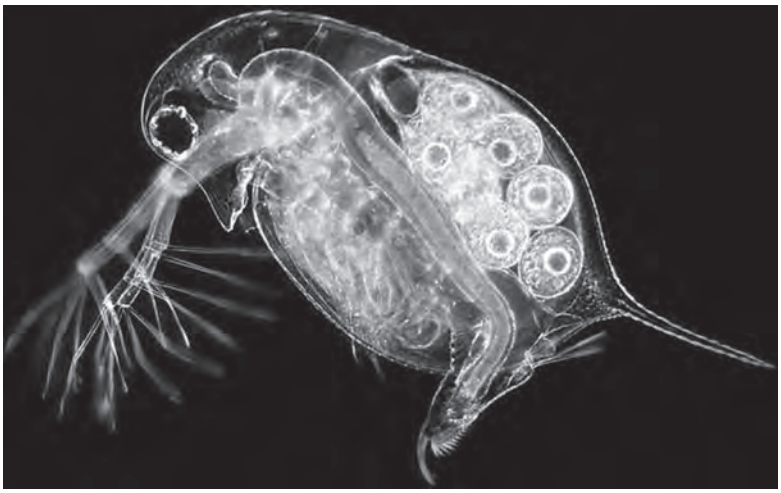
(Total for Question 2 = 8 marks)

3 The photograph below shows *Daphnia* (a water flea). *Daphnia* can be used to investigate the effect of chemicals on heart rate.



Magnification ×30

(a) (i) Give **two** reasons why *Daphnia* is a suitable organism for investigating the effect of chemicals on heart rate.

(2)

1 .....

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2 .....

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(ii) State **two** variables that you would need to control for a valid investigation into the effect of caffeine on the heart rate of *Daphnia*.

Describe how to control each of these variables.

(4)

1. Variable .....

How to control .....

.....

.....

.....

2. Variable .....

How to control .....

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.....

(b) Explain why many small animals, such as *Daphnia,* have a heart.

(3)

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(Total for Question 3 = 9 marks)

4 Cystic fibrosis is an inherited condition.

(a) Read through the following passage about cystic fibrosis then write on the dotted lines the most appropriate word or words to complete the sentences.

(4)

Cystic fibrosis is a disorder caused by one of a number of gene mutations.

The symptoms of the disorder are seen only in an individual who is

..... for the recessive allele. The gene codes for

a ..... protein called CFTR. This protein is responsible for the

movement of ..... ions across the cell membranes. Cystic fibrosis

impairs the functions of the gaseous exchange, digestive and .....

systems in the body.

(b) Explain why people with cystic fibrosis can have breathing difficulties.

(4)

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(c) Cystic fibrosis can be detected using prenatal genetic testing.

(i) Describe how **one** named method of **prenatal** genetic testing can be carried out.

(3)

(ii) Explain **either** one ethical issue **or** one social issue relating to the use of prenatal genetic testing.

(2)

(Total for Question 4 = 13 marks)

5 Over 20% of the population of the UK is classified as obese. Obesity is a significant risk factor in the development of cardiovascular disease (CVD).

(a) One way of estimating if a person is obese is to find their Body Mass Index (BMI). Body Mass Index is calculated using the formula below.

$$\text{BMI} = \frac{\text{Mass in kilograms}}{(\text{height in metres})^2}$$

The table below provides the range of BMI values for different categories of people.

Category	BMI range
Very severely underweight	less than 15.0
Severely underweight	from 15.0 to 15.9
Underweight	from 16.0 to 18.4
Normal (healthy weight)	from 18.5 to 24.9
Overweight	from 25.0 to 29.9
Obese Class I (moderately obese)	from 30.0 to 34.9
Obese Class II (severely obese)	from 35.0 to 39.9
Obese Class III (very severely obese)	over 40.0

(i) Calculate the BMI of a person who has a mass of 95 kg and a height of 1.75 metres.

(1)

Answer .....

(ii) Use your calculated value and the information in the table to find the category of this person.

(1)

Category .....

*(iii) People in this category are more likely to develop high blood pressure than people with a healthy weight.

Explain why someone who has a high blood pressure is at a significantly higher risk of developing CVD.

(4)

(b) Suggest **one** piece of medical advice that could be given to someone who does not have high blood pressure but who is obese.

Explain why this will help to reduce their risk of developing CVD.

(3)

Medical advice: .....

.....

Why this will reduce the risk of developing CVD: .....

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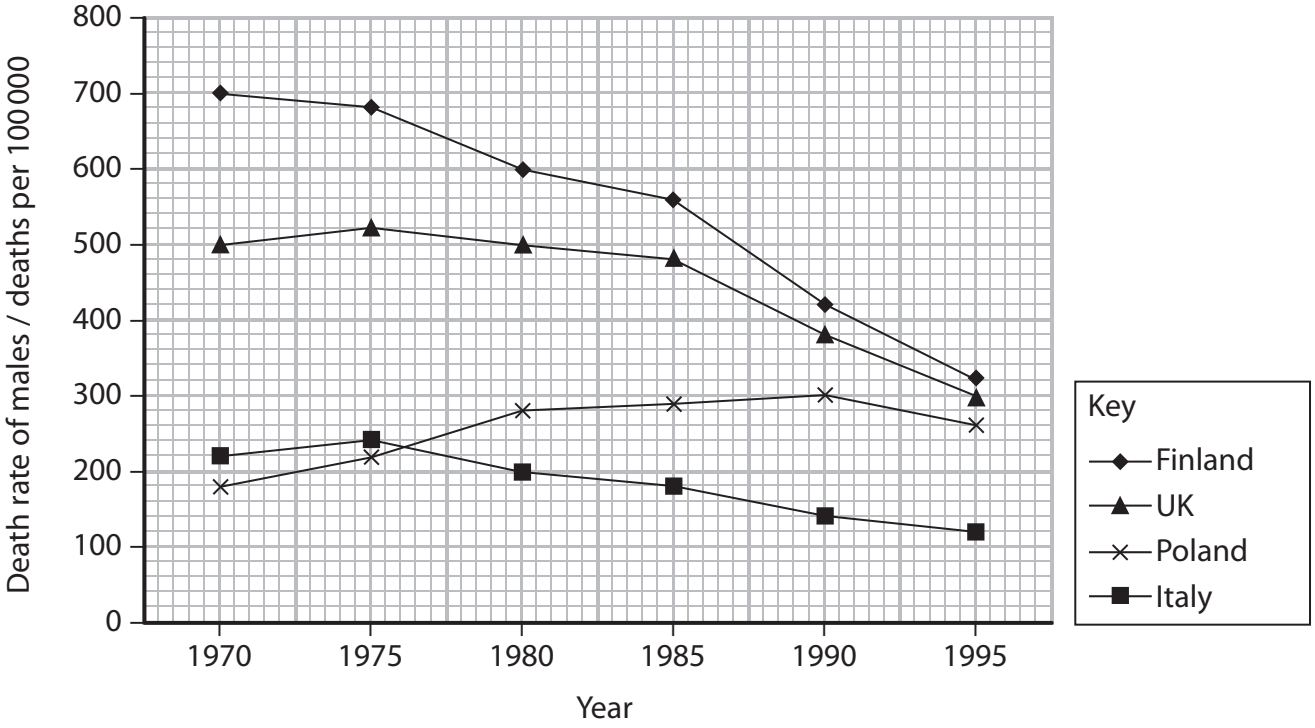
(c) The graph below shows the death rates from CVD for men from four different European countries.



Using the information in the graph, discuss the statement that death rates from CVD are falling.

(3)

(Total for Question 5 = 12 marks)

6 Lysozyme is an enzyme found in tears. Lysozyme can destroy some bacteria by breaking down the polysaccharide chains that form part of their cell walls.

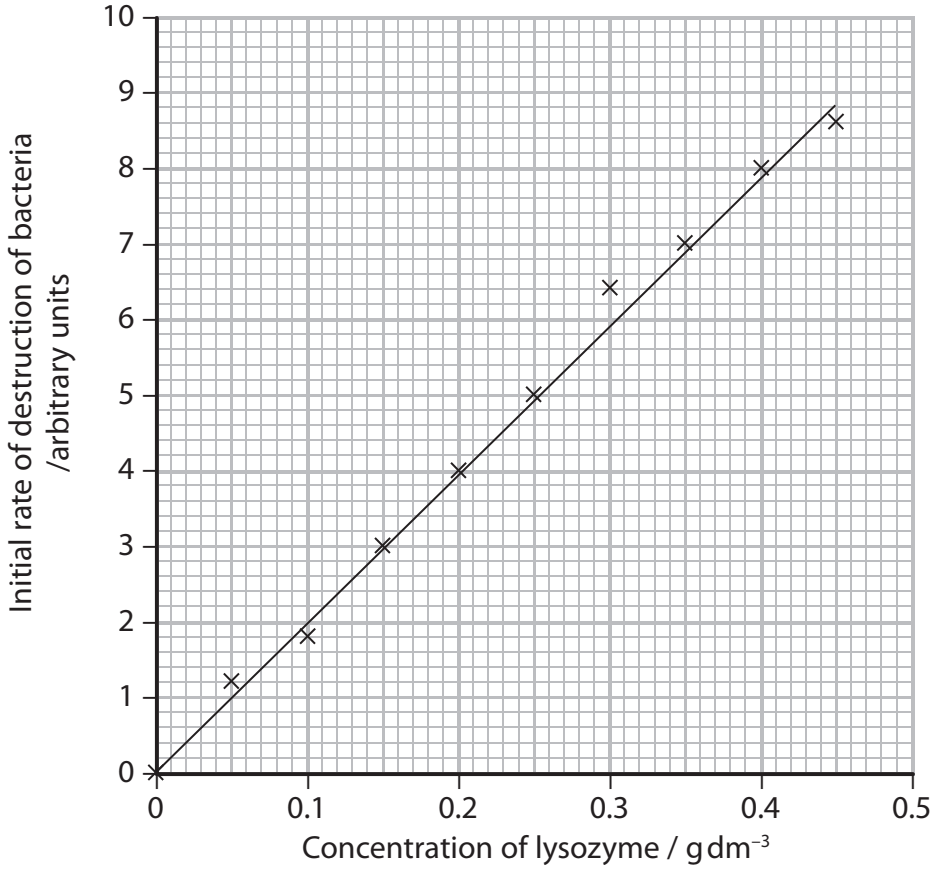
(a) The primary structure of lysozyme is a specific sequence of 129 amino acids.

Two of the amino acids that make up the active site are in positions 35 and 52 in the primary structure.

Suggest how these two amino acids could be brought closer together to form part of the active site of this enzyme.

(3)

(b) The graph below shows the effect of increasing the concentration of lysozyme on the initial rate of destruction of bacteria.



(i) Using the information in the graph, explain the effect of the concentration of lysozyme on the initial rate of destruction of bacteria.

(3)

(ii) Suggest why some of the data points in the graph do not fit on a straight line.

(1)

(c) Temperature affects the activity of lysozyme.

Suggest why increasing the temperature above 45 °C causes a decrease in the activity of lysozyme.

(2)

(Total for Question 6 = 9 marks)

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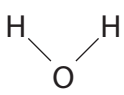
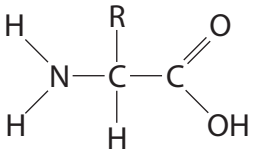
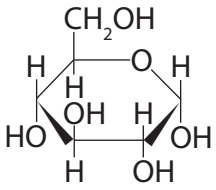
7 The diagram below shows four molecules, P, Q, R and S, found in living organisms.



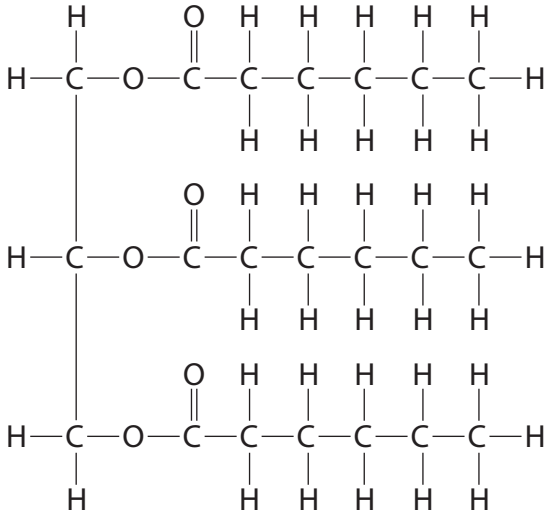
P



Q



R



S

(a) Place a cross ☒ in the box to complete each of the following statements.

(i) Two molecules of **P** can be joined together by

(1)

☒ **A** a hydrogen bond

☒ **B** a hydrophobic interaction

☒ **C** an ionic bond

☒ **D** a peptide bond

(ii) A condensation reaction between two molecules of **Q** forms

(1)

☒ **A** an ester bond

☒ **B** a glycosidic bond

☒ **C** a hydrogen bond

☒ **D** a peptide bond

(iii) Molecule **R** is

(1)

- ☒ **A** a fatty acid
- ☒ **B** an amino acid
- ☒ **C** deoxyribose
- ☒ **D** glucose

(iv) One of the products of the hydrolysis of molecule **S** is

(1)

- ☒ **A** a triglyceride
- ☒ **B** an amino acid
- ☒ **C** glycerol
- ☒ **D** water

(b) Name **one** element found in all molecules of **Q** that would not be found in carbohydrates.

(1)

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(c) Draw a diagram to show the molecules produced when **two** molecules of **R** join together during a condensation reaction.

(3)

(d) Explain how the dipolar nature of water is essential for living organisms.

(2)

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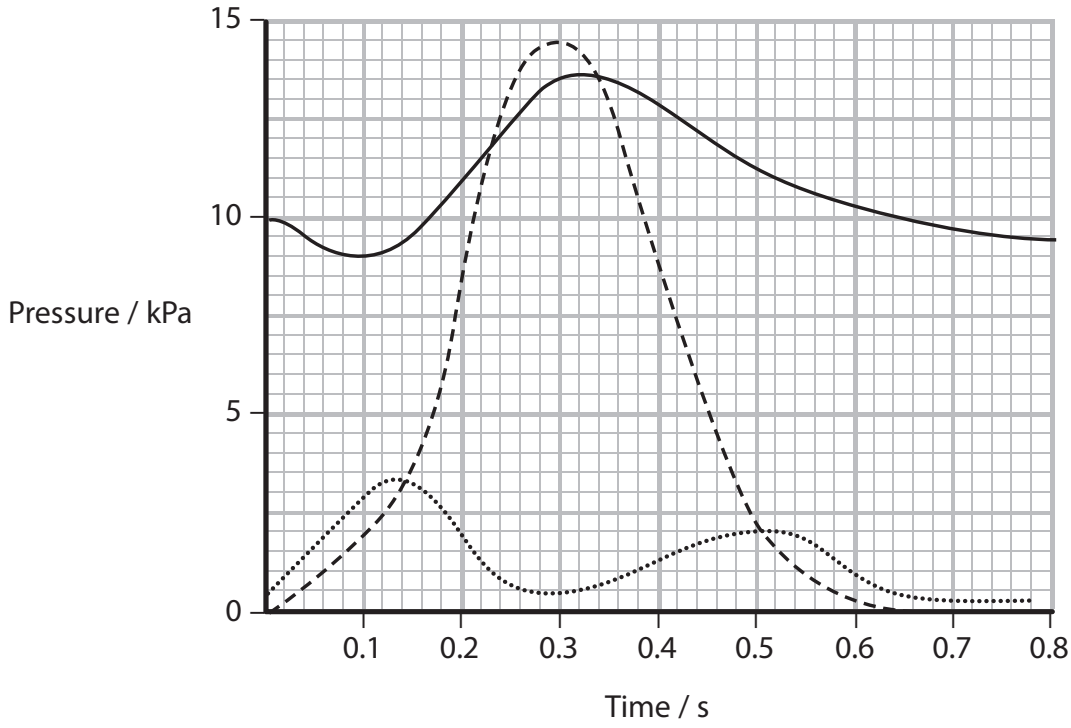
(Total for Question 7 = 10 marks)

8 During the cardiac cycle, muscles in the walls of the atria and ventricles contract and relax.

The graph below shows the changes in pressure that occur in the left side of the mammalian heart during one cardiac cycle.



(a) Use the graph to identify the following.

(i) The time at which the bicuspid (left atrioventricular) valve closes.

(1)

..... seconds

(ii) The pressure in the aorta when the semilunar (aortic) valve closes.

(1)

..... kPa

(b) Using the information in the graph, describe the pressure changes that take place in the left ventricle during each stage of this cardiac cycle.

(3)

*(c) During this cardiac cycle, the changes in pressure that occur in the left atrium and in the left ventricle are different.

Using the information in the graph and your own knowledge, explain these differences.

(5)

(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS

Acknowledgements

http://www.health.state.mn.us/divs/fh/mch/webcourse/vision/coloboma.cfm

http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artmar02/fleanatomy.html

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