Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 21 May 2019

Afternoon (Time: 1 hour 30 minutes) | Paper Reference **WBI01/01**

Biology

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

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 spelling, punctuation and grammar, as well as the clarity of expression may be assessed.
- 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 5 6 1 4 7 A 0 1 2 8

Pearson

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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 All living organisms rely on a variety of biological molecules.

Carbohydrates and lipids are biological molecules.

(a) (i) Below is a list of carbohydrates.

- glucose
- lactose
- maltose
- sucrose

Put a cross ☒ in the box next to the number of these carbohydrates that are disaccharides.

(1)

☒ **A** 1

☒ **B** 2

☒ **C** 3

☒ **D** 4

(ii) Starch is a carbohydrate that breaks down into glucose.

Put a cross ☒ in the box to complete the following statement.

The type of reaction that breaks down starch into glucose is

(1)

☒ **A** condensation

☒ **B** esterification

☒ **C** hydrolysis

☒ **D** synthesis

(b) Lipids can be saturated or unsaturated.

Put a cross ☒ in the box to complete each of the following statements.

(i) A saturated lipid with the same number of carbon atoms as an unsaturated lipid has

(1)

☒ **A** more hydrogen atoms

☒ **B** fewer hydrogen atoms

☒ **C** the same number of hydrogen atoms

☒ **D** no hydrogen atoms

(ii) Saturated lipids have

(1)

☒ **A** no double bonds

☒ **B** C═C and C═O

☒ **C** C═C only

☒ **D** C═O only

(c) Starch is a storage carbohydrate in plants.

Barley grains contain a high proportion of starch.

The photograph below shows barley plants.

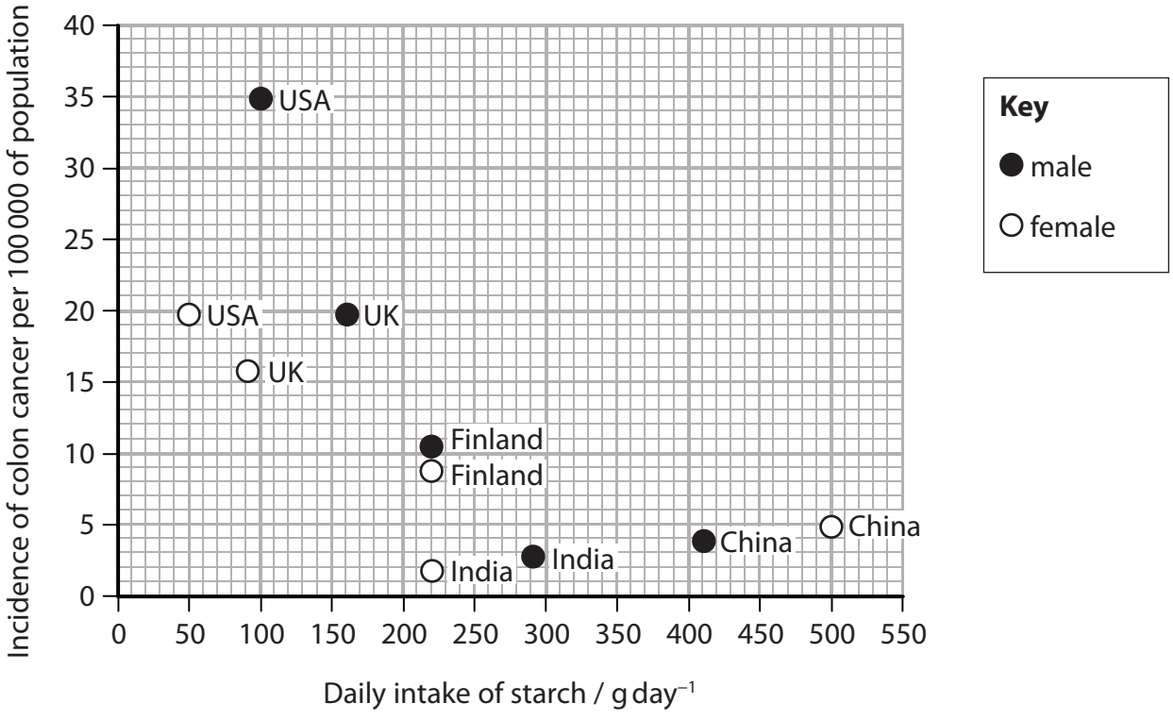
Magnification ×1

Explain how the structure of starch makes it suitable for the storage of energy.

(3)

(d) Scientists have studied the relationship between daily intake of starch and the incidence of colon cancer in humans in five countries.

The graph below shows the results of this study.



(i) State the relationship between the daily intake of starch and the incidence of colon cancer.

(1)

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(ii) Suggest **one** reason for the difference in the daily intake of starch between men and women.

(1)

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(iii) Using the information in the graph, discuss whether males have a higher risk than women of developing colon cancer.

(3)

(Total for Question 1 = 12 marks)

2 *Daphnia* are small invertebrates that live in ponds and lakes.

The photograph below shows a *Daphnia*.

Magnification ×25

A student investigated the effect of temperature on the heart rate of *Daphnia*.

The table below shows the results of this investigation.

Temperature / °C	Heart rate / beats min^{-1}
10	78
15	82
20	96
25	150
30	178

(a) Using the information in the table, explain the effect of temperature on the heart rate of *Daphnia*.

(4)

(b) Suggest **two** ways in which this investigation should be carried out to ensure that the results are valid.

(2)

1

2

(c) State **two** reasons why *Daphnia* are suitable organisms to use in this investigation.

(2)

1 .....

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2 .....

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(Total for Question 2 = 8 marks)

3 Collagen is a fibrous protein found in bones.

Brittle bone disease is a rare condition caused by a dominant allele. This allele is the result of a mutation in a gene coding for the production of collagen.

The photograph below shows an X-ray of an adult with brittle bone disease.

Magnification ×0.2

(a) Name the bond that joins amino acids together to form collagen.

(1)

(b) In the space below, draw a genetic pedigree diagram to show two parents, heterozygous for brittle bone disease, and all their possible offspring.

Use the symbols shown in the key.

(2)

Key

- ● affected female
- ■ affected male
- ○ unaffected female
- □ unaffected male

(c) Brittle bone disease can be caused by a mutation in the COL1A1 gene.

(i) Explain how prenatal testing can be used to identify this condition.

(4)

(ii) Suggest **two** reasons why prenatal testing for brittle bone disease is not offered to all pregnant women.

(2)

1 .....

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2 .....

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(Total for Question 3 = 9 marks)

4 The polynucleotides DNA and RNA are found in living organisms.

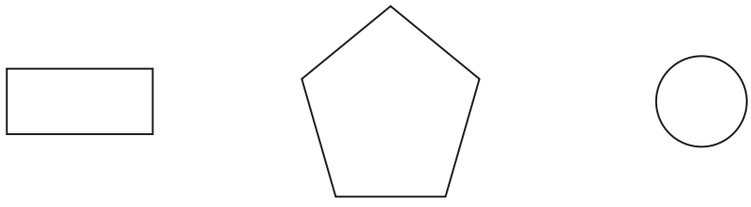
Both are composed of chains of mononucleotides.

(a) A mononucleotide consists of three components joined together by covalent bonds.

Use the following symbols to draw a diagram of a mononucleotide.

(2)

base pentose sugar phosphate group



(b) The photograph below shows a sea urchin, a marine invertebrate that lives on the seabed.

Magnification ×1

A scientist analysed a section of DNA from a sea urchin. The section was 249 base pairs long and 17.5% of the bases were cytosine.

Put a cross ☒ in the box to complete each of the following statements.

(i) The maximum number of amino acids this section of DNA could code for is

(1)

☒ **A** 82

☒ **B** 83

☒ **C** 164

☒ **D** 166

(ii) The percentage of thymine bases present in this section of DNA is

(1)

☒ **A** 17.5%

☒ **B** 32.5%

☒ **C** 35.0%

☒ **D** 65.0%

(c) The sequence of some of the bases in a section of DNA from a sea urchin is shown below.

A	C	C	G	A	C	T	T

Describe the roles of RNA molecules in the synthesis of a protein using this section of DNA as a template.

(5)

(Total for Question 4 = 9 marks)

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5 Several risk factors may contribute to the development of cardiovascular disease (CVD).

The table below shows the percentage contribution of different risk factors to the development of CVD.

Risk factor	Percentage contribution to CVD (%)
inactivity	11
smoking	19
obesity	13
high blood cholesterol	26

(a) Give **one** reason why the percentage total in the table is less than 100%.

(1)

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(b) Obesity can be estimated using the body mass index (BMI) of a person.

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

The table below can be used to identify the category to which a person belongs.

Category	BMI range
underweight	below 18.5
healthy	18.5 to 24.9
overweight	25 to 29.9
obese	30 or above

Calculate the minimum mass for an overweight person who is 1.92 metres tall.

Show your working.

(2)

..... kg

(c) Cholesterol is transported in the blood as lipoproteins.

High levels of low density lipoproteins (LDLs) are known to increase the risk of CVD.

Over half of all adults in the UK have raised blood cholesterol levels ($\geqslant$ 5 mmol dm^{-3}).

(i) Name the type of drug used to reduce blood cholesterol levels. State **one** risk associated with its use.

(2)

Type of drug .....

Risk .....

.....

.....

*(ii) Explain how high levels of LDLs and obesity contribute to the development of CVD.

(5)

(Total for Question 5 = 10 marks)

6 Cell membranes control which molecules can leave or enter a cell.

(a) Active transport, diffusion and facilitated diffusion are methods of transporting molecules across cell membranes.

(i) Put a cross ☒ in the box next to the number of these methods that use protein pumps **and** ATP.

(1)

☒ **A** 0

☒ **B** 1

☒ **C** 2

☒ **D** 3

(ii) Put a cross ☒ in the box next to the number of these methods that use passive transport **and** move molecules against a concentration gradient.

(1)

☒ **A** 0

☒ **B** 1

☒ **C** 2

☒ **D** 3

(b) Endocytosis and exocytosis transport molecules through the cell membrane.

Compare endocytosis with exocytosis.

(2)

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(c) Beetroot cells contain a red pigment.

A student investigated the effect of temperature on the loss of pigment from beetroot cells.

Six cubes of beetroot were cut. One cube of beetroot was placed into a test tube containing 20 cm^3 of water and left for 30 minutes at 5 °C.

The cube was then removed and the colour of the solution recorded using a scale of 0 to 5, where 0 indicates no colour and 5 indicates the darkest colour.

This procedure was repeated at five more temperatures.

The table below shows the results of the investigation.

Temperature / °C	Colour of solution / a.u.
5	1
20	2
35	3
50	4
65	5
80	5

(i) Using the information in the table, describe the effect that temperature has on the loss of pigment from beetroot cells.

(2)

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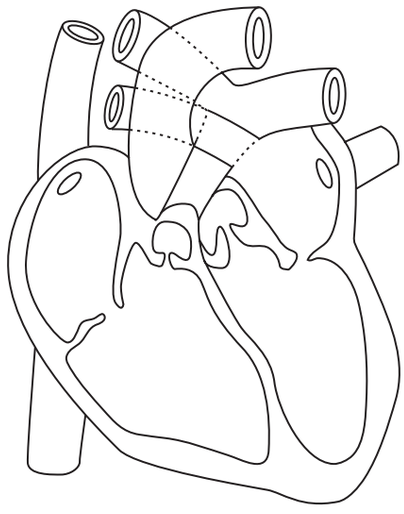
(ii) Suggest an explanation for these results.

(4)

(Total for Question 6 = 10 marks)

7 The diagram below shows a section through a mammalian heart.



(a) (i) Name the vessel that carries blood from the lungs to the heart.

(1)

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(ii) On the diagram, draw arrows to show blood entering the right ventricle of the heart and flowing towards the lungs.

(2)

(iii) Some babies are born with a heart condition known as a hole in the heart.

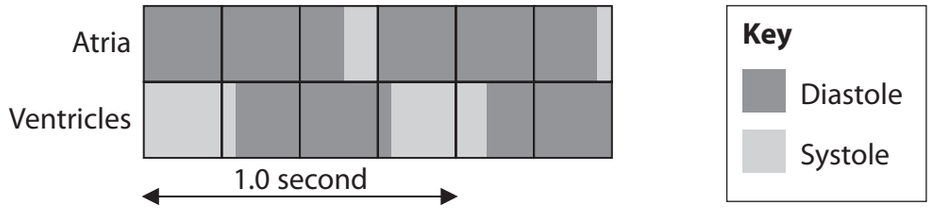
In one form of this condition, there is a hole in the septum separating the right atrium from the left atrium.

Explain why this condition affects the concentration of oxygen in the blood.

(4)

(b) The cardiac cycle is the sequence of events each time the heart beats.

The diagram below shows information about the cardiac cycle.



(i) Using the information in the diagram, calculate the time the atria are in systole during the cardiac cycle.

Show your working.

(2)

Answer .....

(ii) Describe the events that occur in the heart following ventricular systole.

(3)

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(Total for Question 7 = 12 marks)

8 Enzymes are globular proteins.

Prothrombin is converted to the active enzyme thrombin in the blood clotting process.

A gene mutation leads to a change in the structure of prothrombin.

(a) Explain what is meant by the term **gene mutation**.

(2)

(b) A change in one amino acid in prothrombin may or may not affect the blood clotting process.

*(i) Explain how a change in one amino acid in prothrombin could affect the blood clotting process.

(6)

(ii) Suggest **two** reasons why a change in one amino acid in prothrombin may have no effect on the blood clotting process.

(2)

1 .....

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2 .....

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(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS