

Write your name here

Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Biology

Advanced Subsidiary

Unit 1: Lifestyle, Transport, Genes and Health

Thursday 25 May 2017 – Afternoon

Time: 1 hour 30 minutes

Paper Reference

WBI01/01

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 ►

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Pearson

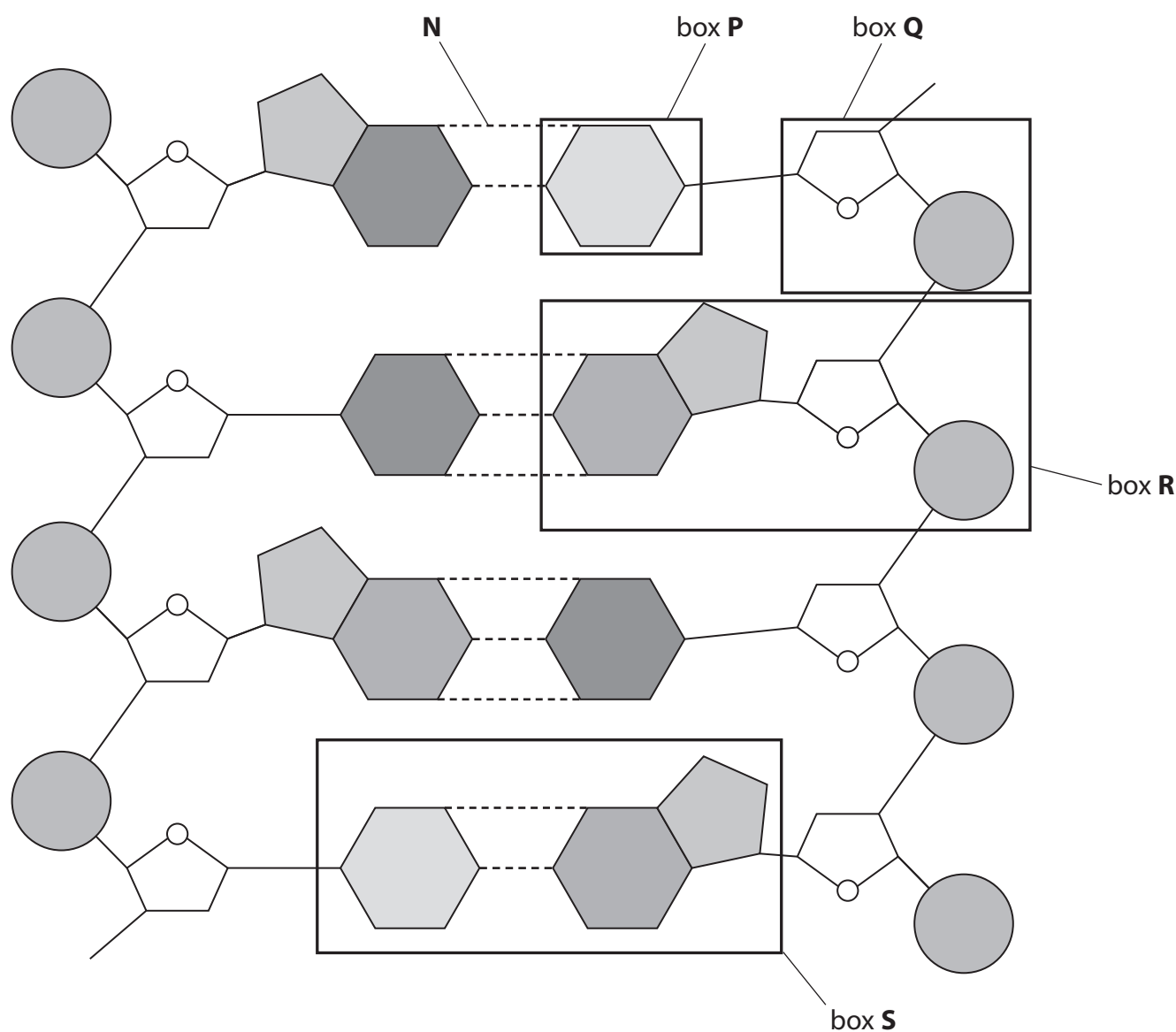
Answer ALL questions.

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 Genetic information is encoded in DNA.

(a) The diagram below shows part of a DNA double helix.

Some parts are shown in the boxes labelled **P**, **Q**, **R** and **S**. One of the bonds is labelled **N**.



For each of the statements below, put a cross in the box ☒ next to the correct answer.

(i) One of the bases in box **S** is adenine, the other base in box **S** is (1)

☐ **A** cytosine

☐ **B** guanine

☐ **C** thymine

☐ **D** uracil

(ii) The bond labelled **N** is a (1)

☐ **A** covalent bond

☐ **B** glycosidic bond

☐ **C** hydrogen bond

☐ **D** phosphodiester bond

(iii) The box that contains a mononucleotide is (1)

☐ **A** box **P**

☐ **B** box **Q**

☐ **C** box **R**

☐ **D** box **S**

(b) Name the sugar present in a DNA mononucleotide. (1)



(c) The accepted theory of DNA replication is semiconservative replication.

(i) Explain the meaning of the term **semiconservative replication**.

(2)

(ii) Name the scientists whose classic experiments provided evidence to support semiconservative replication of DNA.

(1)

(Total for Question 1 = 7 marks)



(3)



- (c) Prenatal testing can be used to determine whether or not a fetus has hereditary haemochromatosis.

Name **one** method of prenatal testing and describe how it can be used to detect hereditary haemochromatosis.

(4)

Method

Description of how the method is used

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(Total for Question 2 = 9 marks)



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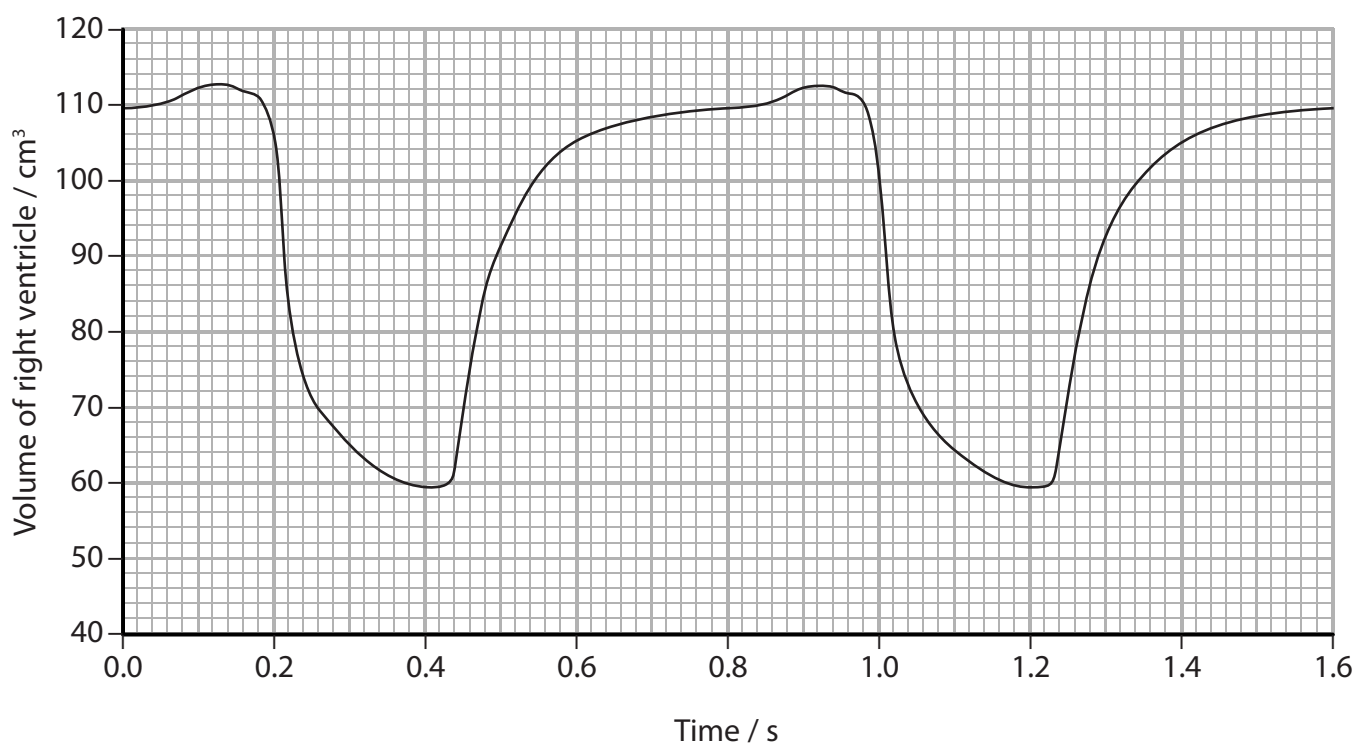
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P 4 8 4 1 7 A 0 7 2 8

3 Mammals require a heart to pump blood.

(a) The graph below shows the volume of the right ventricle during the cardiac cycle of a person.



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

(i) The correct sequence of events in the cardiac cycle is

(1)

- ☒ **A** atrial diastole → ventricular systole → atrial systole → ventricular diastole
- ☒ **B** atrial systole → ventricular systole → atrial diastole → ventricular diastole
- ☒ **C** ventricular diastole → atrial diastole → atrial systole → ventricular systole
- ☒ **D** ventricular systole → atrial systole → atrial diastole → ventricular diastole

(ii) At 0.5 seconds in this cardiac cycle, the

(1)

- ☒ **A** atrioventricular valves and semilunar valves are both closed
- ☒ **B** atrioventricular valves and semilunar valves are both open
- ☒ **C** atrioventricular valves are closed and the semilunar valves open
- ☒ **D** atrioventricular valves are open and the semilunar valves closed



(iii) The right atrium is in systole at

(1)

- ☐ **A** 0.22 seconds
- ☐ **B** 0.52 seconds
- ☐ **C** 0.72 seconds
- ☐ **D** 0.92 seconds

(iv) Use the graph to calculate the heart rate for this person.

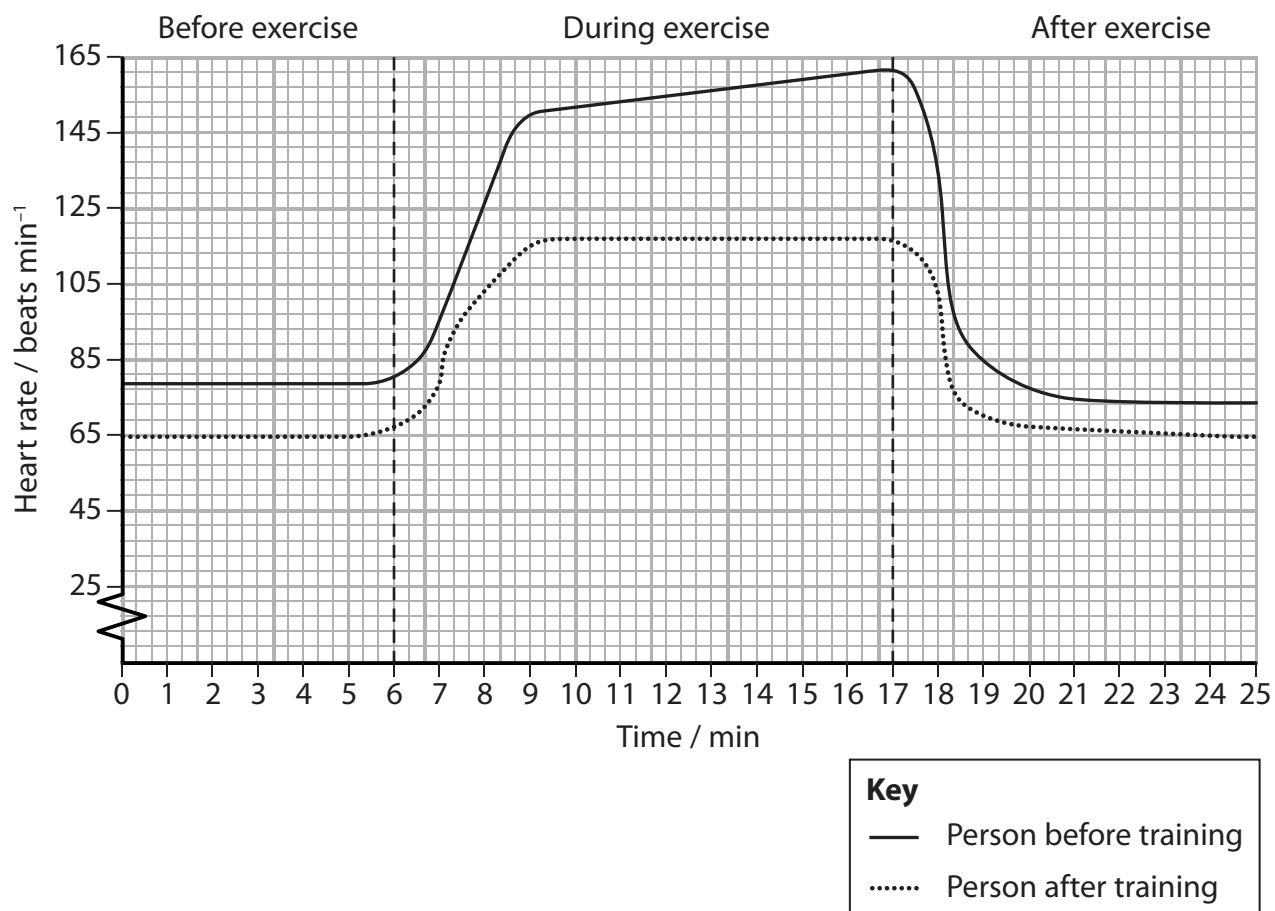
(2)

..... beats min⁻¹



P 4 8 4 1 7 A 0 9 2 8

- (b) The graph below shows the effect of training on the heart rate of a person before, during and after a period of exercise.



- (i) Use the information in the graph to describe the effect of training on the heart rate of this person.

(3)



- (ii) Explain why the risk of developing coronary heart disease may be reduced for this person as a result of the training.

(2)

(Total for Question 3 = 10 marks)



4 The addition of sugars to food is one risk factor for cardiovascular disease (CVD).

(a) Two sources of sugar used in foods are sucrose and high-fructose corn syrup.

(i) Describe how sucrose is formed from monosaccharides.

(3)

(ii) High-fructose corn syrup is manufactured from starch.

Describe the structure of starch.

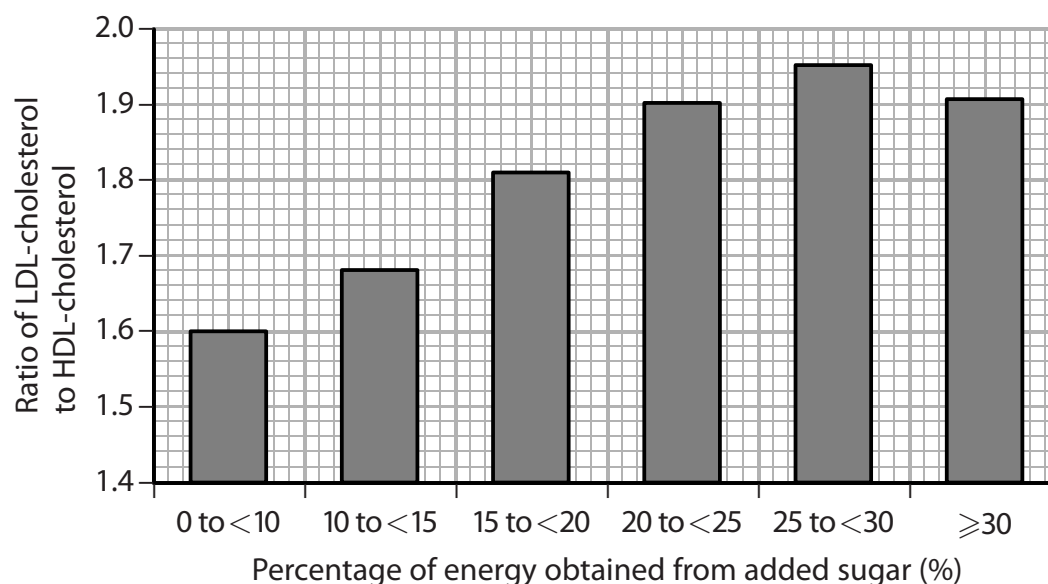
(3)



- (b) There may be a relationship between added sugar in the diet and the ratio of LDL-cholesterol to HDL-cholesterol in the blood.

A study of young people was carried out to investigate this relationship.

The graph below shows the results of this study.



- (i) The scientist who carried out this study concluded that:

'The addition of large quantities of sugar in the diet increases the risk of CVD.'

Use the information in the graph and your own knowledge to explain why the scientist came to this conclusion.

(3)

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- (ii) Suggest **two** reasons why the young people included in this study might underestimate the risks of added sugar in their diet.

(2)

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- (iii) Suggest why young people taking statins were not included in this study.

(2)

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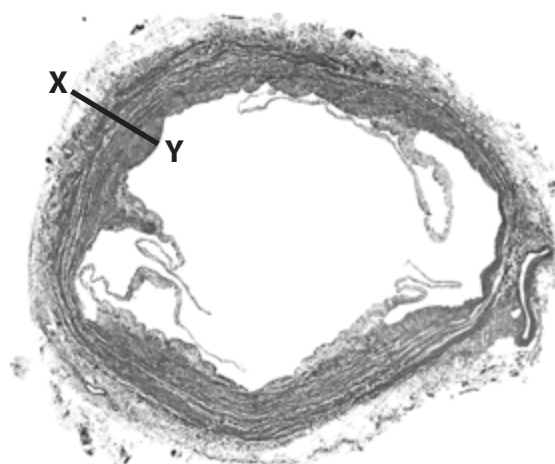
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(Total for Question 4 = 13 marks)



- 5 Blood clots can form in large veins. Venous thromboembolism (VTE) is a condition where blood clots move to other parts of the body.

(a) The photograph below shows a cross section of a large vein.



©gettyimages.co.uk

Magnification $\times 12$

- (i) Measure the width of the wall **X-Y** in the photograph.

Use this measurement to calculate the actual width, in mm, of the wall of this vein.
Show your working.

(2)

..... mm

- (ii) Explain why the structure of a vein differs from the structure of an artery.

(2)

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- (b) Clinical measurements can be used to help diagnose VTE. These measurements include oxygen concentration in the blood, breathing rate and the presence of fibrin fragments in the blood.

The table below shows how these clinical measurements can be used to help diagnose VTE.

Oxygen concentration in the blood / a.u.	Breathing rate / breaths min ⁻¹	Fibrin fragments in the blood	Group
10.7 or higher	20 or lower	present in a few patients	without VTE
lower than 10.7	higher than 20	present in all patients	with VTE

- (i) Describe how a blood clot forms in large veins.

(4)



(ii) Suggest why the oxygen concentration in the blood is low in a patient with VTE.

(3)

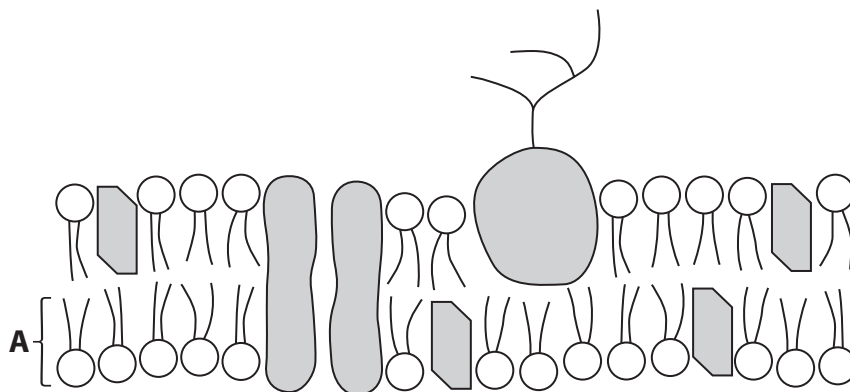
(iii) Explain why all three clinical measurements are needed in order to diagnose VTE.

(2)

(Total for Question 5 = 13 marks)



- 6 The fluid mosaic model describes the structure and properties of cell membranes.
- (a) The diagram below shows the structure of a cell membrane based on this model.



- (i) Name the molecule labelled **A**.

(1)

- (ii) Explain how the properties of molecule **A** contribute to the fluid mosaic model of cell membranes.

(3)



- (b) An experiment was carried out to investigate the effect of pH on the permeability of beetroot membranes.

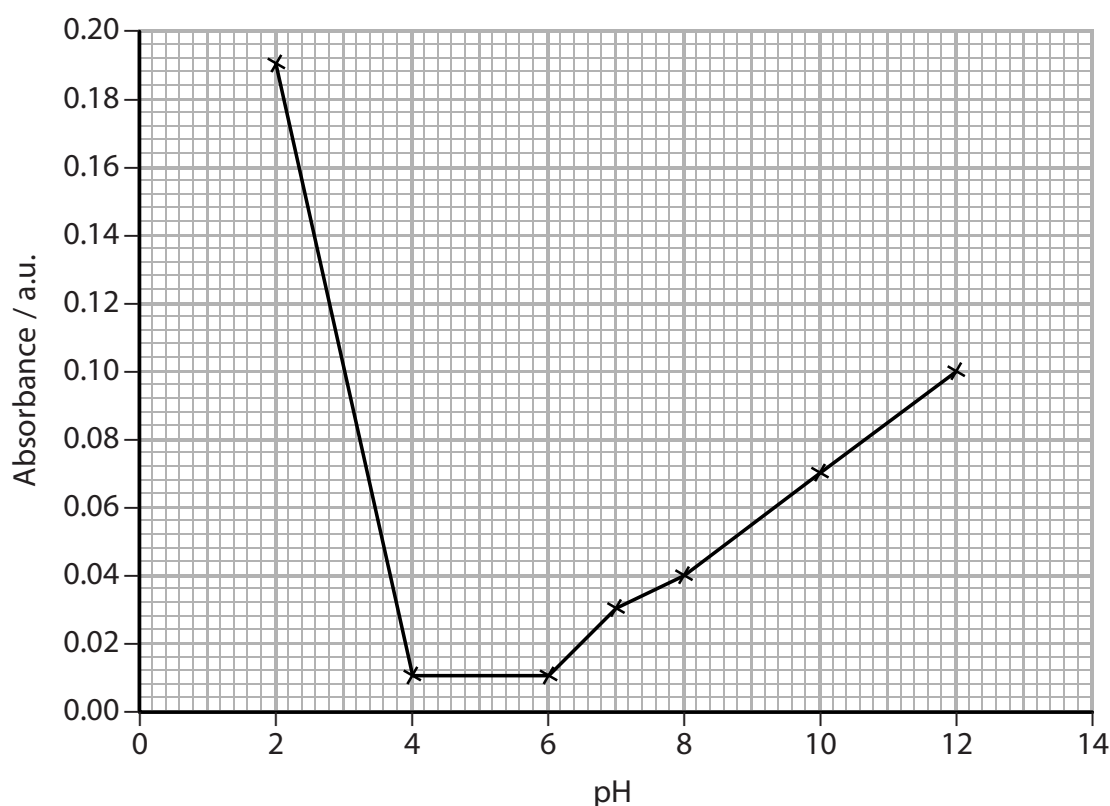
Beetroots are root vegetables that appear red because the vacuoles in their cells contain a water-soluble red pigment. This pigment cannot pass through membranes.

Seven cubes of beetroot were cut, rinsed and blotted dry. One piece of beetroot was placed into a tube containing 10 cm^3 of a solution with a pH of 2. This tube was left for 20 minutes at 5°C .

The beetroot cube was then removed from the tube after 20 minutes and the absorbance of light by the red fluid left in the tube was measured using a colorimeter. As the intensity of the colour increases, the absorbance of light increases.

The procedure was repeated using solutions with six other pH values.

The graph below shows the results of this experiment.



- (i) Use the information in the graph to describe the effect of pH on membrane permeability. (2)

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(ii) Suggest an explanation for the effect of pH on membrane permeability.

(2)

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(Total for Question 6 = 8 marks)

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7 Collagen is a fibrous protein. Prolidase is an enzyme involved in the hydrolysis of collagen.

(a) Which one of the following bonds is hydrolysed by prolidase?

(1)

- ☐ A ester
- ☐ B glycosidic
- ☐ C peptide
- ☐ D phosphodiester

(b) Mutations in the gene for prolidase result in an enzyme that cannot hydrolyse collagen.

*(i) Describe the process of transcription in the synthesis of prolidase.

(5)

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- (ii) Prolidase hydrolyses the bonds that join hydroxyproline to adjacent amino acids in collagen.

Explain how a mutation could result in prolidase that is unable to hydrolyse collagen.
(4)

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(Total for Question 7 = 10 marks)



8 Animals are adapted to obtain oxygen from their environment.

(a) *Tubifex tubifex* is a worm that lives in sediments at the bottom of freshwater streams and lakes.

(i) In an investigation, the concentration of dissolved oxygen in a stream was measured.

The table below shows the results of this investigation.

Water sample	Concentration of dissolved oxygen / $\mu\text{mol dm}^{-3}$
just below the surface	225.0
in the sediment	90.0

Calculate the percentage difference in the concentration of dissolved oxygen in these two samples.

Show your working.

(2)

.....%



(ii) *T. tubifex* obtains oxygen from the water through the surface of its body.

The photograph below shows *T. tubifex* with a scale.



Use the photograph and your own knowledge of gas exchange surfaces to suggest how the structure of *T. tubifex* is adapted to obtain oxygen from the water.

(3)

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*(b) Mammals have adaptations for gas exchange.

Explain how the adaptations found in mammalian lungs ensure rapid gas exchange.

(5)

(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS



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