

Write your name here

Surname

Other names

**Pearson Edexcel**  
**Level 3 GCE**

Centre Number

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Candidate Number

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# Biology B

**Advanced Subsidiary**

**Paper 2: Core Physiology and Ecology**

Sample Assessment Material for first teaching September 2015

**Time: 1 hour 30 minutes**

Paper Reference

**8BI0/02**

**You may need a ruler, a pencil and a calculator.**

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.
- Show your working in any calculation questions and include units in your answer where appropriate.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You may use a scientific calculator.
- In question(s) marked with an asterisk (\*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

## 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.*

## Advice

- Read each question carefully before you start to answer it.
- 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.**

**Write your answers in the spaces provided.**

**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** Platelets are tiny fragments of cells that, together with plasma proteins, are involved in the blood clotting process.

(a) (i) During the blood clotting process

(1)

- A** prothrombin is changed to thromboplastin
- B** prothrombin is changed to thrombin
- C** thrombin is changed to thromboplastin
- D** thromboplastin is changed to thrombin

(ii) When blood clots a mesh is produced because

(1)

- A** insoluble fibrin is converted to soluble fibrinogen
- B** insoluble fibrinogen is converted to soluble fibrin
- C** soluble fibrin is converted to insoluble fibrinogen
- D** soluble fibrinogen is converted to insoluble fibrin

(b) Several of the plasma proteins involved in making blood clot quickly are enzymes.

Explain how the properties of enzymes help to make blood clot quickly.

(2)

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**(Total for Question 1 = 4 marks)**

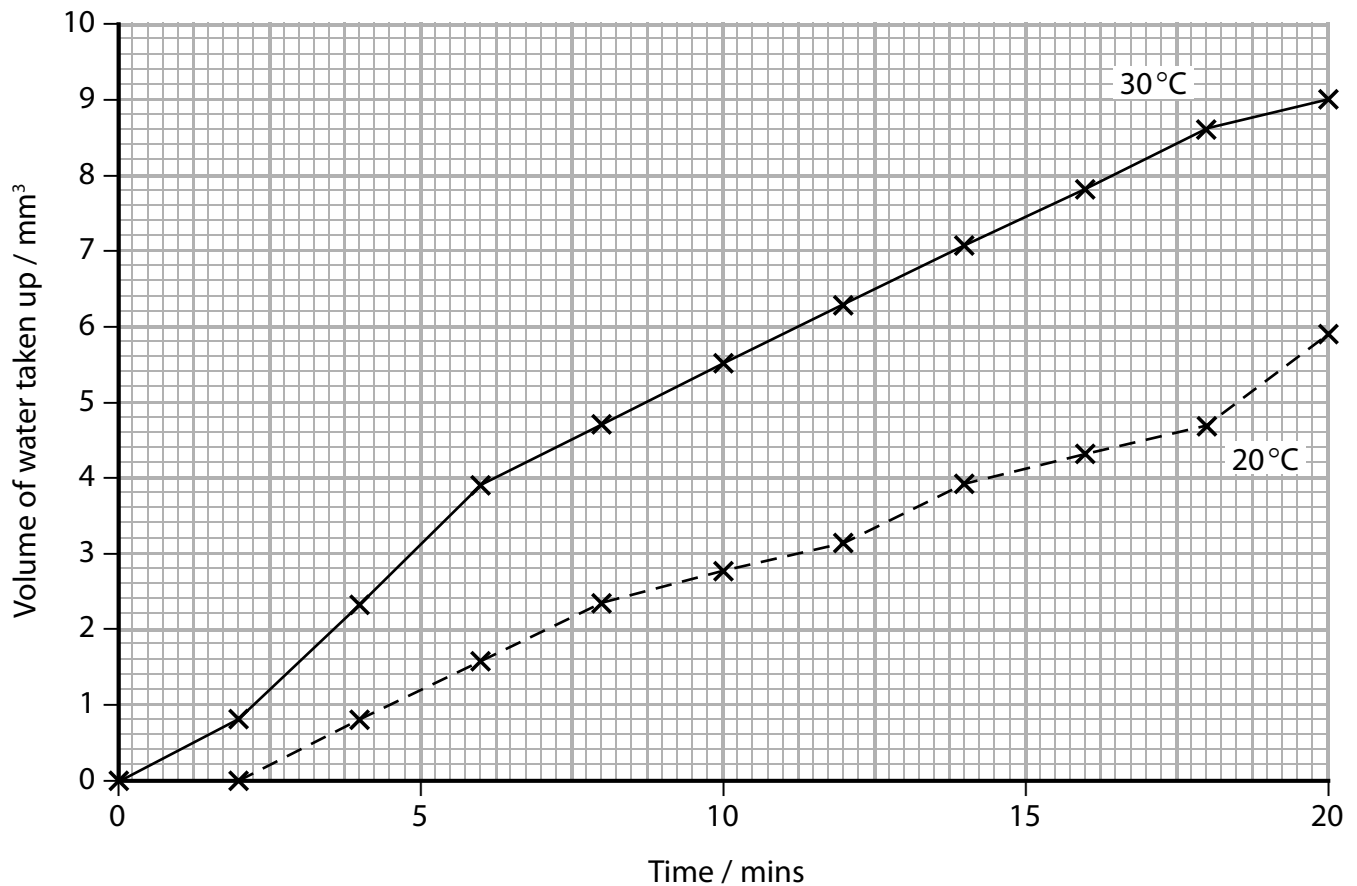
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**Turn over for question 2**

- 2 A student used a potometer to investigate the effect of temperature on the uptake of water by a plant shoot. The potometer was set up in a room at 30 °C and the volume of water taken up by the shoot was recorded for a period of 20 minutes.

The potometer was then moved to a room at 20 °C . After a period of acclimatisation, the volume of water taken up by the shoot was recorded for a further 20 minutes.

The results of the investigation are shown in the graph.



- (a) Calculate the mean transpiration rate for this shoot at 30 °C between 6 and 18 minutes.

(3)

Answer.....

(b) Explain how an increase in temperature increases the transpiration rate of shoots.

(3)

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**(Total for Question 2 = 6 marks)**

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- 3 (a) The image below shows a part of the underside of a leaf as seen by a student using a microscope.



(Source: <http://www.nscsd.org>)

- (i) The stomata in the image is open because the (1)

- A guard cells are turgid and the thin part of the cellulose wall stretches more than the thick part
- B guard cells are flaccid and the thin part of the cellulose wall stretches less than the thick part
- C guard cells are turgid and the thick part of the cellulose wall stretches more than the thin part
- D guard cells are flaccid and the thick part of the cellulose wall stretches less than the thin part

- (ii) Which row of the table correctly shows the method of water absorption by guard cells and the change in size of the stomatal pore? (1)

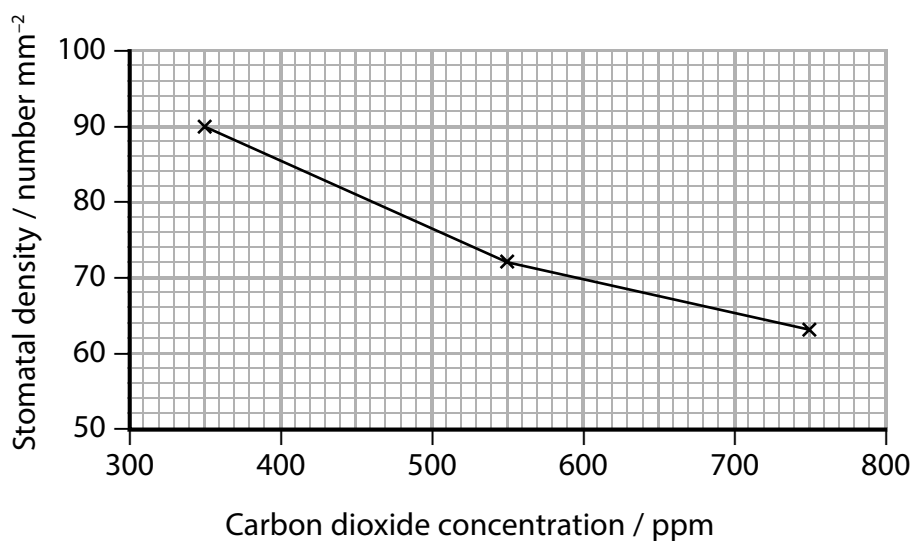
	Method of water absorption	Stomatal pore size
<input type="checkbox"/> A	active transport	decreases
<input type="checkbox"/> B	diffusion	increases
<input type="checkbox"/> C	facilitated diffusion	decreases
<input type="checkbox"/> D	osmosis	increases

(b) A student investigated how the exposure of a young plant called *Arabidopsis thaliana* to different concentrations of carbon dioxide affected the density of stomata in its adult leaves.

He put one plant in a greenhouse where the carbon dioxide concentration was regulated at 350 ppm. He waited for two weeks then measured the number of stomata on a leaf from the plant.

He repeated this procedure using a greenhouse with a carbon dioxide concentration of 550 ppm and a greenhouse with a carbon dioxide concentration of 750 ppm.

His results are shown in the graph.



The student concluded that there was a negative correlation between stomatal density and the concentration of carbon dioxide.

Discuss the improvements that the student needs to make before being confident that this conclusion is supported.

(5)

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(c) Explain how an increase in atmospheric carbon dioxide might affect the evolution of stomatal density in plants.

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**(Total for Question 3 = 10 marks)**

4 An insect pest infects a tree causing the leaves to fall off. These trees need to be treated with an insecticide that kills the pest.

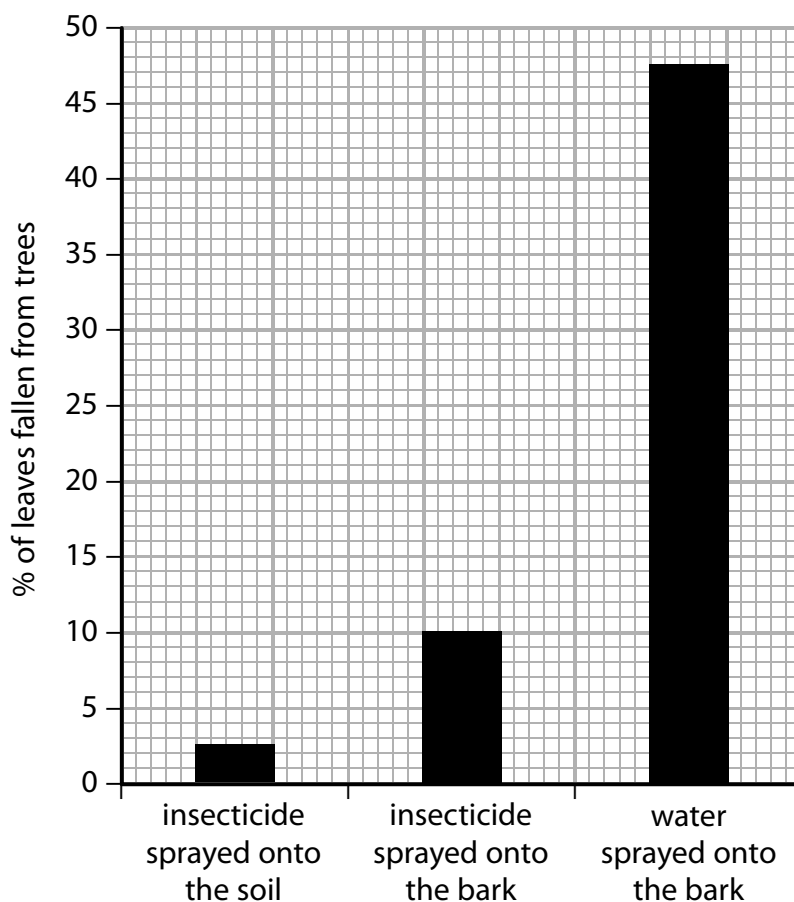
Scientists wanted to compare the procedures that could be used to treat trees with an insecticide.

They used the following procedures in their investigation:

- spraying the insecticide onto the soil
- spraying the insecticide onto the bark of the trees
- spraying the bark of the trees with water

After each procedure was used they measured the percentage of leaves still remaining on the trees after a period of time.

The graph shows the results.



(a) Give one other procedure that should be used to allow a valid comparison of the results to be made.

(1)

(b) Insecticide is transported in trees from root hair cells to the leaves and from lenticels in the bark to the leaves.

(i) Describe how insecticide would be transported from the soil into root hair cells and then to the leaves.

(4)

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(ii) Give a reason why insecticide transport is more effective when sprayed onto soil rather than onto bark.

(1)

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(c) Give a reason why spraying the insecticide onto the bark of trees is better for woodland biodiversity than spraying it onto the soil.

(1)

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**(Total for Question 4 = 7 marks)**

5 (a) (i) Describe how tissue fluid is formed.

(2)

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(ii) Which of the following substances are exchanged between the capillaries and tissue fluid?

(1)

- A lymph, glucose and oxygen
- B oxygen, water and haemoglobin
- C glucose, lymph and water
- D water, glucose and oxygen

(b) Blood samples were taken from a vein of a woman using a needle in order to measure the plasma protein concentration during pregnancy.

(i) Give a reason why the structure of a vein makes it suitable for obtaining blood samples.

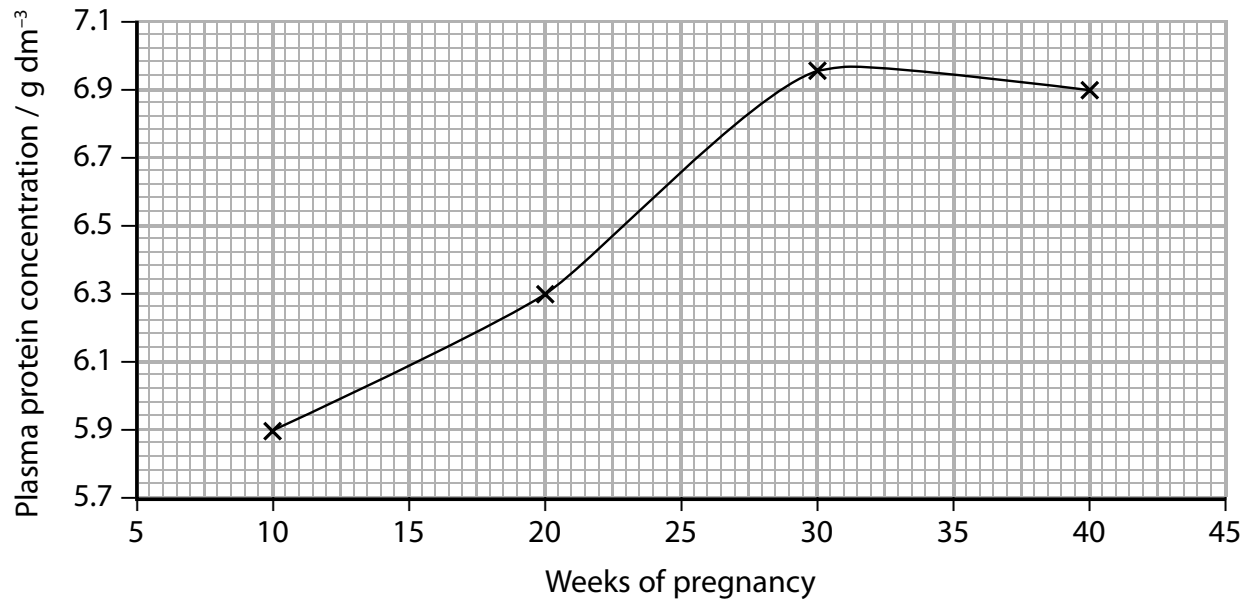
(1)

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The graph shows changes in the plasma protein concentration in the blood of a pregnant woman.



(ii) Analyse the data to explain the effect the changes in plasma protein concentration could have on the blood volume of a pregnant woman.

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**(Total for Question 5 = 8 marks)**

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6 Blood plays a role in the mass transport of substances around the body.

(a) Explain why organisms need a mass transport system.

(2)

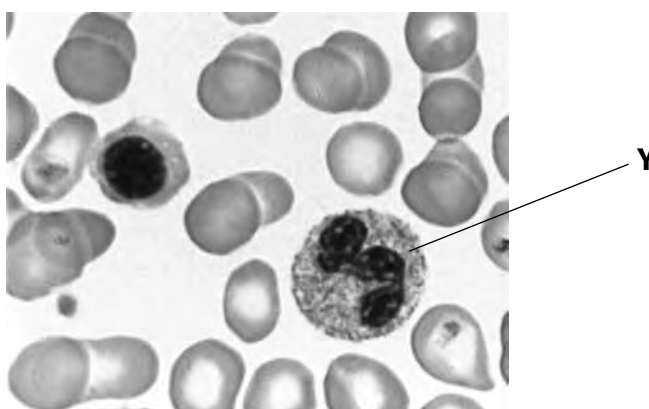
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(b) The photograph shows a stained blood sample.



(Source: <http://www.pathologystudent.com>)

(i) The blood cell labelled **Y** is

(1)

- A** an erythrocyte
- B** a lymphocyte
- C** a neutrophil
- D** a monocyte

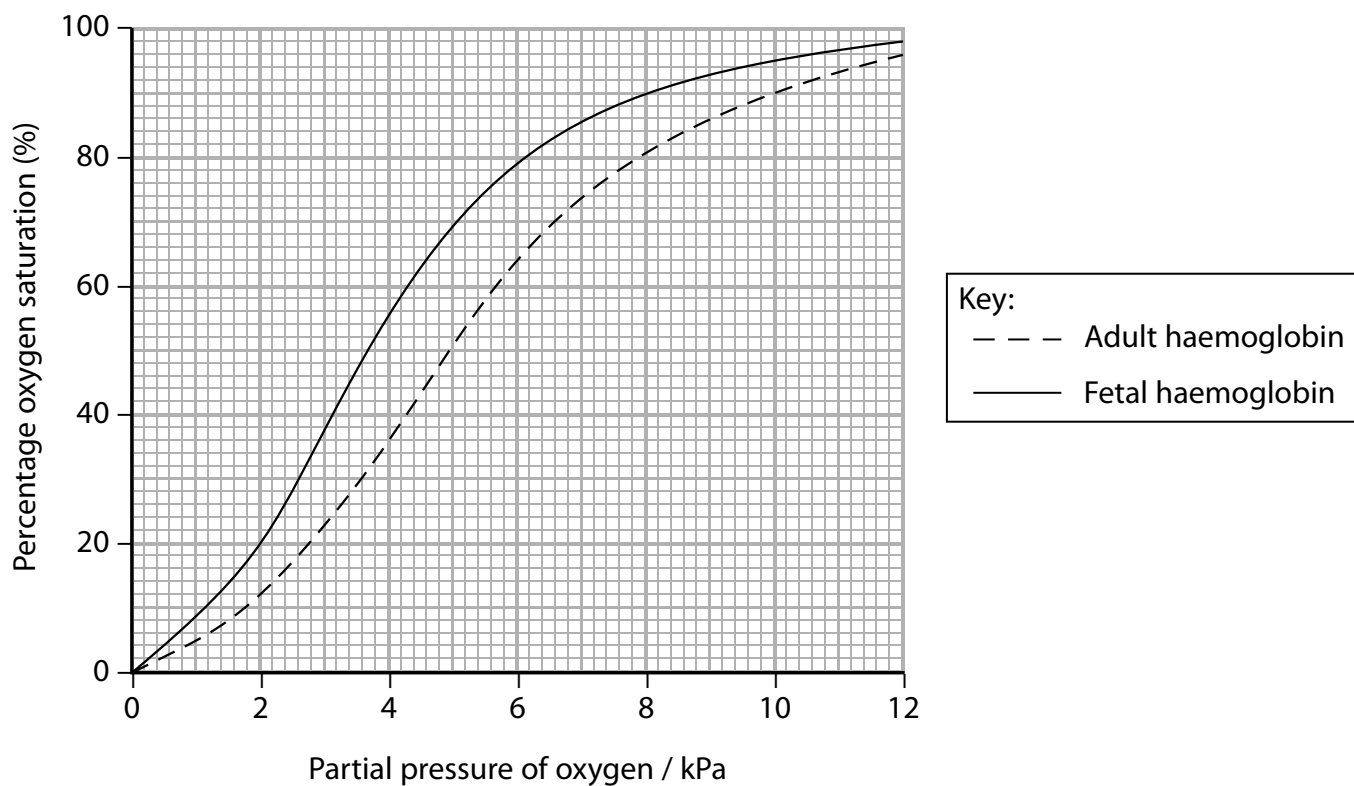
(ii) An increase in the concentration of carbon dioxide in the blood will cause

(1)

- A** more oxygen to bind to haemoglobin
- B** no change in the amount of oxygen bound to haemoglobin
- C** the release of oxygen from haemoglobin
- D** less oxygen to bind to haemoglobin

(c) In mammals, the mother and fetus have separate circulatory systems. Materials are exchanged between the two circulatory systems in the placenta.

The graph shows the oxygen dissociation curves for adult and fetal haemoglobin.



(i) Calculate the percentage increase in oxygen saturation between adult haemoglobin and fetal haemoglobin at an oxygen concentration of 4 kPa.

(2)

Answer.....



(ii) Explain why fetal haemoglobin ensures the transfer of oxygen from the maternal to the fetal circulation.

(2)

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The oxygen dissociation curve for myoglobin is different from that for adult haemoglobin.

(iii) Draw a line on the graph to show the dissociation curve for myoglobin.

(1)

(iv) The table shows the results of an investigation to measure the myoglobin content in the muscle tissue of two different mammals.

Myoglobin concentration in muscle tissue / mg g <sup>-1</sup>	
Dolphin	Whale
25	68

Explain why the difference in myoglobin concentration affects the time mammals can spend underwater.

(3)

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**(Total for Question 6 = 12 marks)**

**7** Species diversity varies in different habitats.

(a) Explain why there is a difference in the species diversity found in a tropical rainforest compared to the species diversity found in a desert.

**(3)**

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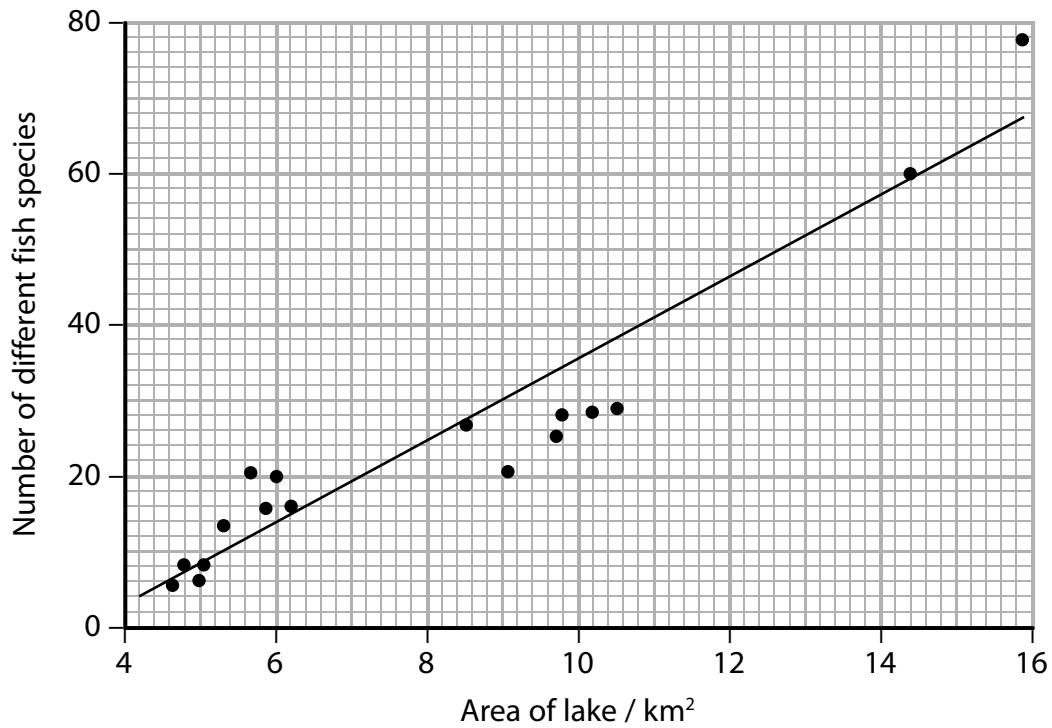
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(b) An investigation was carried out to find out if there was a correlation between the fish species diversity in a lake and the size of the area sampled.

The graph below shows the results.



Explain how natural selection could account for the change in fish species diversity as the size of the area sampled increased.

(3)

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(c) An investigation was carried out to determine the numbers of different species of lizards in two areas. The results are shown in the table.

Species of lizard	Number of individuals observed	
	Area A	Area B
Collared lizard	1	5
Greater earless lizard	6	2
Lesser earless lizard	18	29
Fence lizard	29	3
Texas spotted whiptail lizard	32	2
Little striped whiptail lizard	45	1

(i) Calculate an index of diversity ( $D$ ) for area A, using the formula

(3)

$$D = \frac{N(N - 1)}{\sum n(n - 1)}$$

$N$  = total number of organisms of all species

$n$  = total number of organisms of a particular species

Answer.....

(ii) Area B has an index of diversity of 2.1.

With reference to these indices and the data given, compare and contrast the biodiversity of these two areas.

(4)

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**(Total for Question 7 = 13 marks)**

- 8 A student carried out an investigation to test the hypothesis that the cells of sweet potatoes have a lower water potential than the cells of white potatoes.

One gram of potato tissue was placed in a test tube and 10 cm<sup>3</sup> of a 0.1 mol dm<sup>-3</sup> sucrose solution was added.

After 30 minutes, one drop of blue colouring was added to the test tube and the contents of the tube mixed.

A pipette was used to remove some of the solution from the test tube and one drop was placed in the middle of a second test tube containing the original 0.1 mol dm<sup>-3</sup> sucrose solution.

The movement of the blue coloured drop was observed.

The procedure was repeated for a further six different concentrations of sucrose solution.

The results are shown in the table.

	Concentration of sucrose solution / mol dm <sup>-3</sup>						
	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Sweet potato drop moves	down	down	down	down	up	up	up
White potato drop moves	down	down	down	down	up	up	up

It is important to stop evaporation from the solution in the test tubes in this investigation because it will affect the water potential.

- (a) State how evaporation would affect the water potential of the solution in the test tubes.

(1)

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(b) Explain the movement of the drop placed in the 0.2 mol dm<sup>-3</sup> sucrose solution.

(3)

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(c) The student concluded that the sweet potato and white potato have the same water potential.

Explain why this is not a valid conclusion.

(3)

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**(Total for Question 8 = 7 marks)**





(b) The content of blood needs to be monitored when being stored for later use. In an investigation, samples of blood were stored at 4°C for 5 days.

The concentration of potassium ions in the plasma and in the erythrocytes was measured at the beginning and end of storage.

The results are shown in the table.

<b>Blood</b>	<b>Component of blood</b>	<b>Concentration of potassium ions / mmol dm<sup>-3</sup></b>
At the beginning of storage	Erythrocytes	94
	Plasma	3
At end of storage at 4°C for 5 days	Erythrocytes	65
	Plasma	7

Calculate the percentage change in the concentration of potassium ions in erythrocytes during this storage at 4 °C for 5 days.

(2)

Answer.....

In another investigation, two blood samples, A and B, were stored at 4°C for 5 days.

Sample A was then stored at 37°C for 24 hours.

Glucose was added to sample B, which was stored at 37°C for 24 hours.

The potassium ion concentration in the erythrocytes was recorded.

The results are shown in the graph.

