

Write your name here	
Surname	Other names
Pearson Edexcel International GCSE	Centre Number Candidate Number
Biology Unit: 4BI0 Science (Double Award) 4SC0 Paper: 1BR	
Tuesday 16 May 2017 – Afternoon Time: 2 hours	Paper Reference 4BI0/1BR 4SC0/1BR
You must have: Ruler 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.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- 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.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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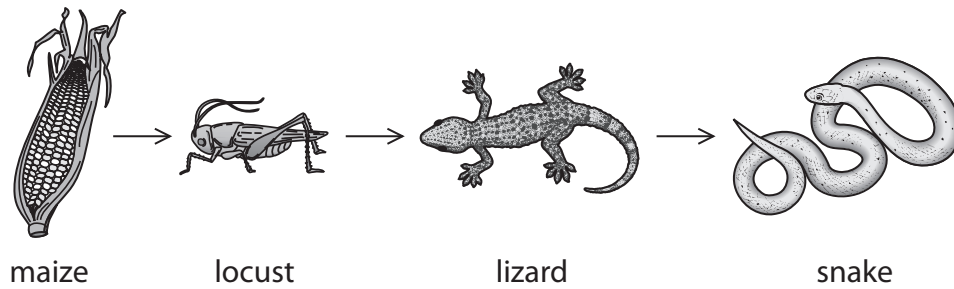
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Pearson

Answer ALL questions.

1 The diagram shows a food chain.



(a) (i) How many consumers are shown in this food chain?

(1)

(ii) What term describes the trophic level of the snake?

(1)

(b) Light is an abiotic (non-living) factor that affects the growth of maize.

(i) Explain the role of light in helping the growth of maize.

(2)

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- (ii) Scientists measured the average (mean) daily increase in mass of maize in a square metre of a field in two different regions of the world. They also measured the daily light energy available in a square centimetre of each of the two regions.

The table shows their results.

Region of the world	Average daily increase in mass in g	Daily light energy available in J
California	52	2000
UK	17	1200

The scientists expected that the same light energy would produce the same average daily increase in mass of maize in each region of the world.

However, the results show that the average daily increase in mass of maize produced in the UK was less than they expected.

Calculate the average daily increase in mass the scientists expected to be produced in the UK.

(2)

average increase in mass = g

- (iii) The scientists concluded that factors other than light must be limiting the growth of maize in the UK.

Name two other abiotic factors that could limit the growth of maize.

(2)

1

2



(c) Give three reasons why not all of the energy available in the maize is transferred to the snake.

(3)

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(Total for Question 1 = 11 marks)

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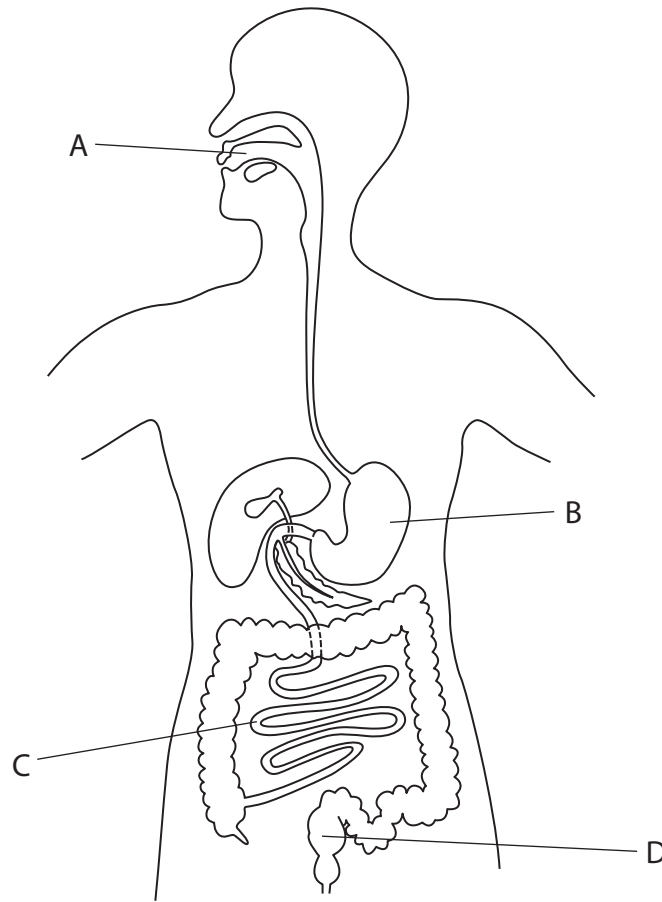
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- 2 The diagram shows the digestive system of a human with parts labelled A, B, C and D.



- (a) The table lists these four parts of the digestive system and three types of food.

For each part, complete the table by putting a tick (✓) in the box if the food is digested, or a cross (✗) if it is not digested.

Some have been done for you.

(4)

Part of digestive system	Starch	Fat	Protein
A	✓		
B	✗		
C			
D			



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(b) Coeliac disease results in part C containing fewer villi.

(i) Draw a labelled diagram of a villus.

(3)

(ii) Suggest why coeliac disease may affect the growth of a child.

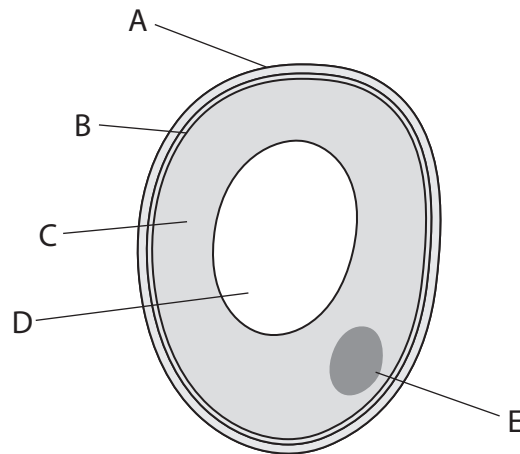
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(Total for Question 2 = 10 marks)



3 Yeast is an organism used in the production of beer.

The diagram shows a yeast cell.



(a) (i) Give the letter of the part made of chitin.

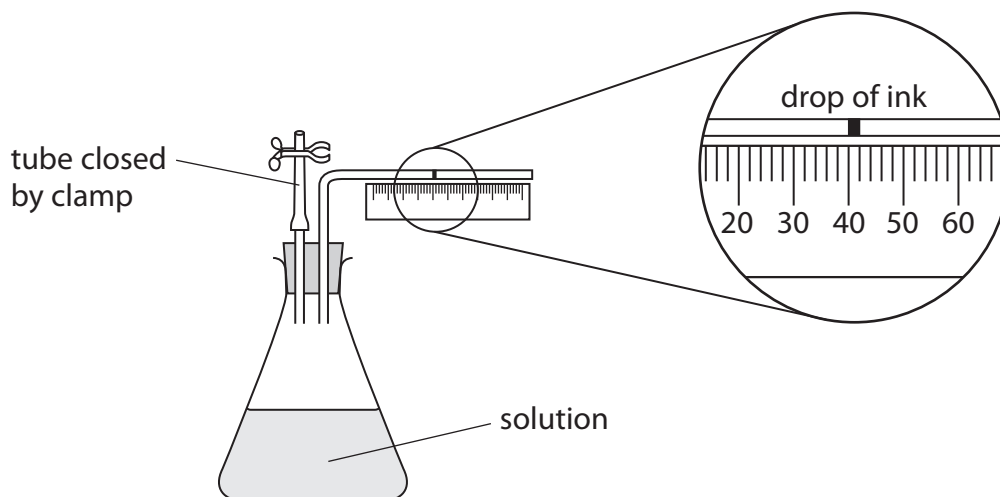
(1)

(ii) Give the letter of the part that contains glycogen.

(1)

(b) Yeast releases carbon dioxide when beer is made.

A student uses this apparatus to measure the rate of carbon dioxide production by yeast.



- (i) The solution contains yeast cells.

Name two substances in the solution.

(2)

1

2

- (ii) Every three minutes, the student records the position of the drop of ink using the scale.

The table shows the student's results.

Time in minutes	Position of drop of ink in mm
0	0
3	39
6	53
9	71

Calculate the difference between the rate of carbon dioxide production in the first three minutes and the rate in the final three minutes.

Show your working.

(2)

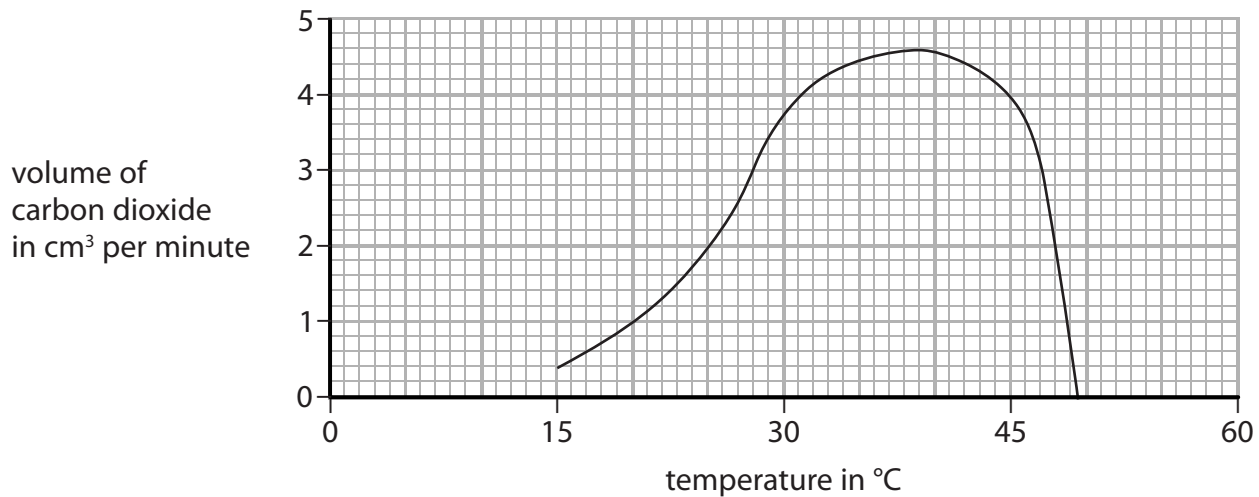
difference in rate = mm per minute



- (c) The student then investigates the effect of temperature on the rate of carbon dioxide production by yeast.

He measures the volume of carbon dioxide produced rather than the distance moved by the drop of ink.

The graph shows his results.



- (i) Give the optimum temperature for the production of carbon dioxide.

(1)

- (ii) Explain why the rate of carbon dioxide production is slow at low temperatures.

(2)

- (iii) Suggest how the student could modify the apparatus to vary the temperature.

(2)

(Total for Question 3 = 11 marks)

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4 (a) Hormones are released during exercise.

(i) Explain the role of adrenaline during exercise.

(4)

(ii) During exercise, water is lost from the body by sweating.

Explain the role of ADH following this loss of water.

(4)

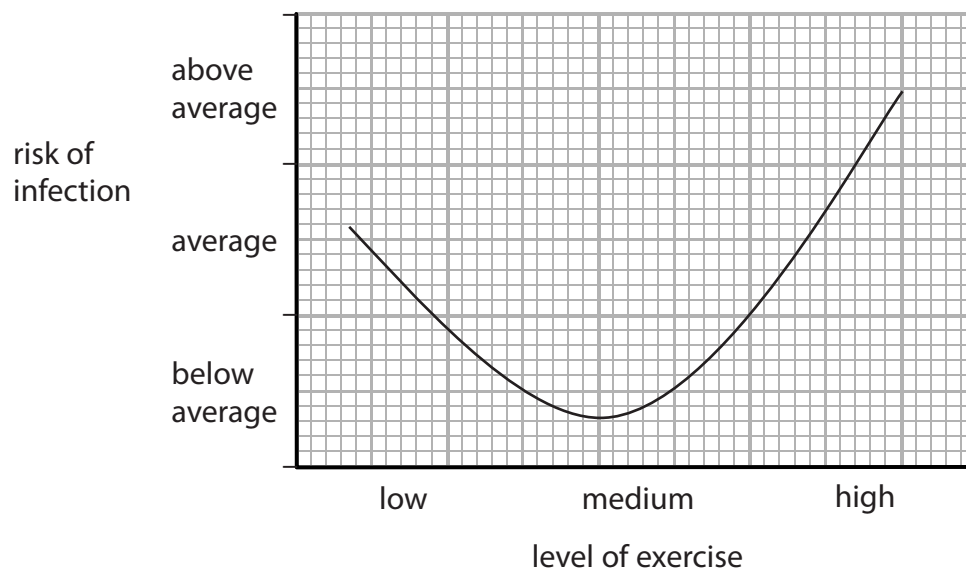
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(b) The graph shows how level of exercise can affect risk of infection in a person.



(i) Describe the relationship between level of exercise and risk of infection.

(2)

(ii) It is thought that exercise affects the immune system by reducing the number of white blood cells in the body.

Explain how a reduction in the number of white blood cells can affect the risk of infection.

(2)

(Total for Question 4 = 12 marks)



5 The passage describes the events that lead to the production of a seed in a plant.

(a) Complete the passage by writing a suitable word in each blank space.

(7)

Pollen grains are produced in the of a flower by a process of
cell division called The pollen grains land on the
of another flower and each grain grows a pollen tube down the

Each pollen tube grows until it reaches the ovary of the flower.

The pollen tube then enters the micropyle of an

The male nucleus passes down the pollen tube and takes place.

A seed is produced and the ovary becomes a

(b) Flowers can be insect-pollinated or wind-pollinated.

(i) State two ways in which the structure of an insect-pollinated flower is
different from the structure of a wind-pollinated flower.

(2)

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- (ii) Some people have an allergy to the pollen produced by flowering plants.

This allergy is known as hay fever.

Suggest why hay fever is more likely to be caused by pollen from a wind-pollinated flower than by pollen from an insect-pollinated flower.

(2)

(Total for Question 5 = 11 marks)

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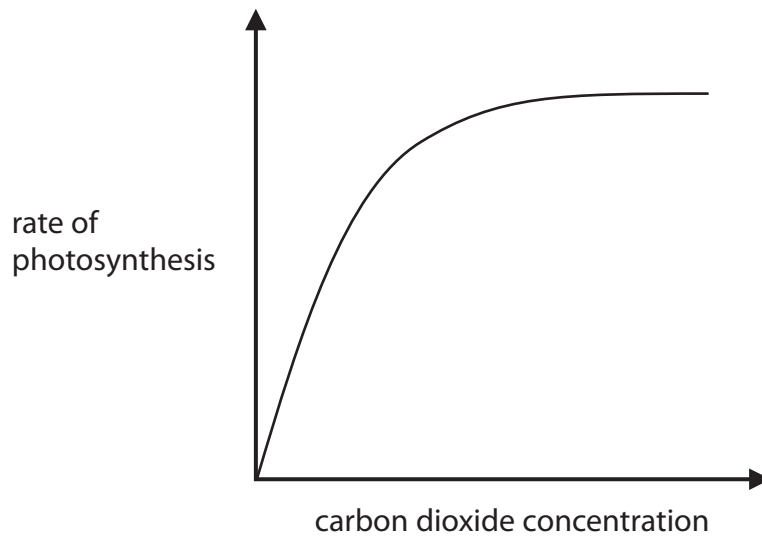
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- 6 A student investigates the effect of carbon dioxide concentration on the rate of photosynthesis in a water plant.

The graph shows the student's results.



- (a) Put an X on the graph to show where carbon dioxide limits the rate of photosynthesis.

(1)

- (b) Write the word equation for photosynthesis.

(2)

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(c) The student's method allows her to make a valid and reliable comparison of the rate of photosynthesis at different carbon dioxide concentrations.

(i) Give the independent variable in her investigation.

(1)

(ii) Suggest a variable the student needs to control in her investigation.

(1)

(iii) Explain how the student could make sure her results are reliable.

(2)

(Total for Question 6 = 7 marks)



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7 Genetically modified (GM) crops have been developed over the last 30 years.

(a) Explain what is meant by the term **genetically modified**.

(2)

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(b) Farmers have been growing GM soybean and corn for a number of years.

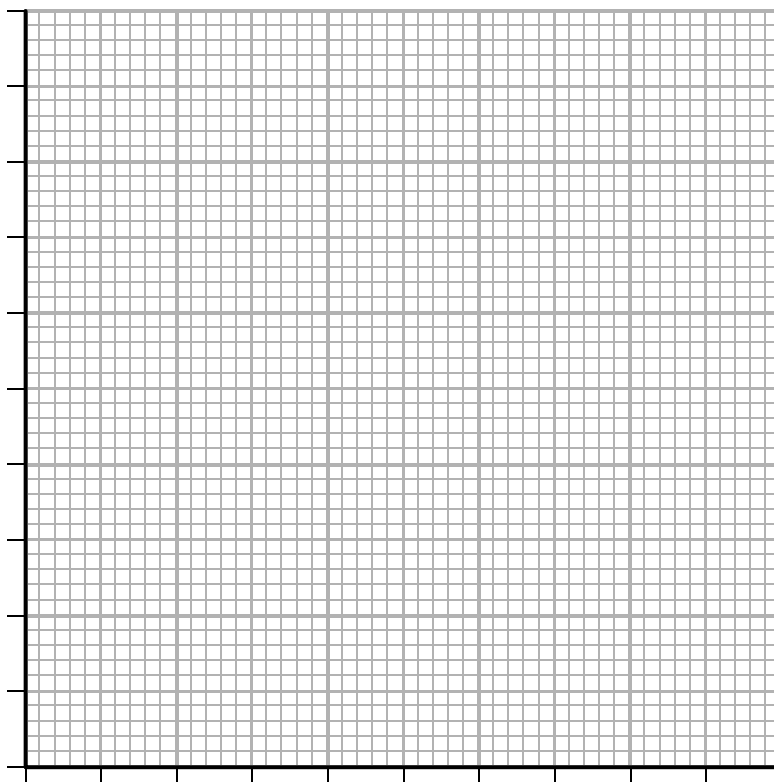
The table shows data for soybean and corn grown in the USA from 1996 to 2014. It shows the percentage of each crop that is GM.

Year	Percentage of each crop that is GM (%)	
	soybean	corn
1996	7	3
2000	54	7
2004	85	20
2008	92	63
2012	93	73
2014	94	89

- (i) Plot a line graph of the data on the grid.

Use a ruler to join the points with straight lines.

(6)



- (ii) Describe the changes in the use of GM soybean and corn from 1996 to 2014.

(2)

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- (c) (i) Herbicides are chemicals that kill plants.

Crops can be genetically modified to be herbicide resistant.

Suggest why farmers may want to grow crops that are herbicide resistant.

(2)

- (ii) Farmers also grow GM crops that are resistant to other factors.

Name one of these factors.

(1)

- (d) Selective breeding is another way of improving crop production.

Describe how selective breeding could be used to improve seed size in wheat.

(4)

(Total for Question 7 = 17 marks)



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8 Students carried out an experiment about kidney function.

Their teacher provided them with three samples of artificial urine.

- one sample contained the same composition as urine from a person with normal kidneys
- one sample contained the same composition as urine from a person with diabetes, who is unable to produce insulin
- one sample contained the same composition as urine from a person with high blood pressure

The students tested the samples for glucose and for protein.

The table shows their results.

Sample	Glucose test	Protein test
A	positive	negative
B	negative	negative
C	negative	positive

(a) High blood pressure occurs when the heart has to pump very hard to force blood through narrow arteries.

- (i) Use information from the table and your own knowledge to explain which sample could be from a person with high blood pressure.

(2)

- (ii) Use information from the table and your own knowledge to explain which sample could be from a person with diabetes.

(2)

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(iii) Describe the test for glucose.

(2)

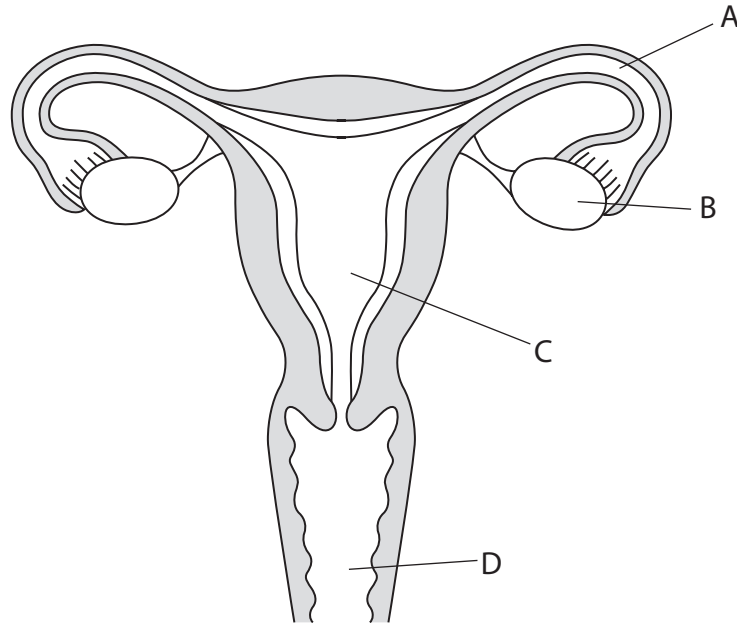
(b) Suggest why the teacher uses artificial urine rather than real urine in this experiment.

(2)

(Total for Question 8 = 8 marks)



9 The diagram shows part of the female reproductive system.



(a) (i) Put an X on the diagram to show the site where fertilisation normally occurs.

(1)

(ii) Name the structures labelled A, B and C.

(3)

A

B

C

(iii) Structure D has two different functions in reproduction.

Describe these two functions.

(2)

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2

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(b) Structure B produces a hormone that changes the female body at puberty.

(i) Name this hormone.

(1)

(ii) Describe the effects of this hormone on the body at puberty.

(2)

(Total for Question 9 = 9 marks)



- 10** The table lists some greenhouse gases and gives their percentage contribution to the greenhouse effect.

Greenhouse gas	Percentage contribution (%)
water vapour	36 to 72
carbon dioxide	9 to 26
methane	4 to 9
ozone	3 to 7

- (a) (i) Which gas makes the greatest contribution to the greenhouse effect?

(1)

- (ii) Name a greenhouse gas not in the table.

(1)

- (b) The percentage contribution for each gas is calculated using these three factors

- the abundance of the gas in the atmosphere
- how long the gas stays in the atmosphere
- how much radiation the gas absorbs (the gas's radiative effect)

- (i) Methane has a radiative effect 72 times greater than the same mass of carbon dioxide.

Suggest why methane has a lower percentage contribution to the greenhouse effect than carbon dioxide.

(2)

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- (ii) Suggest a reason why more attempts are being made to limit the release of carbon dioxide into the atmosphere than the release of water vapour.

(1)

- (iii) Describe two ways that humans can limit the release of carbon dioxide into the atmosphere.

(2)

1

2

- (c) Describe two effects that global warming could have on an animal's habitat.

(2)

1

2

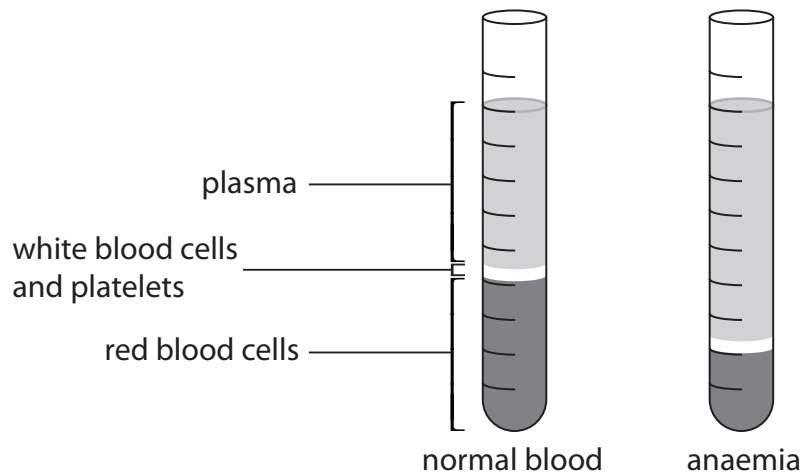
(Total for Question 10 = 9 marks)



- 11** The diagram shows two samples of blood that have been separated using a machine called a centrifuge.

The centrifuge separates the components of blood by their density.

One sample comes from a person with normal blood. The other sample comes from a person with anaemia.



- (a) (i) Suggest why the components of the normal blood sample have separated into different layers as shown in the diagram.

(2)

- (ii) Compare the appearance of the normal blood sample with the appearance of the sample from the person with anaemia.

(2)

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(iii) Explain a symptom of anaemia.

(2)

(iv) Suggest why adult females are more likely to have anaemia than adult males.

(1)

(b) Plasma transports many molecules around the body.

(i) Name a food molecule transported in the plasma.

(1)

(ii) Name a non-food molecule transported in the plasma.

(1)

(Total for Question 11 = 9 marks)



12 Biological washing powder contains enzymes to remove stains from clothes.

Describe an investigation to find the temperature at which biological washing powder is most effective at removing stains.

Your answer should include experimental details and be written in full sentences.

(6)

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(Total for Question 12 = 6 marks)

TOTAL FOR PAPER = 120 MARKS



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