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<h1 style="margin: 0;">Biology</h1> <p style="margin: 5px 0;"><b>Unit: 4BI0</b></p> <p style="margin: 5px 0;"><b>Paper: 2BR</b></p>			
Friday 10 June 2016 – Morning		Paper Reference	
<b>Time: 1 hour</b>		<b>4BI0/2BR</b>	
<b>You must have:</b> 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 60.
- 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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**Answer ALL questions.**

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

**Glucose control**

- 5 Many years ago some scientists wanted to find out more about the role of the pancreas in digestion. They used surgery to remove the pancreas from dogs to see what would happen. During this investigation a laboratory assistant noticed that flies collected around the dogs' urine. This urine was later found to contain large amounts of glucose. Urine from dogs with a pancreas does not contain glucose.

- 10 Another scientist used string to tie a knot around the pancreatic duct of rabbits, which closed the duct. This meant that no pancreatic enzymes could reach the small intestine. It was noticed that when this was done, the cells in the pancreas that made enzymes died, but no glucose appeared in the rabbit urine.

Other scientists made pancreas extract by crushing up a pancreas in water. They injected this extract into dogs that had their pancreas removed. They found that the blood glucose level in these dogs was much reduced.

- 15 These investigations and observations suggest that the pancreas has two different functions. Some of the cells produce enzymes needed for digestion. Other parts of the pancreas are not involved in digestion but are important in controlling blood glucose levels.

- 20 We now know that pancreas extract contains two hormones involved with the regulation of blood glucose levels – insulin and glucagon. High blood glucose levels are detected by the pancreas. This stimulates the pancreas to release insulin. The role of insulin is to lower blood glucose levels. The insulin is released from specialised cells directly into the blood. The insulin travels in the blood to target cells that are in the liver and in large muscles.

- 25 Insulin causes these cells to absorb glucose and use it to make an insoluble storage carbohydrate called glycogen.

The second hormone called glucagon is released by different cells in the pancreas when the blood glucose level falls too low. Glucagon causes liver and muscle cells to change glycogen into soluble glucose.

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(a) Explain what is meant by the term **digestion** (line 2).

(2)

(b) Explain why dogs that had their pancreas removed produced urine that contained glucose (lines 4 and 5).

(3)

(c) Name two enzymes produced by cells in the pancreas (lines 8 and 9).

(2)

1 .....

2 .....

(d) Suggest why rabbits that have had their pancreatic duct tied can still regulate their blood glucose levels (lines 10 and 11).

(1)



P 4 5 9 4 2 R A 0 3 2 0

- (e) The scientists who injected pancreas extract into dogs should have carried out a control experiment (line 13).

Explain the control experiment they should have carried out.

(2)

- (f) Name the blood vessel that transports hormones into the liver (line 24).

(1)

- (g) Suggest one advantage of storing glycogen in cells rather than storing glucose in cells (lines 25 and 26).

(1)

- (h) A number of different substances and structures are involved in the control of blood glucose.

(i) Describe the stimulus.

(1)

(ii) Name the structure that acts as a receptor.

(1)

(iii) Name a structure that acts as an effector.

(1)

(iv) Describe the response.

(1)

(Total for Question 1 = 16 marks)



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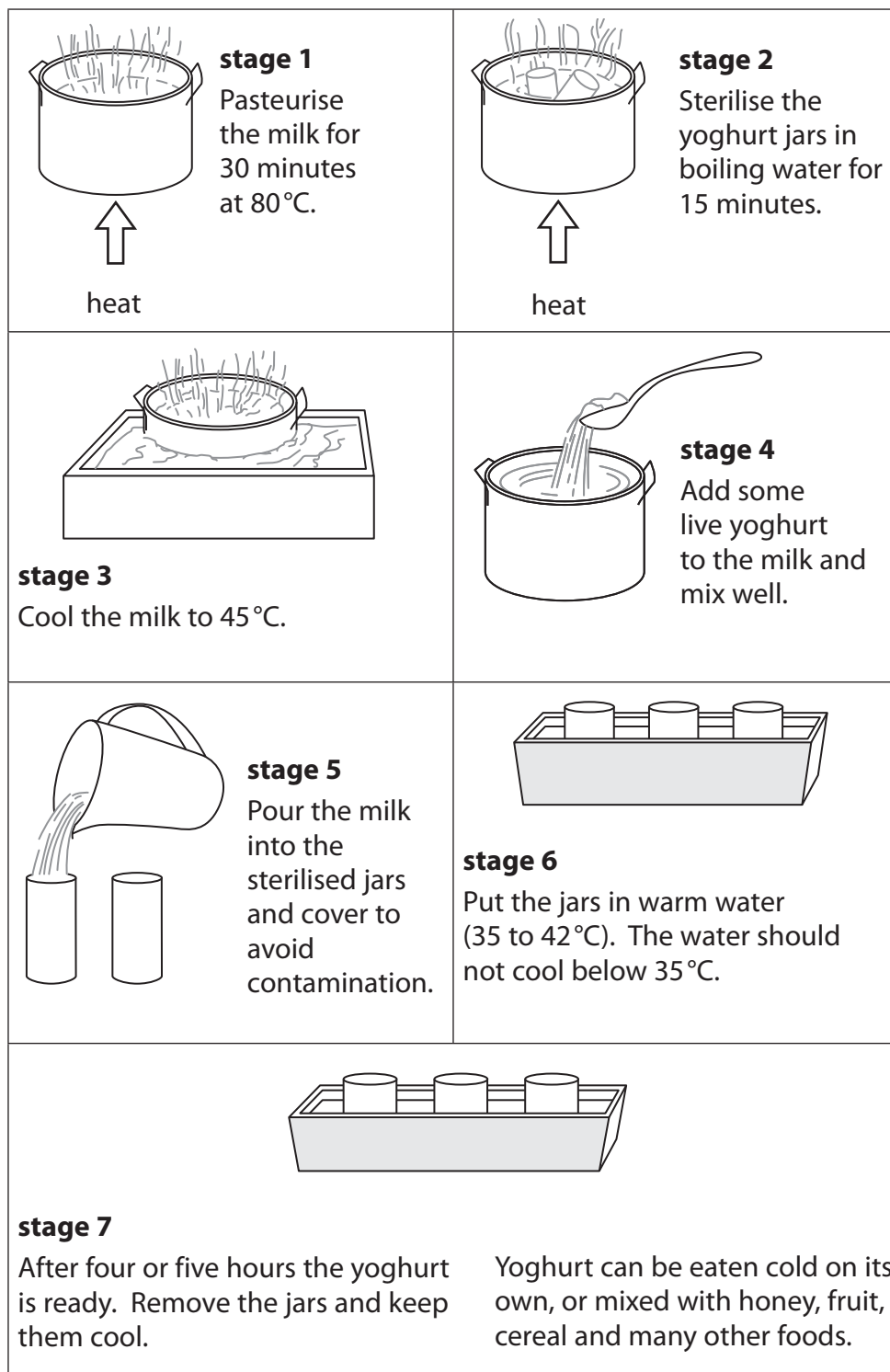
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2 A student wants to make yoghurt. The diagram shows what she did.



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- (a) Which two stages help to improve the production of yoghurt by killing bacteria that compete with *Lactobacillus*?

(2)

..... and .....

- (b) Explain why the milk needed to be cooled to 45 °C in stage 3.

(2)

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.....

.....

- (c) Explain what could happen to the production of yoghurt if the jars used in stage 5 had not been sterilised in stage 2.

(2)

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.....

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- (d) Explain what would happen to the production of yoghurt if the water cooled below 35 °C in stage 6.

(2)

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.....

.....

- (e) The student added fruit to her yoghurt to improve the taste.

Suggest how adding fruit to yoghurt also helps to maintain healthy skin.

(1)

.....

.....

(Total for Question 2 = 9 marks)



- 3 The table shows the concentration of sodium ions and chloride ions inside a plant root hair cell and in the water in the soil.

Place	Ion concentration in mg per dm <sup>3</sup>	
	sodium	chloride
in the root hair cell	1988	3745
in the water in the soil	28	35

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- (a) The ratio for the concentration of sodium ions in the root hair cell compared to the water in the soil is 71:1

- (i) Calculate the ratio for the concentration of chloride ions in the root hair cell compared to the water in the soil.

(1)

ratio = .....

- (ii) Adding too much water to soil will fill all the air spaces in the soil with water.

Suggest why this will prevent root hair cells from absorbing sodium or chloride ions.

(3)

.....

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(b) The table lists two other mineral ions.

Complete the table by naming a molecule that is made in plants using the mineral ion.

(2)

Mineral ion	Molecule made using the mineral ion
magnesium	
nitrate	

(Total for Question 3 = 6 marks)

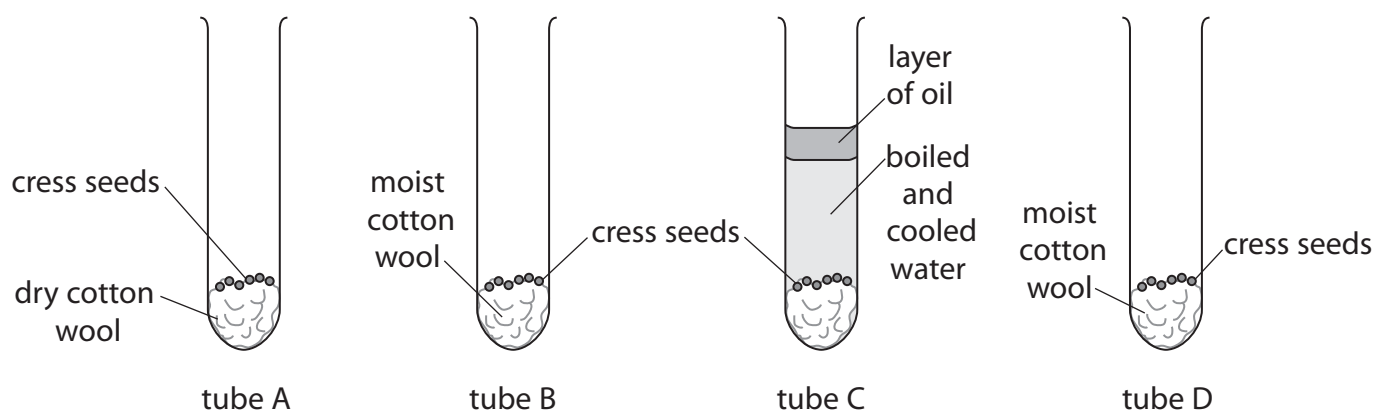
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- 4 A teacher set up an experiment to investigate the factors required for seed germination. He set up four test tubes containing cotton wool and cress seeds as shown in the diagram.



He placed tubes A, B and C in an incubator at 20°C and tube D in a fridge at 4°C.

He left the tubes for four days then returned to look at them.

He asked his students to produce a table to show the factor being tested and whether the seeds germinated.

- (a) Complete the table to show the factor being tested and whether the seeds are likely to germinate.

(3)

Test tube	Factor being tested	Seeds germinated
A		
B	control (all factors present)	yes
C	oxygen	
D		



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(b) (i) Suggest how the students could see if germination had taken place.

(1)

(ii) Name two other variables the teacher should control in his experiment.

(2)

1 .....

2 .....

(c) Other seeds such as beans or peas contain larger food stores.

(i) Suggest a food molecule that seeds could use as a food store.

(1)

(ii) Explain why it is important for seeds to have a food store.

(2)



(d) Describe an experiment you could carry out to determine the energy content of a seed.

(4)

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(Total for Question 4 = 13 marks)



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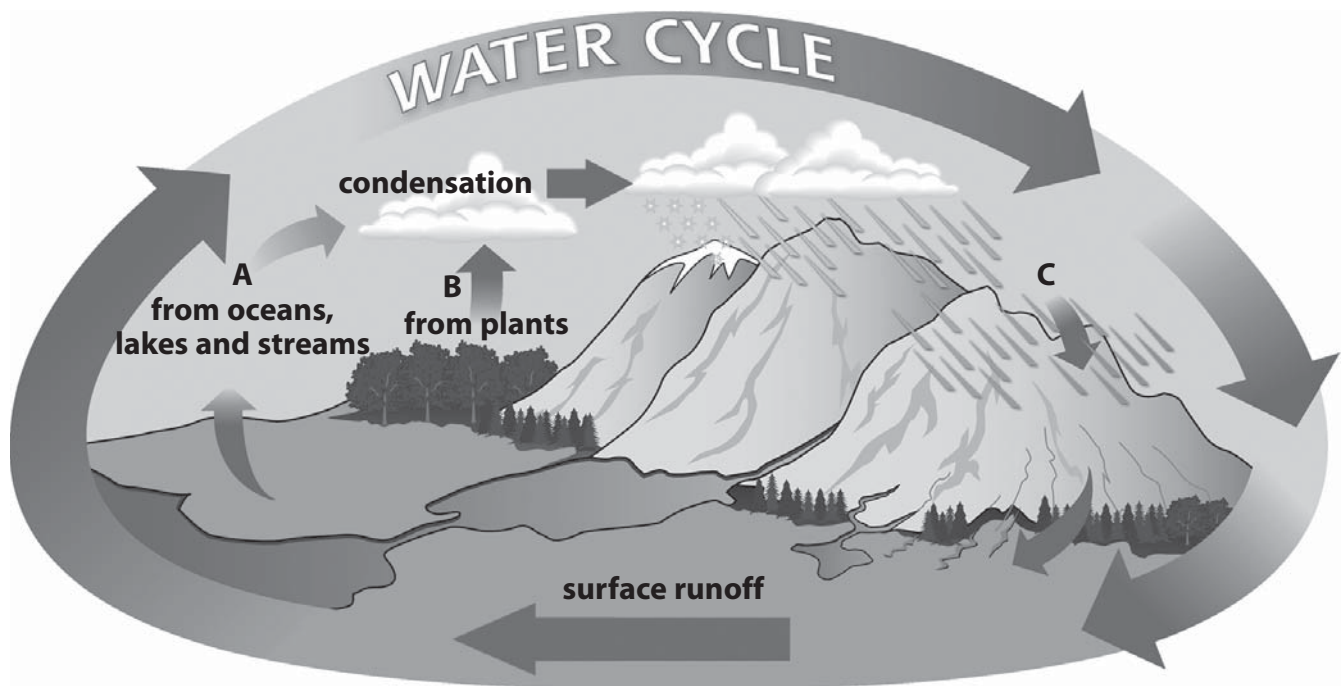
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5 The diagram shows the water cycle.



(a) Name the processes A, B and C shown in the diagram.

(3)

A .....

B .....

C .....

(b) (i) Explain the possible consequences of deforestation for the water cycle.

(2)

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- (ii) Deforestation also affects the carbon cycle.  
Explain these effects.

(4)

(Total for Question 5 = 9 marks)

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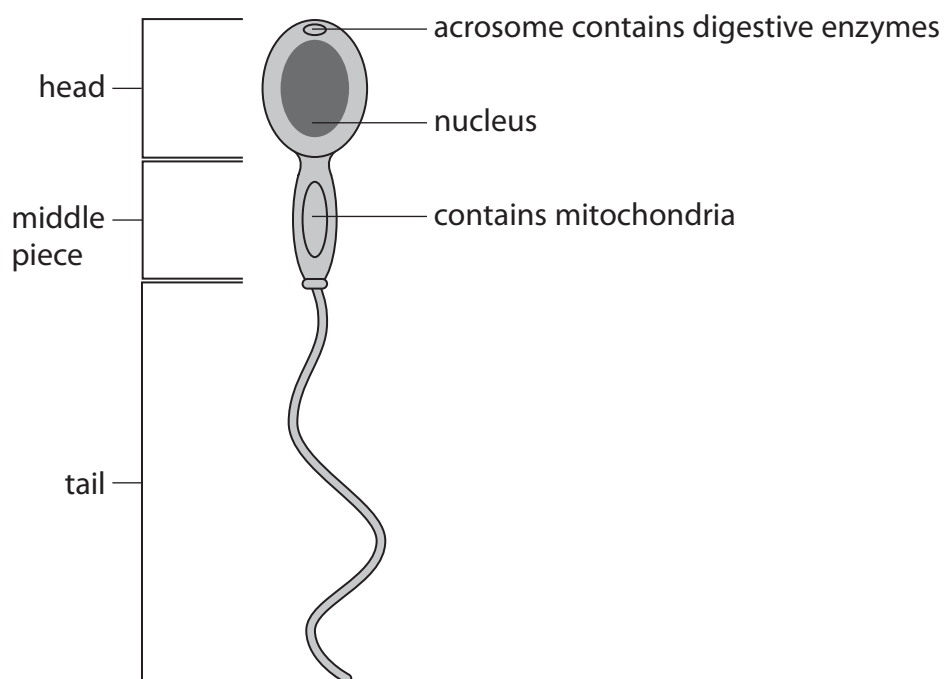
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- 6 (a) The diagram shows a human sperm, which is a specialised cell.



Suggest the function of each of the sections of the sperm cell.

- (i) head

(2)

- (ii) middle piece

(2)

- (iii) tail

(1)

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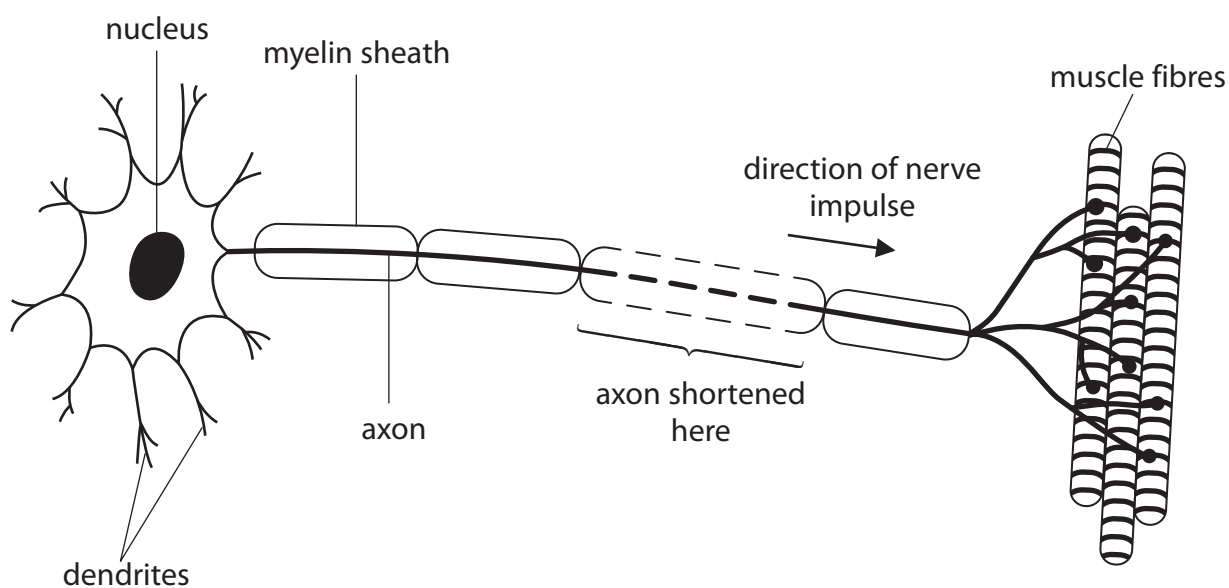
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(b) The diagram shows a motor neurone, which is another specialised human cell.



Suggest two ways in which the structure of the motor neurone is adapted for its function.

(2)

1 .....

2 .....

(Total for Question 6 = 7 marks)

**TOTAL FOR PAPER = 60 MARKS**



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