WJEC GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B3 HIGHER TIER 0243 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0243/02

SCIENCE
HIGHER TIER
BIOLOGY 3

A.M. MONDAY, 28 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**6**	
3.	**3**	
4.	**5**	
5.	**6**	
6.	**10**	
7.	**6**	
8.	**8**	
Total	**50**	

0243
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

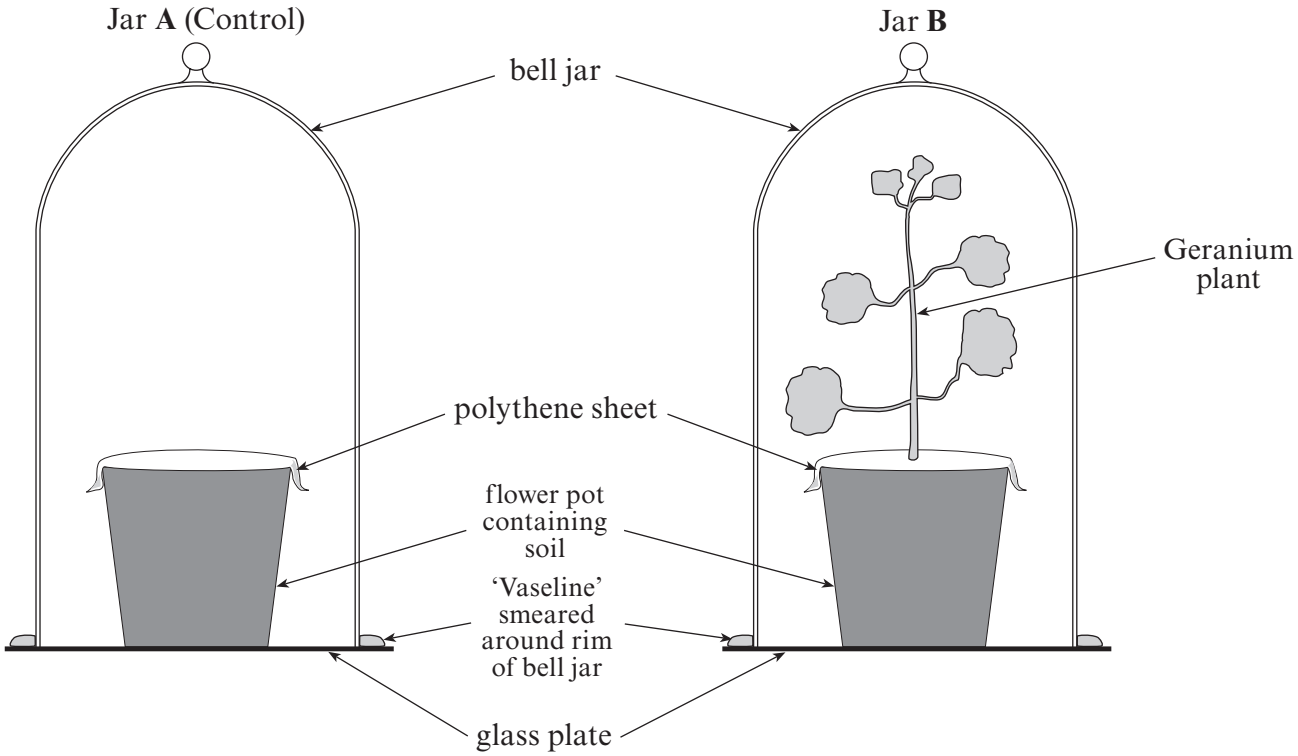
The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.

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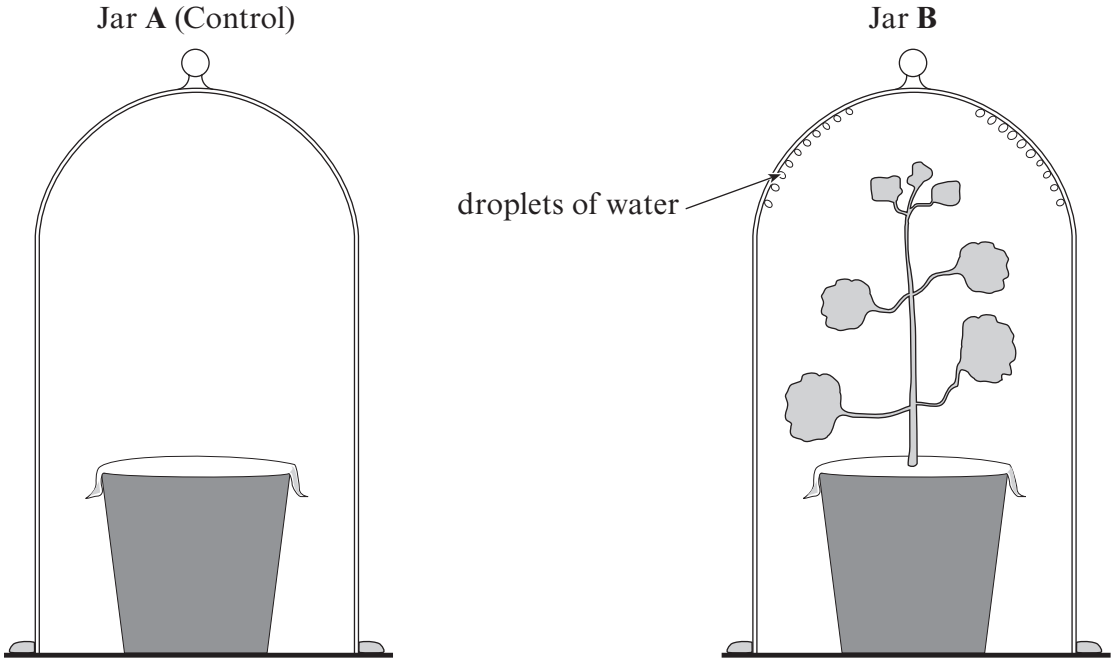
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Answer **all** *questions.*

1. Bethan and Alun set up the following experiment and left it for 24 hours.



After 24 hours the jars were examined. Droplets of water had developed on the inside of Jar **B**. No droplets of water were found on the inside of Jar **A**.



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(a) (i) Explain why droplets of water appear on the inside of jar **B**. [2]

.....

.....

.....

.....

(ii) State the purpose of the control jar **A**. [1]

.....

(iii) Suggest why

I. the soil in both jars **A** and **B** was covered with polythene; [1]

.....

II. the rims of both jars **A** and **B** were smeared with 'Vaseline' petroleum jelly. [1]

.....

(b) Name the vessels which transport water in plants. [1]

.....

6

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2. Bacteria cause milk to go sour. During the souring of milk, the concentration of oxygen in it decreases.

(a) Explain how bacteria affect the concentration of oxygen in milk. [1]

.....

(b) Cows' milk can be treated in two main ways to increase the length of time that it can be stored safely.

- Pasteurisation – milk is heated to 71.7°C for 15 seconds and cooled quickly.
- Ultra Heat Treated (UHT) – milk is heated to 135°C for at least 1 second and cooled quickly.

In an experiment to compare the freshness of different kinds of milk, tubes were set up as shown in the table.

- Equal volumes of milk were added to each tube.
- 1 cm^3 of a blue dye was also added to each tube. The dye changes from blue to pink to white as oxygen decreases in the milk.
- All tubes were kept at 30°C.
- The colour of the dye was recorded every 30 minutes.

	Type of milk in each tube			
Time (min)	UHT	1 day old pasteurised milk	3 day old pasteurised milk	untreated milk
0	blue	blue	blue	blue
30	blue	blue	blue	pink
60	blue	blue	pink	white
90	blue	pink	white	white
120	blue	pink	white	white

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(i) Why were all the tubes treated in the same way? [1]

.....

(ii) Which tube had the greatest number of bacteria after 30 minutes? [1]

.....

(iii) (I) Which milk was the freshest after 120 minutes? [1]

.....

(II) Explain your choice and why it remained freshest. [2]

.....

.....

6

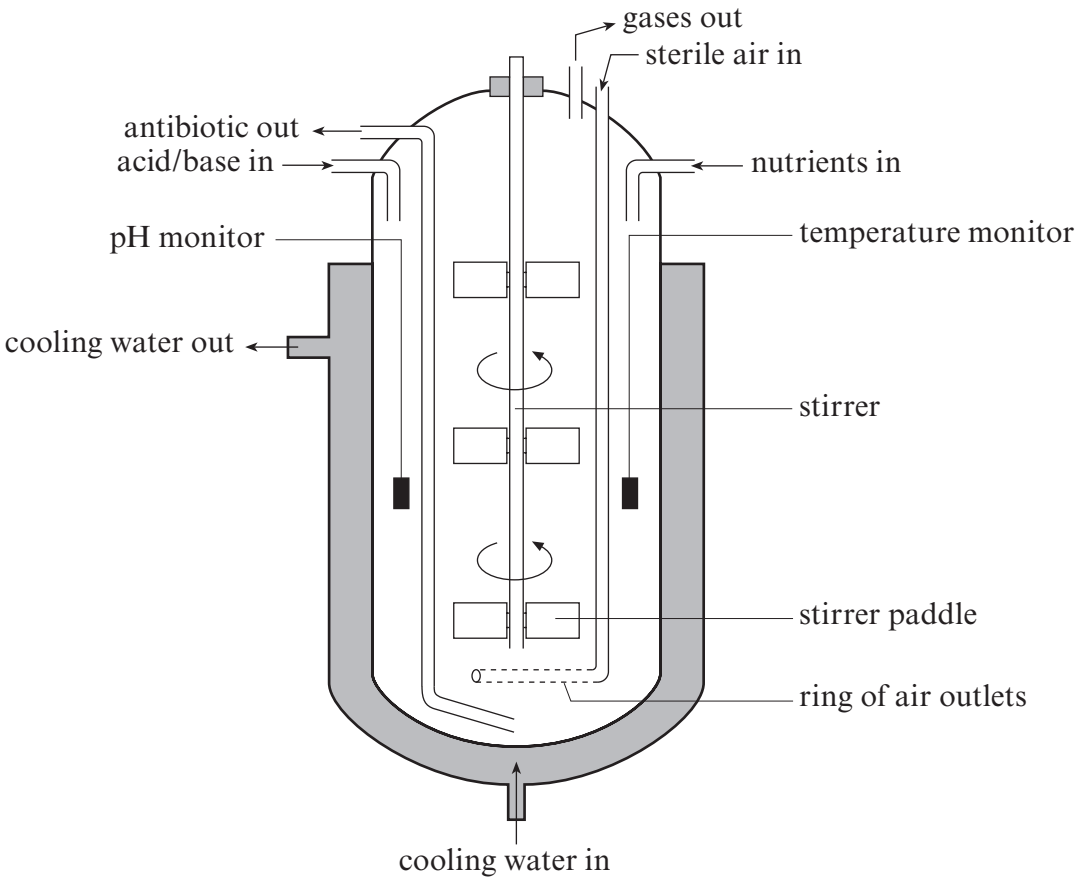
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3. The antibiotic penicillin is produced in large stainless steel fermenters containing a liquid nutrient culture medium in which *Penicillium* is grown.

The diagram shows a fermenter.



(a) (i) Name a nutrient that should be added to the fermenter. [1]

.....

(ii) Why is air pumped into the fermenter? [1]

.....

.....

(b) To which group of living organisms does *Penicillium* belong? [1]

.....

3

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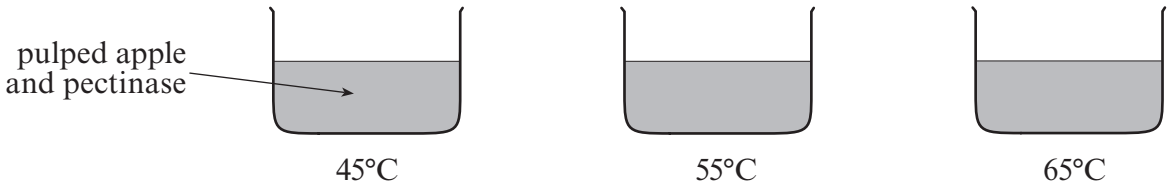
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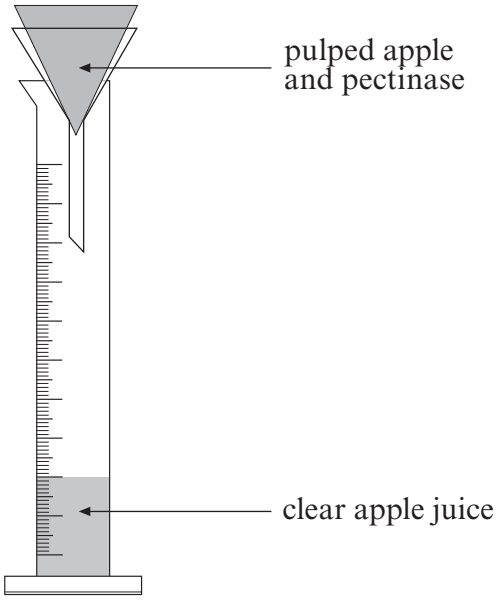
4. The cell walls of fruit, like apples, contain a chemical called pectin which holds the cells together. An enzyme called pectinase can break down the pectin causing the cell walls to breakdown. Pectinase is used in the commercial production of apple juice because it speeds up the extraction of clear fruit juice from the fruit.

The following sequence of diagrams show some of the stages of an experiment using pectinase:

- pectinase was added to equal masses of pulped apple at 3 different temperatures.



- after 30 minutes the pulped apple/pectinase mixture was poured into a filter funnel



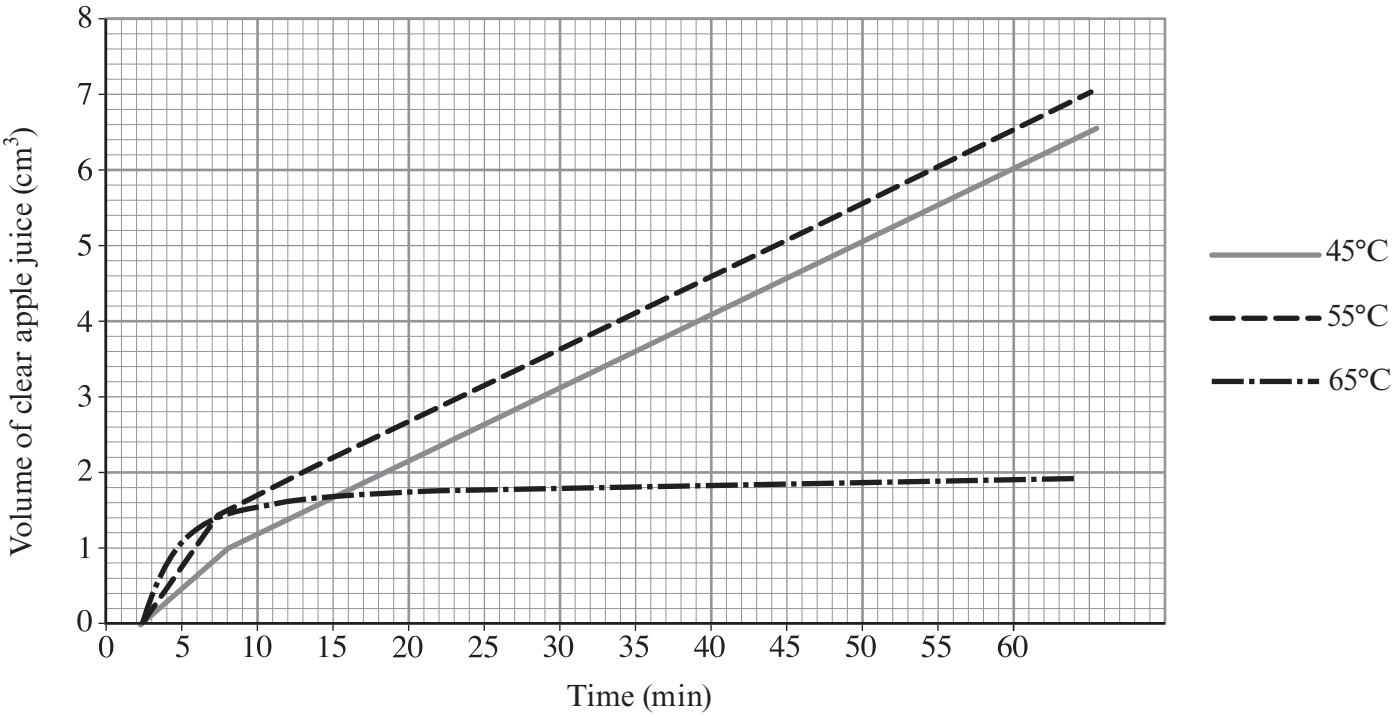
- the volume of clear apple juice collected in the measuring cylinder was recorded every 5 minutes for each temperature.

- the results were plotted on a graph which is shown opposite.

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(a) (i) At which temperature was the greatest volume of clear apple juice produced? [1]

..... °C

(ii) Explain why 65°C produces a low volume of apple juice. [1]

.....

.....

(iii) The optimum temperature for pectinase is 55°C. The 55°C line will eventually level out. Explain why. [1]

.....

(iv) Apart from the mass of pulped apple used, state **one** other factor that must be kept constant during the experiment to make it a fair test. [1]

.....

(b) State **one** *other* **commercial** use of digestive enzymes. [1]

.....

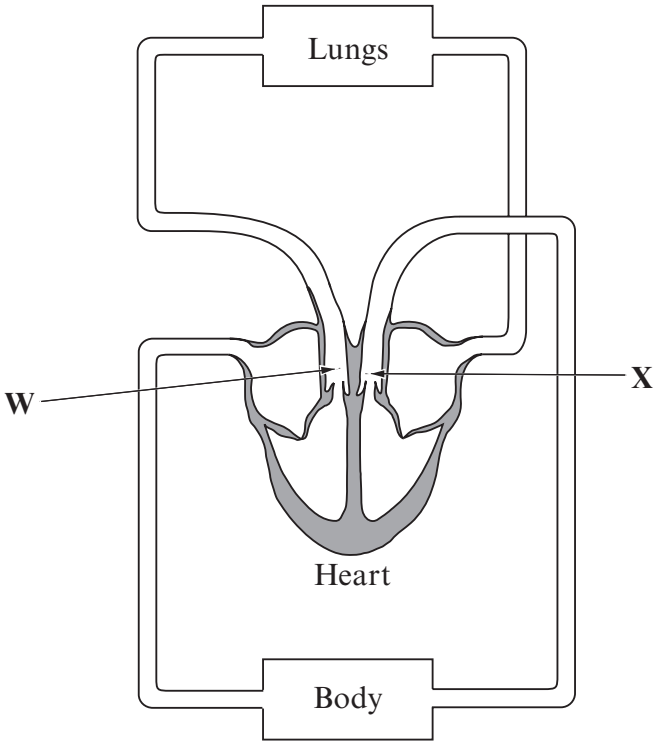
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5. The diagram shows the human circulatory system.



(a) (i) Name the blood vessels labelled: [2]

W .....

X .....

(ii) State **two** differences between the blood in vessels **W** and **X**. [2]

	Blood in vessel **W**	Blood in vessel **X**
1	....	....
2	....	....

(b) Using the diagram only, state whether the ventricles are contracting or relaxing. Explain your answer. [2]

.....

.....

6

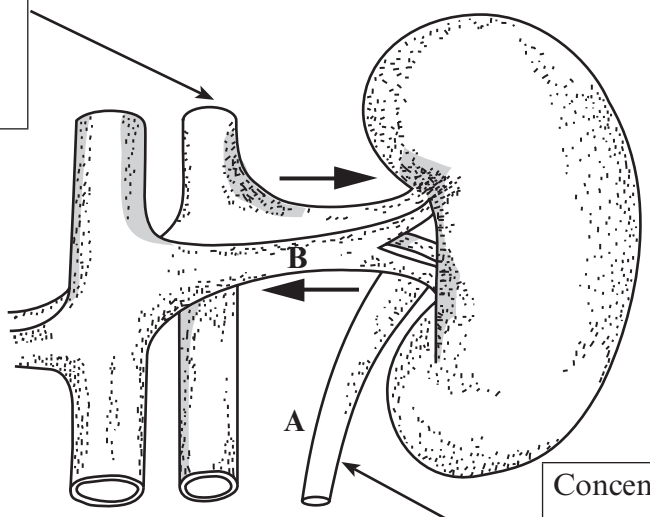
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6. The diagram shows a simplified summary of what happens in a human kidney which is diseased and does not function correctly.

Concentration of substances in blood entering kidney (g/l)	
protein	75.0
urea	0.5
glucose	1.0
salt	9.0



Concentration of substances in urine (g/l)	
protein	10.0
urea	40.0
glucose	1.0
salt	12.0

→ = direction of blood flow

(a) Name parts **A** and **B** shown in the diagram above.

A .....

B ..... [2]

(b) What **two** pieces of evidence in the boxes suggest that the person's kidney is not working properly? [2]

.....

.....

(c) Explain why the concentrations of urea and salt are higher in urine than in the blood. [2]

.....

.....

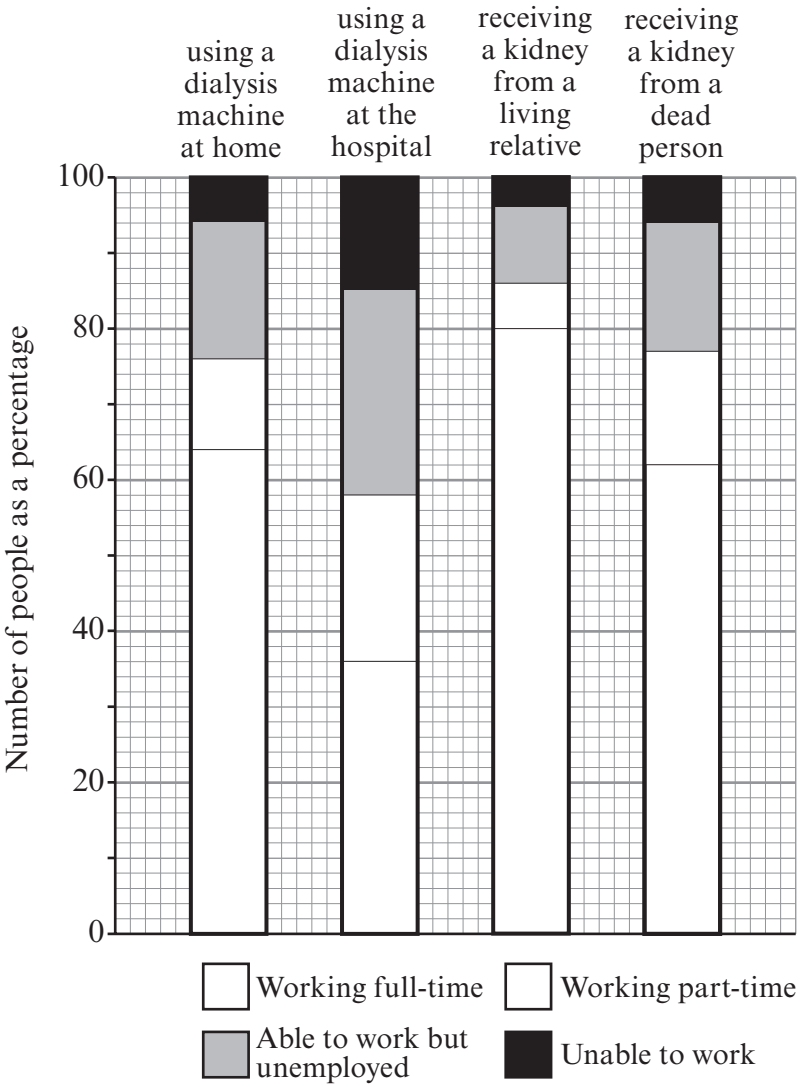
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(d) If a person's kidney fails to work, he or she can be treated either on a dialysis machine, or by having a kidney transplant. The bar-chart below shows a way of comparing the success rates of different treatments.



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(i) From this chart what percentage of people receiving a kidney from a living relative are [2]

I working full time; .....

II working part time? .....

(ii) How does the chart show that receiving a kidney from a living relative is considered to be more successful than treatment with a dialysis machine at a hospital? [1]

.....

.....

(e) Why does a transplant from a living relative have more chance of success than from a living non-relative? [1]

.....

.....

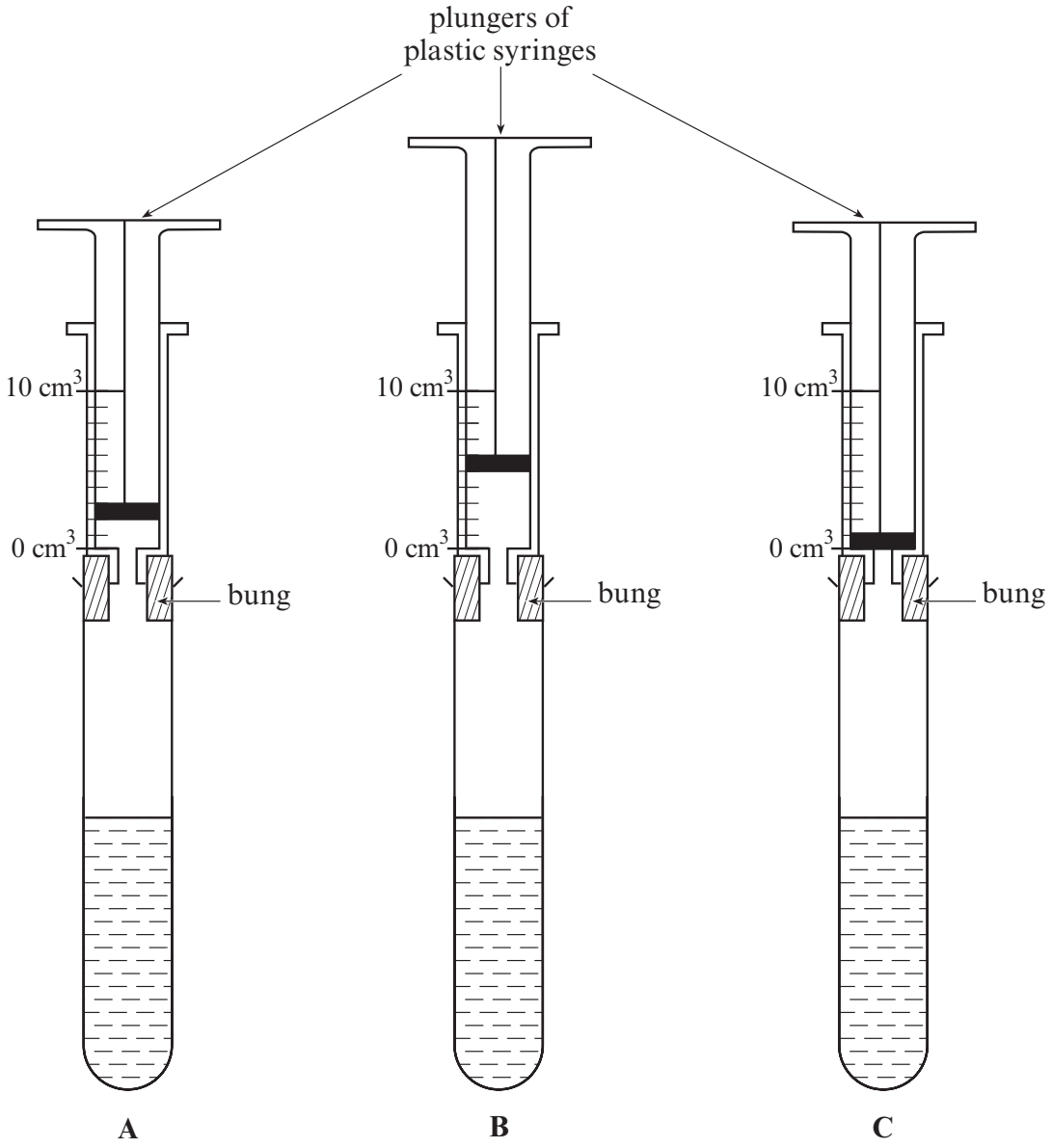
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Turn over.

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7. The apparatus shown in the diagram was set up to investigate the effect of temperature on the rate of fermentation.



A

20 cm^3 distilled water
10 g sugar
0.5 g yeast
5°C

B

20 cm^3 distilled water
10 g sugar
0.5 g yeast
40°C

C

20 cm^3 distilled water
10 g sugar
0.5 g boiled and cooled yeast
40°C

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The plungers in the syringes were set at $0\,cm^3$ in **A**, **B** and **C** at the start. At the end of 30 minutes, the plungers were in the positions shown in the diagrams.

(a) Name the gas produced during fermentation. [1]

.....

(b) Calculate the rate of gas production per minute in **B**. [1]

Answer .....

(c) Explain why gas production would stop in **A** and **B** after 24 hours. [1]

.....

.....

(d) In this investigation, what evidence is there to suggest that enzymes are responsible for fermentation? [2]

.....

.....

(e) State **one** *other* factor which affects the rate of fermentation in yeast. [1]

.....

6

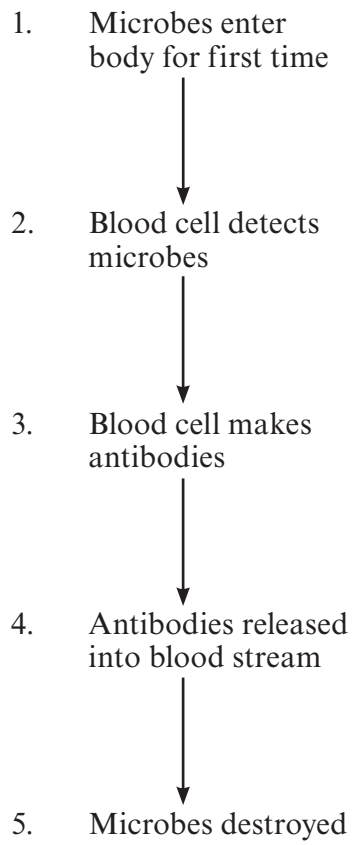
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8. The diagram below shows some of the stages which follow a first infection with disease-causing microbes.



(a) (i) What part do antigens play in the response shown? [2]

.....

.....

.....

.....

(ii) To which group of chemicals do antigens belong? [1]

.....

(b) With a second infection at a later date, a person may show no effect of the disease. Explain why this happens. [2]

.....

.....

.....

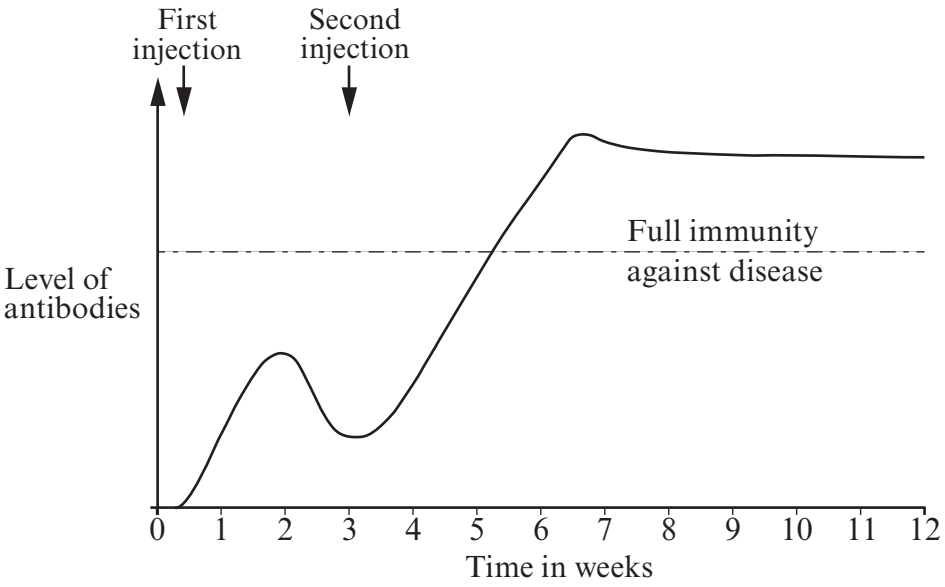
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(c) The graph shows the effect of two injections of a vaccine on the level of antibodies in the blood. The purpose of the injections was to give immunity against a particular disease.



Describe what the graph shows about the effect of the injections. [3]

.....

.....

.....

.....

.....

.....

8

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (LEGACY)

JANUARY 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE SCIENCE - BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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B1 (LEGACY) HIGHER TIER	11
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B3 (LEGACY) MARK SCHEME - JANUARY 2013

FOUNDATION TIER

Question			Marking details	Marks Available
Q.1	(a)	(i)	Kills (unwanted) microbes/bacteria/sterilise the wire;	[1]
			(not: removes microbes/kills germs)	
		(ii)	Keeps microbes away from gel/out/prevent microbes entering;	[1]
		(iii)	Prevents lid being removed/stop dish being opened;	[1]
			(not: keeping microbes out)	
	(b)	(i)	Plotting correct (+/- 0.5 square) -1 per error;	[2]
			Line drawn with ruler joining centre of plots;	[1]
		(ii)	138 (not: if ^{o}C);	[1]
		(iii)	Grow faster at 25 ^{o}C than at 15 ^{o}C;	[1]
	(c)		Slows/prevents growth/multiplication of bacteria;	[1]
			(not: kills bacteria/less bacteria)	
			Question Total	**[9]**

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Question		Marking details	Marks Available
Q.2 (a)	A;		1
	C;		1
	B;		1
	C;		1
	B;		1
		Question Total	**[5]**

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Question			Marking details		Marks Available
Q.3	(a)	(i)	**X** aorta;		[1]
			Y atrium;		[1]
		(ii)	**DACB**;		[1]
	(b)	(i)	Capillary;		[1]
		(ii)	Oxygen; Carbon dioxide; Diffusion;		[3]
				Question Total	**[7]**

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Question			Marking details			Marks Available
Q.4	(a)		Cortex	**L**;		[1]
			Medulla	**K**;		[1]
			Pelivis	**M**;		[1]
	(b)	(i)	Urea;			[1]
		(ii)	Ureter (correct spelling);			[1]
		(iii)	Bladder;			[1]
		(iv)	Urethra (correct spelling);			[1]
	(c)		Glucose;			[1]
					Question Total	**[8]**

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Question			Marking details	Marks Available
Q.5	(a)	(i)	bacteria;	[1]
		(ii)	methanol (not: a waste material);	[1]
		(iii)	Use of waste material (not: industrial material);	[1]
		(iv)	(good) source of protein;	[1]
		(v)	tasteless / dislike of bacteria; (allow: grown on industrial waste)	[1]
	(b)		Food substance <u>produced quickly;</u> (not: fast food/ref. large amounts)	[1]
			Question Total	**[6]**

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B3

FOUNDATION & HIGHER TIER

Question				Marking details	Marks Available
Q.6/1	(a)	(i)		water vapour lost from leaves (plant)/stomata/ water vapour lost by transpiration; not water; allow: water evaporates from leaves)	[1]
				(water vapour) condenses (on inside of bell jar);	[1]
		(ii)		to show the water (vapour) comes from the plant or converse; (not: to make it a fair test/ref. control/ref. soil/compare observations)	[1]
		(iii)	I	to prevent water evaporating/being lost from the soil/ to prevent soil water affecting the environment / evaporation;	[1] [1]
			II	to prevent air entering/leaving the bell jar/to prevent water vapour in the outside air affecting the environment.; (allow ref. airtight; not: seal the jar/ref. oxygen)	[1]
	(b)			xylem;	[1]
				Question Total	**[6]**

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Question				Marking details	Marks Available
Q.7/2	(a)			Oxygen used by the bacteria for respiration/bacteria respire;	[1]
	(b)	(i)		Fair test;	[1]
		(ii)		Untreated (milk);	[1]
		(iii)	I	UHT;	[1]
			II	It had the <u>most</u> amount of oxygen/oxygen not used up;	[1]
				(not: ref colour)	
				therefore the least number of/no bacteria;	[1]
				(not: ref. enzymes)	
				Question Total	**[6]**

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Question			Marking details	Marks Available
Q.8/3	(a)	(i)	glucose/sugar/amino acids/mineral salt/named salt/minerals;	[1]
		(ii)	to provide oxygen for respiration/mixing; (not: stirring/reference to fermentation)	[1]
	(b)		fungi/moulds;	[1]
			Question Total	**[3]**

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B3

HIGHER TIER

Question			Marking details	Marks Available
Q.4	(a)	(i)	55 (^{o}C);	[1]
		(ii)	enzymes are denatured/destroyed/destroyed (not: killed);	[1]
		(iii)	{substrate/pulped} apple used up/all juice extracted/all pectin broken down/maximum working of pectinase; (not: reference to limiting factor unqualified)	[1]
		(iv)	pH/volume/concentration of enzyme/variety or type of apple; (not: amount/quality/temperature)	[1]
	(b)		pre-digestion of baby foods/biological washing powers/cheese making/soft centred chocolates/lactose free milk (not: beer making);	[1]
			Question Total	**[5]**

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Question			Marking details	Marks Available
Q.5	(a)	(i)	**W** - pulmonary artery;	[1]
			X - aorta;	[1]
		(ii)	Both sides of table needed, matched statements per row;	[2]
			W deoxygenated/**X** is oxygenated	
			(allow: ref. CO_2/less or more O_2; not: no O_2)	
			W lower pressure/**X** higher pressure or ref. more/less	
			comparative statements (not: ref. colour)	
	(b)		contracting;	[2]
			Because valves between atria and ventricles closed / values	
			at start of arteries or semi-lunar values are open;	
			(not: valves are open) (linked marks)	
			Question Total	**[6]**

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Question			Marking details	Marks Available
Q.6	(a)		**A** ureter (accurate spelling);	[1]
			B renal vein;	[1]
	(b)		Presence of protein ()not: ref. less);	[1]
			into the blood;	[1]
	(c)		Water has been reabsorbed/removed;	[1]
			into the blood;	[1]
	(d)	(i)	I 80;	2
			II 6;	
		(ii)	More people are able to work (full time)/ORA;	[1]
		(iii)	Relatives will have similar tissue types/ genes/DNA/less chance of rejection; (not: similar blood groups)	[1]
			Question Total	**[10]**

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Question		Marking details	Marks Available
Q.7	(a)	$CO_{2;}$	[1]
	(b)	0.166/0.17 cm per min, units needed (not: $1/6^{th}$);	[1]
	(c)	Glucose/sugar used up; (not: yeast used up)	[1]
	(d)	Increase in temperature; causes increase in rate/speeds up/more gas produced; Boiling {destroys / denatures} enzyme / boiling kills yeast;	[2]
	(e)	pH/substrate conc/CO_2 conc/enzyme conc/type of yeast/type of sugar/O_2 present not: ref. pressure/ref. amount/conc yeast)	[1]
		Question Total	**[6]**

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Question			Marking details		Marks Available
Q.8	(a)	(i)	antigens on microorganism; cause antibody production (not: triggers immune system); by white cells;	2 from 3	[2]
		(ii)	protein;		[1]
	(b)		Memory cells (produced);		[1]
			Antibodies produced very quickly/rapid response/immediately;		[1]
	(c)		After 1st injection antibodies increase (then decrease);		[1]
			After 2nd injection antibodies increase longer/higher;		[1]
			go above level needed for full immunity		[1]
				Question Total	**[8]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0243/02

SCIENCE
HIGHER TIER
BIOLOGY 3

A.M. TUESDAY, 15 May 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**7**	
2	**5**	
3	**3**	
4	**5**	
5	**5**	
6	**8**	
7	**6**	
8	**4**	
9	**7**	
Total	**50**	

0243
020001

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You are reminded of the necessity for good English and orderly presentation in your answers.

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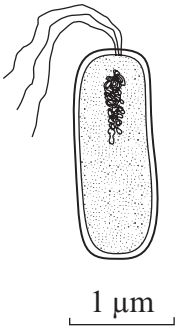
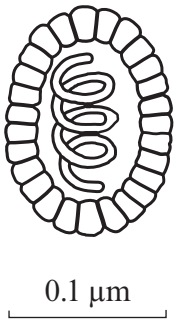
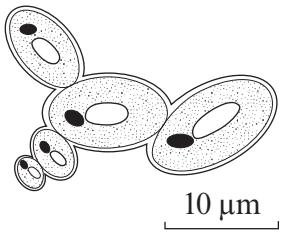
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Answer **all** *questions.*

1. The table below shows diagrams of three different types of micro-organisms **A**, **B** and **C**.

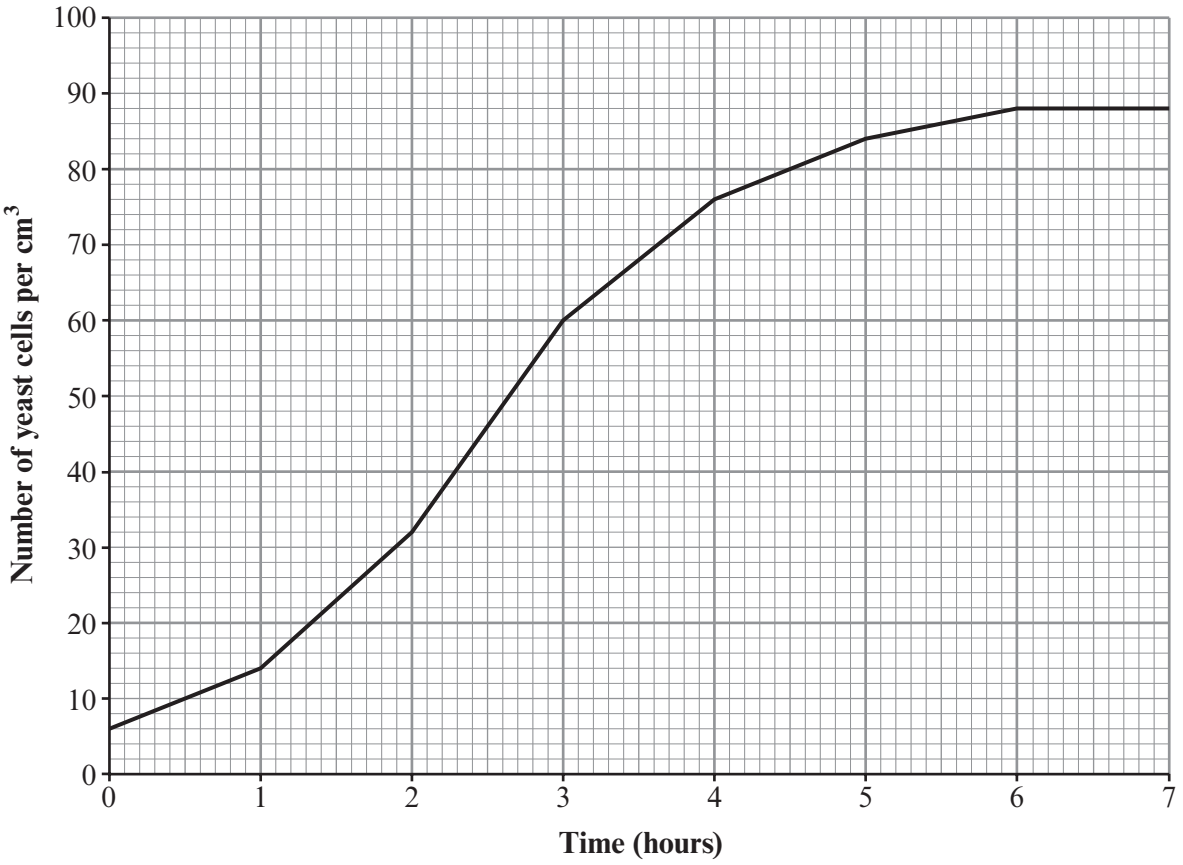
(a) Complete the table by writing in the name and features of each type of micro-organism. [3]

	Micro-organism		
	A	**B**	**C**
Drawing of micro-organism			
Name of type of micro-organism	.....	.....	.....
Outer coat	cell wall	.....	cell wall
Reproduction	.....	inside other cells	by budding
Nucleus	no distinct nucleus	no nucleus	.....

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(b) The graph below shows the growth of yeast cells over a 7 hour period. The yeast cells were grown in a sugar solution and kept at 35°C throughout the experiment. At the end of each hour 1 cm^3 of test solution was extracted and the number of yeast cells were counted using a microscope.



(i) Between which times was the yeast growing at its fastest rate? [1]
Circle the correct answer.

0 - 1 hours 2 - 3 hours 5 - 6 hours

(ii) Suggest **one** reason why the growth of yeast cells slows down. [1]

.....

.....

(iii) Why was the temperature kept at 35°C? [1]

.....

(c) State **one** use of yeast in the food industry. [1]

.....

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2. Biological washing powders contain enzymes. A student carried out an investigation using both biological and non-biological washing powders.

Four white T-shirts were stained with egg yolk which is mainly fat. Each of the T-shirts were treated as follows:

A



Wash with biological washing powder at 35°C

B



Wash with biological washing powder at 60°C

C



Wash with non-biological washing powder at 35°C

D



Wash with non-biological washing powder at 60°C

After the wash the percentage of stain remaining on each of the T-shirts is shown in the table below:

T-shirt	Percentage of stain remaining (%)
A	0
B	68
C	79
D	0

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(a) State **two** factors, other than time, which should be kept constant in this investigation. [2]

(i) .....

(ii) .....

(b) From this investigation, what conclusion can be drawn about the effectiveness of **biological** washing powders? [1]

.....

.....

(c) Give **one** advantage of using biological washing powder over a non-biological one. [1]

.....

.....

(d) State the type of enzyme found in the **biological** washing powder, which digested the egg yolk. [1]

.....

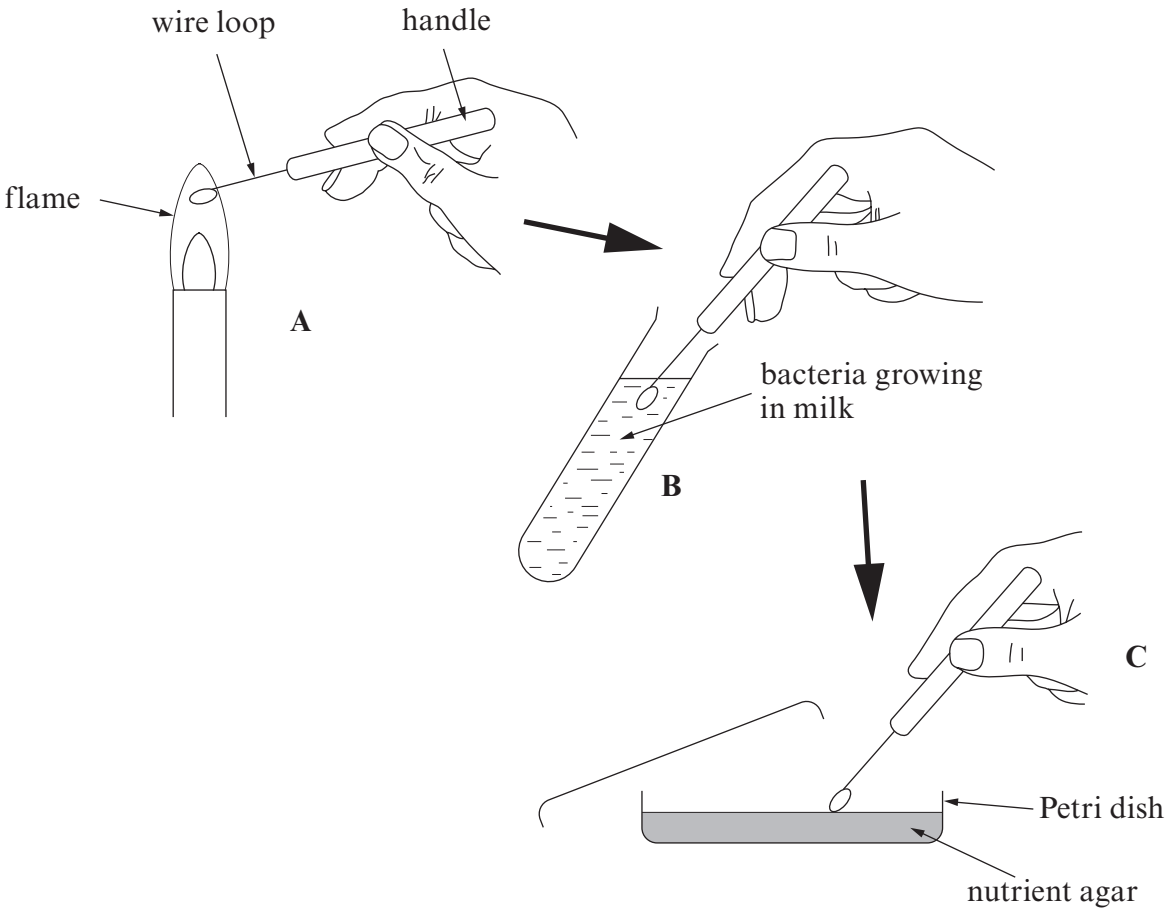
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3. The diagrams below show some of the steps used when growing bacteria in a laboratory.



(a) Why is the wire loop placed in the flame? [1]

.....

(b) For safety reasons, what must happen to the Petri dish immediately after the lid is replaced in stage **C**? Explain why this is done. [2]

.....

.....

.....

.....

3

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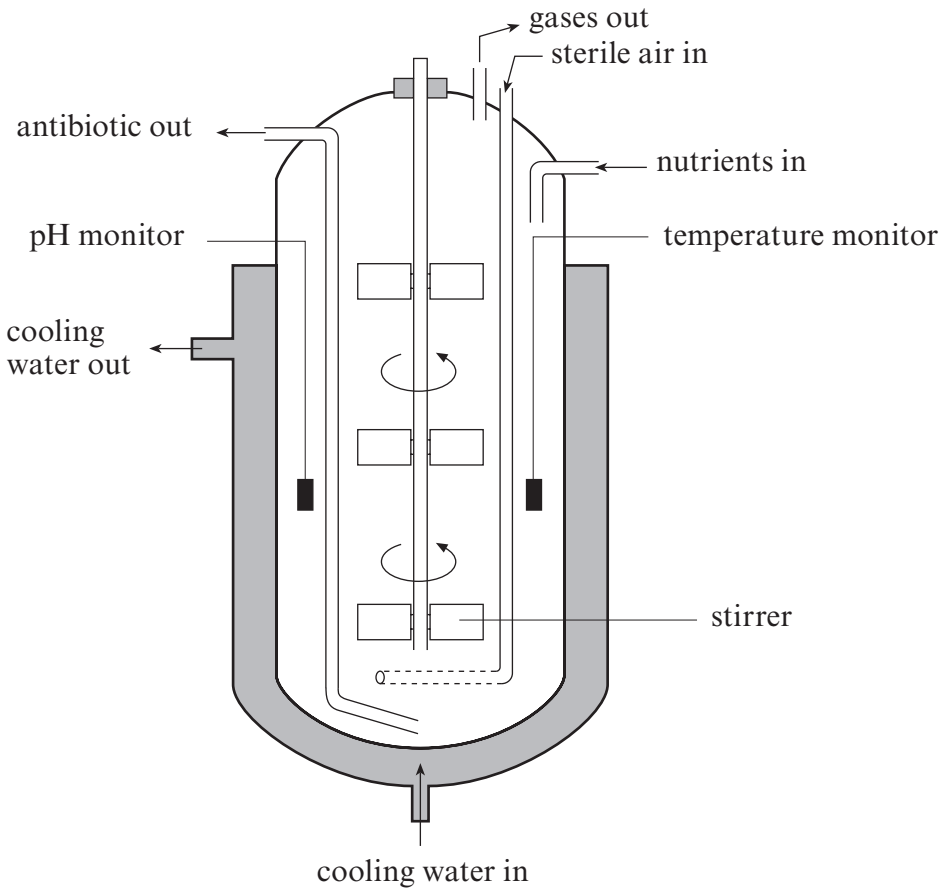
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4. The diagram below shows a fermenter used to produce the antibiotic penicillin.



(a) Explain why the air entering the fermenter must be sterile. [1]

.....

.....

(b) From the diagram suggest how the temperature of the fermenter is controlled. [2]

.....

.....

.....

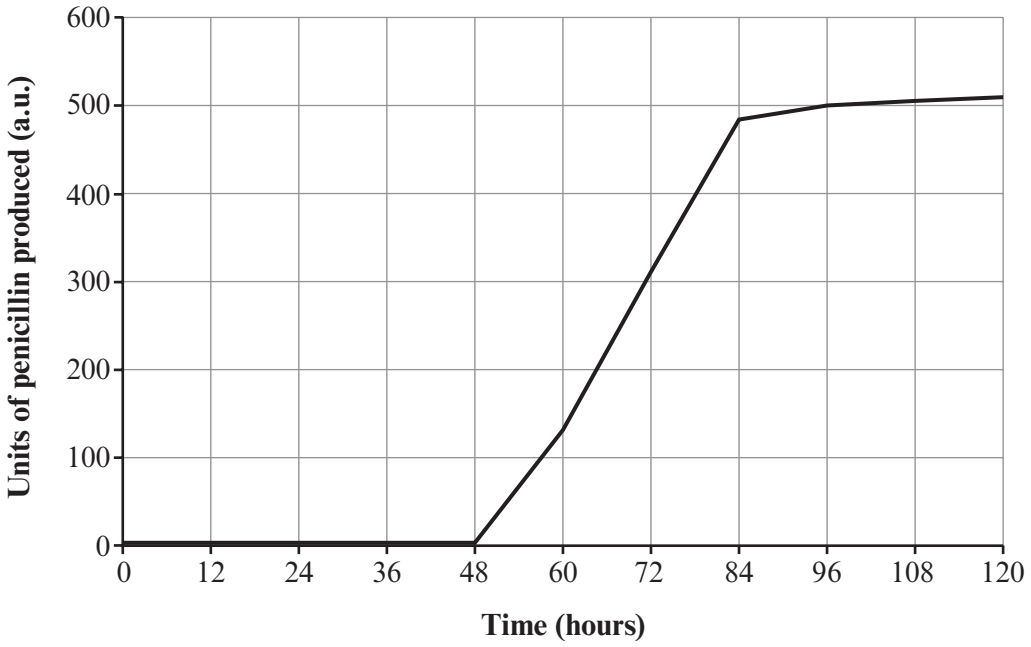
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(c) The graph below shows the production of penicillin in a fermenter.



(i) Use the graph to suggest at what time the penicillin should be removed from the fermenter to obtain the highest yield in the **shortest** time. [1]

..... hours

(ii) State the name of the organism that produces penicillin. [1]

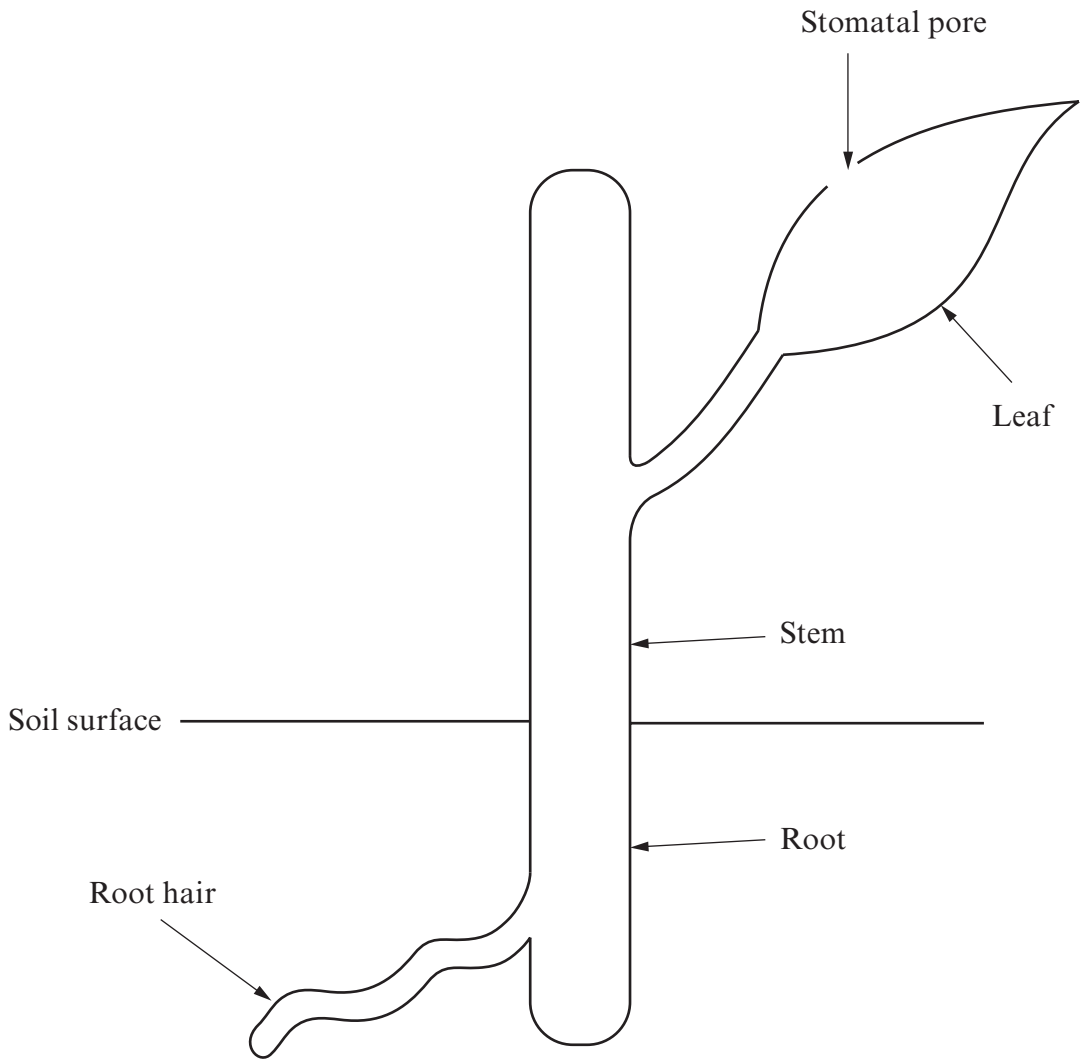
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5. The diagram below shows a simplified plant.



(a) Draw a single continuous arrow through the whole plant to show the pathway taken by water as it travels from the **soil** to the **air**. [1]

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(b) Describe and explain how the movement of water takes place through the plant, from the **soil** to the **air**. [4]

.....

.....

.....

.....

.....

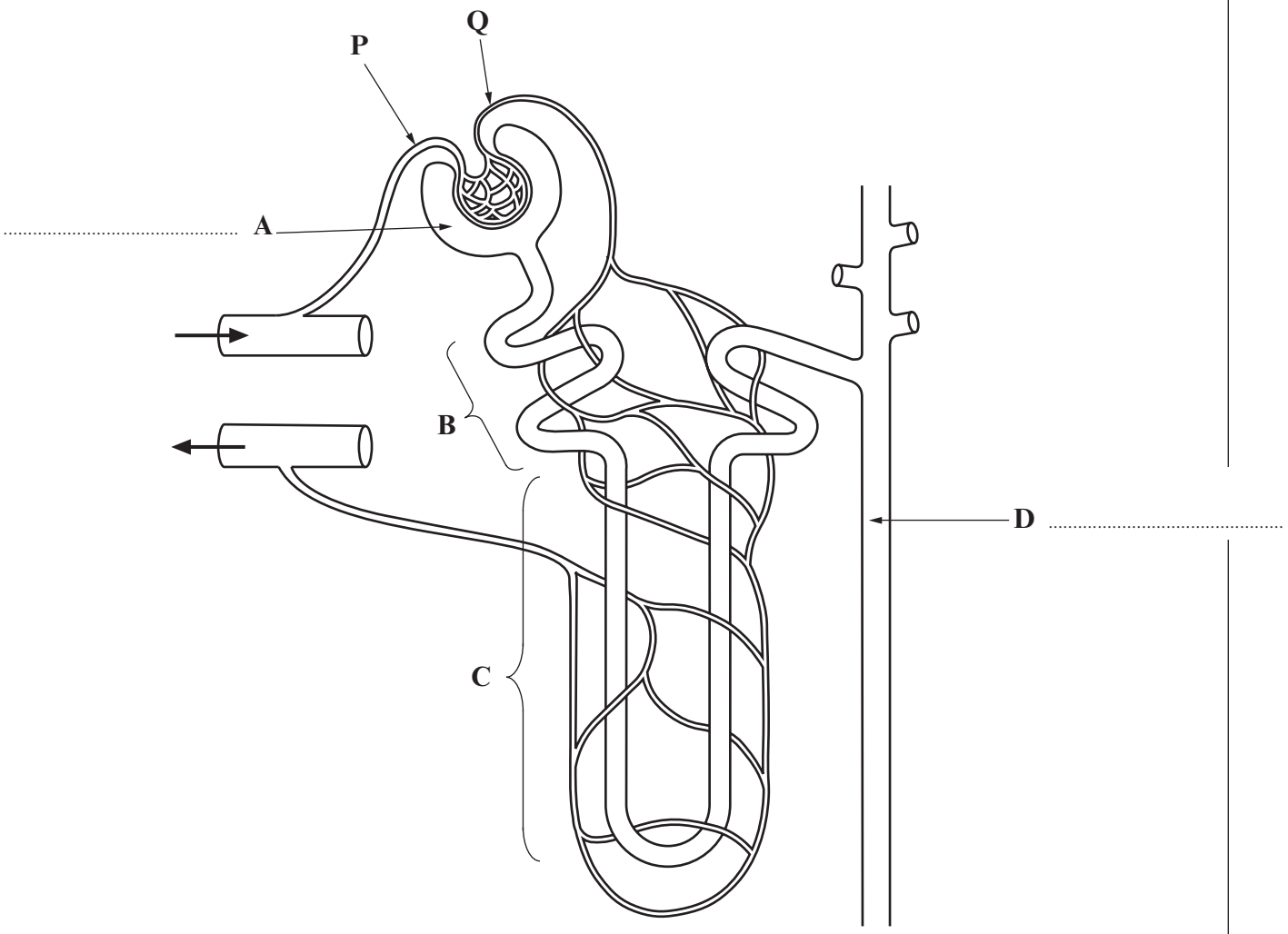
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6. *(a)* The diagram below shows a kidney tubule.



(i) Label parts **A** and **D**. [2]

(ii) Explain the advantage of part **P** being wider in diameter than part **Q**. [2]

.....

.....

.....

(iii) Name the liquid found in part **D**. [1]

.....

(iv) Explain why protein is not found in part **A** of the tubule in a healthy kidney. [1]

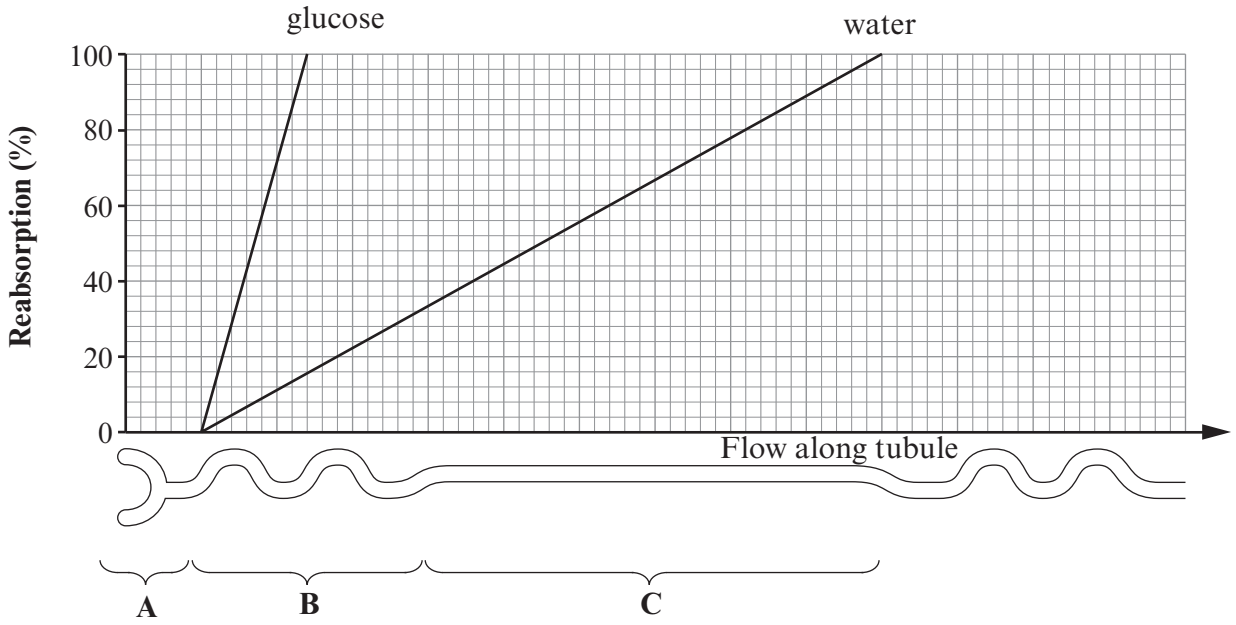
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(b) The graph below shows the changes in composition of the liquid as it flows along the tubule.
The diagram below the graph shows a kidney tubule that has been straightened.



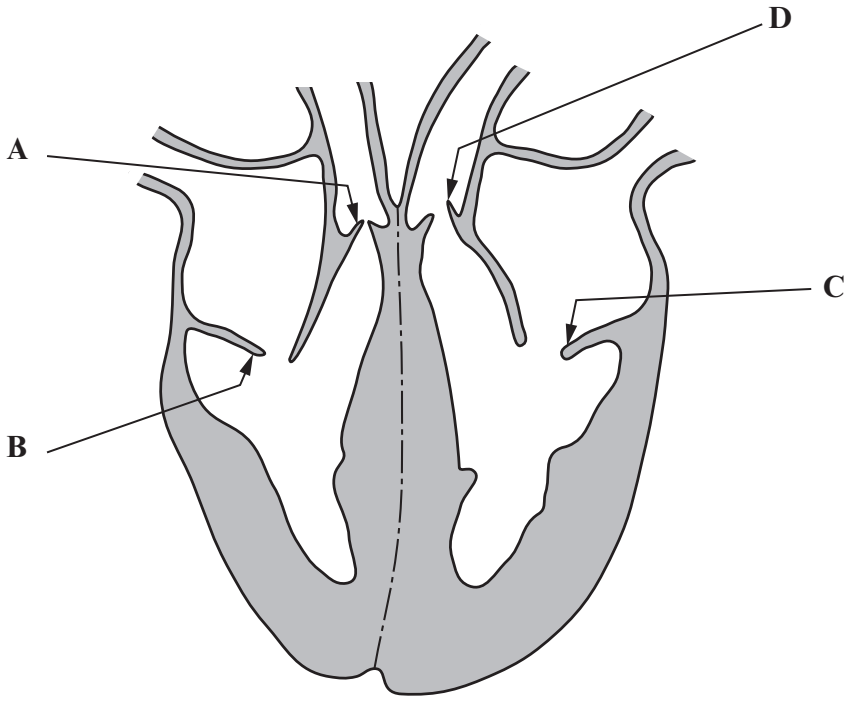
Using the graph and diagram, write letters, **A**, **B** or **C** in the following table to show in which parts of the tubule each process takes place. [2]

Process	Part of tubule (**A**, **B** or **C**)
Most selective reabsorption of glucose.	
Most water reabsorption.	

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7. The diagram below shows a section through the heart with its valves labelled **A**, **B**, **C** and **D**.



(a) On the diagram label:

(i) the pulmonary vein; [1]

(ii) the vena cava. [1]

(b) On the diagram, draw arrows to show the direction of blood flow in the pulmonary artery and the aorta. [2]

(c) Underline the correct statement in (i) and (ii) below.

(i) When the pressure in the ventricles is highest the valves: [1]

I. **A** and **D** are open and **B** and **C** are closed;

II. **A** and **B** are open and **D** and **C** are closed;

III. **B** and **C** are open and **A** and **D** are closed;

IV. **C** and **D** are open and **A** and **B** are closed.

(ii) When the pressure in the ventricles is lowest the valves: [1]

I. **A** and **B** are closed and **D** and **C** are open;

II. **B** and **C** are closed and **A** and **D** are open;

III. **A** and **D** are closed and **B** and **C** are open;

IV. **C** and **D** are closed and **A** and **B** are open.

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8. In the 20th century it was believed that the virus that caused squirrel pox killed **all** red squirrels that became infected.
In 2008 new evidence suggested that the red squirrel was becoming immune to the virus.

(a) 500 red squirrels were examined and it was found that 8 had been infected by the virus but were not killed by it.
What evidence did the scientists look for in the blood of the eight surviving squirrels to prove that they had been infected by the virus? [1]

.....

.....

(b) (i) What name do we give to the protein in the virus that triggered the immune response? [1]

.....

(ii) Name the type of cells in the squirrel's immune system that responded to this protein. [1]

.....

(c) Research is taking place to develop a vaccine that can be fed to red squirrels so that they develop immunity to the squirrel pox virus.
Name the cells that would have to remain in the body to produce immunity if the vaccine were to be successful. [1]

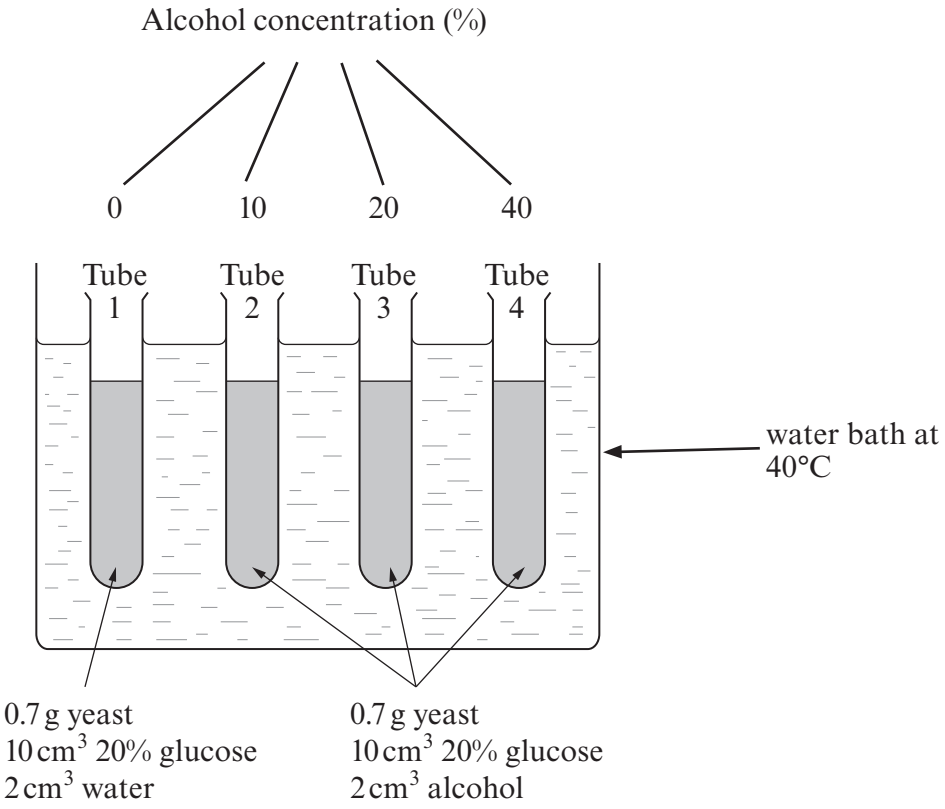
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9. During fermentation, yeast uses glucose and produces carbon dioxide and alcohol.
Carbon dioxide dissolves in water to produce carbonic acid.
The effect of different concentrations of alcohol on the activity of yeast was investigated using the following apparatus.



The pH of the contents of each test tube was measured after 1 minute, then after 10 minutes.

The results are shown in the table below:

Tube	Alcohol concentration (%)	pH at start	pH at 10 min
1	0	7	4
2	10	7	5
3	20	7	6
4	40	7	7

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(a) Explain the results

(i) in tube 2; [3]

.....

.....

.....

(ii) in tube 4. [3]

.....

.....

.....

(b) What could you conclude about the effect of increasing concentrations of alcohol on yeast? [1]

.....

THERE ARE NO MORE QUESTIONS IN THIS EXAMINATION.

7

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (LEGACY)

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT B3 (LEGACY)

FOUNDATION TIER

Question			Marking details	Marks Available
1.	(a)		Red (blood) cell; White (blood) cell; Platelet; Plasma;	4
	(b)	(i)	Capillary;	1
		(ii)	{Named substances/ substances} {diffuse/ pass} {through/ in/ out} OR less distance for diffusion; Allow reference to white blood cells passing through Allow exchange of materials NOT diffusion unqualified or Blood passing through If use named substance must be in correct direction	1
	(c)		Artery/ arteries;	1
			Question total	**[7]**

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Question				Marking details	Marks Available
2.	(a)			Ureter; Bladder; Urethra; SPELLING correct	3
	(b)	(i)	I	Eat normally/ not a strict diet / <u>only</u> one hospital visit/ fewer hospital visits; NOT you can have a operation	1
			II	No drugs;	1
		(ii)	I	Low blood pressure / vomiting;	1
			II	Rejection;	1
	(c)			(Measures to encourage) <u>more</u> donors/ make donation compulsory;	1
	(d)			Urea/ <u>excess</u> water/ <u>excess</u> salt;	1
				Question total	**[9]**

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Question			Marking details	Marks Available
3.	(a)		Day 2 = 37/38/39 Day 3 = 52 (both correct for 1 mark);	1
	(b)		Three correct bars (height and position and labelled 1,2,3);;	2
			3 bars correct = 2 marks	
			2 bars correct = 1 marks	
			0/1 bars correct = 0 marks	
	(c)	(i)	Consistent with bar chart (allow e.c.f.) (should be B);	1
		(ii)	C;	1
			Largest/ Highest at day 1;	1
			OR first bar is the highest	
	(d)		Prevents entry of {unwanted/ other} {micro-organisms/ bacteria/ microbes/ fungi/ viruses} (from the air)/ prevent exit of bacteria; NOT to prevent contamination unqualified NOT reference to germs/ pathogens	1
	(e)	(i)	Cannot kill viruses;	1
		(ii)	Resistance/ Bacteria become immune (accept MRSA); NOT disease or patient becomes {immune/ resistant}/ the bacteria start to fight it/ germs becoming resistant	1
			Question total	**[9]**

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FOUNDATION / HIGHER TIER

Question		Marking details	Marks Available
4.	(a)	Bacteria;	1
		27-33(^{o}C);	1
		Protein;	1
	(b)	{Prevents / slows} {bacterial growth/ reproduction}. NOT kills bacteria	1
	(c)	Any one from Bread and yeast; {Mycoprotein/ Quorn} and fungus; {Single Cell Protein/ Pruteen} and bacteria; Cheese and fungus; Cheese and bacteria;	1
		Question total	**[5]**

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Question			Marking details	Marks Available
5.	(a)		3/ 4 correct = 3 marks;;; 2 correct = 2 marks 1 correct = 1 mark	3 max
	(b)	(i)	Nitrate / potassium / phosphate/ calcium/ magnesium; NOT nitrogen/ phosphorus	1
		(ii)	Support / prevent wilting/ keeps cells turgid/ photosynthesis NOT carries minerals	1
			Question total	**[5]**

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Question	Marking details	Marks Available

6/1 (a) (i)

	A	B	C
Drawing of micro-organism			
Name of type of micro-organism	**Bacterium/ Bacteria**	**Virus**	**Yeast/ Fungi**
Outer Coat		**Protein**	
Reproduction	**Divide/ split in two NOT asexual reproduction / mitosis**		
Nucleus			**Yes/ nucleus**

3

1 mark is awarded for **each correct column**;;;

(b) (i) 2-3 hours; 1

(ii) Sugar being {used up/ decreases}/ less sugar available/ sugar solution is becoming less concentrated; 1
NOT sugar has run out/ no sugar left

(iii) Optimum or best temperature {<u>for yeast growth</u>/ <u>for yeast to work/ for fermentation</u>}; 1

(iv) Bread making / brewing / winemaking or any other correct answer; 1
NOT bread alone or baking unqualified

Question total **[7]**

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Question		Marking details	Marks Available
7/2	(a)	Any **two** from: (Same) {amount/ size/ volume/ area} of {egg stain/ egg/ stain}; (Same) {size/ material / brand/ type} of T-shirts/ use 4 identical t shirts; (Same) {volume/ concentration} of washing powder used/ same pairs of washing powder; NOT amount (Same) washing machine used/ same program/ same time. NOT pH	2
	(b)	Biological washing powders work {better/ best / are more effective} {at 35^{o}C / lower temperatures} (ORA); Biological washing powders work better than non-biological powders at 35^{o}C or lower temperature/ ORA; Credit can be given for any other correct conclusion/ must imply comparison.	1
	(c)	reference to: less {energy / electricity} used /financial {cost / savings/ more economical/ more cost effective};	1
	(d)	Lipase;	1
		Question total	**[5]**

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Question		Marking details	Marks Available
8/3	(a)	{Destroy or kill} {bacteria / micro-organisms}/ to sterilise it; NOT denature/ get rid of bacteria/ sanitise	1
	(b)	Lid must be {sealed/ secured (with tape)};	1
		To prevent entry of other micro-organisms / prevent exit of {micro-organisms/ pathogens};	1
		Question total	**[3]**
		Foundation tier total	**50**

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HIGHER TIER

Question			Marking details	Marks Available
4.	(a)		To prevent the entry of {micro-organisms or named micro-organims}(which could kill the yeast / contaminate Penicillin / culture.);	1
	(b)		Temperature monitor {measures/ takes temperature}; And {controls / adjusts} the {rate of movement/ flow of / temperature of }cooling water;	2
	(c)	(i)	84 hours;	1
		(ii)	Penicillium; Correct spelling, (allow lower case p)	1
			Question total	**[5]**
5.	(a)		Single arrow (or many small arrows) starting at the soil, through root hair and passing out the stomatal pore.	1
	(b)		Any **four** of the following points. Water enters root hair by osmosis; Water vapour lost through transpiration/ through stomata; Creates a pull/ draws water up; moves water up the xylem.	Max 4
			Question total	**[5]**

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Question			Marking details	Marks Available
6.	(a)	(i)	**A** Bowman's capsule; Allow Bowmens **D** Collecting duct; NOT collection duct	2
		(ii)	The pressure of blood is increased/ builds up pressure/ causes high pressure; NOT for pressure for ultrafiltration/ to increase filtration/ forces out small molecules or named molecules;	2
		(iii)	Urine;	1
		(iv)	{Molecules/ particles} too big {to pass through filter or capillary knot/ to be filtered/ to pass into Bowman's capsule};	1
	(b)		B; C;	2
			Question total	**[8]**

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Question			Marking details	Marks Available
7.	(a)		Correct labels ;;	2
	(b)		Both arrows leaving heart;;	2
	(c)	(i)	I;	2
		(ii)	III;	
			Question total	**[6]**

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Question			Marking details		Marks Available
8.	(a)		Presence of antibodies; NOT memory cells (not neutral)		1
	(b)	(i)	Antigen;		1
		(ii)	White <u>blood</u> cells / lymphocytes; NOT phagocytes		1
	(c)		Memory Cells;		1
				Question total	**[4]**

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Question			Marking details	Marks Available
9.	(a)	(i)	Carbon dioxide is produced by respiration; Forms carbonic acid; Lowers pH/ makes it more acid; NOT becomes 5	3
		(ii)	(At 40%) yeast is killed (Not denatured)/ enzymes are denatured by alcohol; No {carbon dioxide/ carbonic acid} produced / no respiration; NOT less respiration pH does not change; ref to lactic acid - negates any marks	3
	(b)		As concentration increases {more yeast is killed/ less respiration/ less carbon dioxide produced/ less carbonic acid produced};	1
			Question total	**[7]**
			PAPER TOTAL	**50**

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Candidate Name	Centre Number	Candidate Number
		0

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GCSE

243/02

SCIENCE BIOLOGY
HIGHER TIER
BIOLOGY 3

P.M. THURSDAY, 19 May 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**4**	
3	**6**	
4	**6**	
5	**4**	
6	**9**	
7	**6**	
8	**10**	
Total	**50**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

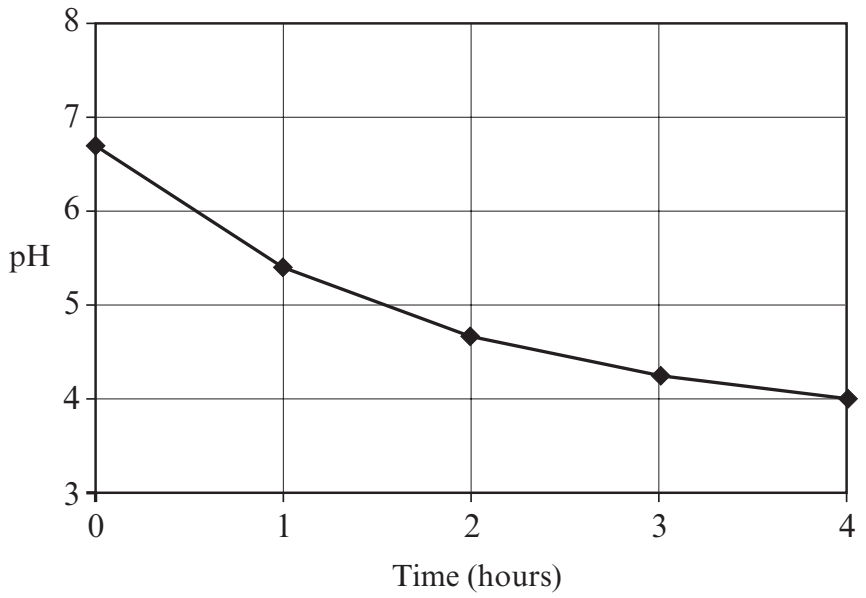
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. During yoghurt making the pH of the milk used in the process changes. The graph below shows these changes over a 4 hour period.



(a) **Describe** the change shown in the graph. [1]

.....

.....

(b) **Explain** how this change in pH is brought about during the yoghurt making process. [3]

.....

.....

.....

.....

(c) State **one** factor that must remain constant during this phase of the yoghurt making process. [1]

.....

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2. Megan was concerned about the high cost of running her washing machine.
She washed some of her baby's egg stained clothes in two different washing powders at 30°C and at 80°C.
Megan's results are shown in the table below.

	Washing powder	
Temperature / °C	*Sudsbright* (non biological)	*SuperBIO* (biological)
30	Egg stains remaining	No egg stains
80	No egg stains	Egg stains remaining

(a) Explain the results for *SuperBIO* at

(i) 30°C; [2]

.....

.....

.....

(ii) 80°C. [1]

.....

.....

(b) Which washing powder would you recommend that Megan uses? Explain your answer. [1]

.....

.....

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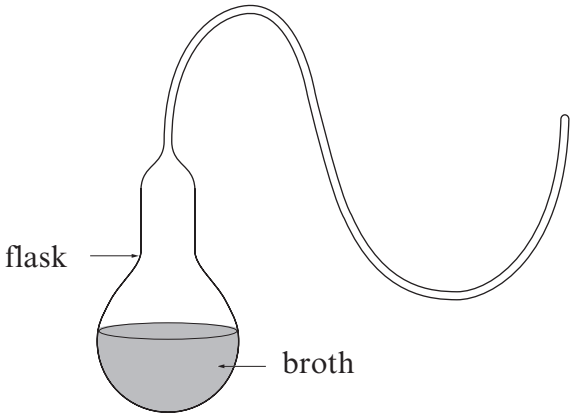
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3. The diagram shows the apparatus used by a famous scientist in the 19th Century to disprove the theory of spontaneous generation.

(a) What is meant by the term *spontaneous generation*? [1]

.....

.....



(b) (i) Name the flask shown above. [1]

.....

(ii) Name the famous scientist, who used the apparatus above, to disprove the theory of, spontaneous generation. [1]

.....

(c) When the above apparatus was used, the contents of the flask were boiled and the neck of the flask was sealed.

(i) State why the contents of the flask were boiled. [1]

.....

(ii) State why the neck of the flask was sealed. [1]

.....

(d) Some of the sealed flasks were opened in a room full of people and were left there for 8 hours. Other sealed flasks were opened on the top of a mountain and left for the same amount of time. Both sets of flasks were then sealed and returned to the laboratory. After 3 days the contents of the flasks were examined.
State **one** difference you would expect to see between the two sets of flasks. [1]

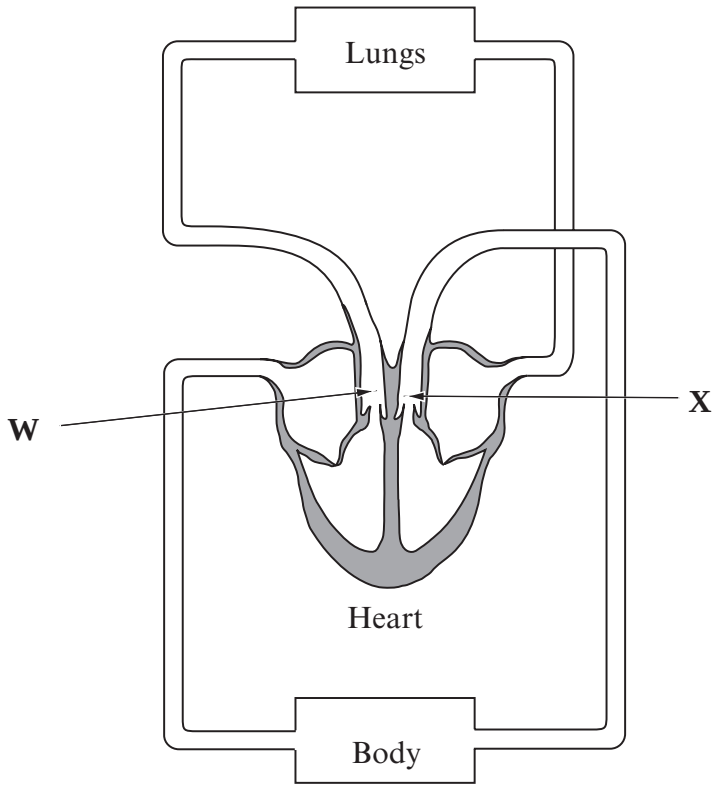
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4. The diagram shows the human circulatory system.



(a) (i) Name the blood vessels labelled: [2]

W .....

X .....

(ii) State **two** differences between the blood in vessels **W** and **X**. [2]

	Blood in vessel **W**	Blood in vessel **X**
1	....	....
2	....	....

(b) Using the diagram only, state whether the ventricles are contracting or relaxing. Explain your answer. [2]

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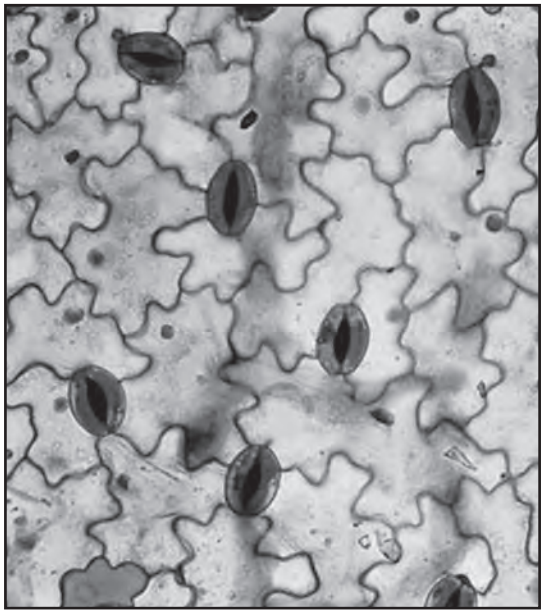
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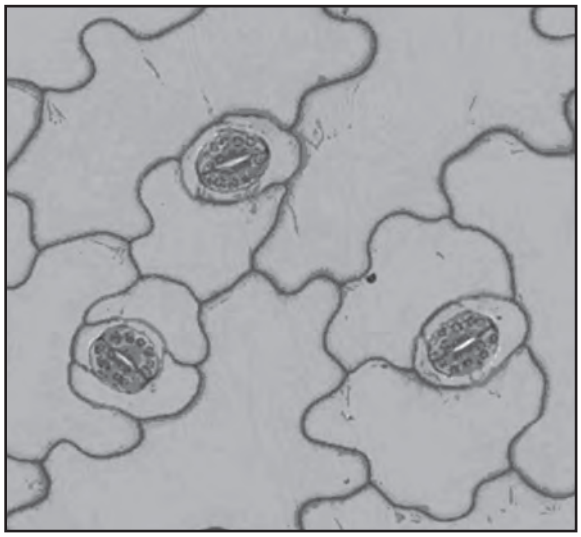
5. Students investigated the distribution of stomata on the lower surface of a leaf from two different plants, **A** and **B**.
The students viewed the leaves under the microscope. Both images were viewed under the same magnification and occupied the same surface area.

Leaf from plant **A**



Google Images

Leaf from plant **B**



© Image by John Adds

(a) Using an arrow, label **one** of the guard cells in the leaf from plant **B**. [1]

(b) Suggest which of the plants is better adapted to living in a dry environment. Explain your answer. [2]

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(c) Stomata can open and close. Explain why it is important that they do not remain closed. [1]

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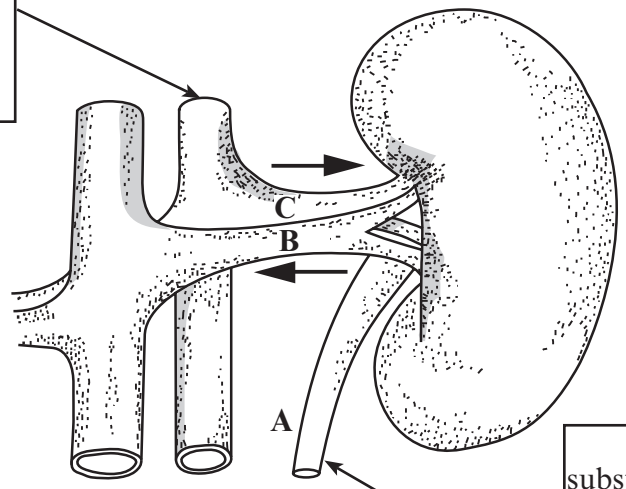
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6. The diagram shows a simplified summary of what happens in a human kidney which is diseased and does not function correctly.

Concentration of substances in blood entering kidney (g per 1)	
protein	75.0
urea	0.5
glucose	1.0
salt	9.0



Concentration of substances in urine (g per 1)	
protein	10.0
urea	40.0
glucose	1.0
salt	12.0

→ = direction of blood flow

(a) Name **A** .....

B .....

C ..... [3]

(b) What **two** pieces of evidence in the boxes suggest that the person's kidney is not working properly? [2]

.....

.....

(c) Explain why the concentrations of urea and salt are higher in urine than in the blood. [2]

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(d) A diseased kidney may be replaced by a healthy one by transplanting one from a donor to a recipient.
State the most important precaution that has to be taken

(i) before the transplant takes place; [1]

.....

.....

(ii) after the transplant has taken place and the surgery has been completed. [1]

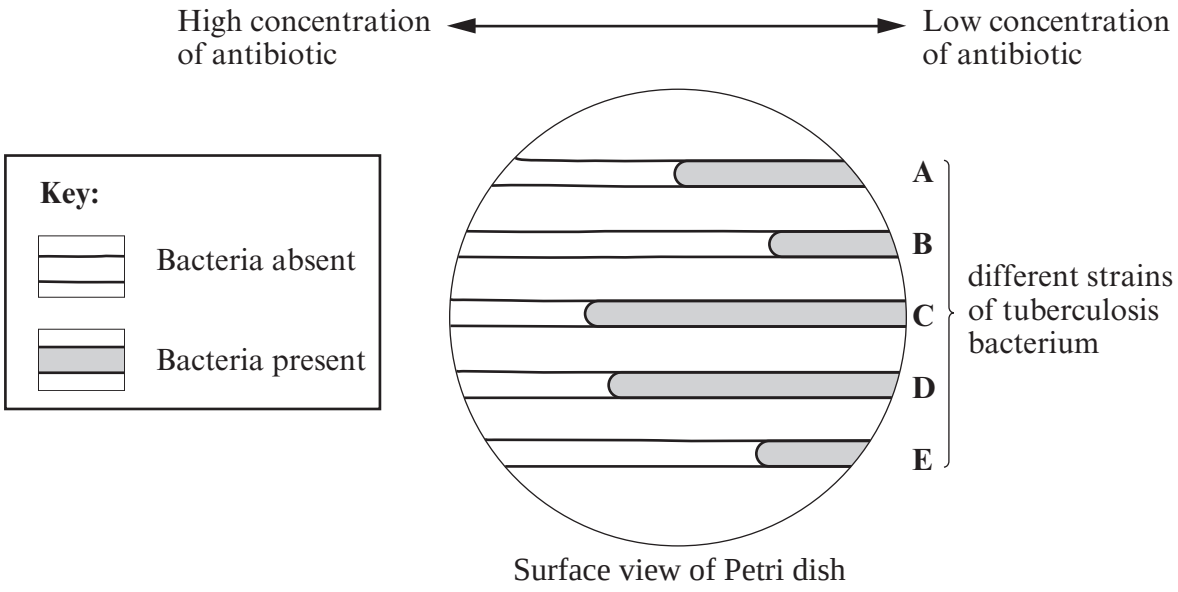
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7. A scientist investigated how effective an antibiotic was in treating five different strains of the bacterium which causes tuberculosis.
She prepared an agar plate with a concentration gradient of the antibiotic.
She then spread the different strains of the bacterium across the agar plate in 5 different lines labelled **A** to **E**. The plate was incubated at 37°C for 12 hours.



(a) Which strain is the most resistant to the antibiotic? Explain your answer. [2]

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.....

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(b) Explain how resistance to antibiotics has evolved in bacteria which infect humans. [4]

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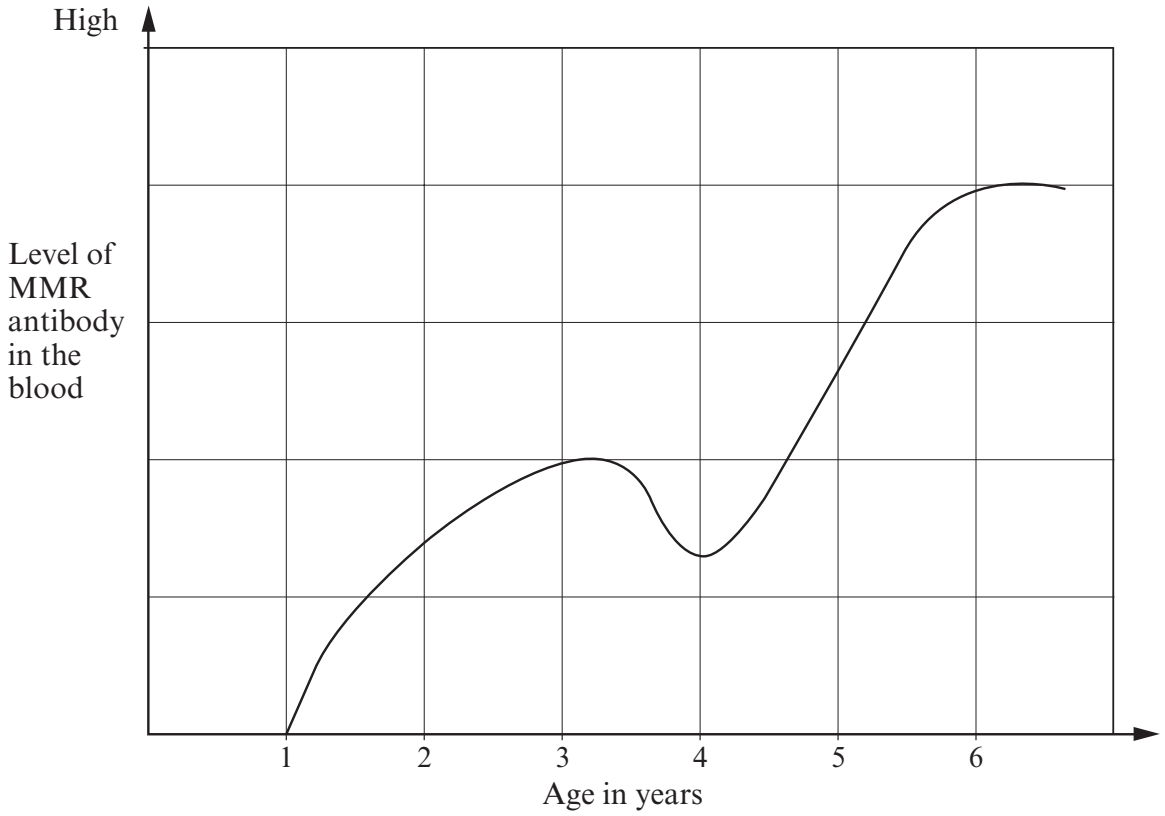
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8. Different types of vaccine are used to protect people against different diseases. Some vaccines are made using the microbes which cause the disease.

The graph below shows the level of antibodies in the blood of a child vaccinated against mumps, measles, and rubella (MMR).



(a) Use the graph to

(i) state the **two** ages when the MMR vaccinations were given;

..... and ..... [1]

(ii) explain why second (booster) vaccinations are needed. [2]

.....

.....

(b) Describe and explain how a vaccine protects the body from a microbe such as the measles virus. [4]

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(c) An unfounded report stating that the MMR vaccine was a danger to health was published in 2004. After the report was published many parents decided not to have their children vaccinated against MMR. This resulted in an increase in the number of cases of mumps, measles and rubella, as follows:

Date	Number of cases
Jan 2007 - Jan 2008	990
Jan 2008 - Nov 2008	1217

In some countries, vaccination of school children is compulsory.

Make a case

(i) for compulsory vaccination;

.....

.....

.....

.....

(ii) against compulsory vaccination.

.....

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.....

.....

[3]

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