



NAME: _____

DATE: ____ / ____ / ____

TOTAL MARKS: ____ / 99

Some words from TheGOALKeeper®-

- Almost all these questions have been taken from past papers and are an excellent way to master each topic.
- This should be used as an aid to your revision and not be your primary revision tool.

1. Plants need chemical energy for respiration and for active transport.

- (i) Write a balanced chemical equation which represents the process of respiration in plants

_____ (2)

- (ii) Describe the process of active transport in the root hair cells of plants.

(3)

(Total 5 marks)

2. The table shows the number of chromosomes found in each body cell of some different organisms.

Animals		Plants	
Species	Number of chromosomes in each body cell	Species	Number of chromosomes in each body cell
Fruit fly	8	Tomato	24
Goat	60	Potato	44
Human	46	Rice	24

- (a) Nearly every organism on earth has an even number of chromosomes in its body cells. Suggest why.

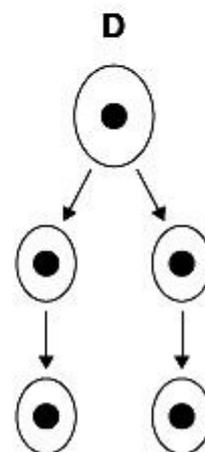
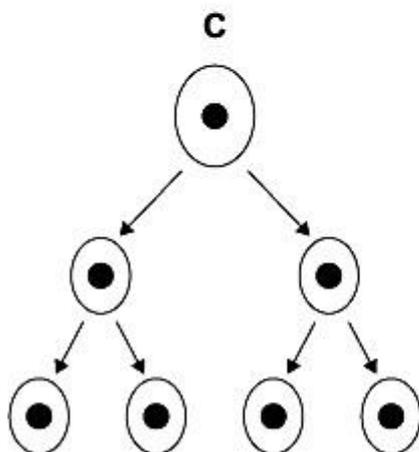
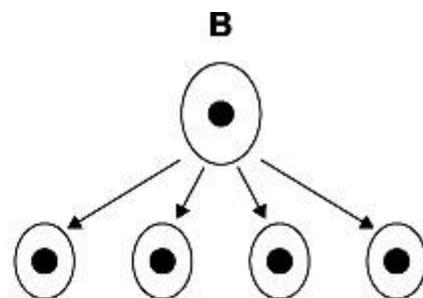
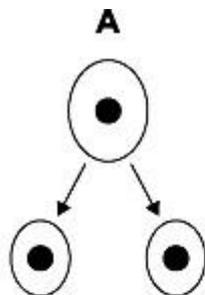
(1)

- (b) Chromosomes contain DNA molecules.
Describe the function of DNA.

(2)

- (c) Gametes are made in the testes by meiosis.

- (i) Look at the diagrams.



Which diagram, **A**, **B**, **C** or **D**, represents how cell division by meiosis

produces gametes in the testes?



(1)

(ii) How many chromosomes will each goat gamete contain?

(1)

(d) Body cells divide by mitosis.

(i) Why is the ability of body cells to divide important?

(1)

(ii) When a body cell of a potato plant divides, how many chromosomes will each of the new cells contain?

(1)

(Total 7 marks)

3. The diagrams show the same cell of a common pond plant.

Diagram A shows the cell in a hypotonic solution.

Diagram B shows the same cell in a hypertonic solution.

Diagram A

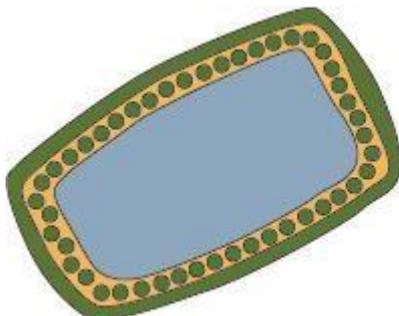
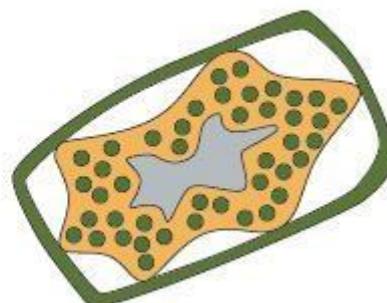


Diagram B



(a) What is a **hypertonic** solution?

(2)

(b) What word is used to describe plant cells placed in:

(i) a **hypotonic** solution

(1)

(ii) a **hypertonic** solution?

(1)

(c) Explain what has happened to the plant cell in **diagram B**.

(4)

(Total 8 marks)

4. A student investigated the effect of different sugar solutions on potato tissue.

This is the method used.

1. Add 30 cm³ of 0.8 mol dm⁻³ sugar solution to a boiling tube.
2. Repeat step 1 with equal volumes of 0.6, 0.4 and 0.2 mol dm⁻³ sugar solutions.
3. Use water to give a concentration of 0.0 mol dm⁻³.
4. Cut five cylinders of potato of equal size using a cork borer.
5. Weigh each potato cylinder and place one in each tube.
6. Remove the potato cylinders from the solutions after 24 hours.
7. Dry each potato cylinder with a paper towel.
8. Reweigh the potato cylinders.

The table below shows the results.

Concentration of sugar solution in mol dm ⁻³	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
0.0	1.30	1.51	0.21	16.2
0.2	1.35	1.50	0.15	X
0.4	1.30	1.35	0.05	3.8
0.6	1.34	1.28	-0.06	-4.5
0.8	1.22	1.11	-0.11	-9.0

- (a) Calculate the value of **X** in the table above.

Percentage change in mass = _____

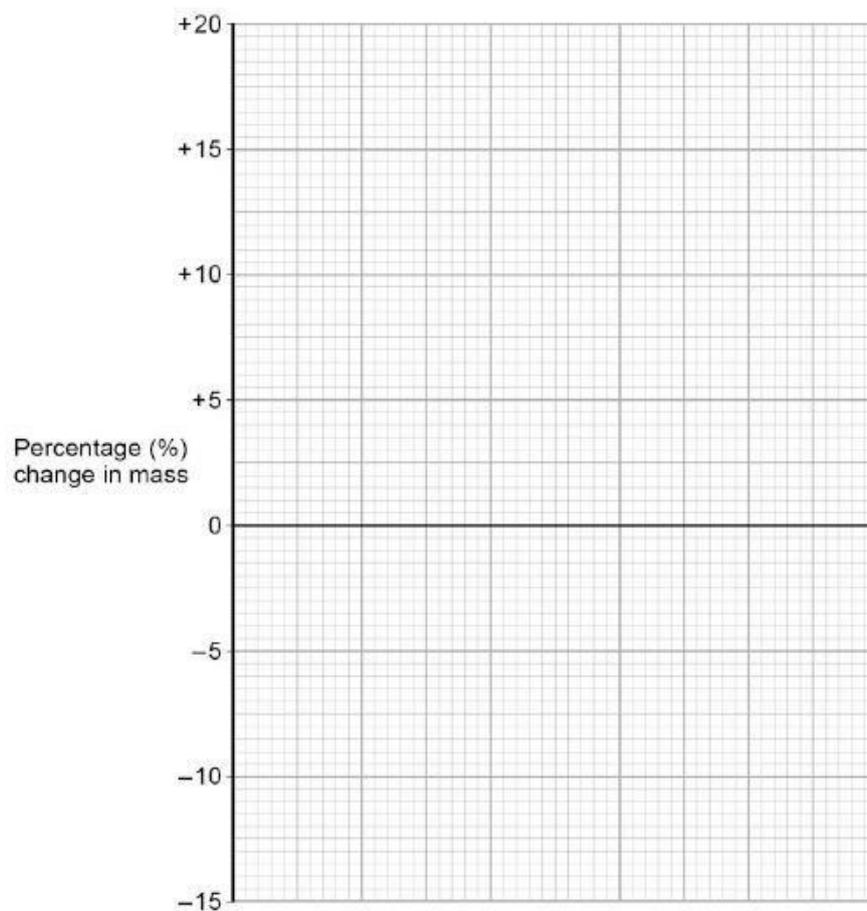
(2)

- (b) Why did the student calculate the percentage change in mass as well as the change in grams?

(1)

- (c) Complete the graph using data from the table above.

- Choose a suitable scale and label for the x-axis.
- Plot the percentage (%) change in mass.
- Draw a line of best fit.



(4)

- (d) Use your graph to estimate the concentration of the solution inside the potato cells.

Concentration = _____ mol dm⁻³

(1)

- (e) The results in the table above show the percentage change in mass of the potato cylinders.

Explain why the percentage change results are positive **and** negative.

(3)

- (f) Suggest **two** possible sources of error in the method given above.

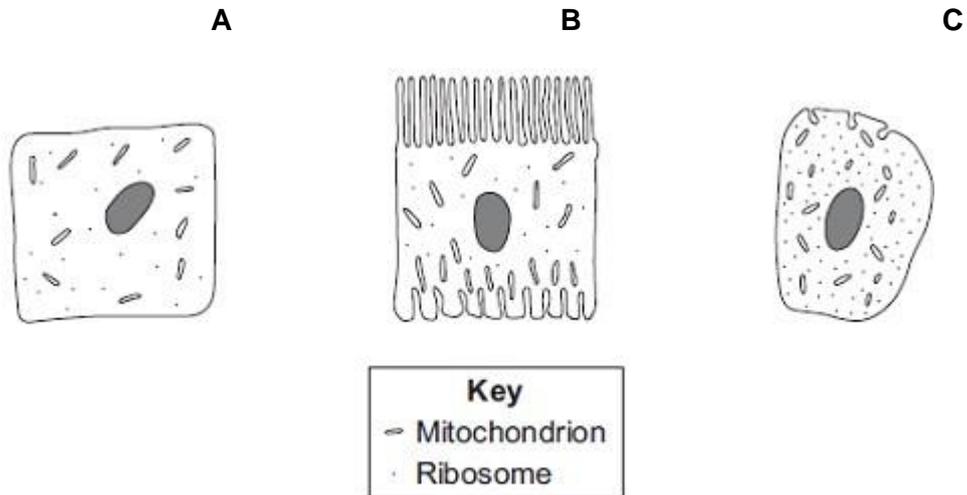
1.

2.

(2)

(Total 13 marks)

5. Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to be best adapted to increase diffusion into or out of the cell?

Give **one** reason for your choice.

(1) (b) (i) Cell **C** is found in the salivary glands.

Name the enzyme produced by the salivary glands.

(1)

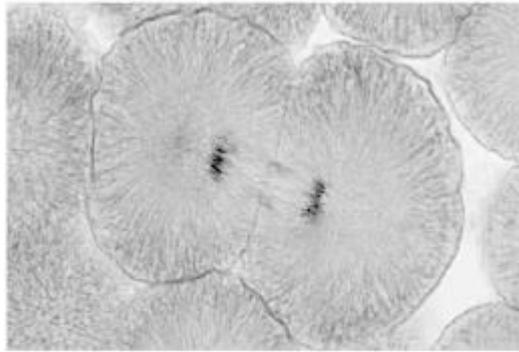
(ii) Use information from the diagram to explain how cell **C** is adapted for producing this enzyme.

(2)
(Total 4 marks)

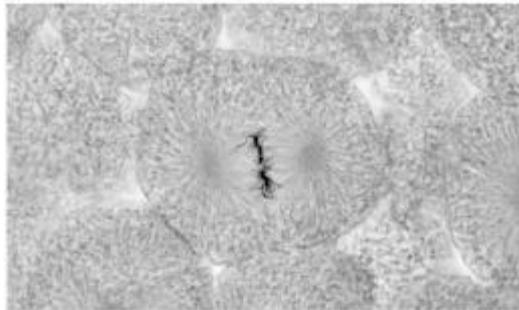
6. Figure 1 shows photographs of some animal cells at different stages during the cell cycle.

Figure 1

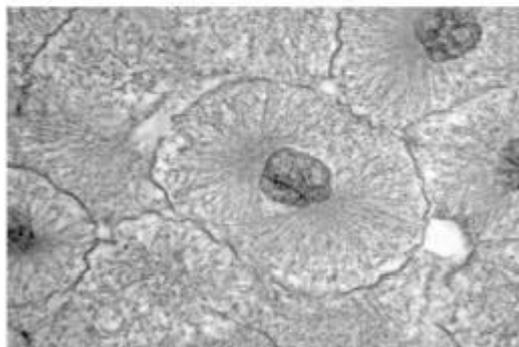
A



B



C



A © Ed Reschke/Photlibrary/Getty Images
B © Ed Reschke/Oxford Scientific/Getty Images
C © Ed Reschke/Photlibrary/Getty Images

- (a) Which photograph in **Figure 1** shows a cell that is **not** going through mitosis?

Tick **one** box.

A B C

(1)

- (b) Describe what is happening in photograph **A**.

- (2) (c) A student wanted to find out more about the cell cycle.

The student made a slide of an onion root tip.

She counted the number of cells in each stage of the cell cycle in one field of view.

The table below shows the results.

	Stages in the cell cycle					Total
	Non-dividing cells	Stage 1	Stage 2	Stage 3	Stage 4	
Number of cells	20	9	4	2	1	36

Each stage of the cell cycle takes a different amount of time.

Which stage is the fastest in the cell cycle?

Give a reason for your answer.

Stage _____

Reason

(2) (d) The cell cycle in an onion root tip cell takes 16 hours.

Calculate the length of time **Stage 2** lasts in a typical cell.

Give your answer to 2 significant figures.

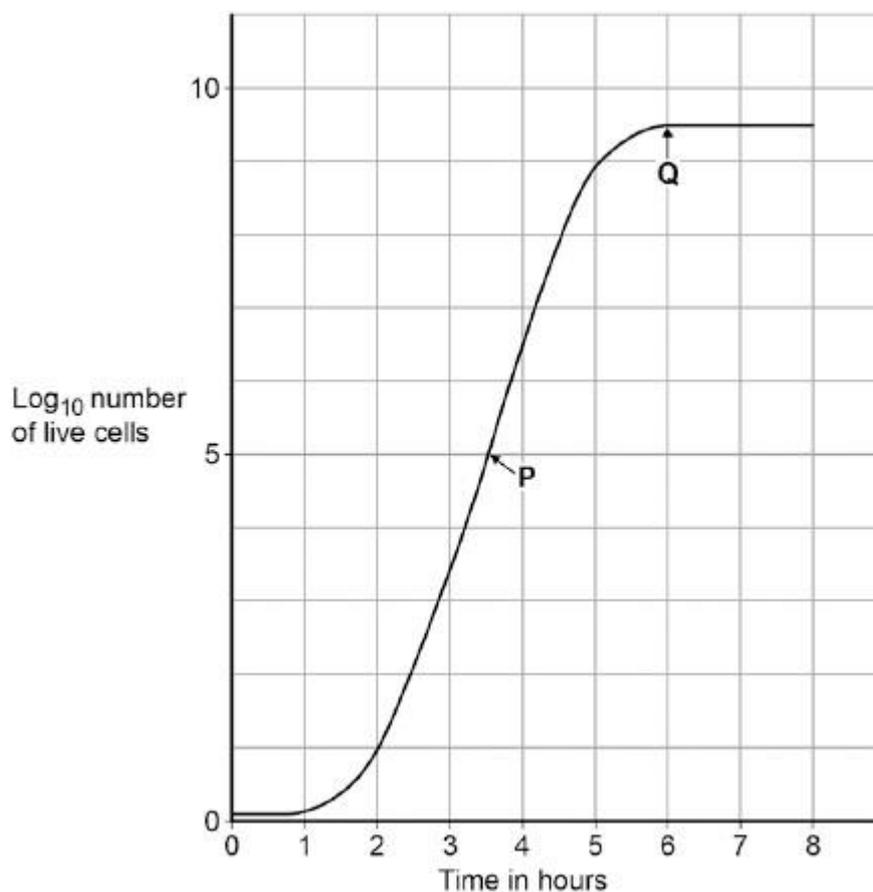
Time in **Stage 2** = _____ minutes

(3)

(e) Bacteria such as *Escherichia coli* undergo cell division similar to mitosis.

Figure 2 shows a growth curve for *E. coli* grown in a nutrient broth.

Figure 2



What type of cell division causes the change in number of *E. coli* cells at **P**?

(1)

- (f) Suggest why the number of cells levels out at **Q**.

(2)

(Total 11 marks)

- 7.** The table shows the concentrations of three mineral ions in the roots of a plant and in the water in the surrounding soil.

Mineral ion	Concentration in millimoles per kilogram	
	Plant root	Soil
Calcium	120	2.0
Magnesium	80	3.1
Potassium	250	1.2

- (a) (i) The plant roots could **not** have absorbed these mineral ions by diffusion.

Explain why.

(2)

(ii) Name the process by which the plant roots absorb mineral ions.

(1)

(b) How do the following features of plant roots help the plant to absorb mineral ions from the soil?

(i) A plant root has thousands of root hairs.

(1) (ii) A root hair cell contains many mitochondria.

(2)

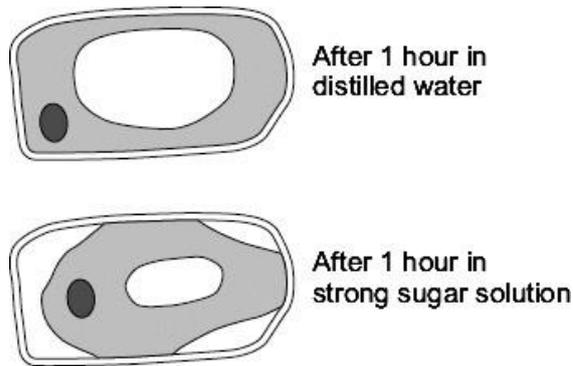
(iii) Many of the cells in the root store starch.

(1)

(Total 7 marks)

8. The diagram shows the same plant cell:

- after 1 hour in distilled water
- after 1 hour in strong sugar solution.



- (a) Describe **two** ways in which the cell in the strong sugar solution is different from the cell in distilled water.

1.

2.

(2)

- (b) Explain how the differences between the cell in the strong sugar solution and the cell in distilled water were caused.

(2)

(Total 4 marks)

9.

Read the following information about how the small intestine absorbs sugars.

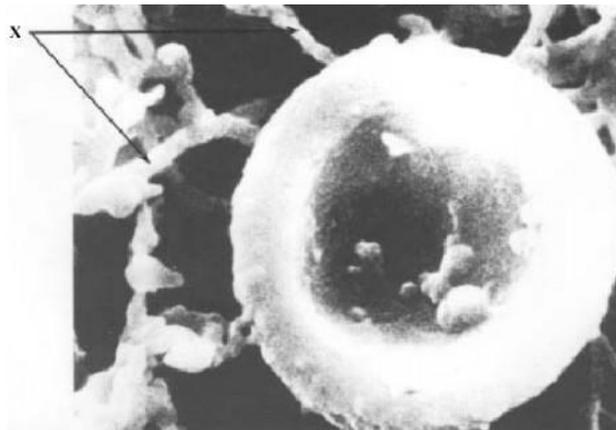
- The blood absorbs glucose and some other sugars, like xylose, from the small intestine.
- Glucose molecules are the same size as xylose molecules, but glucose is absorbed more quickly than xylose.
- Experiments with pieces of intestine show that the uptake of oxygen by the intestine is 50 % higher in the presence of glucose than in the absence of glucose. Xylose does not have this effect on the uptake of oxygen.
- The cells lining the small intestine have many mitochondria.

Explain how this information provides evidence that glucose is absorbed by the small intestine using *active transport*.

(Total 4 marks)

10.

The photograph shows a red blood cell in part of a blood clot. The fibres labelled X are produced in the early stages of the clotting process.



(a) Suggest how the fibres labelled X help in blood clot formation.

(1)

- (b) The average diameter of a real red blood cell is 0.008 millimetres.
On the photograph, the diameter of the red blood cell is 100 millimetres.

Use the formula to calculate the magnification of the photograph.

$$\text{Diameter on photograph} = \text{Real diameter} \times \text{Magnification}$$

$$\text{Magnification} = \underline{\hspace{10em}}$$

(2)

- (c) Some blood capillaries have an internal diameter of approximately 0.01 millimetres.

- (i) Use information given in part (b) to explain why only one red blood cell at a time can pass through a capillary.

(1)

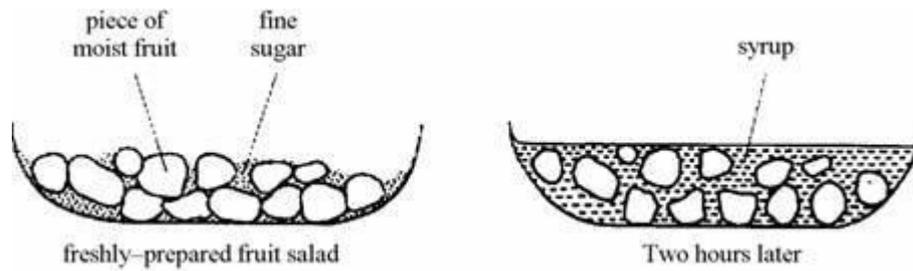
- (ii) Explain the advantages of red blood cells passing through a capillary one at a time.

(3)

(Total 7 marks)

11.

A cook prepares a fresh fruit salad by cutting up a variety of fruits and placing them in a bowl with layers of sugar in between. After two hours the fruit is surrounded by syrup (concentrated sugar solution).



Explain, as fully as you can, why syrup (concentrated sugar solution) was produced after two hours.

(Total 4 marks)

12.

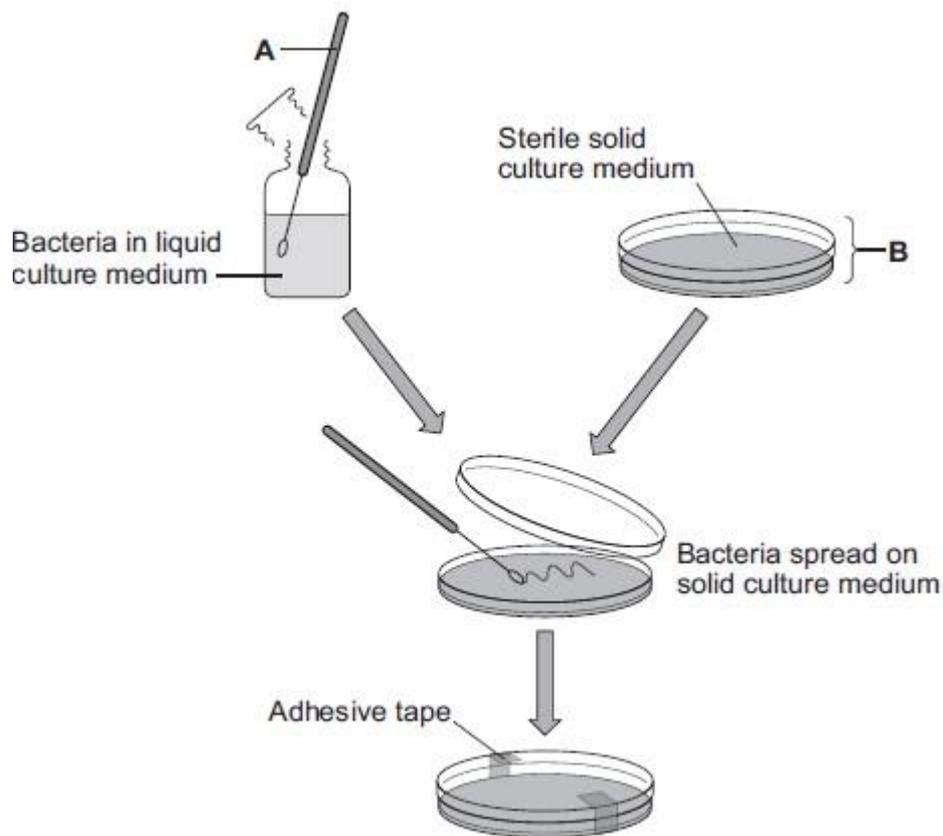
Plant roots obtain some of their mineral salts from the soil by active transport.

What is involved in *active transport*?

(Total 3 marks)

13.

The diagram shows a method used to grow pure cultures of a bacterium.



- (a) Name apparatus **A** and apparatus **B**.

Apparatus **A** _____

Apparatus **B** _____

(2)

- (b) (i) Why should apparatus **A** and apparatus **B** be sterilised before they are used?

- (1) (ii) How should apparatus **A** be sterilised?

Tick (✓) **one** box.

Using
enzymes

Using a flame

In an incubator



(1) (iii) Adhesive tape is used to secure the lid on apparatus **B**.

Give **one** reason why the lid of apparatus **B** should be securely taped in place.

(1)

(c) What is the maximum temperature that should be used **in schools** to grow the bacteria in apparatus **B**?

Draw a ring around the correct answer.

10 °C 25 °C 50 °C

(1)

(Total 6 marks)

14.

(a) Microorganisms can be grown on agar jelly in a Petri dish.

List A gives three actions used when growing microorganisms. **List B** gives four possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

List A – Action

The agar jelly is heated at 120°C for 30 minutes

Make sure the temperature for growing the microorganisms is no higher than 25°C

The lid of the Petri dish is held on with tape

List B – Effect

To reduce the growth of pathogens

To kill unwanted microorganisms

To prevent microorganisms from the air getting into the Petri dish

To prevent oxygen entering the Petri dish

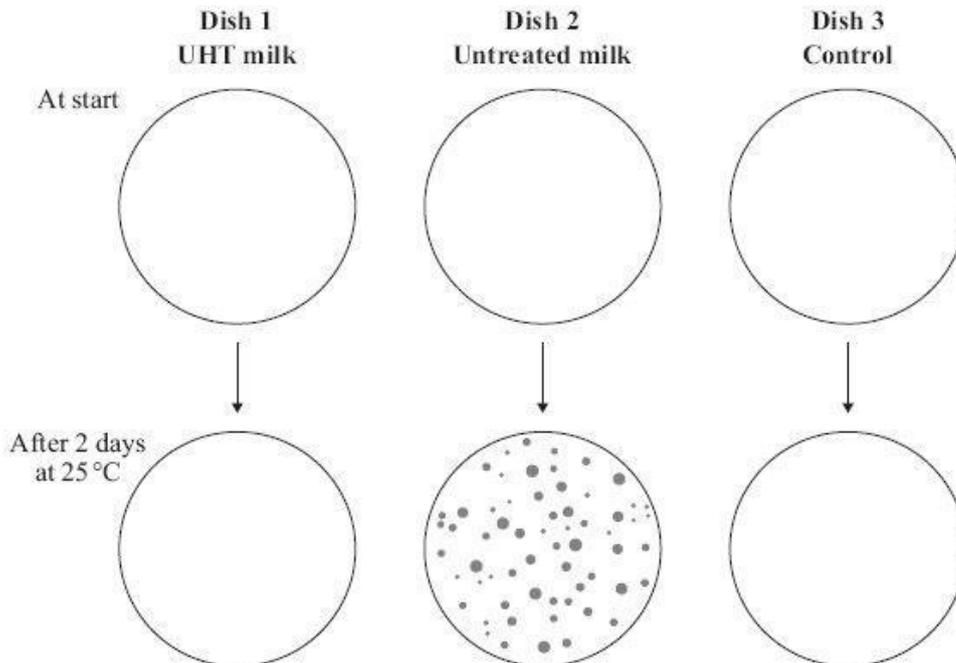
(3)

- (b) UHT milk is milk that has been heated to 135 °C, then cooled.

In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.

- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram below.



- (i) Describe the difference in appearance between dishes **1** and **2** after two days.

(1)

- (ii) Give **one** reason for this difference.

(1)

- (iii) There was no change in the appearance of dish **3** after two days.

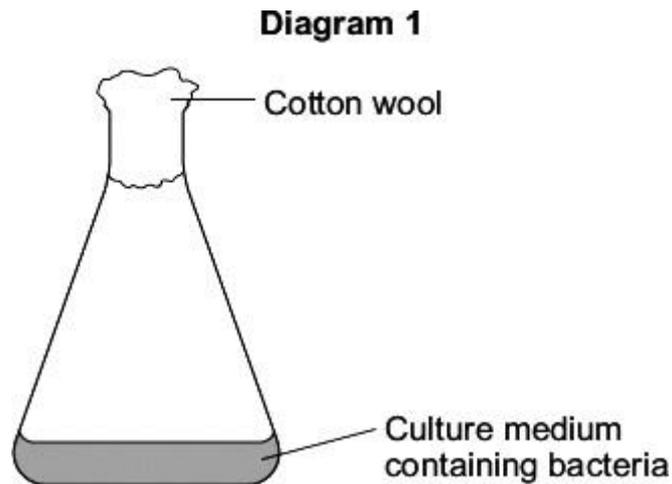
Give **one** reason why.

(1)
(Total 6 marks)

15.

Some students grew one species of bacterium in a flask.

Diagram 1 shows the flask.

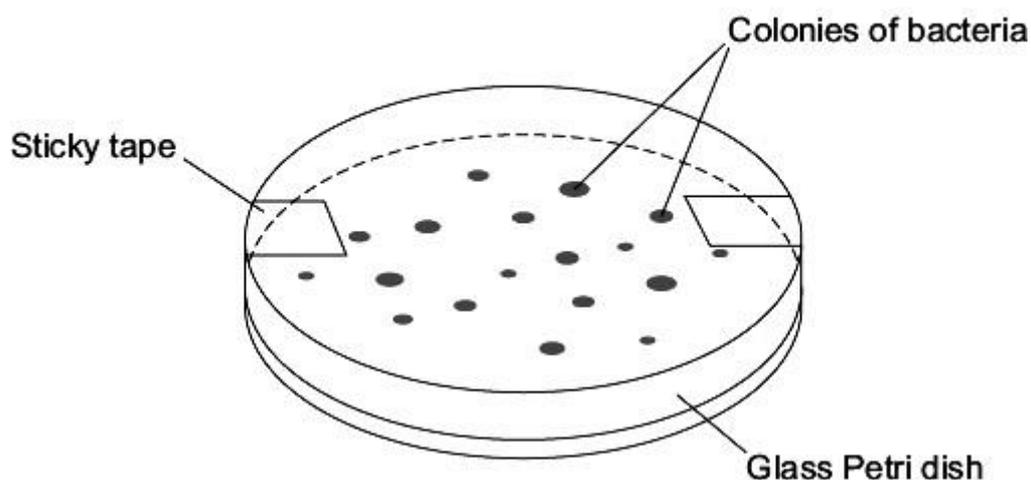


The students wanted to find the number of bacteria in 1 cm^3 of the culture medium.

The students:

- diluted 1 cm^3 of the culture medium from the flask with 999 cm^3 of water
- added 1 cm^3 of diluted culture to sterilised nutrient agar in a Petri dish
- placed the Petri dish in an incubator at $25 \text{ }^\circ\text{C}$.

Diagram 2 shows the Petri dish after 3 days in the incubator.

Diagram 2

- (a) Each colony of bacteria is formed where one bacterium landed on the agar jelly.

How is each colony formed?

(1)

- (b) Complete the following calculation to find how many bacteria there were in 1 cm^3 of the undiluted culture.

Number of colonies of bacteria in the Petri dish = _____

These colonies were formed from 1 cm^3 of the culture diluted $\times 1000$.

Therefore, number of bacteria in 1 cm^3 of undiluted culture = _____

(2)

- (c) It is important to sterilise the culture medium and all the apparatus before use.

Explain why.

(2)

- (d) The bacteria would grow faster at 35°C . In a school laboratory, the Petri dish should **not** be incubated at a temperature higher than 25°C .

Why?

(1) (e) The students decided to repeat their investigation.

Why?

(1)

(Total 7 marks)

16.

A student is given a tube containing a liquid nutrient medium. The medium contains one type of bacterium.

- (a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The student is told to grow some of the bacteria on agar jelly in a Petri dish.

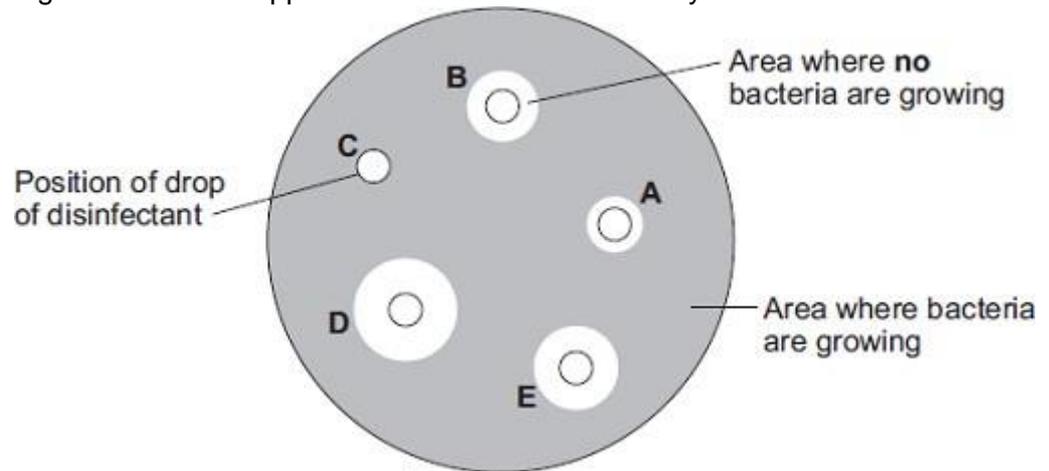
Describe how the student should prepare an uncontaminated culture of the bacterium in the Petri dish.

You should explain the reasons for each of the steps you describe.

(6)

- (b) After the culture had been prepared, the student added one drop of each of five disinfectants, **A**, **B**, **C**, **D** and **E**, onto the culture.

The diagram shows the appearance of the Petri dish 3 days later.



- (i) There are areas on the agar jelly where **no** bacteria are growing.

Why?

(1)

- (ii) The student concluded that disinfectant **D** would be the best for using around the home.

Give **one** reason why the student might be correct.

Give **one** reason why the student might **not** be correct.

(2)

(Total 9 marks)