# Cell Structure

**These practice questions can be used by students and teachers and is suitable for GCSE AQA Biology topic Questions 8641**

**Level: GCSE AQA Biology 8641**

**Subject: Biology**

**Exam board: GCSE AQA**

**Topic: Cell Structure**

## Q1.

This question is about the cell cycle.

(a) Chromosomes are copied during the cell cycle.

Where are chromosomes found?

Tick **one** box.

| | |
|---|---|
| Cytoplasm | ☐ |
| Nucleus | ☐ |
| Ribosomes | ☐ |
| Vacuole | ☐ |

**(1)**

(b) What is the name of a section of a chromosome that controls a characteristic?

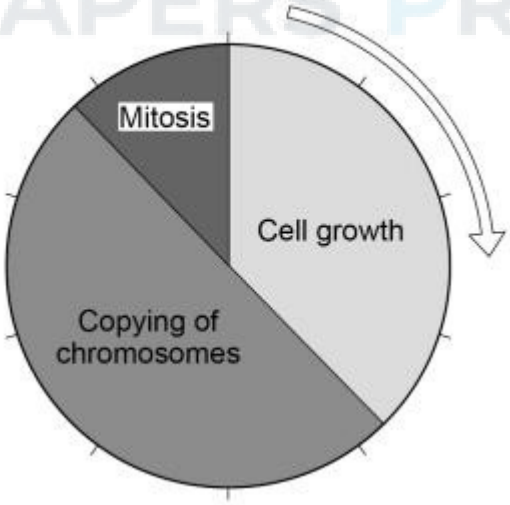
_____

_____

**(1)**

**Figure 1** shows information about the cell cycle.

**Figure 1**



(c) Which stage of the cell cycle in **Figure 1** takes the most time?

Tick **one** box.

- Cell growth ☐
- Copying of chromosomes ☐
- Mitosis ☐

**(1)**

(d) During mitosis cells need extra energy.
Which cell structures provide most of this energy?

Tick **one** box.

- Chromosomes ☐
- Cytoplasm ☐
- Mitochondria ☐
- Ribosomes ☐

**(1)**



(e) The cell cycle in **Figure 1** takes two hours in total.
The cell growth stage takes 45 minutes.

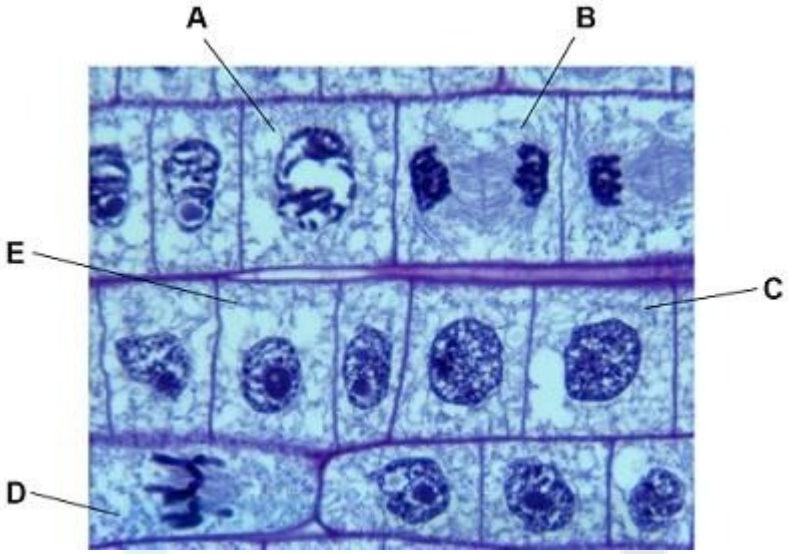
Calculate the time taken for mitosis.

_____
_____
_____
_____
_____
_____
_____

Time = _____ minutes

**(2)**

**Figure 2** shows some cells in different stages of the cell cycle.




(f) Which cell is **not** dividing by mitosis

Tick **one** box.

| A | | B | | C | | D | |
|---|---|---|---|---|---|---|---|

**(1)**

(g) Cell **E** in **Figure 2** contains 8 chromosomes.
Cell **E** divides by mitosis.
How many chromosomes will each new cell contain?

Tick **one** box.

2 ☐

4 ☐

8 ☐

16 ☐

**(1)**

(h) Why is mitosis important in living organisms?

Tick **one** box.

| | |
|---|---|
| To produce gametes | ☐ |
| To produce variation | ☐ |
| To release energy | ☐ |
| To repair tissues | ☐ |

**(1)**

**(Total 9 marks)**

## Q2.

Plants are made up of cells, tissuesand organs.

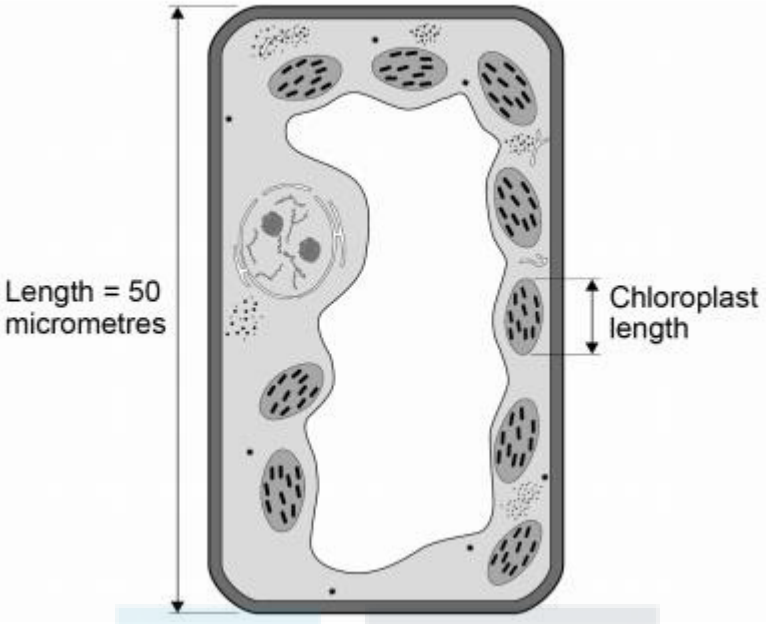
(a) Draw **one** line from each leveloforganisation to the correct plant part.

| **Level of organisation** | **Plant part** |
|---|---|
| | Leaf |
| Organ | Root hair |
| | Spongy mesophyll |
| Tissue | Vacuole |
| | Xylem |

**(2)**

**Figure 1** shows a plant cell drawn to scale.

Figure 1




(b) Where in a plant would the cell in **Figure 1** be found?

Tick **one** box.

Epidermis ☐

Palisade mesophyll ☐

Phloem ☐

Xylem ☐

**(1)**

(c) Calculate the length of the chloroplast labelled in **Figure 1**.

_____

_____

_____

_____

_____

_____

_____

Length = _____ micrometres

**(2)**

(d) Cells in plant roots do **not** photosynthesise.

Give **one** reason why.

_____

_____

_____

_____

**(1)**

(e) As a plant grows, new root hair cells are formed from unspecialised cells.

How does an unspecialised cell become a new root hair cell?

Tick **one** box.

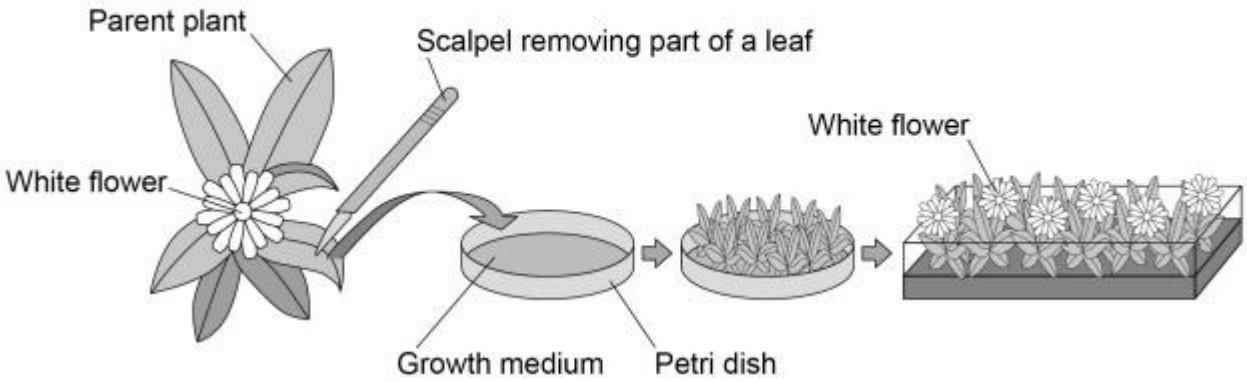
- Differentiation ☐
- Metabolism ☐
- Transpiration ☐
- Transport ☐

**(1)**

Scientists can clone plants using tissue culture.

**Figure 2** shows the process of tissue culture.

Figure 2




(f) Why might scientists want to clone plants?

Tick **one** box.

To create new species of plants. ☐

To introduce variation into plants. ☐

To protect endangered plants from extinction. ☐

To reduce disease resistance in plants. ☐

**(1)**

(g) What is the advantage of cloning plants using tissue culture?

Tick **one** box.

No special equipment is needed. ☐

Plants can be produced quickly. ☐

The flowers are all different colours. ☐

The offspring are all genetically different. ☐

**(1)**

(h) The growth medium in **Figure 2** helps the plants to grow.

Name **one** substance in the growth medium.

_____

_____

_____

_____

**(1)**

**(Total 10 marks)**

## Q3.

Eating food containing *Salmonella* bacteria can cause illness.

(a) Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

_____

_____

_____

_____

**(1)**

(b) Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

1.

_____

_____

_____

2.

_____

_____

_____

_____

**(2)**

(c) In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

**(1)**

(d) A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

**(2)**

(e) *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest **one** other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

**(1)**

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

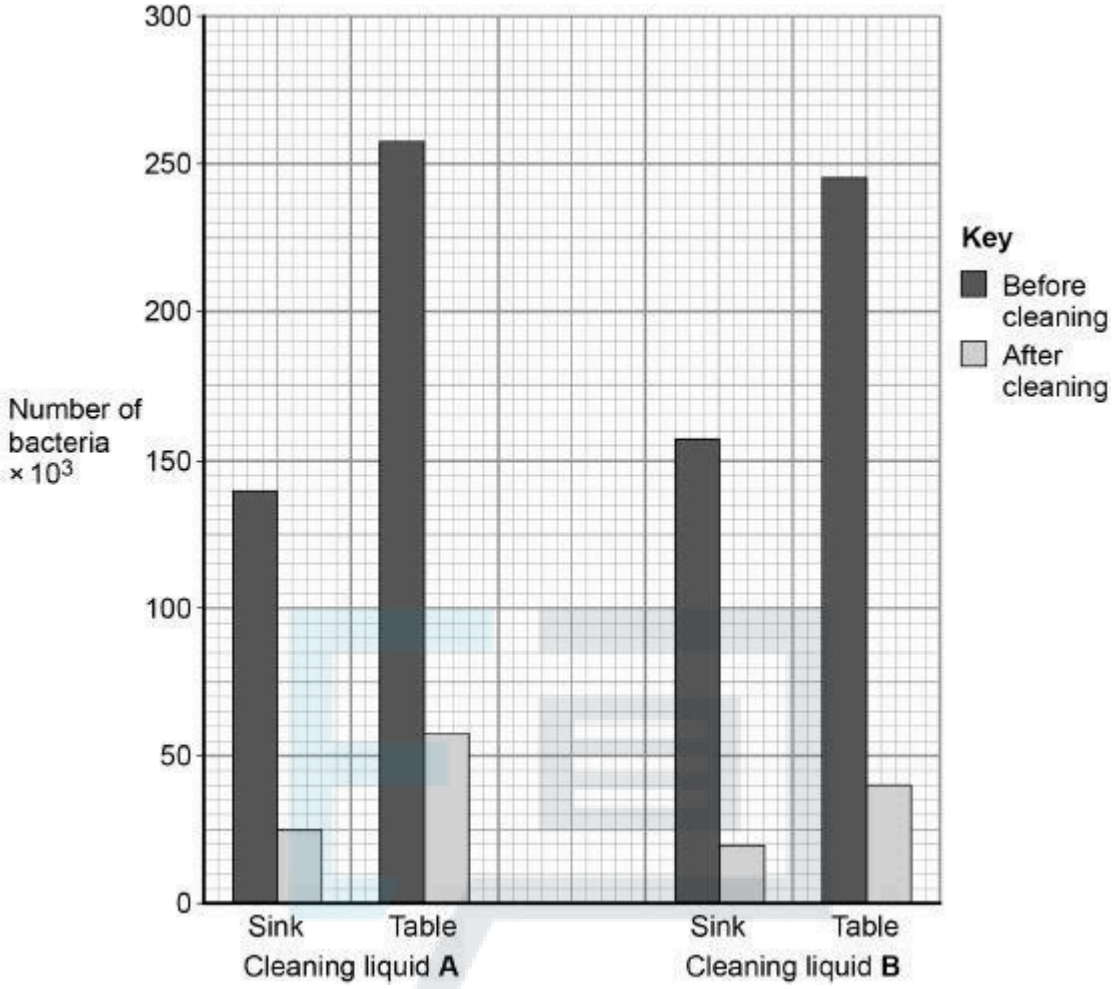
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 1**.

**Figure 1**




(f) Which cleaning liquid is the more effective?

Give a reason for your answer.

Cleaning liquid _____

Reason

_____

_____

_____

_____

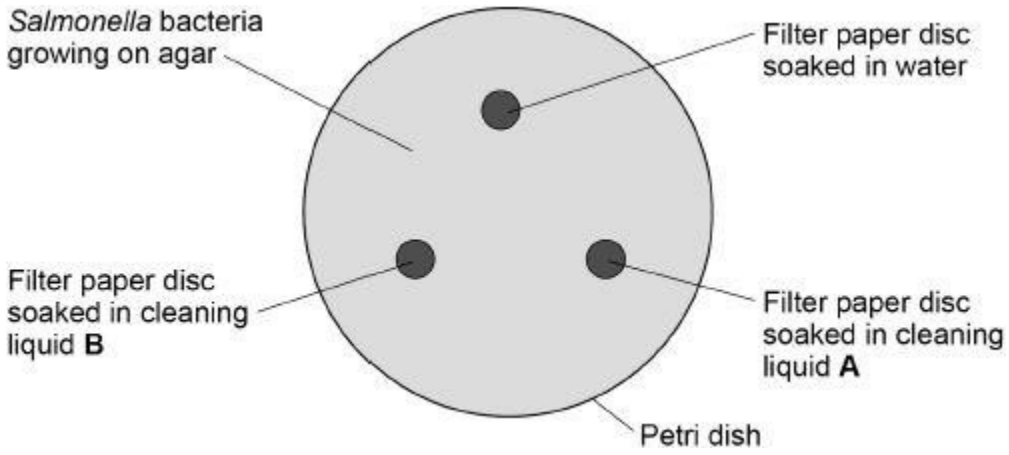
_____

**(1)**

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

**Figure 2** shows the way the investigation was set up.

**Figure 2**




The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.
The results are shown in the table below.

| **Filter paper disc** | **Area around disc with no bacteria growing in cm2** |
|---|---|
| Water Cleaning | 0 |
| liquid **A** Cleaning | 11 |
| liquid **B** | 13 |

(g) What measurement would the scientist need to take to calculate the area where no bacteria were growing?

_____

_____

_____

_____

**(1)**

(h) Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

_____

_____

_____

_____

**(1)**

(i) The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm3.

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

_____

_____

_____

_____

**(1)**

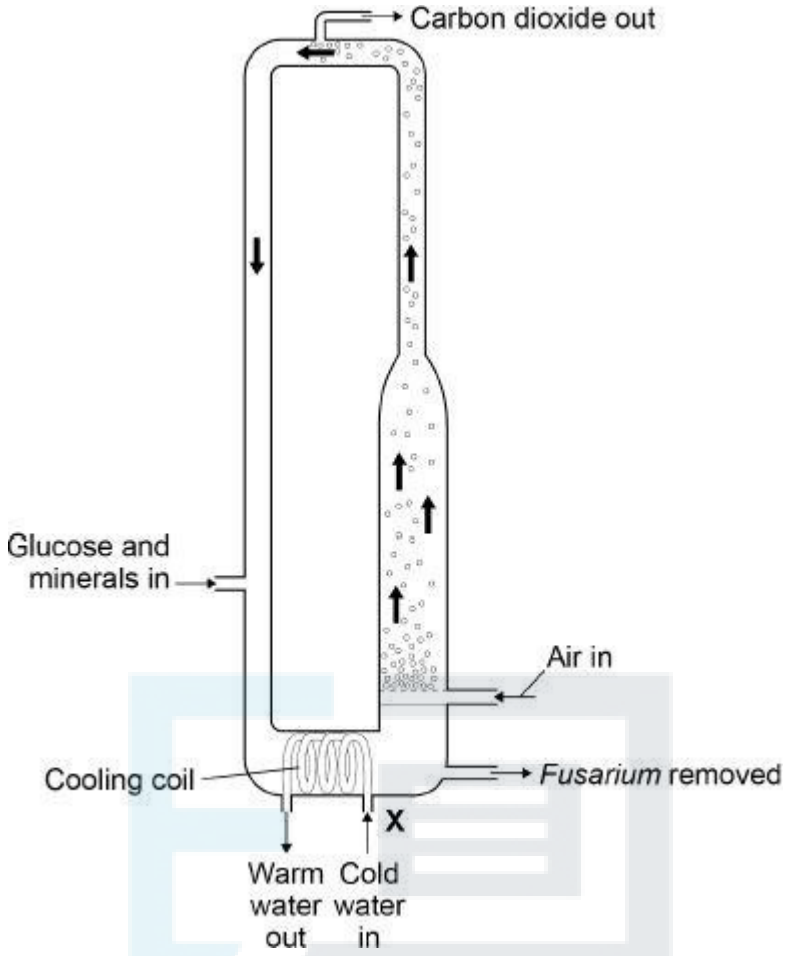
**(Total 11 marks)**

## Q4.

Mycoprotein is a protein-rich food.

Mycoprotein is made from the fungus *Fusarium*.

The diagram below shows a fermenter used for growing *Fusarium*.




(a) Explain why the fermenter is sterilised before use.

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(b) Cold water is pumped through the cooling coil at point **X**.

This maintains a constant temperature inside the fermenter.

Suggest the temperature at which *Fusarium* grows fastest.

Tick **one** box.

5 °C ☐

20 °C ☐

30 °C ☐

85 °C ☐

**(1)**

(c) Glucose and bubbles of air enter the fermenter.

The bubbles of air supply oxygen.

Explain why *Fusarium* needs glucose and oxygen.

**(2)**

(d) The bubbles of air also move materials around the fermenter.

Suggest why it is useful for bubbles of air and materials to move around inside the fermenter.

**(2)**

(e) 100 grams of chicken meat contains 22 grams of protein.

100 grams of mycoprotein contains 11 grams of protein.

A man ate 100 grams of chicken in one meal.

How many grams of mycoprotein would the man need to eat to get the same mass of protein as in 100 grams of chicken?
Tick **one** box.

100 grams ☐

110 grams ☐

200 grams ☐

220 grams ☐

**(1)**

**(Total 8 marks)**

## Q5.

Cells can be classified according to their structure.

(a) Complete **Table 1** to show which features each cell type has.

Write a tick or a cross in each box.

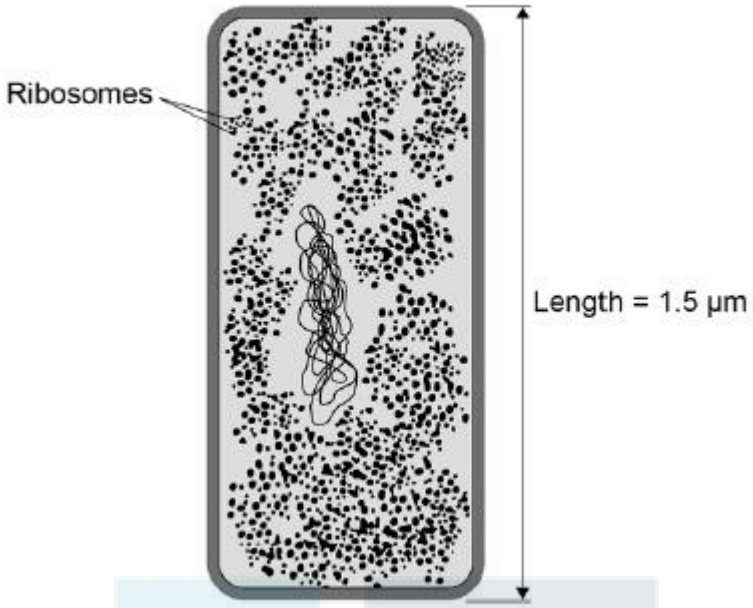
**Table 1**

| | **Nucleus** | **Plasmids** | **Cytoplasm** |
|---|---|---|---|
| Prokaryotic cell | | | |
| Eukaryotic cell | | | |

**(2)**

**Figure 1** shows a cell.

Figure 1




(b) What type of cell is shown in **Figure 1**.

Tick **one** box.

An animal cell ☐

A bacterial cell ☐

A plant cell ☐

**(1)**

(c) The cell in **Figure 1** contains ribosomes.

What is the function of ribosomes?

_____

_____

_____

_____

**(1)**

(d) There are 1000 micrometres (µm) in a millimetre (mm).

The length of the cell in **Figure 1** is 1.5 micrometres (μm).

Give the length of the cell in millimetres (mm).

_____

_____

_____

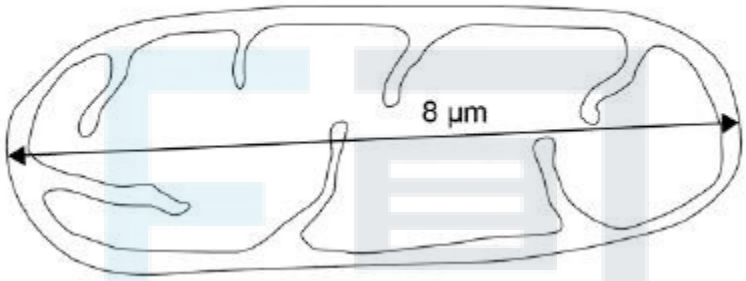
_____

Length of cell = _____ mm

**(1)**

**Figure 2** shows a mitochondrion viewed with a microscope.

**Figure 2**




(e) Give **one** reason why the cell in **Figure 1** does **not** contain mitochondria.

Use information from **Figure 1** and **Figure 2**.

_____

_____

_____

_____

**(1)**

The cell in **Figure 1** divides once every 30 minutes.

**Table 2** shows how many cells are present after a given time.

**Table 2**

| Time in minutes | Number of cells present |
|---|---|
| 0 | 1 |

| | |
|---|---|
| 30 | 2 |
| 60 | 4 |

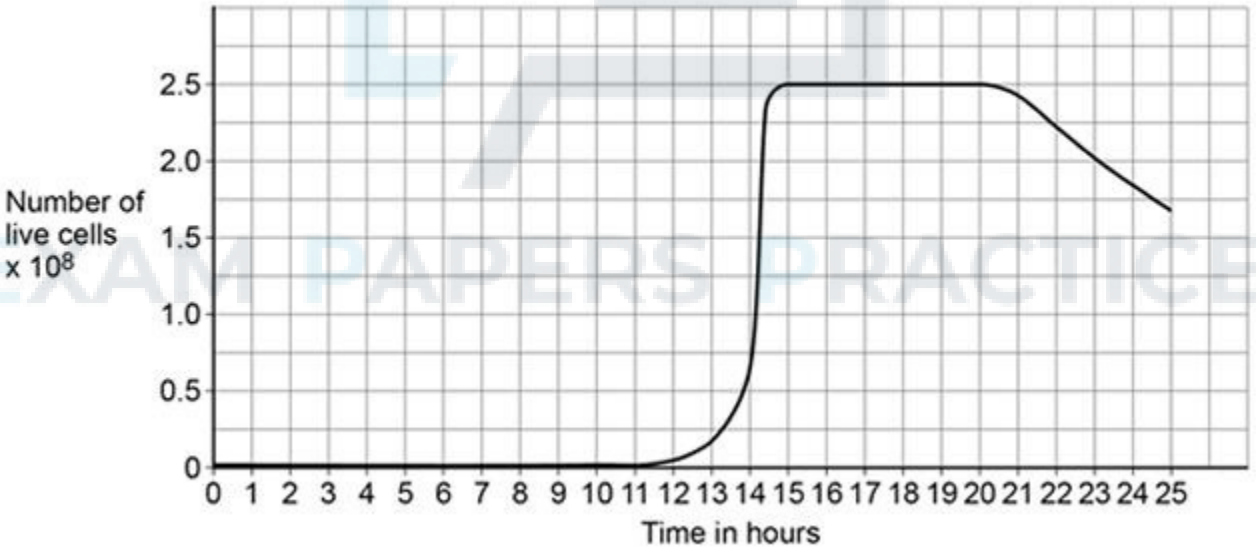
(f) Calculate how many cells will be present after 2 hours.

Number of cells = _____

**(2)**

Cells like the one in **Figure 1** are kept in a culture solution for 25 hours.

The graph below shows the number of live cells present.




(g) Describe the changes in the numberof live cells shown in the graph above in the first 20 hours.

Use data from the graph in your answer.

**(3)**

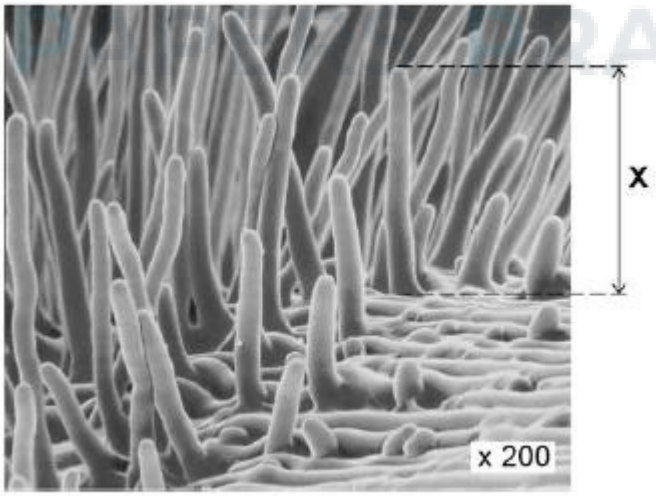
(h) Suggest **one** reason why the number of live cells decreases after 20 hours.

**(1)**

**(Total 12 marks)**

## Q6.

The image below shows part of a root from a cress plant.



(a) What type of microscope was used to create the image above?

_____

_____

**(1)**

(b) The magnification of the cress root in the image above is × 200.
There are 1000 micrometres (µm) in a millimetre (mm).

Calculate the real length of the root hair, **X**.
Give your answer in micrometres (µm).

_____

_____

_____

_____

_____

_____

_____

_____

Real length **X** = _____ µm

**(2)**

(c) Root hair cells take up water from the soil.

Explain **one** way in which the root hair cell is adapted to this function.

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

The table shows the water uptake by a plant's roots on two different days.

| | **Mean water uptake in cm3 per hour** |
|---|---|
| Coldday | 1.8 |

| | |
|---|---|
| Hot day | 3.4 |

(d) Explain why the mean rate of water uptake is higher on a hot day than on a cold day.

**(3)**

(e) The concentration of mineral ions in the soil is lower than in root hair cells.
Root hair cells take up mineral ions from the soil.
Root hair cells contain mitochondria.

Explain why root hair cells contain mitochondria.

_____

_____

**(4)**

**(Total 12 marks)**

## Q7.

A student carried out an investigation using leaf epidermis.

This is the method used.

1. Peel the lower epidermis from the underside of a leaf.
2. Cut the epidermis into six equal sized pieces.
3. Place each piece of lower epidermis into a different Petri dish.
4. Add 5 cm3 of salt solution to the six Petri dishes. Each Petri dish should have a different concentration of salt solution.
5. After 1 hour, view each piece of epidermis under a microscope at ×400 magnification.
6. Count and record the total number of stomata present and the number of open stomata that can be seen in one field of view.

The student's results are shown in the table.

| Concentration of salt solution in mol / dm3 | Number of stomata in field of view | Number of open stomata in field of view | Percentage (%) of open stomata in field of view |
|---|---|---|---|
| 0.0 | 7 | 7 | 100 |
| 0.1 | 8 | 8 | 100 |
| 0.2 | 7 | 6 | **X** |
| 0.3 | 9 | 6 | 67 |
| 0.4 | 10 | 4 | 40 |
| 0.5 | 9 | 2 | 22 |

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

_____

_____

_____

_____

**X** = _____ %

**(1)**

(b) Give **one** conclusion from the results in the table above.

_____

_____

_____

_____

**(1)**

(c) How could the student find out what concentration of salt solution would result in half of the stomata being open?

_____

_____

_____

_____

**(1)**

(d) The student measured the real diameter of the field of view to be 0.375 mm.

Calculate the number of open stomata per mm2 of leaf for the epidermis placed in 0.4 mol / dm3 salt solution.
Use information from the table above.

Take $\pi$ to be 3.14

_____

_____

_____

_____

_____

_____

_____

_____

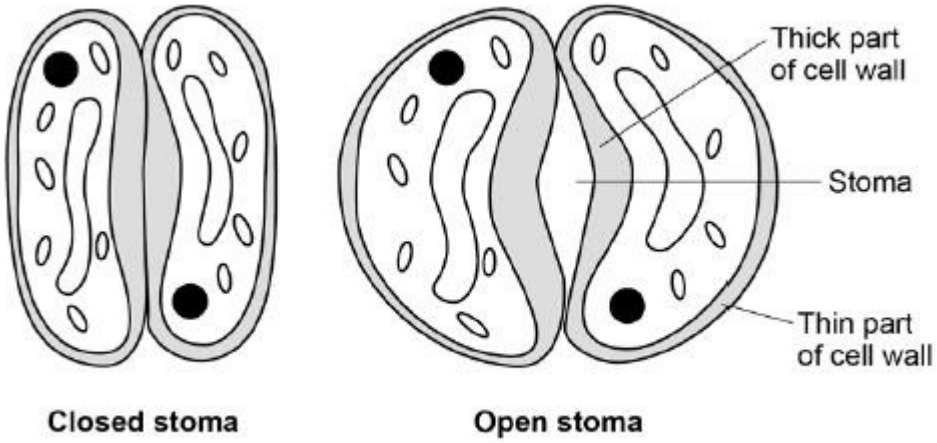
_____

_____

Number of open stomata = _____ per mm2

**(3)**

(e) The diagram below shows two guard cells surrounding a closed stoma and two guard cells surrounding an open stoma.




**Closed stoma** **Open stoma**

When light intensity is high potassium ions are moved into the guard cells.

Describe how the movement of potassium ions into the guard cells causes the stoma to open.

**(4)**

**(Total 10 marks)**

## Q8.

Fresh milk contains bacteria.

Some students investigated decay caused by the bacteria in fresh milk.

This is the method used:

1. Put 200 cm3 of fresh milk in a sterilised flask.
2. Leave the flask for 3 days at 20 °C.
3. Measure the pH of the milk each day using universal indicator paper.

**Figure 1** and **Figure 2** show the apparatus the students used.

**Figure 1**

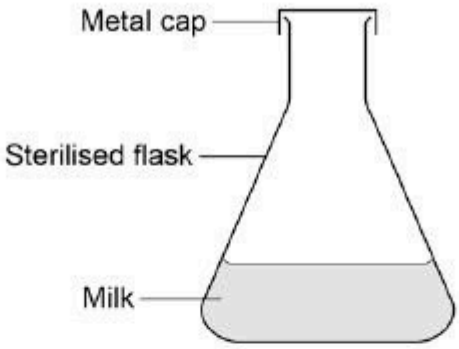
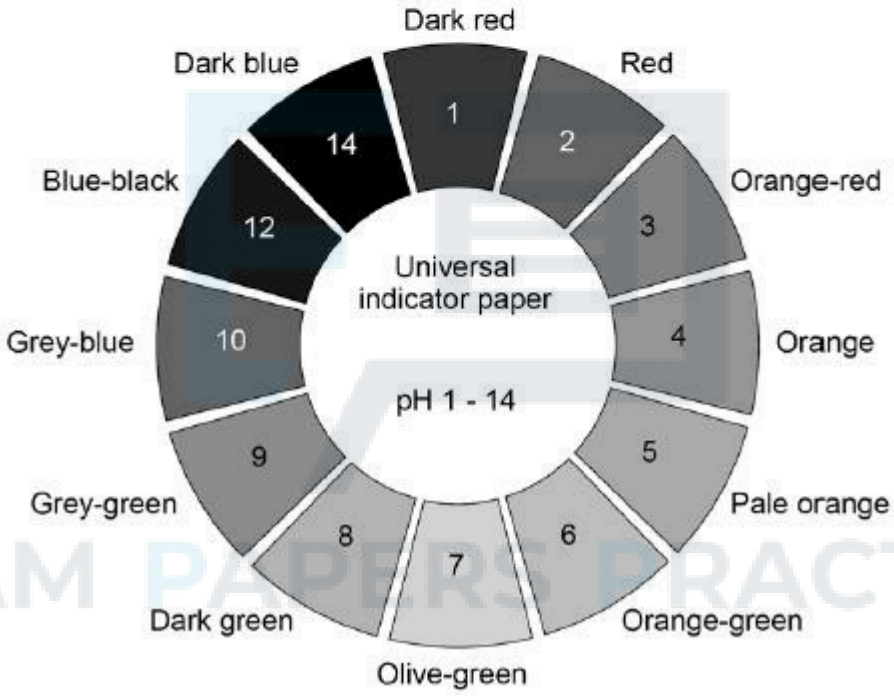



**Figure 2**




(a) Give **one** reason why the students sterilised the flask before adding the milk.

_____

_____

_____

_____

**(1)**

(b) Describe how the students could sterilise the flask in a school laboratory.

_____

_____

_____

_____

_____

_____

_____

**(2)**

(c) Why did the students put a cap on top of the flask?

_____

_____

_____

_____

**(1)**

(d) The table shows the students' results.

**Table 1**

| Time in days | Colour of universal indicator paper | pH |
|---|---|---|
| 0 | Olive-green | |
| 1 | Olive-green | |
| 2 | Olive-green | |
| 3 | Orange-green | |

Complete **Table 1**.

Use information from **Figure 2**.

**(1)**

(e) The students repeated their investigation with two changes to the method:

- they used a pH meter to measure the pH
- they left the apparatus set up for 6 days instead of for 3 days.

Suggest a reason why each of these changes improves the investigation.

Using a pH meter

_____

_____

_____

Leaving the apparatus set up for 6 days

_____

_____

_____

**(2)**

**Table 2** shows the results of the students' second investigation.

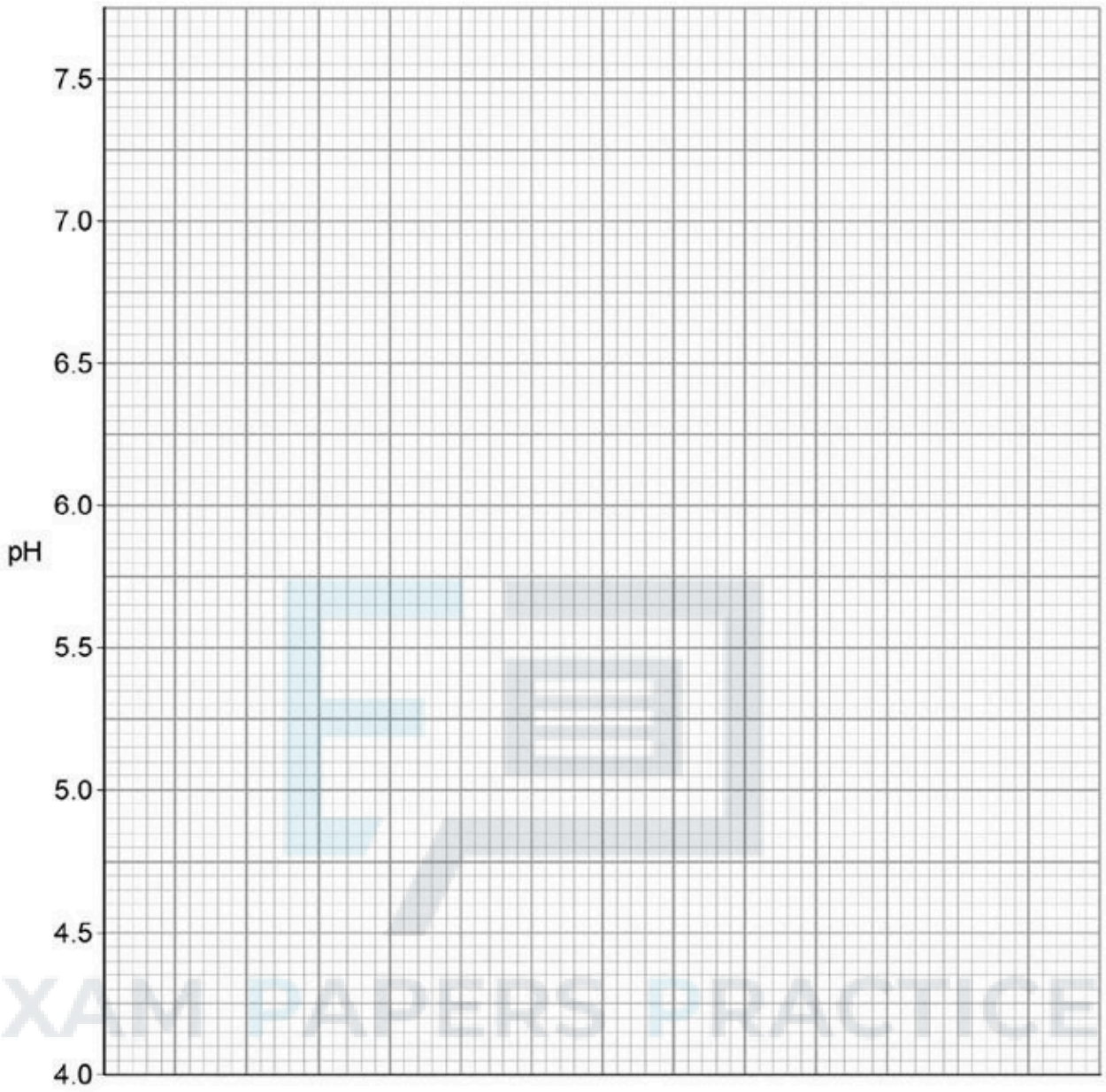
**Table 2**

| Time in days | pH |
|---|---|
| 0 | 7.0 |
| 1 | 7.0 |
| 2 | 6.7 |
| 3 | 6.0 |
| 4 | 5.0 |
| 5 | 4.5 |
| 6 | 4.5 |

(f) Complete the graph below.

You should:

- label the x-axis
- plot the data from **Table 2**
- draw a line of best fit.




**(4)**

(g) Give **one** reason for each of the following.

Use information from **Table 2** and the graph above.

The pH did not change during the first day:

_____

_____

_____

The pH decreased after day 1:

_____

_____

_____

There was no change in pH between days 5 and 6:

_____

_____

_____

**(3)**

(h) The students did both of their investigations at 20 °C

The students then repeated the investigation with the pH meter, but at 25 °C

Predict how the new results would be:

- similar to the results at 20 °C
- different from the results at 20 °C

Similarity

_____

_____

_____

Difference

_____

_____

_____

**(2)**

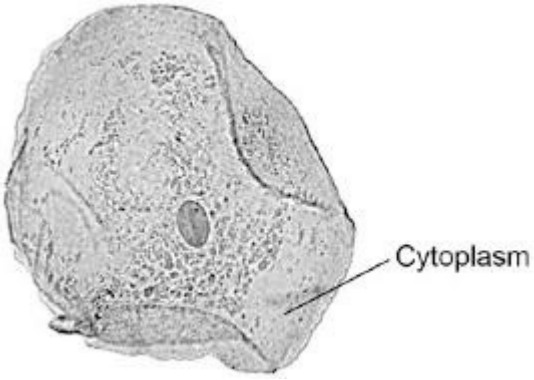
**(Total 16 marks)**



## Q9.

**Figure 1** shows a human cheek cell viewed under a light microscope.

**Figure 1**






(a) Label the nucleus **and** cell membrane on **Figure 1**.

**(2)**

(b) Cheek cells are a type of body cell.

Body cells grow through cell division.

What is the name of this type of cell division?

Tick **one** box.

Differentiation ☐

Mitosis ☐

Specialisation ☐

**(1)**

(c) Ribosomes and mitochondria are **not** shown in **Figure 1**.

What type of microscope is needed to see ribosomes and mitochondria?

_____

**(1)**

(d) What is the advantage of using the type of microscope you named in part **(c)**?

Tick **one** box.

Cheaper ☐

Higher magnification ☐

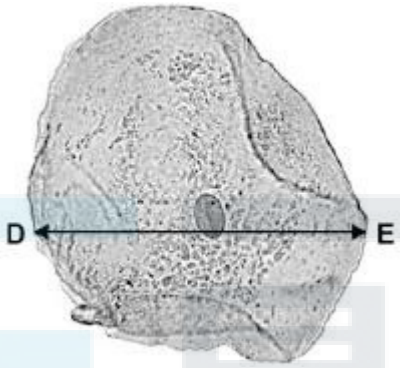
Lower resolution ☐

**(1)**

(e) The cheek cell in **Figure 2** is magnified 250 times.

The width of the cell is shown by the line **D** to **E**.

**Figure 2**




Calculate the width of the cell in micrometres(μm).

Complete the following steps.

Measure the width of the cell using a ruler _____ mm

Use the equation to work out the real width of the cell in mm:

$$\textbf{real size} = \frac{\textbf{image size}}{\textbf{magnification}}$$

_____ mm

Convert mmtoμm _____ μm

**(3)**

(f) A red blood cell is 8 μm in diameter.

A bacterial cell is 40 times smaller.

Calculate the diameter of the bacterial cell.

Tick **one** box.

0.02 μm ☐

0.2 μm ☐

2.0 μm ☐

20.0 μm ☐

**(1)**

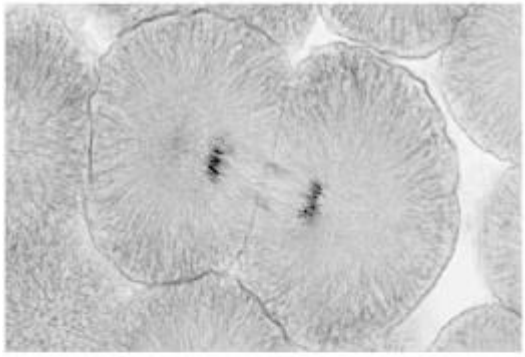
**(Total 9 marks)**

## Q10.

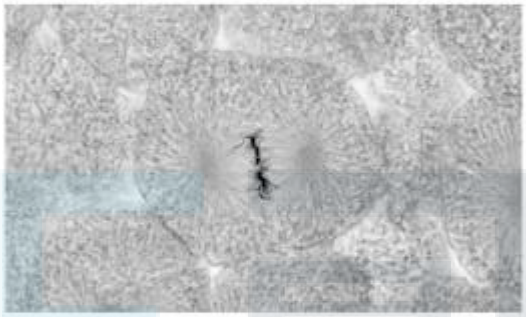
**Figure 1** shows photographs of some animal cells at different stages during the cell cycle.

**Figure 1**

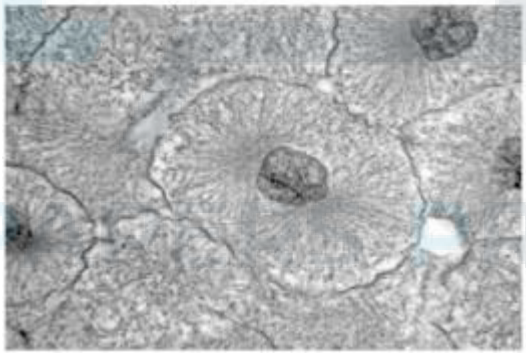
A



B



C



A © Ed Reschke/Photolibrary/Getty Images
B © Ed Reschke/Oxford Scientific/Getty Images
C © Ed Reschke/Photolibrary/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** | | | | |
|---|---|---|---|---|---|---|
| | **Non-dividing cells** | **Stage 1** | **Stage 2** | **Stage 3** | **Stage 4** | **Total** |
| **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.

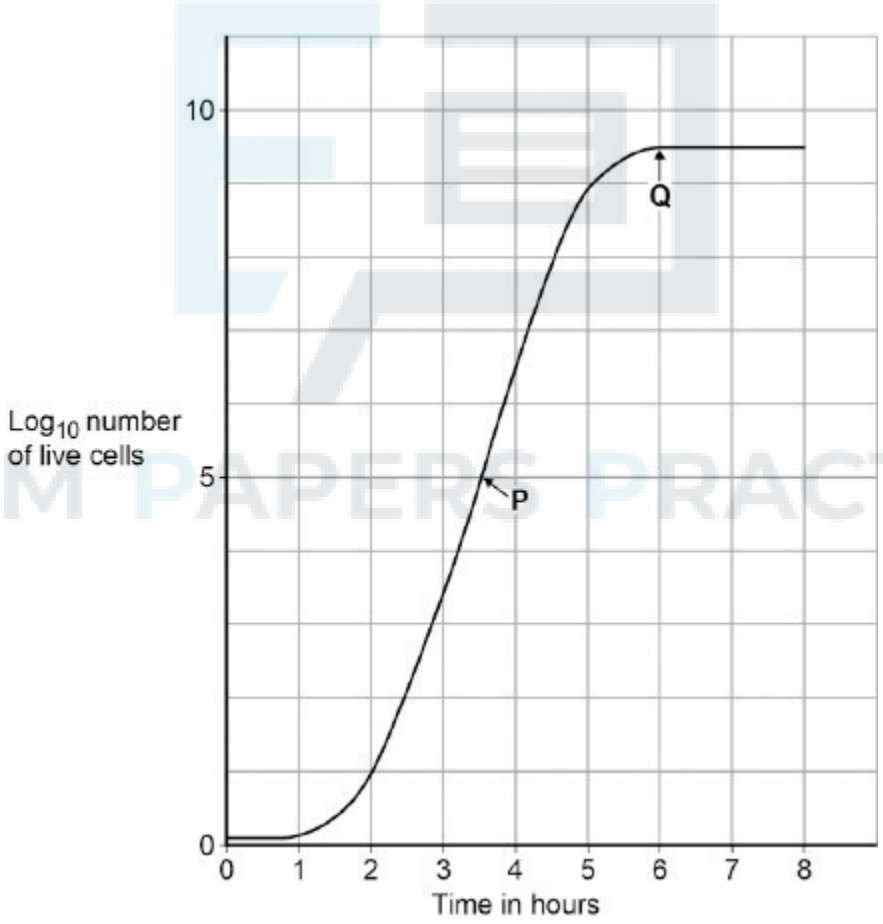
Time in **Stage 2** = _____ minutes

**(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* cellsat **P**?

_____

**(1)**

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

**(2)**

**(Total 11 marks)**

## Q11.

Explain how the human circulatory system is adapted to:

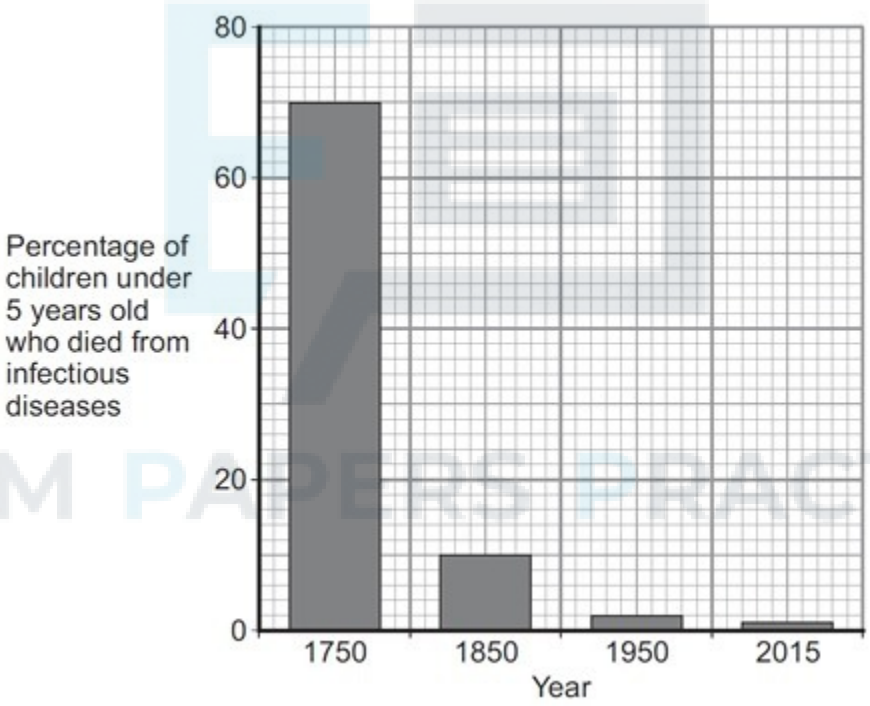
- supply oxygen to the tissues
- remove waste products from tissues.

**(Total6marks)**

## Q12.

Pathogens are microorganisms that cause infectious diseases.

(a) The graph shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.




(i) Between 1750 and 1850 vaccinations were also developed.
What is in a vaccine?

Tick (✓) **one** box.

large amounts of dead pathogens ☐

large amounts of live pathogens ☐

small amounts of dead pathogens ☐

**(1)**

(ii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from the graph above.

_____

_____

_____

_____

_____

_____

_____

**(2)**

(b) Antibiotics weredeveloped in the1940s.Antibiotics kill bacteria.

(i) Which**one**of the followingisanantibiotic?

Drawaringaround thecorrectanswer.

**cholesterol** **penicillin** **thalidomide**

**(1)**

(ii) The use of antibiotics has **not** reduced the death rate due to all diseases to zero.

Suggest **two** reasons why.

1. _____

_____

_____

_____

2. _____

___

_____

_____

**(2)**

(c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give **one** reason why companies testing new antibiotics grow bacteria at 37 °C.

_____

_____

_____

_____

**(1)**

**(Total 7 marks)**

## Q13.

Living organisms are made of cells.

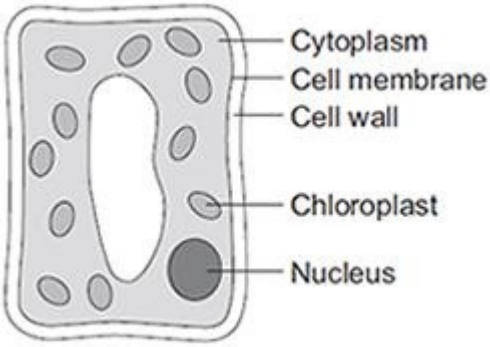
(a) Animal and plant cells have several parts. Each part has a different function.

Draw **one** line from each cell part to the correct function of that part.

| Cell part | Function |
| --- | --- |
| Cell membrane | Where most energy is released in respiration |
| Mitochondria | Controls the movement of substances into and out of the cell |
| Nucleus | Controls the activities of the cell |
| | Where proteins are made |

**(3)**

(b) The diagram below shows a cell from a plant leaf.




Which **two** parts in the diagram above are **not** found inan animal cell?

1. _____

2. _____

**(2)**

**(Total 5 marks)**

## Q14.

Enzymes are made and used in all living organisms.

(a) What is an enzyme?

_____

_____

_____

_____

_____

_____

**(2)**

(b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

Draw a ring around the correct answer.

**cell membrane** **cytoplasm** **nucleus**

**(1)**

(c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.
The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.
A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.
Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.
Advantage of hydrogen peroxide and catalase

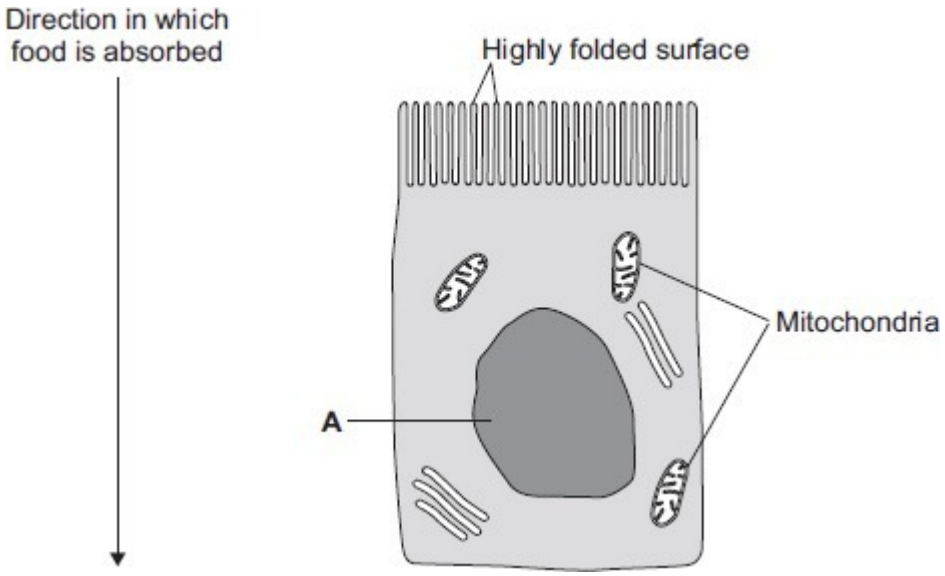
_____
_____
_____
_____
_____
Disadvantage of hydrogen peroxide and catalase
_____
_____
_____
_____
_____



**(2)**
**(Total 5 marks)**

## Q15.

The image below shows an epithelial cell from the lining of the small intestine.




(a) (i) In the image above, the part of the cell labelled **A** contains chromosomes.

What is the name of part **A**?

_____

_____

**(1)**

(ii) How are most soluble food molecules absorbed into the epithelial cells of the small intestine?

Draw a ring around the correct answer.

**diffusion** **osmosis** **respiration**

**(1)**

(b) Suggest how the highly folded cell surface helps the epithelial cell to absorb soluble food.

_____

_____

_____

_____

**(1)**

(c) Epithelial cells also carry out active transport.

(i) Name **one** food molecule absorbed into epithelial cells by active transport.

_____

_____

**(1)**

(ii) Why is it necessary to absorb some food molecules by active transport?

_____

_____

_____

_____

**(1)**

(ii) Suggest why epithelial cells have many mitochondria.

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(d) Some plants also carry out active transport.

Give **one** substance that plants absorb by active transport.

_____

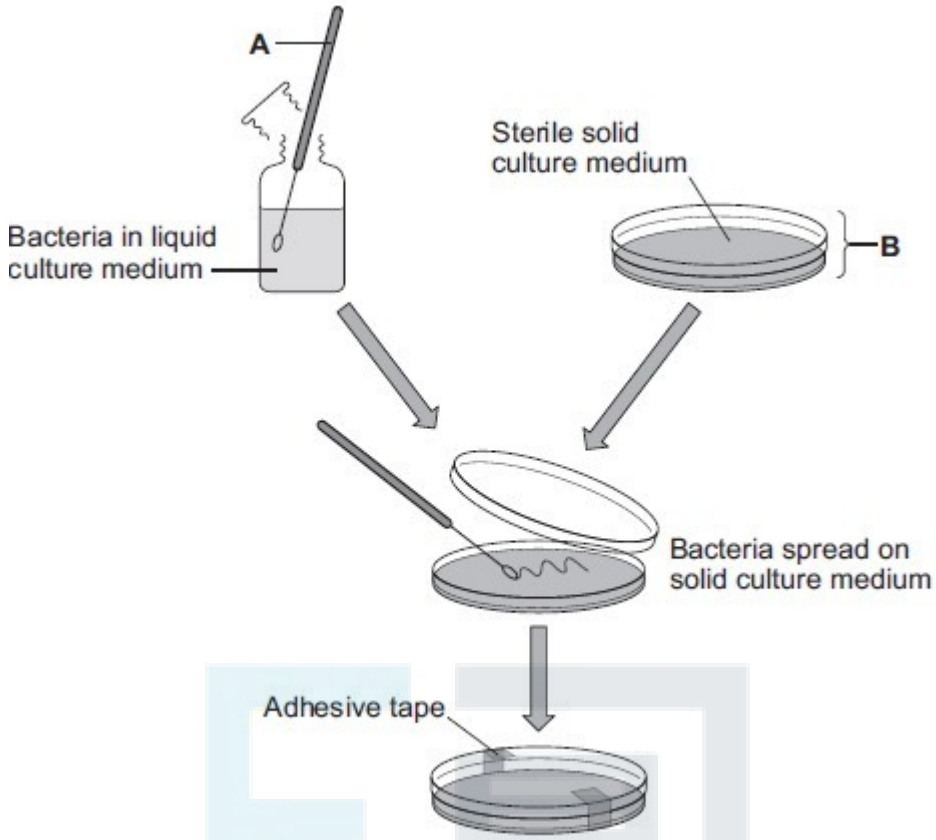
_____

**(1)**

**(Total 8 marks)**

## Q16.

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**

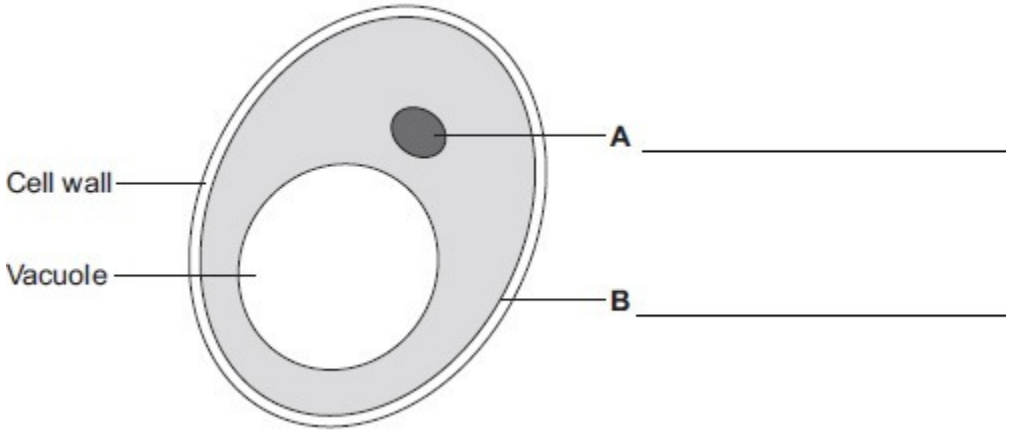
**(1)**

**(Total 6 marks)**

## Q17.

Human cells and yeast cells have some parts that are the same.

(a) The diagram shows a yeast cell.




Parts **A** and **B** are found in human cells and in yeast cells. On the diagram, label parts **A** and **B**.

**(2)**

(b) Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

_____

_____

_____

_____

**(1)**

(c) Human stem cells can develop into many different types of human cell.

(i) Use the correct answer from the box to complete the sentence.

| | | |
|---|---|---|
| **embryos** | **hair** | **nerve cells** |

Human stem cells may come from

_____

_____

**(1)**

(ii) Use the correct answer from the box to complete the sentence.

| | | |
|---|---|---|
| **cystic fibrosis** | **paralysis** | **polydactyly** |

Human stem cells can be used to treat

_____

_____

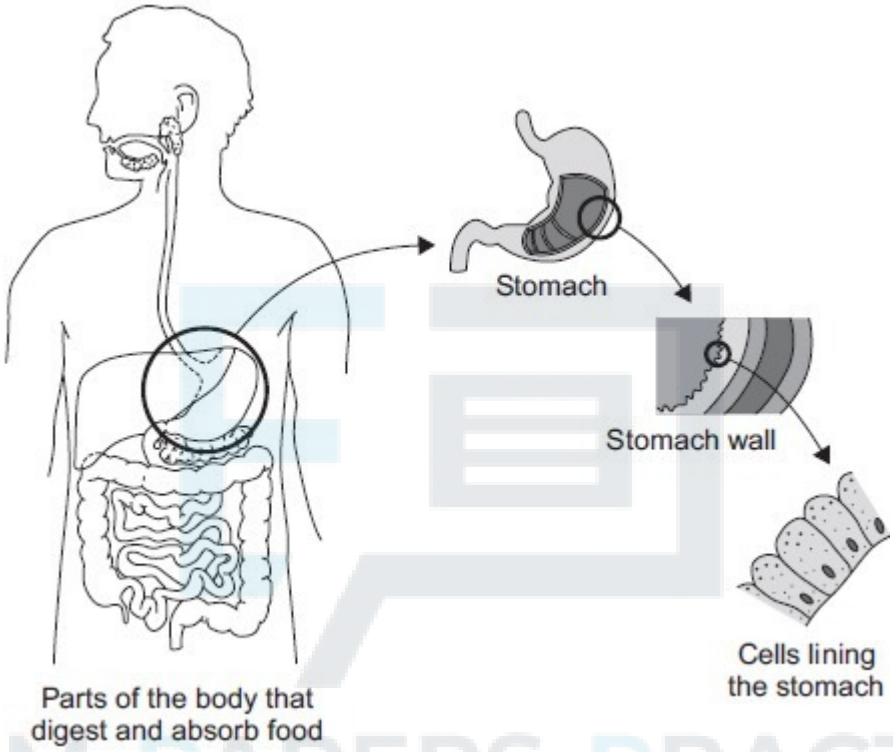
**(1)**

**(Total 5 marks)**

## Q18.

The diagram below shows the parts of the body that digest and absorb food.

It also shows some details about the structure of the stomach.




(a) Complete the table to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (✓) **one** box.

| **Structure** | **Organ** | **Organ system** | **Tissue** |
|---|---|---|---|
| Stomach | | | |
| Cells lining the stomach | | | |
| Mouth, oesophagus, stomach, liver, pancreas, small and large intestine | | | |

**(2)**

(b) (i) The blood going to the stomach has a high concentration of oxygen. The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

Oxygen moves from the blood to the cells lining the stomach by

the process of _____ .

**(1)**

(ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

**glucose** **protein** **starch**

**(1)**

(iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

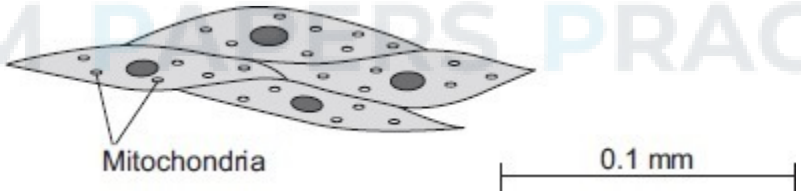
**cell membrane** **mitochondria** **nucleus**

**(1)**

**(Total 5 marks)**

## Q19.

The image below shows some muscle cells from the wall of the stomach, as seen through a light microscope.




(a) Describe the function of muscle cells in the wall of the stomach.

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(b) The figure above is highly magnified.

The scale bar in the figure above represents 0.1 mm.

Use a ruler to measure the length of the scale bar and then calculate the magnification of the figure above.

_____

_____

_____

_____

_____

_____

_____

_____

Magnification = _____ times

**(2)**

(c) The muscle cells in **Figure above** contain many mitochondria.

What is the function of mitochondria?

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(d) The muscle cells also contain many ribosomes. The ribosomes cannot be seen in the figure above.

(i) What is the function of a ribosome?

_____

_____

_____

_____

**(1)**

(ii) Suggest why the ribosomes **cannot** be seen through a light microscope.

_____

_____

_____

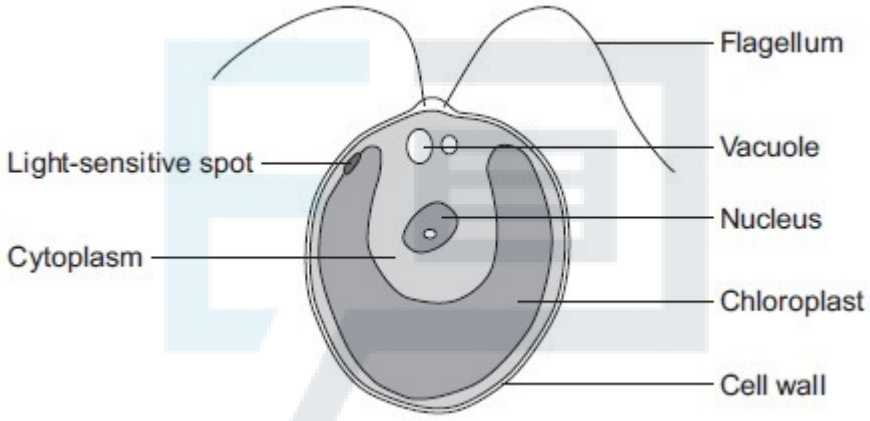
_____

**(1)**

**(Total 8 marks)**

## Q20.

The diagram below shows a single-celled alga which lives in fresh water.




(a) Which part of the cell labelled above:

(i) traps light for photosynthesis

_____

_____

**(1)**

(ii) is made of cellulose?

_____

_____

**(1)**

(b) In the freshwater environment water enters the algal cell.

(i) What is the name of the process by which water moves into cells?

_____

_____

**(1)**

(ii) Give the reason why the algal cell does not burst.

_____

_____

_____

_____

**(1)**

(c) (i) The alga can photosynthesise.

Complete the **word** equation for photosynthesis.

water + _____ $\xrightarrow{\text{Light energy}}$ _____ + oxygen

**(2)**

(ii) The flagellum helps the cell to move through water. Scientists think that the flagellum and the light-sensitive spot work together to increase photosynthesis.

Suggest how this might happen.

_____

_____

_____

_____

_____

_____

_____

_____



**(2)**

(d) Multicellular organisms often have complex structures, such as lungs, for gas exchange.

Explain why single-celled organisms, like algae, do **not** need complex structures for gas exchange.

_____

_____

_____

_____

_____

_____

_____

_____

_____

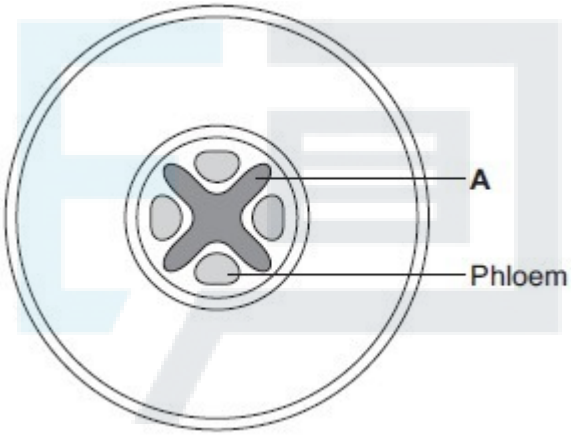
_____

**(3)**

**(Total 11 marks)**

## Q21.

The diagram below shows a cross-section of a plant root. The transport tissues are labelled.




(a) (i) What is tissue **A**?

Draw a ring around the correct answer.

**cuticle** **epidermis** **xylem**

**(1)**

(ii) Name **two** substances transported by tissue **A**.

1. _____

2. _____

**(2)**

(b) Phloem is involved in a process called translocation.

(i) What is translocation?

_____

_____

_____

_____

_____

**(1)**

(ii) Explain why translocation is important to plants.

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(c) Plants must use active transport to move some substances from the soil into root hair cells.

(i) Active transport needs energy.

Which part of the cell releases most of this energy?

Tick (✓) **one** box.

mitochondria ☐

nucleus ☐

ribosome ☐

**(1)**

(ii) Explain why active transport is necessary in root hair cells.

**(2)**
**(Total 9 marks)**

## Q22.

Some infections are caused by bacteria.

(a) The genetic material is arranged differently in the cells of bacteria compared with animal and plant cells.
Describe **two** differences.

**(2)**

(b) Tuberculosis (TB) is an infection caused by bacteria.

The tablebelow shows the number of cases of TB in different regions of southernEngland from 2000–2011.

**Number of cases of TB per 100 000 people**

| Year | London | South | South |
|---|---|---|---|

| | | East | West |
|---|---|---|---|
| 2000 | 37 | 5 | 3 |
| 2001 | 36 | 6 | 4 |
| 2002 | 42 | 6 | 6 |
| 2003 | 42 | 7 | 4 |
| 2004 | 42 | 7 | 5 |
| 2005 | 49 | 8 | 5 |
| 2006 | 44 | 8 | 3 |
| 2007 | 43 | 8 | 5 |
| 2008 | 44 | 8 | 5 |
| 2009 | 44 | 9 | 6 |
| 2010 | 42 | 9 | 5 |
| 2011 | 45 | 10 | 5 |

(i) How does the number of cases of TB for London compare with the rest of southern England?

_____

_____

_____

_____

**(1)**

(ii) Describe the pattern in the data for cases of TB in the South East.

_____

_____

_____

_____

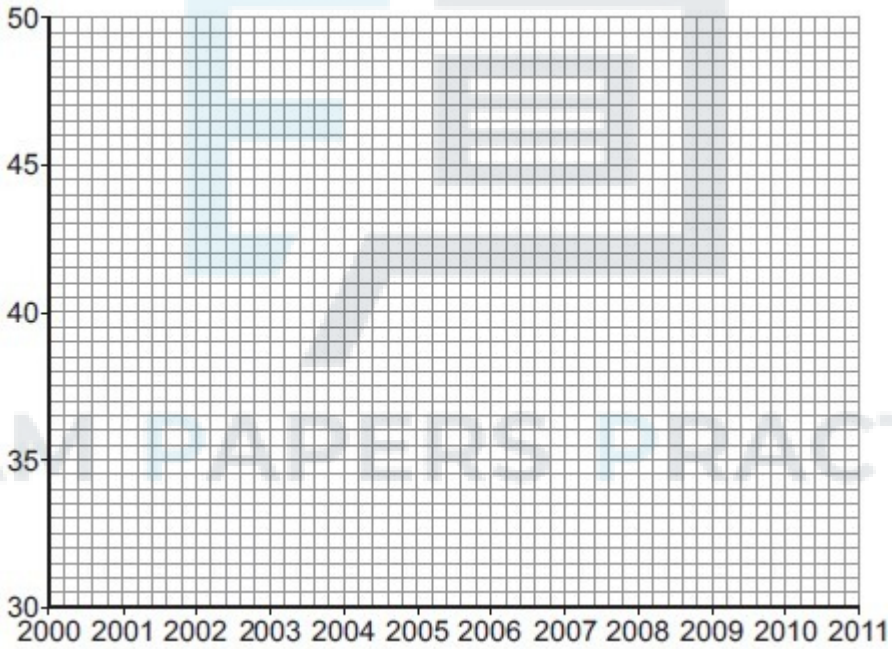
**(1)**

(iii) Describe the pattern in the data for cases of TB in the South West.

**(2)**

(c) (i) Onthegraph paper below:

- plot the number of cases of TB in **London**
- label both the axes on the graph
- draw a line of best fit.




**(4)**

(ii) Suggest why a student thought the value for 2005 in London was anomalous.

**(1)**

(d) People can be vaccinated against TB.

Suggest how a vaccination programme would reduce the number of people with TB.

Details of how a vaccine works are **not** required.

_____

_____

_____

_____

_____

_____

_____

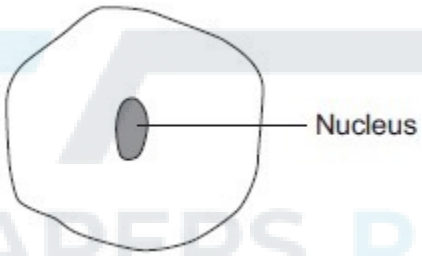
_____

**(2)**

**(Total 13 marks)**

## Q23.

The diagram below shows a cell.






(a) Draw a ring around the correct answer to complete each sentence.

(i) In the nucleus of a cell, genes are part of

| |
|---|
| chromosomes. |
| membranes. |
| receptors. |

**(1)**

(ii) Different genes control different

| |
|---|
| characteristics |
| gametes |
| nuclei |

of an organism.

**(1)**

(iii) Studying the similarities and differences between organisms allows us to

| |
|---|
| classify |
| clone |
| grow |

the organisms.

**(1)**

(b) Complete the following sentence.

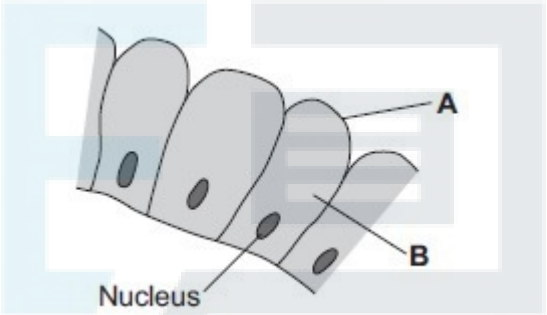
Living things can be grouped into animals, microorganisms and _____ .

**(1)**

**(Total 4 marks)**

## Q24.

The image below shows some cells in the lining of the stomach.




(a) (i) Use words from the box to name structures **A**and **B**.

| | | | |
|---|---|---|---|
| **cell membrane** | **chloroplast** | **cytoplasm** | **vacuole** |

**A** _____

**B** _____

**(2)**

(ii) What is the function of the nucleus?

Tick (✓) **one** box.

To control the activities of the cell ☐

To control movement of substances into and out of the cell ☐

To release energy in respiration ☐

**(1)**

(b) Draw **one** line from each part of the human body to its correct scientific name.

| Part of human body | Scientific name |
| --- | --- |
| Layer of cells lining the stomach | An organ |
| Stomach | An organism |
| Mouth, stomach, intestines, liver and pancreas | An organ system |
| | A tissue |

**(3)**

**(Total 6 marks)**

## Q25.

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

(a) *Inthisquestionyou will beassessedon using good English,organising informationclearly and usingspecialist 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.

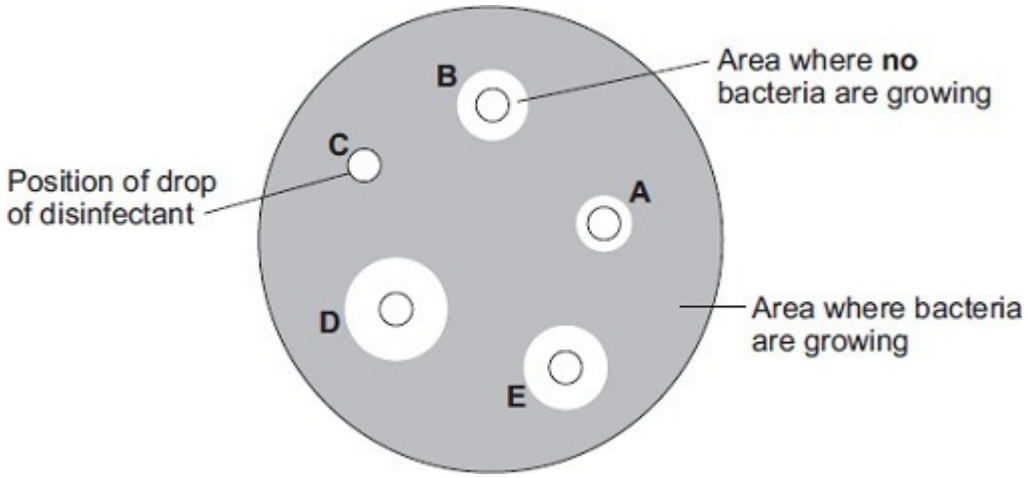
_____

_____

**(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.

_____

_____

_____

_____

_____

_____

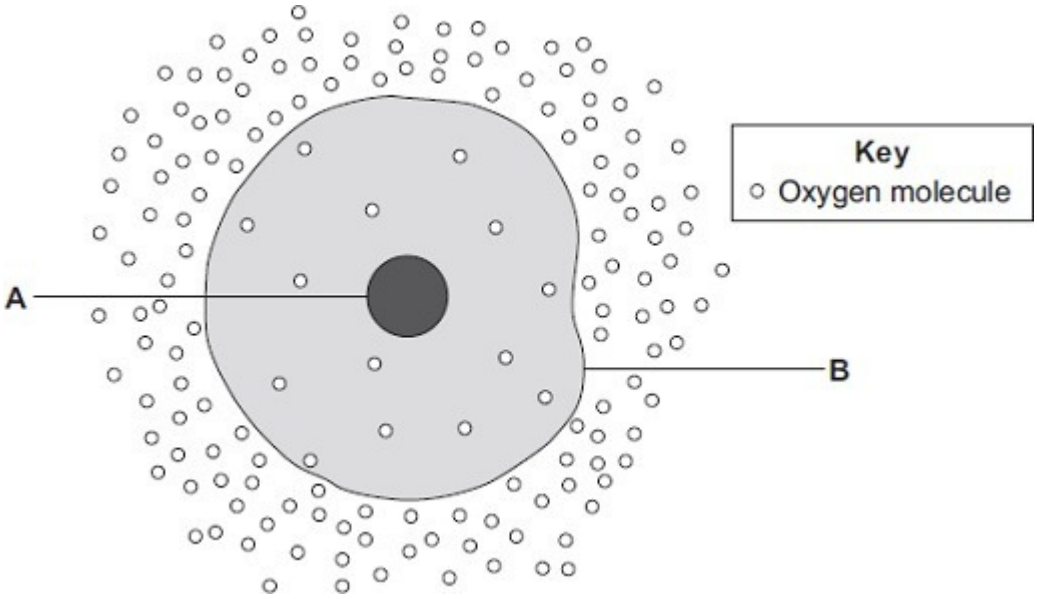


**(2)**

**(Total 9 marks)**

## Q26.

The diagram shows a cell.




(a) (i) Use words from the box to name the structures labelled **A** and **B** .

| cell membrane | chloroplast | cytoplasm | nucleus |
|---|---|---|---|

**A** _____

**B** _____

**(2)**

(ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and **not** a plant cell?

Give **two** reasons.

1. _____

2. _____

**(2)**

(b) Oxygen will diffuse into the cell in the diagram.

Why?

Use information from the diagram.

_____

_____

_____

_____

**(1)**

(c) The cell shown in the diagram is usually found with similar cells.

Draw a ring around the correct answer to complete the sentence.

Scientists call a group of similar cells

| |
|---|
| an organ. |
| a system. |
| a tissue. |

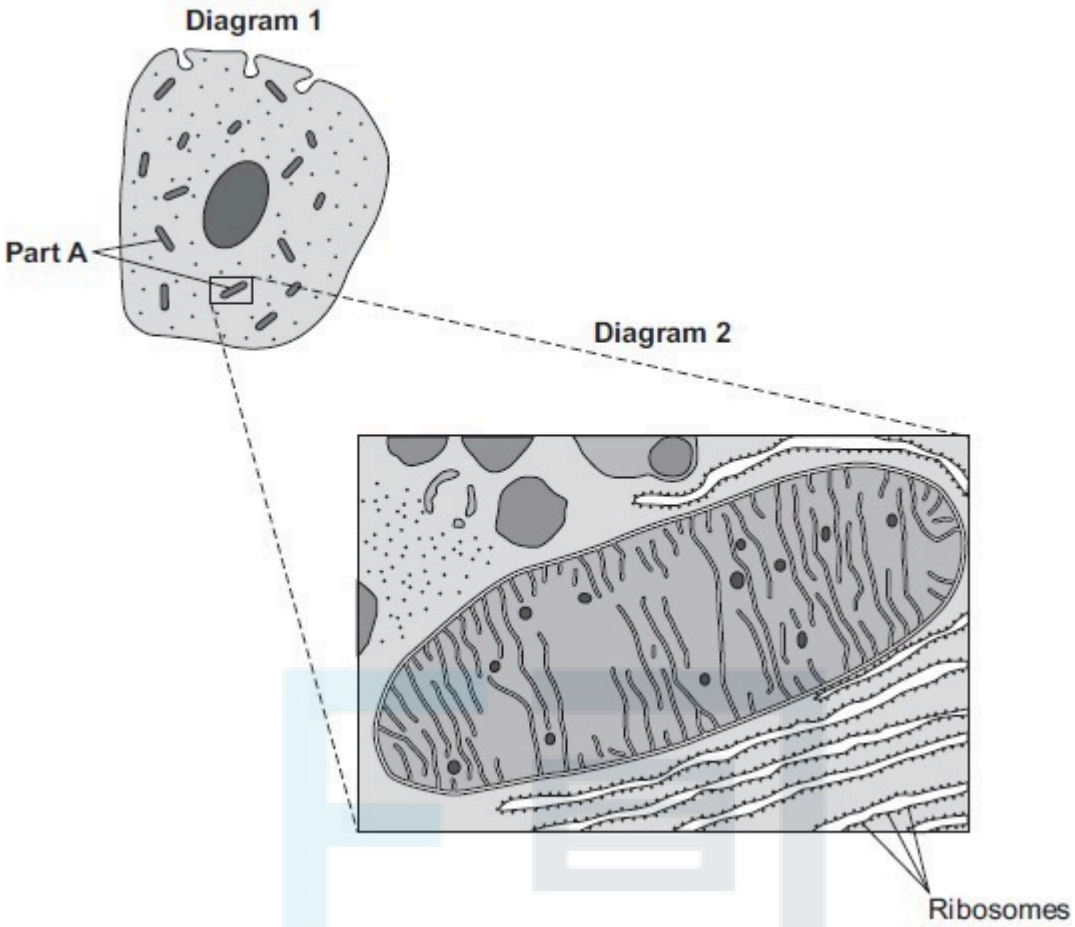
**(1)**

**(Total 6 marks)**

## Q27.

**Diagram 1** shows a cell from the pancreas.

**Diagram 2** shows part of the cell seen under an electron microscope.




Part **A**iswhere most of the reactions of aerobic respiration happen.

(a) (i) Name part **A**.

_____

**(1)**

(ii) Complete the equation for aerobic respiration.

glucose + oxygen ⟶ _____ + _____ (+ energy)

**(2)**

(iii) Part **A** uses oxygen.

Explain how oxygen passes from the blood to part **A**.

_____

_____

_____

_____

**(3)**

(b) The pancreas cell makes enzymes.

Enzymes are proteins.

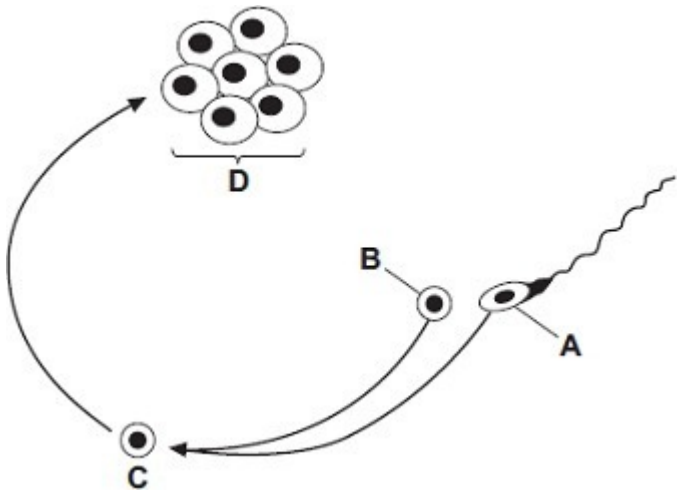
Describe how the ribosomes and part **A** help the cell to make enzymes.

**(3)**

**(Total 9 marks)**

## Q28.

The diagram shows some of the stages in IVF (in vitro fertilisation).




(a) Use wordsfrom the box to name structures **A**, **B**, **C** and **D**.

| | | | | |
|---|---|---|---|---|
| **egg** | **embryo** | **fertilised egg** | **ovary** | **sperm** |

Structure **A** _____

Structure **B** _____

Structure **C** _____

Structure **D** _____

**(4)**

(b) What do doctors do next with structure **D**?

_____

_____

_____

_____

_____

_____

_____

_____

**(2)**

(c) The table gives statistics for an IVF clinic.

| | Age of women treated | | | |
|---|---|---|---|---|
| | **Below 35 years** | **35 – 37 years** | **38 – 39 years** | **40 – 42 years** |
| Number of women treated | 414 | 207 | 106 | 53 |
| Number of women who produced one baby | 90 | 43 | 17 | 1 |
| Number of women who produced twins | 24 | 8 | 4 | 1 |
| Number of women who produced triplets | 1 | 0 | 0 | 0 |

(i) About what proportionofthe treated women aged 35 – 37 years produced one or morebabies?
Drawa ring aroundyouranswer.

**one quarter** **one third** **half**

**(1)**

(ii) This clinic does **not** give IVF treatment to women over 42 years of age.

Use data from the table to explain why.

_____
_____
_____
_____
_____
_____

**(2)**

(iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

_____
_____

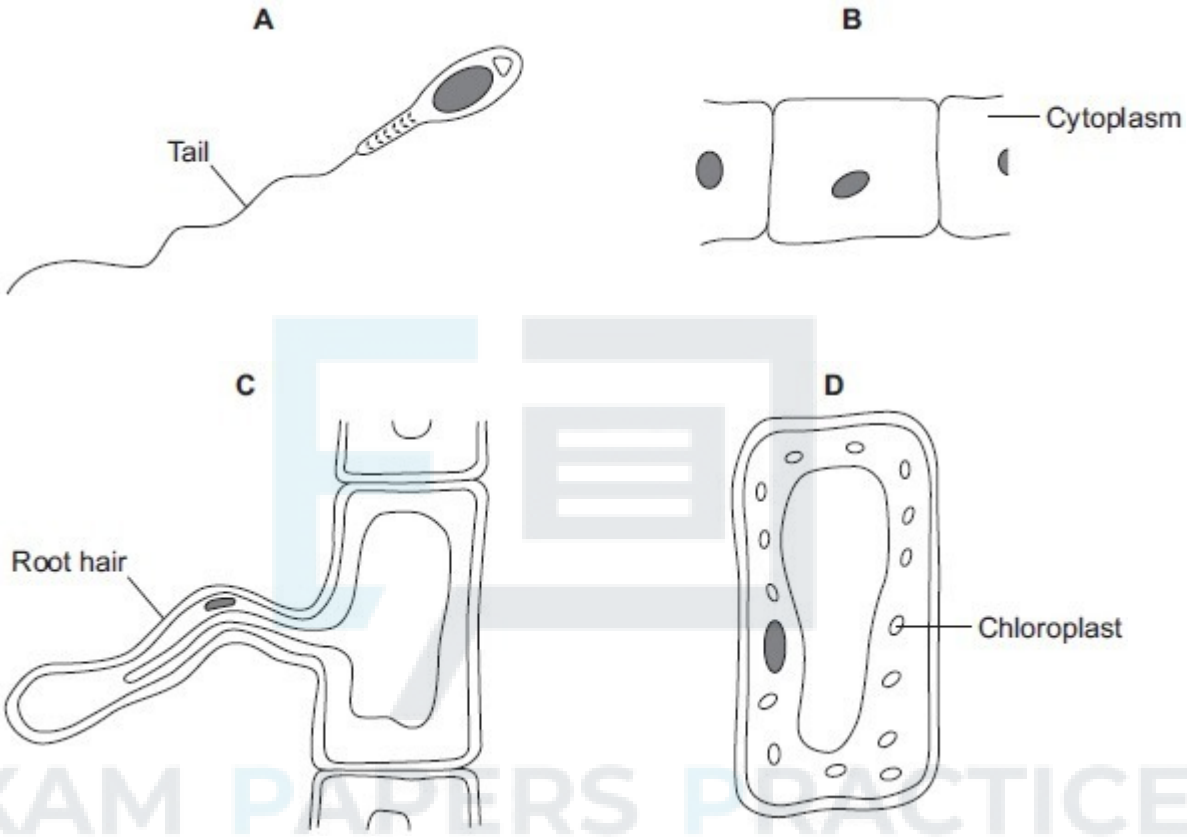
_____

**(1)**

**(Total 10 marks)**

## Q29.

The diagrams show four types of cell, **A**, **B**, **C** and **D**.
Two of the cells are plant cells and two are animal cells.




(a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

**A** and **B** ☐

**A** and **D** ☐

**C** and **D** ☐

**(1)**

(ii) Give **one** reason for your answer.

_____

_____

_____

_____

**(1)**

(b) (i) Which cell, **A**, **B**, **C** or **D**, is adapted for swimming? ☐

**(1)**

(ii) Which cell, **A**, **B**, **C** or **D**, can produce glucose by photosynthesis? ☐

**(1)**

(c) Cells **A**, **B**, **C** and **D** all use oxygen.

For what process do cells use oxygen?

Draw a ring around **one** answer.

**osmosis** **photosynthesis** **respiration**

**(1)**

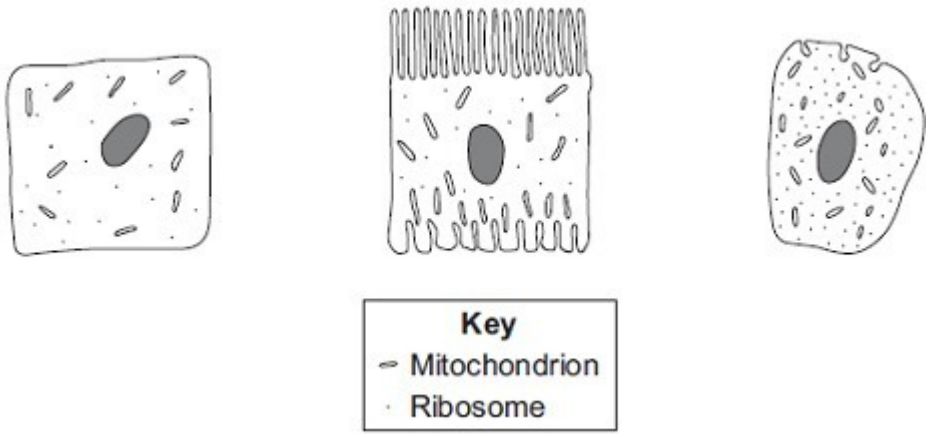
**(Total 5 marks)**



## Q30.

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

**A** **B** **C**




(a) Which cell, **A**, **B** or **C**, appears to be best adapted to increase diffusioninto 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)**

## Q31.

(a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.
Neither of them has cystic fibrosis.
Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

**(3)**

(b) Mr and Mrs Smith decided to visit a genetic counsellor who discussed embryo screening.

Read the information which they received from the genetic counsellor.

- Five eggs will be removed from Mrs Smith's ovary while she is under an anaesthetic.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about
- thirty cells.
  One cell will be removed from each embryo and tested for cystic
- fibrosis.
  A suitable embryo will be placed into Mrs Smith's uterus and she may become pregnant.

- Any unsuitable embryos will be destroyed.

(i) Suggest why it is helpful to take five eggs from the ovary and not just one egg.

**(1)**

(ii) Evaluate the use of embryo screening in this case.

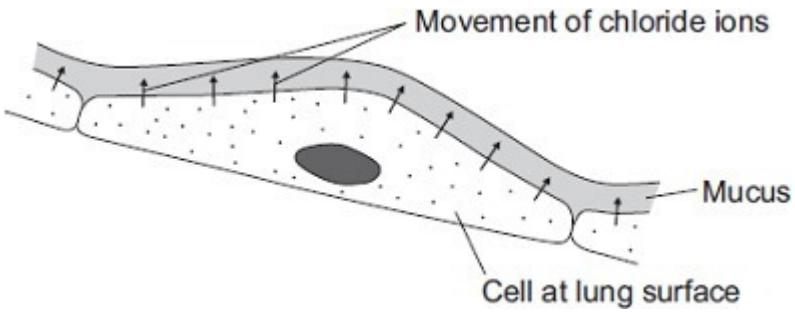
Remember to give a conclusion to your evaluation.

**(4)**

(c) In someone who has cystic fibrosis the person's mucus becomes thick.

The diagram shows how, in a healthy person, cells at the lung surface move

chloride ions into the mucus surrounding the air passages.




The movement of chloride ions causes water to pass out of the cellsinto the mucus.

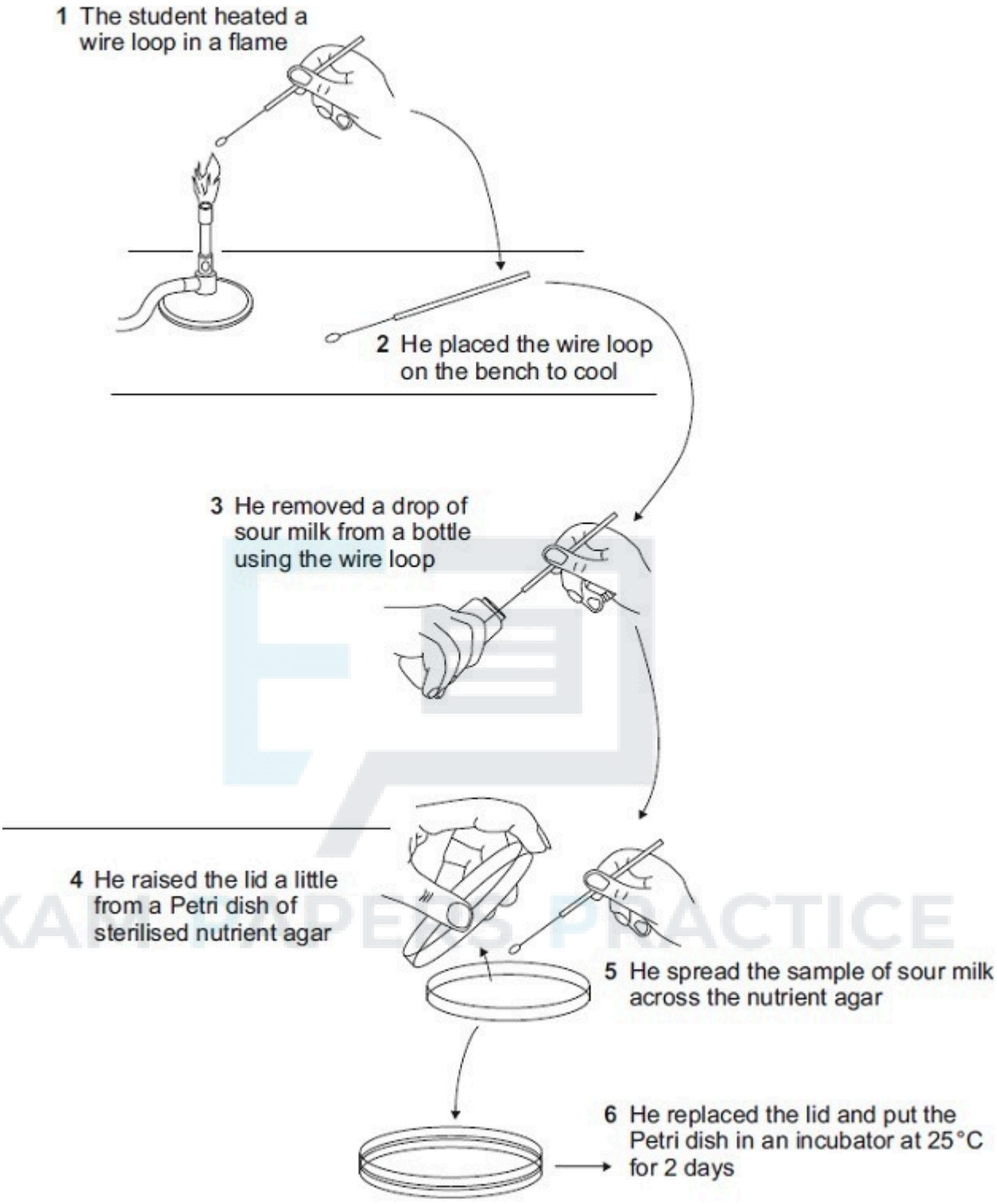
Explain why.

**(3)**

**(Total 11 marks)**

## Q32.

The diagram shows how a student transferred some sour milk from a bottle to a Petri
dish of nutrient agar.




**List A** gives four actions carried out by the student.
**List B**gives five possible effects of these actions.

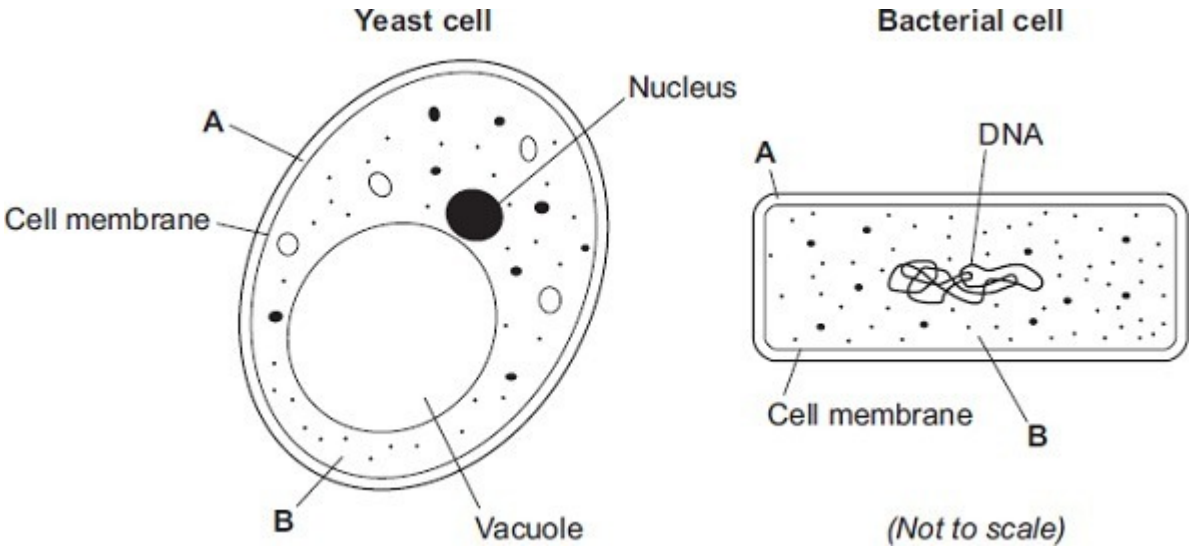
Draw a straight line from each action in **List A** to its effect in **List B**.
Draw only **one** line from each action.

| List A – Action | List B – Effect |
| --- | --- |
| Heating loop in flame | Risk of contamination with bacteria increased |
| Placing loop on bench to cool | Fewer bacteria will enter |
| Only lifting lid of Petri dish a little | Kills bacteria |
| Placing Petri dish in incubator at 25°C | Prevents airentering |
| | Risk of growthof pathogens decreased |

**(Total 4 marks)**

**Q33.**

(a) The diagrams show the structures of a yeast cell and a bacterial cell.




(i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**. **A**

_____

**B**

_____

**(2)**

(ii) The yeast cell and the bacterial cell have different shapes and sizes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

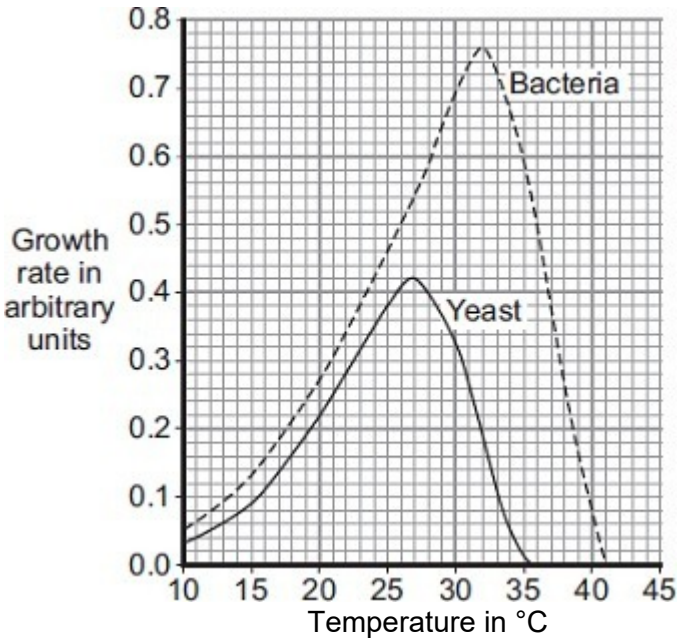
_____

_____

**(1)**

(b) Sourdough bread is light in texture and tastes slightly sour. The bread is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. The acid makes the bread taste sour.

The graph shows how the growth rates of the yeast and the bacteria change with temperature.




(i) Sourdough bread rises fastest at 27°C.

Use information from the graph to explain why.

_____

_____

_____

_____

_____

_____

_____

**(2)**

(ii) The bread tastes most sour if it rises at 32°C.

Use information from the graph to explain why.

_____

_____

_____

_____

_____

_____

_____

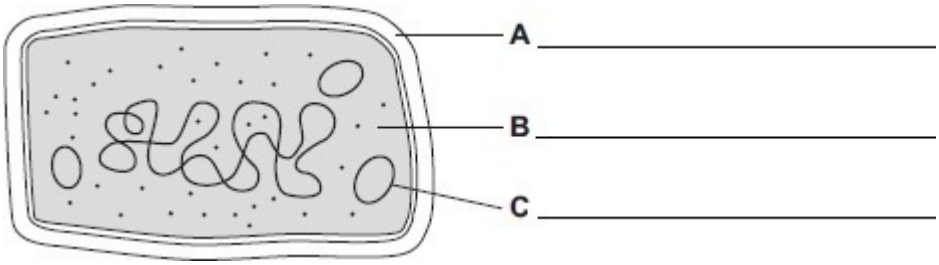
_____

**(2)**

**(Total 7 marks)**

## Q34.

(a) The diagram shows the structure of a bacterial cell.




(i) On the diagram use words from the box to label structures **A**, **B** and **C**.

| | | | | |
|---|---|---|---|---|
| **cell membrane** | **cell wall** | **chloroplast** | **cytoplasm** | **plasmid** |

**(3)**

(ii) Give **one** difference between the structure of the bacterial cell and an animal cell.

_____

_____

**(1)**

(iii) Name **one** structure that is found in a plant cell but is **not** found in a bacterial or an animal cell.

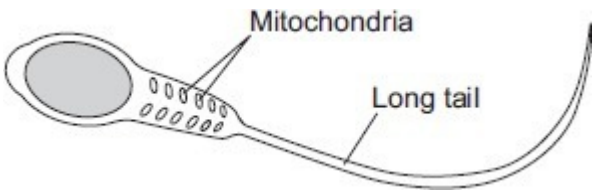
_____

_____

**(1)**

(b) Cells can be specialised for a particular job.

The diagram shows the structure of a human sperm cell.




Describe how the long tail and the mitochondria help the sperm to do its job.

Long tail

_____

_____

_____

_____

Mitochondria

_____

_____

_____

_____

_____

**(4)**

**(Total 9 marks)**