

Multiple Choice: Paper 1

1.1 Cells: Theory

1.1.1 Cell Theory / 1.1.2 Functions of Life / 1.1.3 Surface Area to Volume Ratio /
1.1.4 Cell Specialisation / 1.1.5 Stem Cells / 1.1.6 Skills: Cell Theory

| | |
|-----------------------|------------|
| Easy (5 questions) | /5 |
| Medium (10 questions) | /10 |
| Hard (5 questions) | /5 |
| Total Marks | /20 |

Scan here to return to the course
or visit [savemyexams.com](https://www.savemyexams.com)



Easy Questions

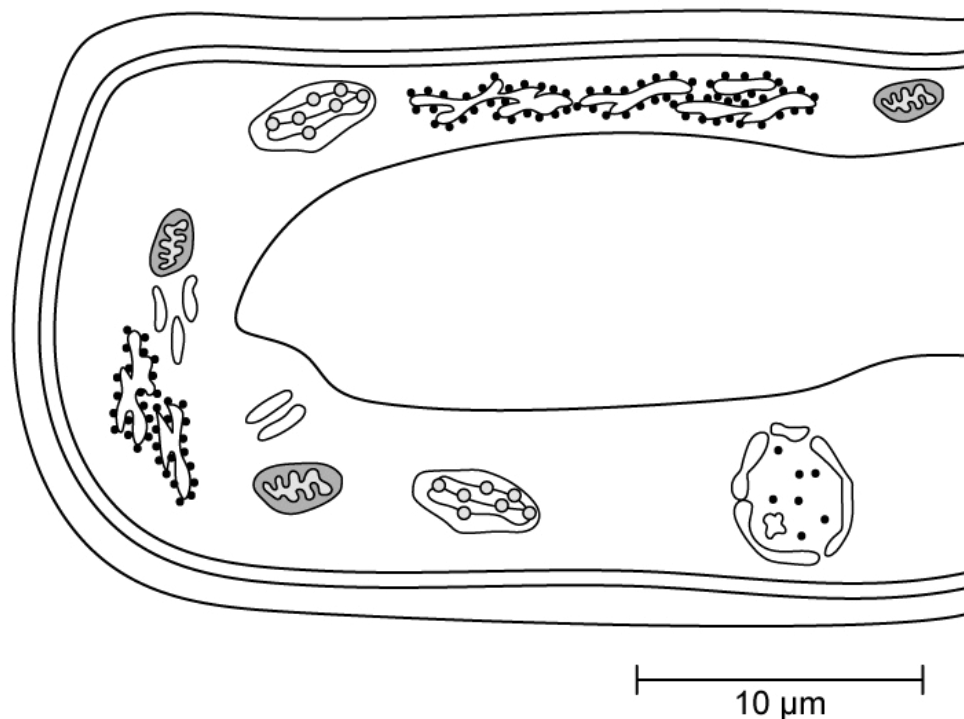
1 Which of the following options is **not** a source of stem cells?

- A. Umbilical cord blood
- B. Bone marrow
- C. An embryo
- D. Blood plasma

(1 mark)

2 The electron micrograph below shows a plant cell.

The scale bar (measuring 45 mm in length) on this drawing represents a length of 10 μm .



Which of the following correctly represents the magnification of the electron micrograph?

A. x45000

B. x4.5

C. x4500

D. x450

(1 mark)

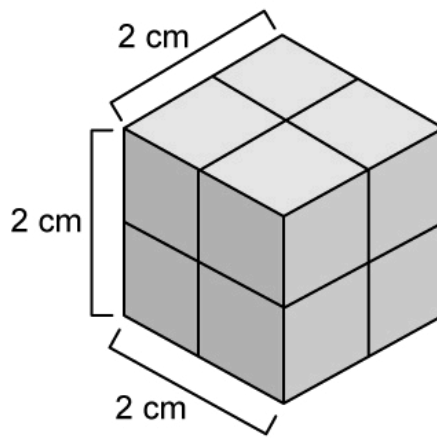
- 3 *Paramecium* is a genus of unicellular eukaryotic organisms which carry out several functions in order to stay alive. The table below lists four of these functions and descriptions on how *Paramecium* carry them out.

Which of the following rows correctly describes the processes of the *Paramecium*?

| | Metabolism | Reproduction | Response | Nutrition |
|----|---|------------------|--|---|
| A. | Carry out photosynthesis in their chloroplasts | Commonly asexual | Beating cilia moves them through water in response to external stimuli | Get their nutrition from the products of photosynthesis |
| B. | Reactions such as respiration take place in the cytoplasm | Commonly asexual | Beating cilia moves them through water in response to external stimuli | Take in nutrients via their oral groove which they digest using enzymes |
| C. | Carry out photosynthesis in their chloroplasts | Mostly sexual | Beating 'tail' called a flagellum moves them through water in response to external stimuli | Get their nutrition from the products of photosynthesis |
| D. | Reactions such as respiration take place in the cytoplasm | Mostly sexual | Beating 'tail' called a flagellum moves them through water in response to external stimuli | Take in nutrients via their oral groove which they digest using enzymes |

(1 mark)

- 4 The cube below has sides that measure 2 cm in length.



Which of the following represents the correct surface area : volume ratio of this cube?

- A.** 1:1
- B.** 6:1
- C.** 3:1
- D.** 2:1

(1 mark)

5 Which changes can occur when a cell differentiates from a stem cell into a specialised cell?

- I. The shape of the cell can change
- II. The number and type of proteins in the cell changes
- III. Enzymes cut out the DNA that is no longer needed

- A.** I. and II.
- B.** II. and III.
- C.** I. and III.
- D.** All of the options

(1 mark)

Medium Questions

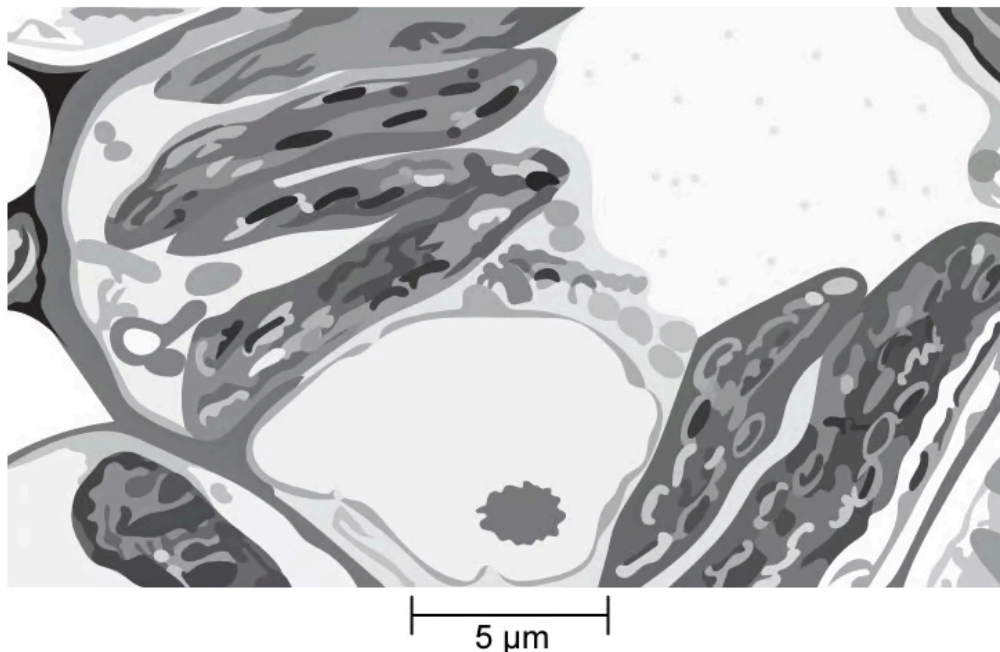
- 1 A prokaryotic cell has a diameter of $1\ \mu\text{m}$. The cell is magnified 50 000 times by an electron microscope.

In the electron micrograph that is produced by the electron microscope, what is the diameter of the prokaryotic cell?

- A. $5 \times 10^0\ \text{mm}$
- B. $5 \times 10^{-1}\ \text{mm}$
- C. $5 \times 10^2\ \text{mm}$
- D. $5 \times 10^1\ \text{mm}$

(1 mark)

- 2 The electron micrograph shows the organelles in a leaf cell. A student uses their ruler to measure the length of the scale bar, which they find to be 1.5 cm.



What is the magnification?

A. $\times 7\ 000$

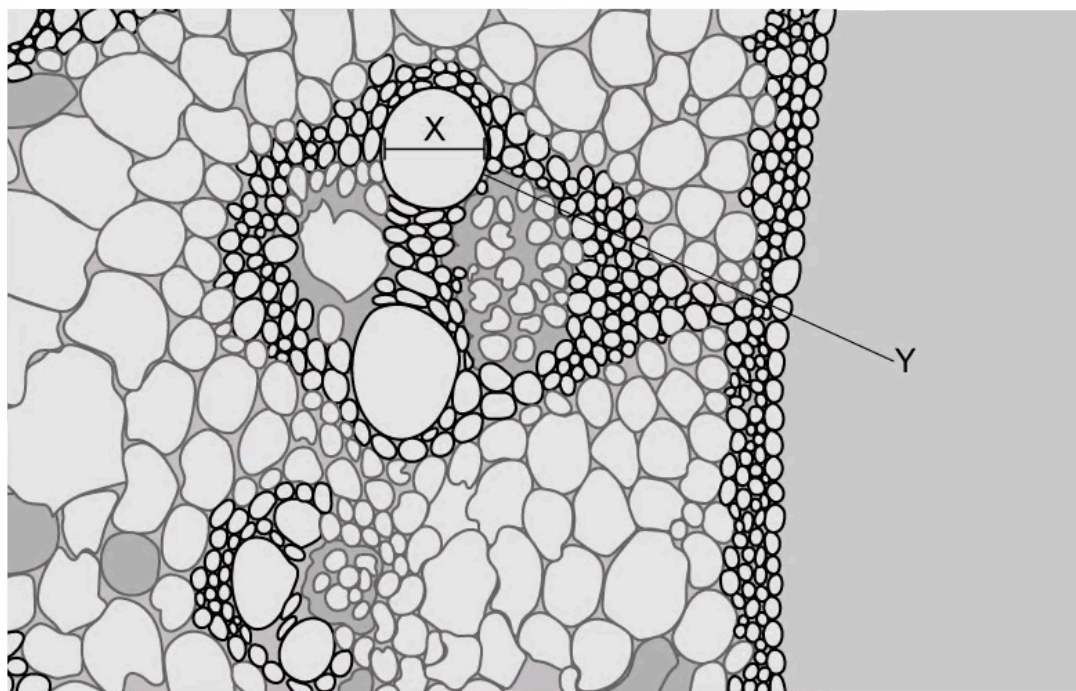
B. $\times 7.5$

C. $\times 3\ 000$

D. $\times 300$

(1 mark)

- 3 The electron micrograph below shows a root vascular system. The magnification of the image is $\times 200$. A student uses a ruler to measure distance X and finds it to be 10 mm.



What is the diameter of the cell labelled Y?

A. $100\ \mu\text{m}$

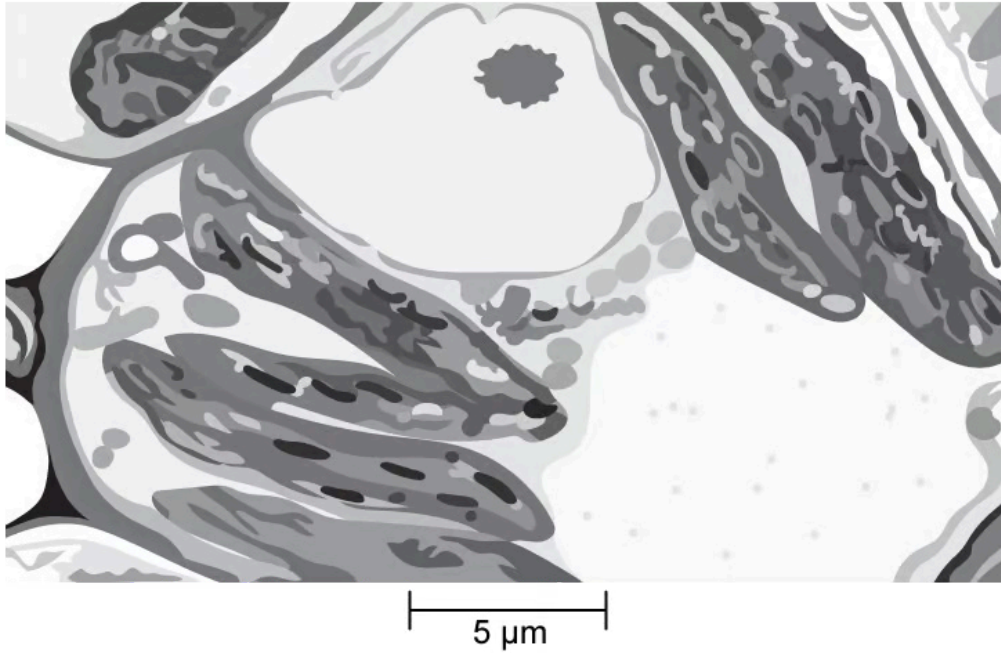
B. $50\ \mu\text{m}$

C. $10\ \mu\text{m}$

D. $5\ \mu\text{m}$

(1 mark)

4 The electron micrograph of the plant cell has a 2 cm scale line labelled 5 μm .



What is the magnification?

- A. $\times 5\,000$
- B. $\times 4\,000$
- C. $\times 2\,000$
- D. $\times 1\,000$

(1 mark)

- 5 Erythrocytes (red blood cells) have a diameter of 7 000 nm. Pancreatic cells have a diameter of 35 μm .

Which of these statements is correct about the relative sizes of these cells?

- A. The erythrocytes are 5 times smaller.
- B. The erythrocytes are 50 times smaller.
- C. The erythrocytes are 5 times larger.
- D. The erythrocytes are 50 times larger.

(1 mark)

- 6 Which of the following ideas are part of cell theory?

- I. Cells are the smallest unit of life.
- II. Cells show great variety in shape and structure.
- III. Cells are derived from other cells (pre-existing cells) by division.

- A. I only
- B. II only
- C. I and III only
- D. II and III only

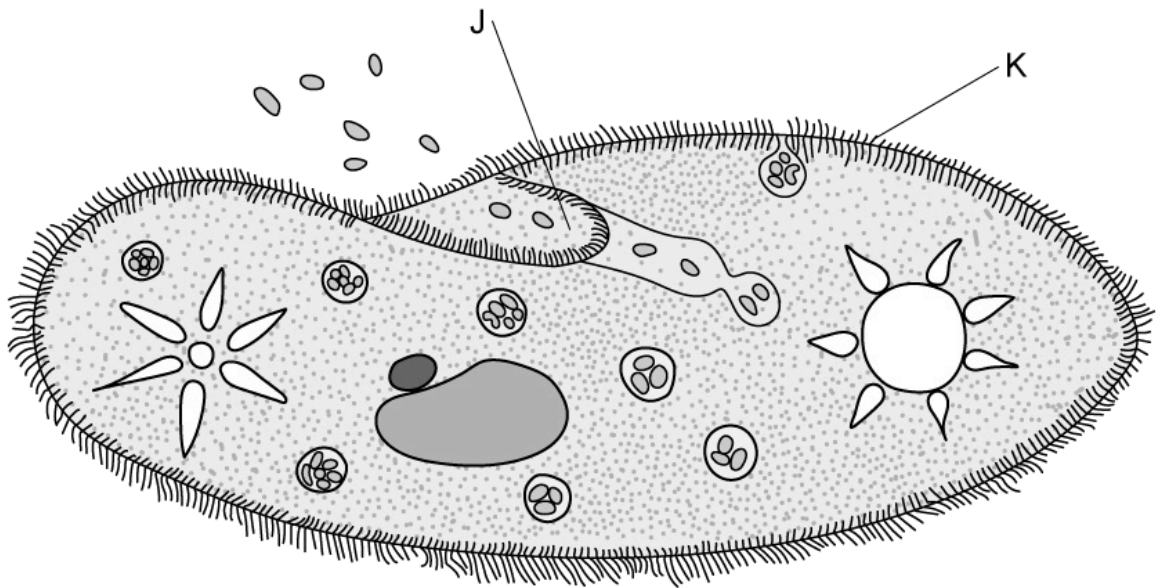
(1 mark)

7 Which property of stem cells makes them suitable for therapeutic uses?

- A. They can differentiate into specialised cells.
- B. They can produce chemicals that destroy viruses.
- C. They can form gametes when they divide by mitosis.
- D. They have chromosomes that are suitable for gene transfer.

(1 mark)

8 A *Paramecium* is shown in the image below.



Which functions are structures **J** and **K** responsible for carrying out in *Paramecium*?

| | J | K |
|----------|-----------------|-------------|
| A | Respiration | Movement |
| B | Feeding | Movement |
| C | Excretion | Respiration |
| D | DNA replication | Digestion |

(1 mark)

9 What happens to the surface area:volume ratio of a cell as the cell grows and increases in size?

- A. It does not change.
- B. It increases.
- C. It decreases.
- D. It doubles as the cell doubles in size.

(1 mark)

10 Which of the following statements relate to Stargardt's disease?

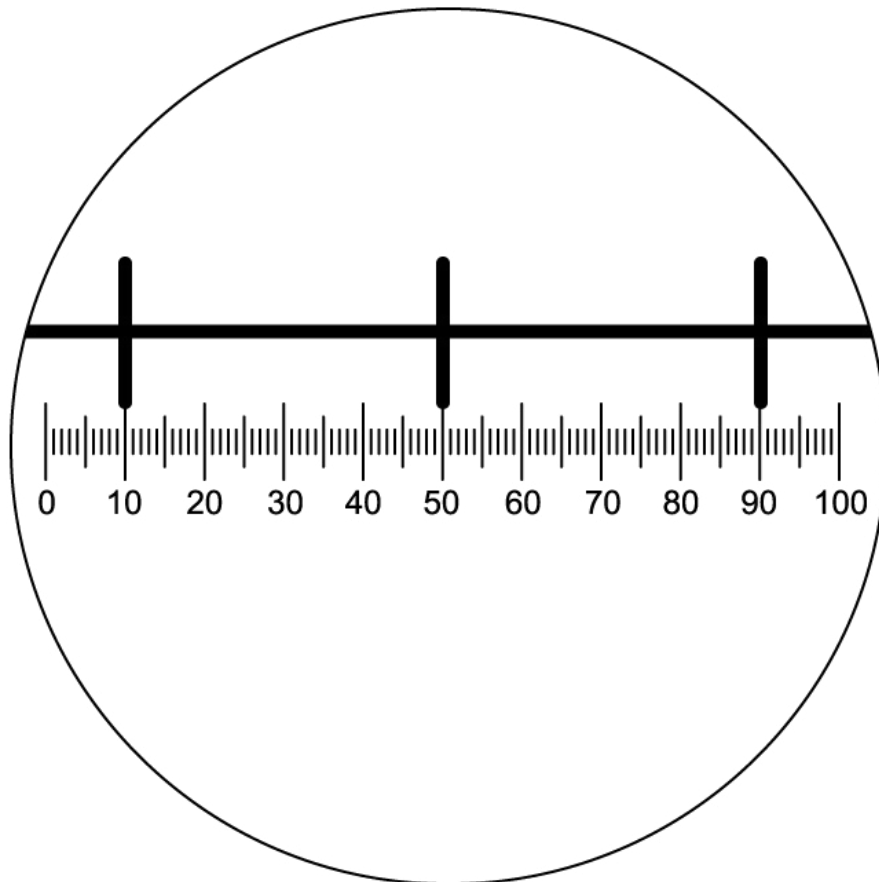
- I. There is neuron death in the part of the midbrain that controls subconscious muscle activities.
- II. There is a mutation in a gene for active transport in photoreceptor cells.
- III. β -cells of the pancreas are destroyed by the body's immune system.
- IV. There is a breakdown of light-sensitive cells in the retina.

- A. I only
- B. I and II only
- C. II and III only
- D. II and IV only

(1 mark)

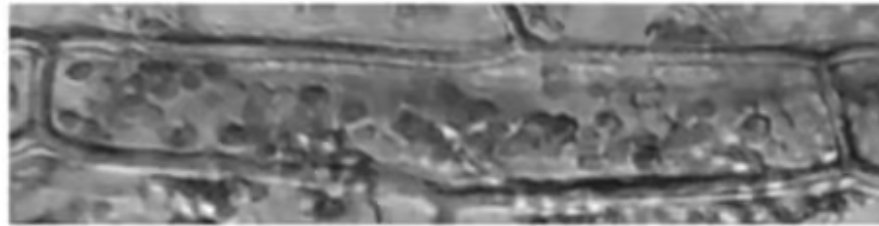
Hard Questions

- 1 A stage micrometer with small divisions of 0.1 mm was used to calibrate a graticule. This is shown in the diagram below.



A slide of a plant cell was placed on the stage in place of the stage micrometer.

What is the width of one of the chloroplasts below?



- A. 100 μm
- B. 50 μm
- C. 10 μm
- D. 0.5 mm

(1 mark)

- 2 Current research is making great advances in the therapeutic use of stem cells. Embryonic stem cells are delivering promising results in treating diseases such as Stargardt's disease due to their unique characteristics.

Which of the following characteristics would **not** apply to embryonic stem cells?

- A. They have the potential to develop into any type of tissue if taken within the first few days after fertilisation
- B. There are methods that can be used to make the embryonic stem cells develop into specialised cells needed to treat specific diseases
- C. A small number of stem cells remain in many tissues of the body, such as bone marrow, skin and the liver to replace damaged or dead cells
- D. The stem cells can divide an unlimited number of times to produce a large number of cells that can become specialised

(1 mark)

3 There are many ethical objections to the use of stem cells in medical research.

Some of the objections are as follows:

- I. These cells have a higher risk of developing into tumours
- II. They need to be a close match in terms of blood type and other body antigens or there is a chance that the cells used will be rejected by the patient's immune system
- III. The cells are multipotent and therefore have a limited capacity to differentiate into different cell types
- IV. Difficult to obtain as there are a small number of them and so they can be painful to extract
- V. The destruction of these cells can be viewed as being equivalent to ending a life

Which of the objections only apply to stem cells taken from embryos?

- A. I. and V.
- B. I., II. and III.
- C. I. and IV.
- D. I., IV. and V.

(1 mark)

4 The cells of bacteria are on average 1-5 μm long, whereas human cells are on average 100 μm in diameter.

What is the main limiting factor preventing the bacterial cells from growing to the same size as the human cells?

- A. The rate of cell division would be too slow to take advantage of colonising new areas
- B. The structure of the cell wall of bacteria limits the size of the cell
- C. A larger size would prevent the cells from moving and being pushed by the flagella
- D. The rate of diffusion of substances being exchanged across the membrane slows as the cell gets larger

(1 mark)

- 5 The cell theory describes the idea that all living organisms are made of cells that have a particular set of features, such as being surrounded by a cell membrane.

The options below describe some atypical examples that don't possess all the features described by the cell theory.

Which of the examples below does conform to the cell theory?

- A.** Striated muscle fibres possess multiple nuclei and can grow up to 300 mm in length.
- B.** Skin cells replicate so quickly that our full body of skin cells die and are regenerated every 27 days
- C.** Aseptate fungal hyphae do not possess septa (end walls between the cell) meaning that the cells are multinucleated with a shared cytoplasm.
- D.** Giant algae (*Acetabularia*) are unicellular but can be up to 100 mm long with just one nucleus and a complex structure.

(1 mark)