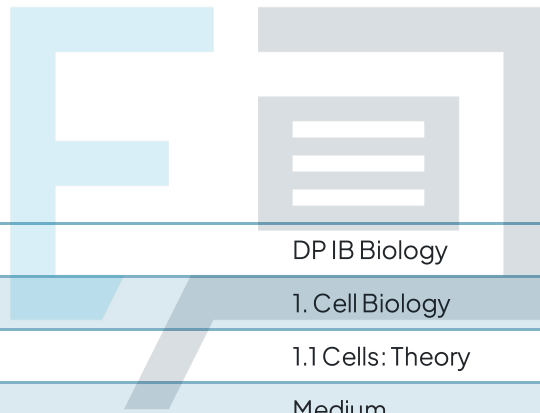




# 1.1 Cells: Theory

## Mark Schemes



Course	DP IB Biology
Section	1. Cell Biology
Topic	1.1 Cells: Theory
Difficulty	Medium

# Exam Papers Practice

To be used by all students preparing for DP IB Biology HL  
Students of other boards may also find this useful

1

The correct answer is **D** because:

Step ①: Recall formula triangle



I = image size  
A = actual size  
M = magnification

Step ②: Calculate image size

$$\begin{aligned} I &= A \times M \\ I &= 1 \mu\text{m} \times 50,000 \\ I &= 50,000 \mu\text{m} \end{aligned}$$

Step ③: Convert units from  $\mu\text{m}$  to mm

$$50,000 \div 1,000 = 50 \text{ mm}$$

There are  
1,000 micrometres  
in a millimetre

Step ④: Convert 50 mm into standard form

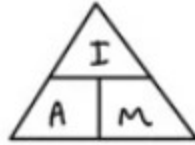
$$50 \text{ mm} = \underline{\underline{5 \times 10^1 \text{ mm}}}$$

**A** is incorrect because  $10^0 = 1$ , so  $5 \times 10^0 \text{ mm} = 5 \text{ mm}$ . **B** is incorrect because  $10^{-1} = 0.1$ , so  $5 \times 10^{-1} \text{ mm} = 0.5 \text{ mm}$ . **C** is incorrect because  $10^2 = 100$ , so  $5 \times 10^2 \text{ mm} = 500 \text{ mm}$ .

2

The correct answer is C because:

Step ①: Recall formula triangle



I = image size  
A = actual size  
M = magnification

Step ②: Ensure units for I and A are the same

Convert all values to smallest unit given

$$1.5 \times 10,000 = 15,000 \mu\text{m}$$

There are 10,000 micrometres in a centimetre

Step ③: Calculate magnification

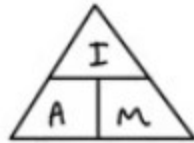
$$M = I \div A$$
$$M = 15,000 \mu\text{m} \div 5 \mu\text{m}$$
$$M = \underline{\underline{3,000}}$$

Exam Papers Practice

3

The correct answer is **B** because:

Step ①: Recall formula triangle



I = image size  
A = actual size  
M = magnification

Step ②: Calculate actual size

$$\begin{aligned} A &= I \div M \\ A &= 10 \text{ mm} \div 200 \\ A &= 0.05 \text{ mm} \end{aligned}$$

Step ③: Convert units from mm to  $\mu\text{m}$

$$0.05 \times 1,000 = 50 \mu\text{m}$$

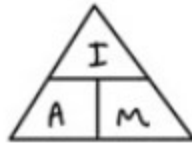
There are  
1,000 micrometres  
in a millimetre

# Exam Papers Practice

4

The correct answer is **B** because:

Step ①: Recall formula triangle



I = image size  
A = actual size  
M = magnification

Step ②: Ensure units for I and A are the same

Convert all values to smallest unit given

$$2 \times 10,000 = 20,000 \mu\text{m}$$

There are 10,000 micrometres in a centimetre

Step ③: Calculate magnification

$$M = \frac{I}{A}$$
$$M = \frac{20,000 \mu\text{m}}{5 \mu\text{m}}$$
$$M = 4,000$$

Step ④: Convert 4,000 into standard form

$$4,000 = \underline{\underline{4 \times 10^3}}$$

Exam Papers Practice

5

The correct answer is **A** because:

Step ①: Convert all units to  $\mu\text{m}$

$$7,000 \text{ nm} = 7 \mu\text{m}$$

There are  
1,000 nanometres  
in a micrometre

Step ②: Compare the sizes  
of the cells

$$35 \div 7 = 5$$

Pancreatic  
cell

Erythrocyte

So erythrocytes are x5  
smaller than pancreatic cells

6

The correct answer is **C** because cell theory contains three basic ideas, which are:

- Cells are the building blocks of structure in living things.
- Cells are the smallest unit of life.
- Cells are derived from other cells (pre-existing cells) by division.

Although statement II is true, it is not one of the fundamental principles of cell theory.

7

The correct answer is **A** because this property means that stem cells could be used, for example, to produce regenerated tissue (e.g. new skin tissue for people who have suffered severe burns) or to help with diseases in which a particular cell type is absent or malfunctioning (e.g. type 1 diabetes). These types of uses are known as therapeutic uses, because they provide therapies for diseases, injuries and other health problems.

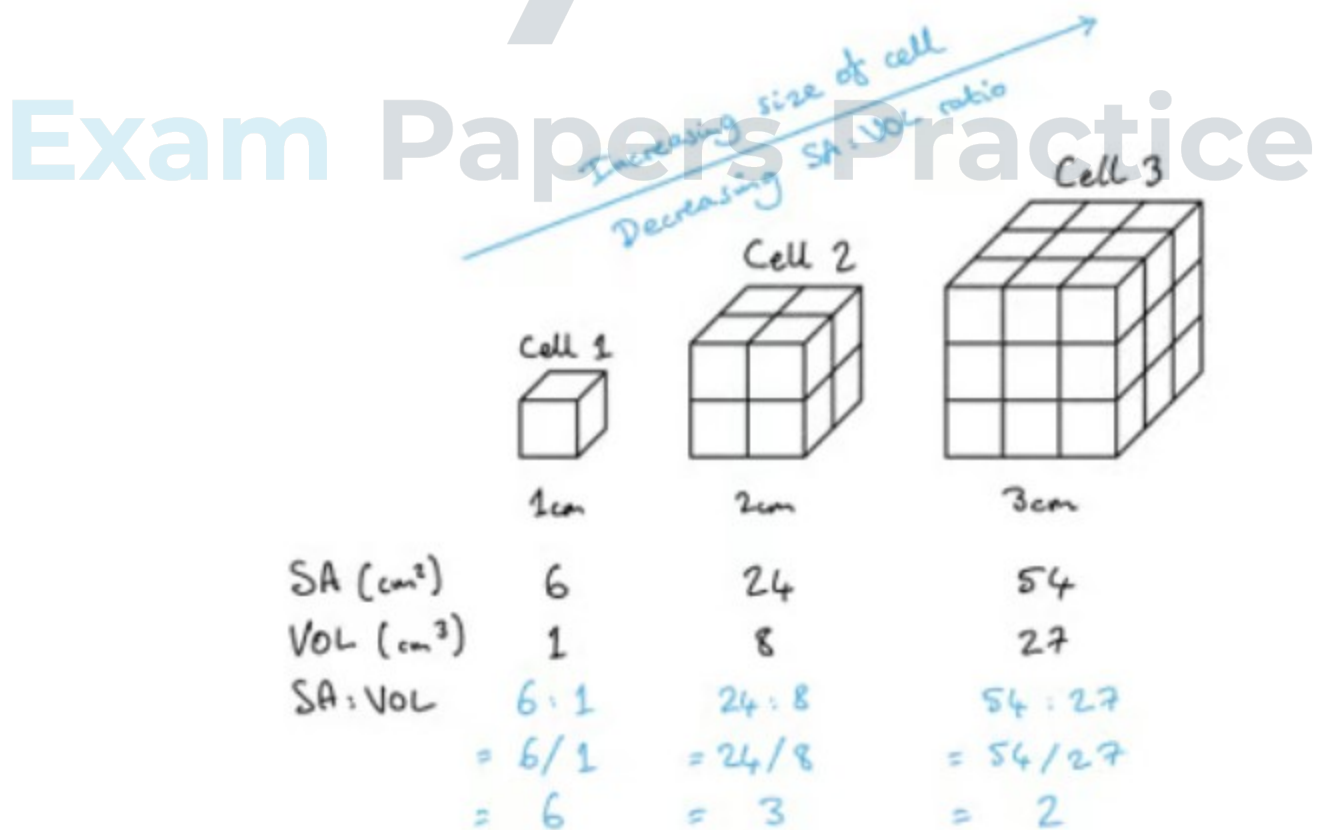
8

The correct answer is **B** because *Paramecium* is a 'particle feeder' that takes in small unicellular organisms (e.g. bacteria) into food vacuoles formed in the cytoplasm. The contents of the food vacuole are then digested and the products absorbed. In addition, *Paramecium* moves through the water by beating its cilia (structure K).

**A** is incorrect as respiration occurs in mitochondria, which are not labelled in the image. **C** is also incorrect for this reason and because excretion in *Paramecium* occurs by waste products simply diffusing out through the cell membrane over the cell's entire surface. **D** is incorrect as DNA replication occurs in the nucleus, which is not labelled in the image.

9

The correct answer is **C** because as a cell increases in size, its volume increases faster than its surface area. As surface area:volume ratio is calculated by dividing the surface area by the volume, this means that the ratio decreases as the cell size increases.



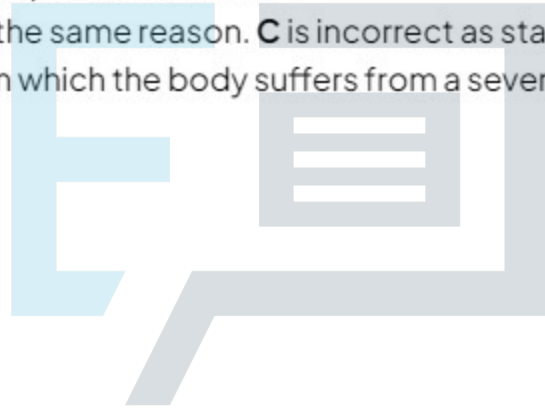


10

The correct answer is **D** because Stargardt's disease is an inherited disease in which a mutation of a gene associated with the processing of vitamin A in the eye results in breakdown of light-sensitive cells in the retina, specifically in the area where fine-level focusing occurs. In some cases, the loss of vision can be severe enough for the person to be registered as blind.

**A** is incorrect as statement I describes Parkinson's disease, which results in movement disorders such as hand tremor, limb rigidity, slow movements and impaired balance.

**B** is incorrect for the same reason. **C** is incorrect as statement III describes type 1 diabetes, in which the body suffers from a severe lack of insulin.



# Exam Papers Practice