Cambridge Assessment International Education

O LEVEL | 5090

BIOLOGY

TOPICAL P4

With Mark Scheme
All Variants
Question Bank from 2012 to 2023
Classified in 19 Chapter and 32 Sub-topics
Questions Order New to Old
References of repeated Questions added

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Content

Chapter 1

Cells

O Level Biology Topical Paper 4

Iram Habib Malik

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In this chapter

You will read the following topics:

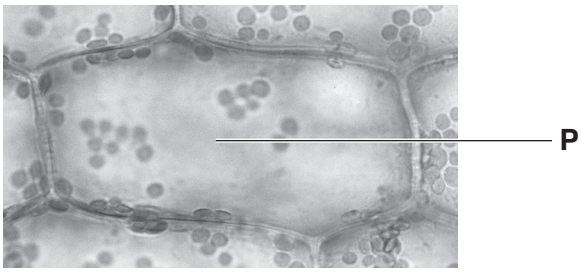
1.1: Cell Structure and Function

1.2: Specialised cells, tissue and organs

Topic 1.1: Cell structure and function

1 5090/62/M/J/17/Q3

Fig. 3.1 shows cells as seen using a light microscope.



magnification ×200

Fig. 3.1

(a) In the space below, make a large drawing of the cell labelled **P**. You do not need to label your drawing.

[4]

(b) Measure and record the maximum length of cell **P** in Fig. 3.1.

Maximum length of cell **P** in Fig. 3.1 ..... mm

Use the magnification of Fig. 3.1 to calculate the **actual** length of cell **P**.

Show your working.

.....

[4]

(c) State **two** structures, visible in Fig. 3.1, that are found only in plant cells.

1 .....

2 .....

[2]

[Total: 10]

2 5090/61/O/N/17/Q3

Fig. 3.1 shows some starch grains in a potato cell as seen under a microscope.

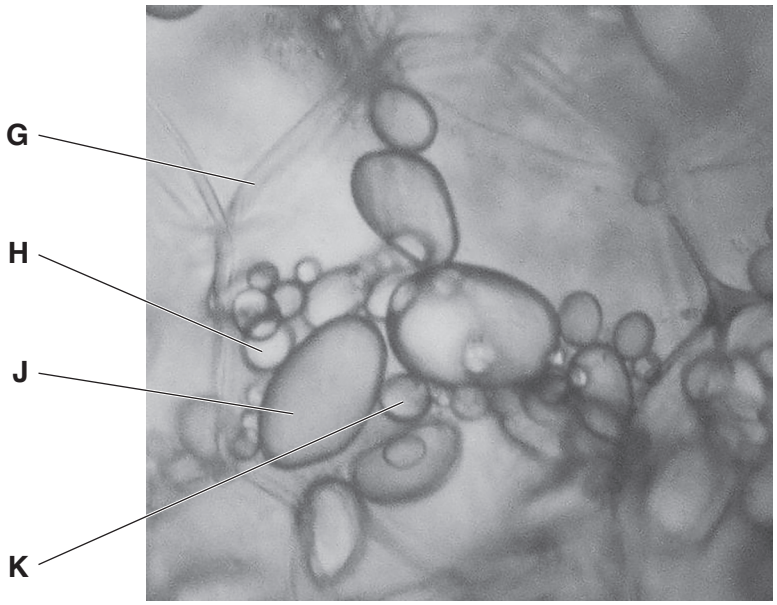


Fig. 3.1

(a) State the name of the structure labelled **G** in Fig. 3.1.

G ..... [1]

(b) In the space below make a large drawing of the starch grains labelled **H**, **J** and **K** as they appear in Fig. 3.1.

[3]

(c) **(i)** Draw a line on your drawing of grain **J** to indicate its maximum length.

Measure this length and record it.

..... mm [2]

(ii) The actual length of grain **J** is 0.03 mm. Calculate the magnification of your drawing and show your working.

magnification × ..... [2]

(d) Describe how you would prepare a slide of potato tissue to observe starch grains as clearly as possible under a microscope.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 12]

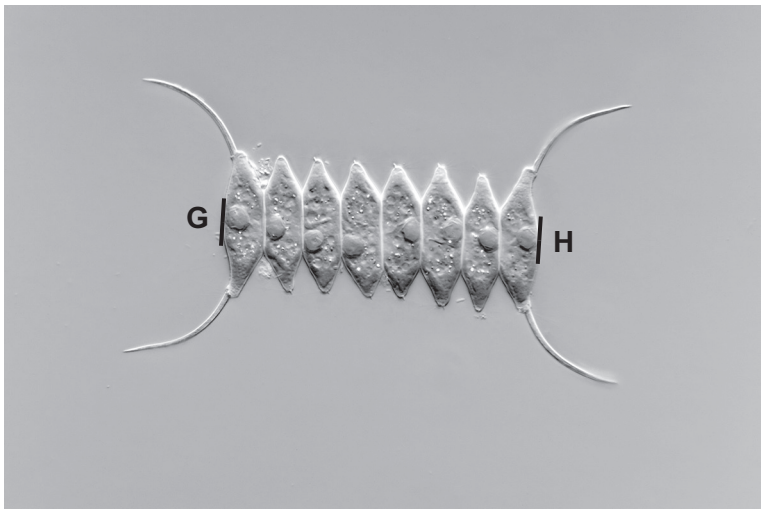
1(a)	cell **P** at least 80 mm long **+** good proportions **;** line clear, clean, and continuous drawn with a sharp pencil **+** no shading / stippling / cross-hatching anywhere **;** cell wall indicated with a double line **;** chloroplasts shown in acceptable numbers **+** all drawn with complete outlines **;**	**4**
(b)	measurement 48–51 **;** measurement ÷ 200 **;** correct value **;** mm **;**	**4**
(c)	chloroplasts **;** **R** chlorophyll (cell) wall **;** **Ig** vacuole (not visible)	**2**

2(a)	<u>cell wall</u> **;**	**1**
(b)	clear continuous (outer) line for grain **J +** no shading anywhere **;** grain **J** at least 60 mm long **+** grains touching **;** correct relative proportions for all three grains **;**	**3**
(c)(i)	straight line drawn on maximum length of **J** **;** measurement (± 1 mm) **;** no units required	**2**
(c)(ii)	measurement from drawing ÷ 0.03 **;** answer **;** correct answer with no working = 2 marks	**2**
(d)	scraping from cut surface / thin section **OR** slice **;** drop of iodine solution / iodine in potassium iodide solution **;** to stain **;** cover slip **;** prevent **OR** remove air bubbles **;** excess stain mopped up / removed / washed off **;**	**4**

Topic 1.2: Specialised cells, tissue and organs

1 5090/62/O/N/22/Q3

The photomicrograph shows a simple plant that lives in ponds and lakes.



magnification ×630

(a) In the space below make a large drawing of the plant as it appears in the photomicrograph.

[5]

(b) Draw a straight line on the photomicrograph to join lines **G** and **H**. Measure the length of this line and record it.

.....

Use your measurement to calculate the actual length of the plant. Round your answer to 3 decimal places.

Space for working.

..... mm
[3]

(c) Describe how you would find out whether a sample of pond water contained this plant.

.....

.....

.....

.....

.....

..... [2]

1	(a)	8 touching cells of similar shape drawn **+** height of each cell > width ; sharp pencil **+** continuous lines drawn for outline of cells **+** no shading ; G-H at least 70 mm ; nucleus in each cell **+** on correct side of cell ; 2 spines, attached to top and bottom of each of end cells, drawn with double lines **+** all 4 spines delimited from cell ;	**5**
	(b)	42 $\pm$ 1 **+** mm ; measurement / 630 ; (for 42 mm) 0.067 ;	**3**
	(c)	reference to microscope ; use high power lens **AW** ;	**2**

Chapter 2

Classification

O Level Biology Topical Paper 4

Iram Habib Malik

STUDENTS RESOURCE

In this chapter

You will read the following topics:

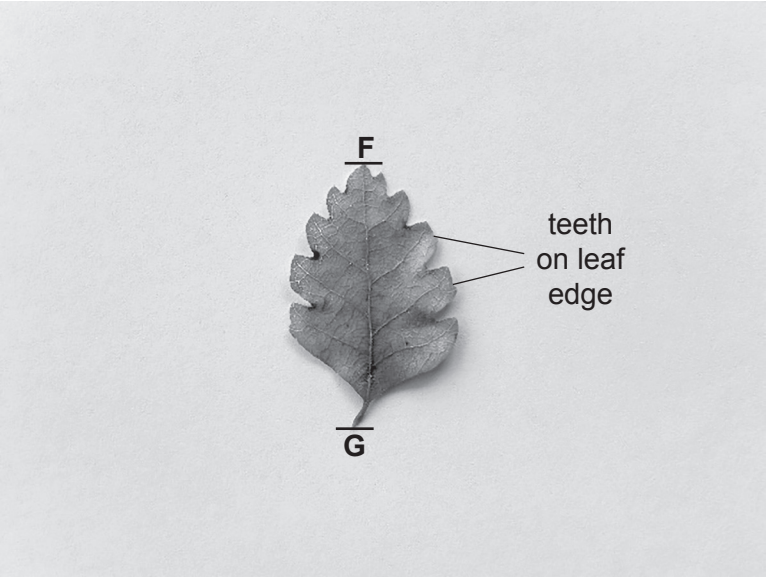
2.1: Concept and use of a classification system

2.2: Features of organisms

Topic 2.1: Concept and use of a classification system

1 5090/61/O/N/20/Q3

The photograph shows a leaf of a southern beech tree.



magnification ×1

(a) (i) Make a large drawing of the leaf in the space below.

(ii) **On the photograph** draw a straight line to join **F** and **G**.

Measure and record the length of the line.

.....

On your drawing draw a straight line in the same position as on the photograph.

Measure and record the length of the line.

.....

[3]

(iii) Calculate the magnification of your drawing compared to the original size of the leaf. Space for working.

magnification × ..... [2]

(b) Biological keys can be used to identify species. A biological key for five different species of southern beech tree is shown below.

Use this key to identify the name of the tree whose leaf is shown in the photograph on page 8.

To use the key start at 1 and read the two alternatives, (a) and (b). Decide which one is correct and tick [✓] the box next to that option. If indicated, go to the next number. Continue with this procedure until you identify the tree leaf in the photograph.

1	(a)	Leaf with a smooth edge	☐ mountain beech
	(b)	Leaf with teeth on edge	☐ go to 2
2	(a)	Leaf 20–40 mm long	☐ go to 3
	(b)	Leaf 6–15 mm long	☐ silver beech
3	(a)	Leaf with 4–7 teeth on each side	☐ red beech
	(b)	Leaf with 8–12 teeth on each side	☐ hard beech

name of tree .....

[2]

[Total: 12]

1 (a)(i)	drawing at least 8 cm long **;** drawn with a sharp pencil **+** continuous lines **+** no shading **;** leaf length greater than width **+** stalk drawn with double line **+** closed at end **;** four teeth on left side of leaf **+** five teeth on right side of leaf **;** smooth edge to leaf **+** first point on right higher then left **;**	**5**
(a)(ii)	measurement for **F**-**G** in photograph 34–36 **;** two lines drawn in same positions **;** correct measurement of candidate's line on drawing ± 1mm **+** correct unit **;** **A** 3.4–3.6 (unit not required)	**3**
(a)(iii)	working shown **;** length in photograph / length of drawing **;** **R** units	**2**
(b)	boxes 1b **+** 2a ticked **;** red beech **;**	**2**

Topic 2.2: Features of organisms

1 5090/41/M/J/23/Q2

Fig. 2.1 is a photograph of a small animal that has an external shell.

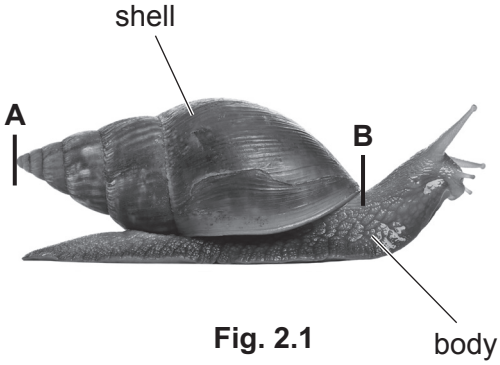


Fig. 2.1

(a) In the space below make a large drawing of the animal and its shell as shown in Fig. 2.1. Do **not** include the surface detail of the body of the animal.

[5]

(b) (i) Draw a straight line on the photograph to join lines **A** and **B**.
Measure and record the length of this line.

length of line **A–B** ..... mm [1]

(ii) On your drawing, draw a line at the same location as the line **A–B**.
Measure and record the length of this line.

length of line on drawing ..... mm [2]

(iii) Use your measurements in **(b)(i)** and **(ii)** to calculate the magnification of your drawing compared to the photograph. Give your answer to 1 decimal place.

Space for working.

magnification × ..... [2]

1 (a)	clear and clean lines drawn with a sharp pencil + no shading ; minimum size ; detail of snail body ; detail of shell ; realistic proportions of shell and body ;	**5**	
(b)(i)	measurement 45 – 47 (mm) ;	**1**	
(b)(ii)	line drawn in correct position ; measurement ;	**2**	± 1 mm
(b)(iii)	measurement in (b)(ii) ÷ measurement in bi ; correct magnification to 1 decimal place ;	**2**	

Chapter 3

Movement into and Out of Cells

O Level Biology Topical Paper 4

Iram Habib Malik

STUDENTS RESOURCE

In this chapter

You will read the following topics:

3.1: Diffusion and osmosis

Topic 3.1: Diffusion and osmosis

1 5090/42/M/J/23/Q1

Some students investigated the movement of water by osmosis, using potato tissue.

They were provided with:

- a balance
- five cylinders of potato tissue with equal diameters
- five different concentrations of sodium chloride (salt) solution at room temperature
- five test-tubes
- a sharp knife
- a white tile
- a marker pen / pencil
- paper towels.

They used the following method:

- label the test-tubes 0%, 2%, 4%, 6% and 8%
- cut each of the potato cylinders so that each has a mass of 3.0 g
- place one cylinder of potato in each test-tube
- add the matching concentration of salt solution to each test-tube so that the potato cylinder in it is covered as shown in Fig. 1.1
- note the time and leave the potato cylinders in the solutions for 40 minutes
- after 40 minutes remove the potato cylinders from the test-tubes
- dry each potato cylinder using a paper towel
- measure and record the mass of each potato cylinder.

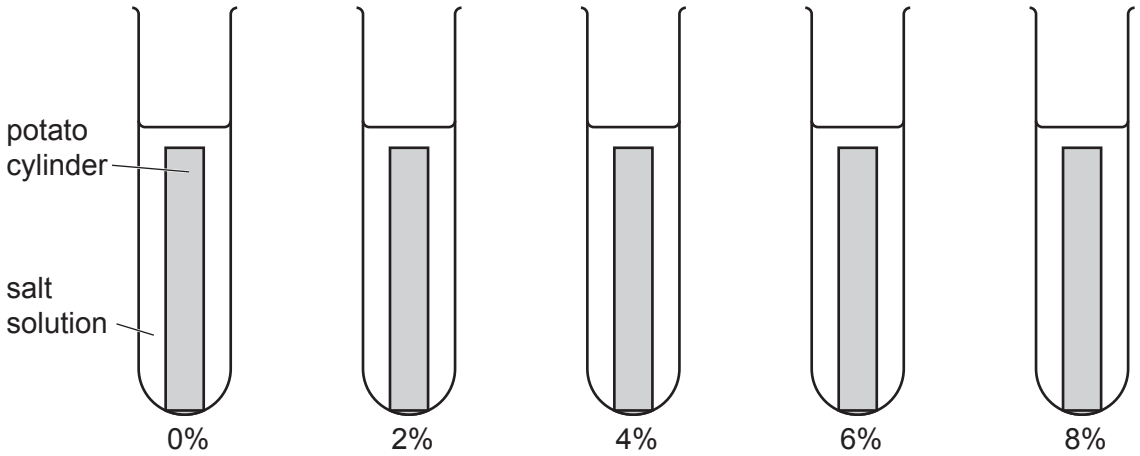


Fig. 1.1

(a) (i) Complete the column headings in Table 1.1. [1]

(ii) Fig. 1.2 shows the balance readings for the potato cylinders taken from the 0% and 8% salt solutions after 40 minutes.

cylinder in 0% solution cylinder in 8% solution

Fig. 1.2

Record these masses as 'final mass' in Table 1.1. [2]

(iii) Complete Table 1.1 by calculating the change in mass for each of these cylinders of potato. [2]

Table 1.1

percentage concentration of salt solution	**starting mass** /	**final mass** /	**change in mass** / .....
0	3.0		
2	3.0	3.1	+0.1
4	3.0	2.5	–0.5
6	3.0	2.3	–0.7
8	3.0		

(iv) Water can move into and out of potato cells by osmosis. Salt cannot move into and out of potato cells.

Use this information to explain the results in the test-tube containing 6% salt solution.

.....

.....

..... [2]

(v) Explain why it is important that all the potato cylinders have the same mass at the start of the investigation.

.....

..... [1]

(b) (i) The concentrations of salt solution were made by using different volumes of a 10% salt solution and distilled water.

Calculate the volumes of 10% salt solution and distilled water needed to make 10 cm^3 of a 4% salt solution.

volume of distilled water .....

volume of 10% salt solution .....

[2]

(ii) Explain why using a 10 cm^3 measuring cylinder is better than using a 50 cm^3 beaker for measuring the volumes of distilled water and salt solution.

..... [1]

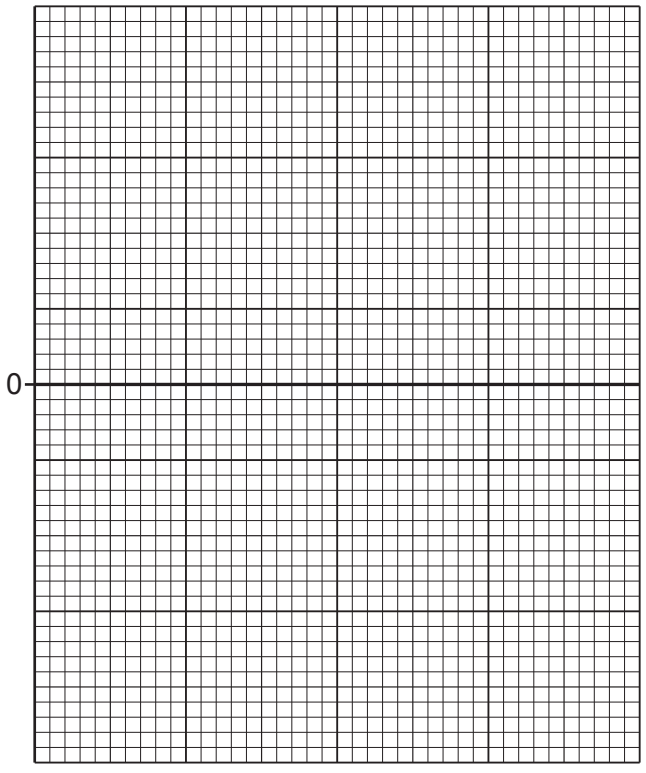
(iii) Explain why it is important that the students dried the potato cylinders before obtaining their final mass.

.....

.....

..... [2]

(c) (i) Construct a graph of percentage concentration of salt solution against **change** in mass. Join your points with ruled lines.



[5]

(ii) Each potato cylinder had a starting mass of 3.0 g.

Use your graph to determine the **final mass** of a potato cylinder placed in a 3% salt solution. Show your working on your graph.

final mass ..... g [2]

(d) (i) Design an investigation to determine the concentration of salt solution in which movement into and out of potato tissue is equal.

Your investigation should be based on the method described on page 3 but using changes in **length** of the potato tissue and not changes in mass.

Give full experimental details.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(ii) Identify the dependent variable in the investigation you have designed.

..... [1]

(e) (i) Potatoes store starch. Describe a test to confirm the presence of starch. Include the observation for a positive result.

.....

.....

..... [2]

(ii) The starch can be broken down into glucose for the plant to use in respiration. Name the reagent used to test for the presence of glucose.

..... [1]

2 5090/62/O/N/21/Q1

Cells have membranes which can allow molecules to enter and leave the cell.

A student wanted to investigate the movement of glucose and protein molecules through a membrane. He decided to use Visking tubing that acts in a similar way to an actual cell membrane.

He was given two solutions, **A** and **B**.

He wanted to test both solutions **A** and **B** for the presence of glucose and protein.

(a) State which reagents you would use to test for glucose and protein.

glucose .....

protein .....

[2]

He labelled four glass test-tubes to do these tests.

(b) (i) State what you would use to label glass test-tubes.

..... [1]

(ii) Suggest what you would write on each test-tube and record this in the table on page 3. [1]

He completed the tests and recorded the resulting colours of the solutions in his notebook.

Glucose test A - pale blue

Glucose test B - orange

Protein test A - pale blue

Protein test B - purple