

COMBINED SCIENCE

0653 | Paper 4

2017 — 2023

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1 - (0653/41_Summer_2017_Q4) - B2. Cells, B11. Organisms And Their Environment

(a) Fig. 4.1 shows a drawing of a single-celled organism called *Euglena* as seen using a light microscope.

This organism has features of both plants and animals.

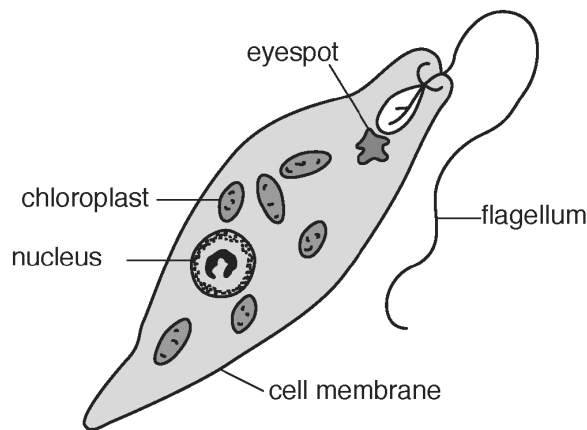


Fig. 4.1

(i) Chloroplasts are usually found in plant cells.

Describe in detail the function of chloroplasts.

.....

.....

.....

.....

..... [3]

(ii) Name **one** feature of *Euglena* you would more likely see in an animal than a plant.

Explain your answer.

feature

explanation

.....

..... [2]

2 - (0653/41_Winter_2017_Q4) - B2. Cells, B4. Enzymes, B11. Organisms And Their Environment

(a) Fig. 4.1 shows some bacterial cells as seen using an electron microscope. They are an example of the microorganisms used in the manufacture of yoghurt.

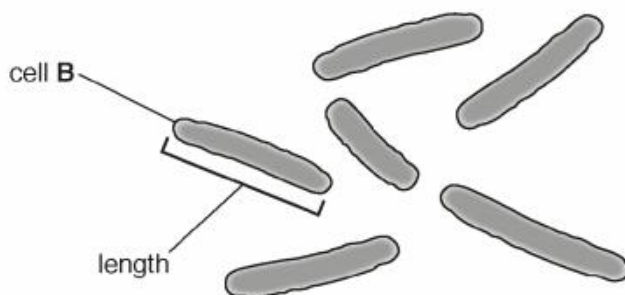


Fig. 4.1

The actual length of cell B is 0.001 mm.

Calculate the magnification of cell B.

magnification = [2]

(b) The microorganisms break down the sugar in milk. They produce an acid as a waste product. The acid affects the activity of the enzymes in the microorganisms.

(i) Suggest the effect of the acid on the rate of sugar breakdown. Explain your answer.

.....
.....
.....[1]

(ii) Yoghurt can be made at a range of temperatures. However the reaction is usually carried out at 44 °C.

Suggest why the temperature of 44 °C is used, and not a higher temperature.

.....
.....
.....[2]

(c) Microorganisms have the role of decomposers in the carbon cycle.

(i) Define the term *decomposer*.

.....
.....[1]

(ii) Explain **two** reasons why decomposers are essential in the carbon cycle.

1.
.....
2.
.....[2]

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3 - (0653/42_Winter_2017_Q7) - B2. Cells, B12. Human Influences On Ecosystems

(a) Fig. 7.1 shows a longitudinal section of a capillary next to some tissue cells.

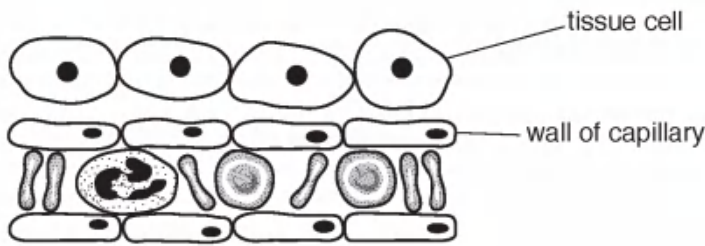


Fig. 7.1

(i) On Fig. 7.1 draw an arrow to show the direction of the net movement of oxygen molecules by diffusion. [1]

(ii) Explain your answer to (i).

.....
 [1]

(b) Fig. 7.2 shows a diagram of a root hair cell. It absorbs water by diffusion.

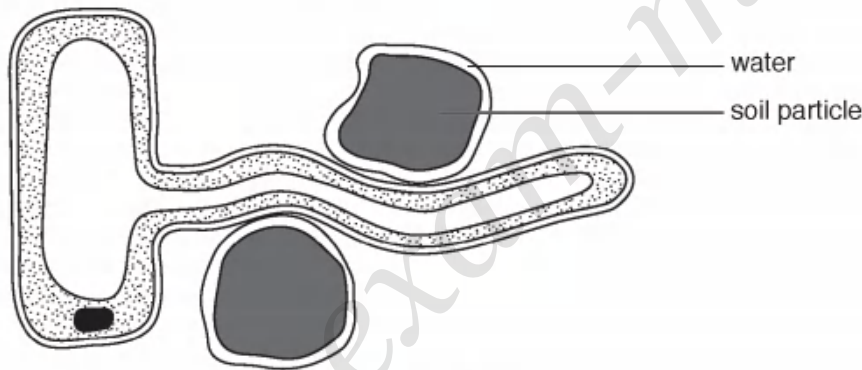


Fig. 7.2

(i) Describe how the structure of the root hair cell is adapted for its function.

.....
 [2]

(ii) A large amount of salt is added to the soil. The salt dissolves in the water in the soil.

Suggest what happens to the rate of diffusion of water into the root hair cell.

Explain your answer.

.....
.....
.....[2]

(c) Some fertiliser is washed by rain into a pond.

The fertiliser causes the algae on the surface of the pond to reproduce rapidly and cover the surface of the pond. Many algae and plants beneath the surface die due to lack of light.

Describe the changes that follow in the pond which can cause fish in the pond to die.

.....
.....
.....
.....[3]



4 - (0653/43_Winter_2018_Q1) - B2. Cells, B10. Reproduction

(a) Fig. 1.1 is a diagram of a cell which lines the human airway.

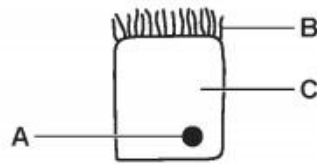


Fig. 1.1

Table 1.1 shows the names and functions of parts of the cell shown in Fig. 1.1.

Complete Table 1.1.

Table 1.1

| letter | name | functions |
|--------|---------|-------------------------------------|
| A | nucleus | controls the activities of the cell |
| B | | |
| C | | |

[4]

(b) Fig. 1.2 shows a drawing of a wind-pollinated flower.

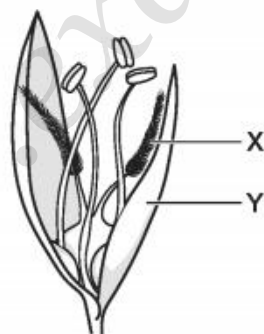


Fig. 1.2

(i) Describe how the structure of X is adapted to its function.

.....

.....

.....[2]

(ii) Structure Y is not brightly coloured.

Explain why a bright colour is not necessary for structure Y.

.....

.....

.....[2]

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ANSWERS

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1 - (0653/41_Summer_2017_Q4) - B2. Cells, B11. Organisms And Their Environment

| | | |
|---------|--|---|
| (a)(i) | contain chlorophyll ; trap light (energy) ; converts (light) into chemical energy ; the idea that chemical energy is contained in glucose / starch / carbohydrate ; | 3 |
| (a)(ii) | flagellum ; the idea that the flagellum is for movement ; | 2 |
| (b)(i) | food chain containing the following organisms phytoplankton → zooplankton → mussel → crab → seagull ; four arrows in correct direction in the chain ; | 2 |
| (b)(ii) | fewer steps / stages / organisms in chain containing mussels / ora ; use of the term <u>trophic level</u> ; energy is lost at each stage ; by heat / movement / avp ; | 3 |

2 - (0653/41_Winter_2017_Q4) - B2. Cells, B4. Enzymes, B11. Organisms And Their Environment

| | | |
|---------|---|-------|
| (a) | length of cell on diagram is 25 mm ; divided by 0.001 = 25 000 ; | 2 |
| (b)(i) | reduces rate – no mark enzymes made inactive / denatured by acid / no longer at optimum pH ; | 1 |
| (b)(ii) | 44°C is optimum temperature ; above 44°C enzymes denatured by heat ; additional detail describing denaturation ; | max 2 |
| (c)(i) | (an organism) that gets energy from / feeds on dead / waste organic matter ; | 1 |
| (c)(ii) | they decompose / break down / get rid of dead bodies / waste ; allow carbon to be recycled / release carbon dioxide (into the air) ; the idea that plants make use of carbon dioxide / carbon (during photosynthesis) ; | max 2 |

3 - (0653/42_Winter_2017_Q7) - B2. Cells, B12. Human Influences On Ecosystems

| | | |
|---------|---|-------|
| (a)(i) | arrow drawn on Fig. 3.1 from red blood cell to any tissue cell ; | 1 |
| (a)(ii) | lower concentration in tissue cells than in the red blood cells / blood ; | 1 |
| (b)(i) | elongated shape / large surface area ; for increased rate / efficiency of uptake (of water) ; | max 2 |
| (b)(ii) | diffusion rate would slow down / stop ; because the water / solution concentrations have become similar to / the same as each other ; or water diffuses from cells into the soil (water) ; because the concentration of water is now higher inside the cell / concentration of salt is now higher outside the cell ; | max 2 |
| (c) | bacteria feed on dead organisms / bacteria population increases ; bacteria respire ; bacteria / respiration use up oxygen ; no oxygen left for fish ; | max 3 |

4 - (0653/43_Winter_2018_Q1) - B2. Cells, B10. Reproduction

| | | |
|---------|---|---|
| (a) | (B) cilia ; removes mucus from airway ; (C) cytoplasm ; place where chemical reactions / respiration takes place ; | 4 |
| (b)(i) | feathery / large surface area ; for collecting pollen ; | 2 |
| (b)(ii) | no need to attract insects ; because they are not needed for pollination / pollination is by wind / not by insects ; | 2 |

5 - (0653/41_Summer_2019_Q1) - B2. Cells, B5. Plant Nutrition

| | | |
|---------|---|-------|
| (a)(i) | 27.3–25.6 = 1.7 ; (1.7) / 25.6 × 100 = 6.64(%) ; | 2 |
| (a)(ii) | high water potential outside and low water potential inside bag / higher water potential outside bag / water moves from high to low water potential ; and one of water moves in by osmosis ; use of the term diffusion ; water moves so as to try to equalise water potential ; | 2 |
| (b) | protein ; | 1 |
| (c)(i) | $6\text{H}_2\text{O} + 6\text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ 1 mark for formulae ; 1 mark for balancing dependent on formulae ; | 2 |
| (c)(ii) | any two of (used) in respiration / release energy ; stored as starch ; avp ; | max 2 |

6 - (0653/41_Winter_2019_Q1) - B2. Cells, B7. Transport

| | | |
|----------|--|---|
| (a) | any two of the following correctly labelled: nucleus ; chloroplast ; cell wall ; vacuole ; | 2 |
| (b) | for (rapid) absorption of water ; | 1 |
| (c)(i) | for movement ; | 1 |
| (c)(ii) | acrosome containing enzymes used in fertilisation / many mitochondria to release energy for swimming ; | 1 |
| (d)(i) | glucose ; | 1 |
| (d)(ii) | haemoglobin ; red blood cells ; diffusion ; | 3 |
| (d)(iii) | capillary walls are thin ; | 1 |

7 - (0653/42_Winter_2019_Q4) - B2. Cells, B5. Plant Nutrition

| | | |
|---------|--|--------|
| (a)(i) | nucleus correctly labelled ; cell membrane correctly labelled ; | 2 |
| (a)(ii) | large surface area ; increases rate of water uptake ; | 2 |
| (b)(i) | needed to make amino acids ; | 1 |
| (b)(ii) | across root cortex ; up stem ; in xylem ; | Max. 2 |
| (c)(i) | rickets / soft (and deformed) bones ; | 1 |
| (c)(ii) | butter / margarine / egg (yolks) / milk ; | 1 |