IGCSE Cambridge Topical Past Papers

COMBINED SCIENCE

0653 | Paper 4

2020 — 2024

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ANSWERS

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1 – (0653/42_Summer_2020_Q1) – *B2. Cells, B11. Organisms And Their Environment, B5. Plant Nutrition*

(a) Fig. 1.1 represents a plant cell.

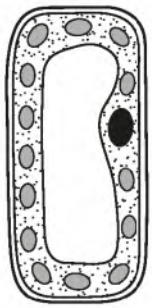

Fig. 1.1

Add labels to Fig. 1.1 to name **two** structures that are **only** present in plant cells. [2]

(b) Fig. 1.2 represents an animal cell from the trachea.

Fig. 1.2

Describe how the structure of this cell is adapted to its function.

.....

.....

..... [2]

(c) Fig. 1.3 shows part of a food web.

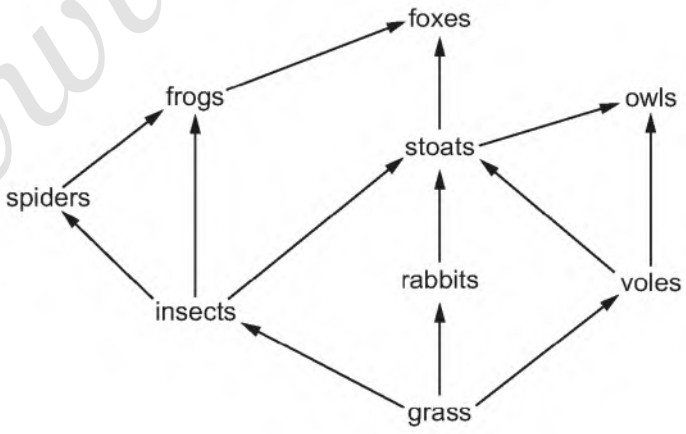

Fig. 1.3

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(i) Define the term *consumer*.

.....

..... [1]

(ii) List **all** of the tertiary consumers shown in the food web in Fig. 1.3.

Explain how you identified these consumers using the term *trophic level*.

tertiary consumers .....

.....

explanation .....

.....

[2]

(iii) Complete the food chain containing five organisms from the food web in Fig. 1.3.

[1]

(iv) Describe what the arrows in the food chain represent.

..... [1]

(d) Use words from the list to complete the sentences about photosynthesis.

chemical **chlorophyll** **cytoplasm** **glucose**

light **oxygen** **starch** **thermal**

Each word may be used once, more than once or not at all.

During photosynthesis ..... energy is transferred into

..... energy by ..... molecules. [2]

[Total: 11]

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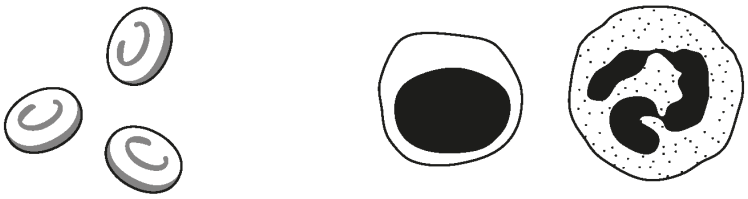
2 – (0653/43_Winter_2020_Q1) – *B2. Cells, B7. Transport, B8. Gas Exchange And Respiration*

(a) Fig. 1.1 shows red blood cells and white blood cells.



red blood cells white blood cells

Fig. 1.1

(i) Describe how the structure of a red blood cell is adapted for transporting oxygen.

.....

..... [1]

(ii) State **two** functions of white blood cells.

1 .....

2 .....

[2]

(b) Fig. 1.2 is a flowchart to show the circulation of blood in humans.

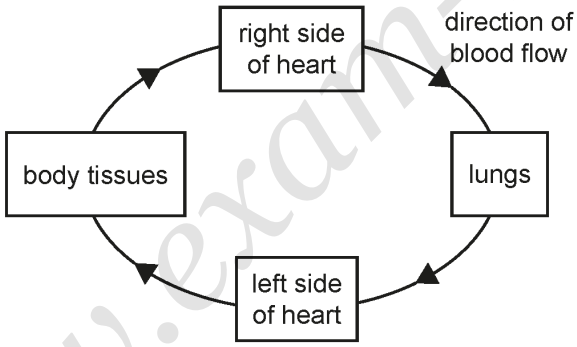


Fig. 1.2

(i) Explain why the circulation in Fig. 1.2 is described as a *double circulation*.

.....

..... [1]

(ii) Describe **two** advantages of a double circulation.

1 .....

.....

2 .....

.....

[2]

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(c) During exercise, the breathing rate and heart rate increase.

Describe how these two increases cause an increase in the amount of oxygen reaching the exercising muscles.

increase in breathing rate .....

.....

.....

increase in heart rate .....

.....

.....

[2]

(d) Smoking tobacco can cause cancer.

Name **two** other diseases caused by smoking tobacco.

1 .....

2 .....

[2]

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3 – (0653/41_Winter_2021_Q1) – *B2. Cells, B5. Plant Nutrition*

(a) The boxes on the left show the names of different types of cell.

The boxes on the right show the functions of these cells.

Draw one straight line from each cell to its function.

cell	function
ciliated cell	movement of mucus
palisade mesophyll cell	photosynthesis
sperm cell	reproduction

[2]

(b) Fig. 1.1 is a photomicrograph of some cells in a plant root.

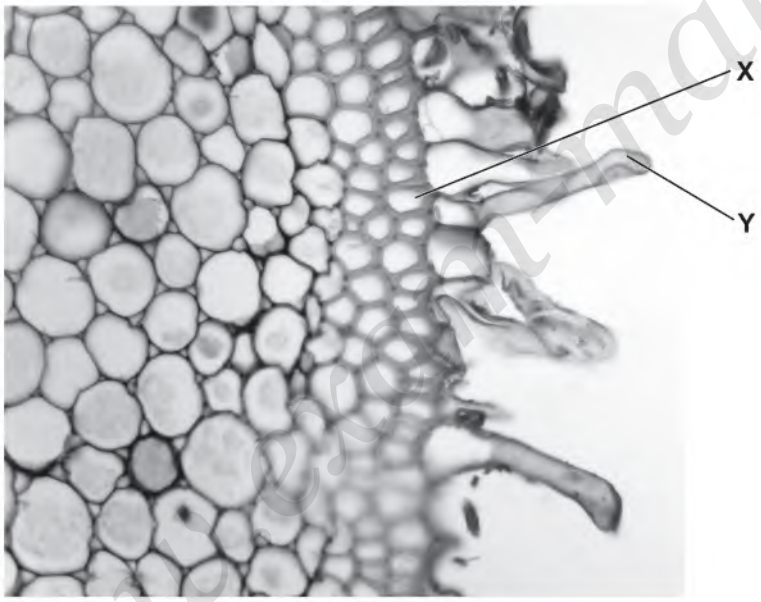

Fig. 1.1

(i) State the name of **one** structure shown in Fig. 1.1 that identifies cell **X** as a plant cell.

..... [1]

(ii) Identify the type of plant cell labelled **Y** in Fig. 1.1.

..... [1]

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(iii) The liquid inside cell **X** has a higher concentration of salts than the liquid inside cell **Y**.

Explain why water moves from cell **Y** to cell **X**.

Use ideas about water potential in your answer.

.....

.....

.....

.....

.....

..... [3]

(c) Describe how water is lost from the leaves of a plant by transpiration.

.....

.....

..... [2]

(d) The roots of a plant absorb magnesium ions.

Explain the effect of a deficiency of magnesium on the **colour** of plant leaves.

.....

.....

..... [2]

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4 – (0653/43_Winter_2021_Q4) – *B11. Organisms And Their Environment, B2. Cells*

(a) Fig. 4.1 shows part of a food web.

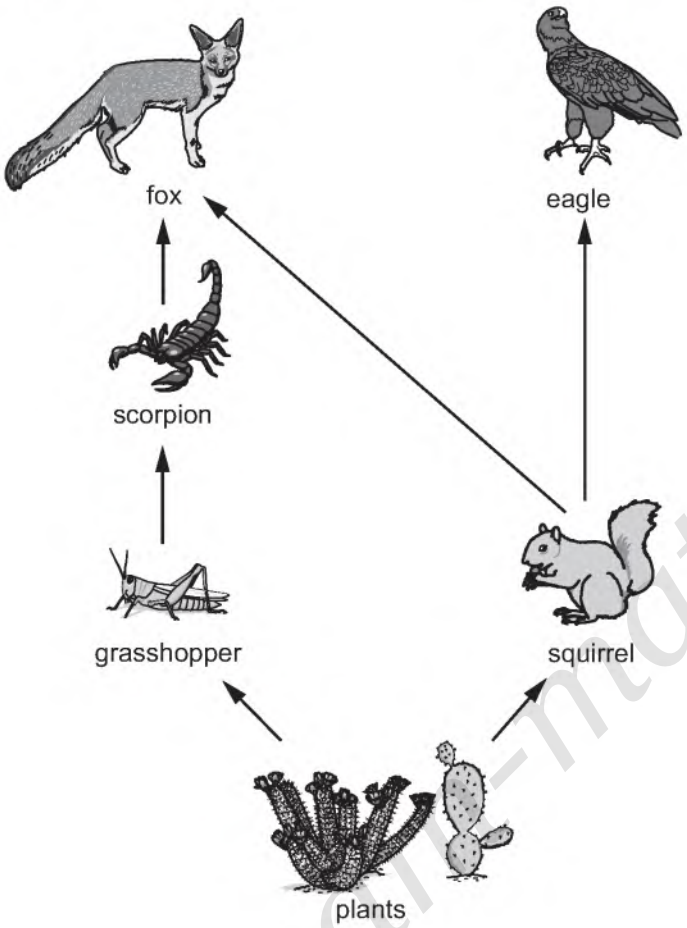

Fig. 4.1

(i) The food web is **not** complete.

Eagles also eat grasshoppers.

On Fig. 4.1, draw **one** arrow to show this relationship between eagles and grasshoppers. [1]

(ii) Identify **one** primary consumer in the food web shown in Fig. 4.1.

..... [1]

(iii) Explain why food chains usually have fewer than five trophic levels.

.....

.....

..... [2]

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(b) The roots of plants take in water.

Explain how water moves from the soil into the root hair cells of a plant.

Use ideas about water potential in your answer.

.....

.....

.....

..... [3]

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ANSWERS

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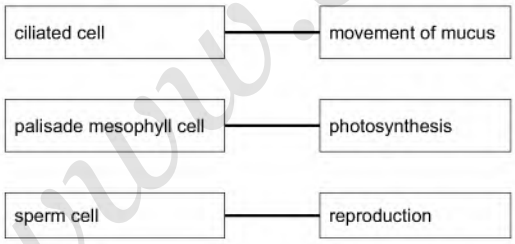
1 – (0653/42_Summer_2020_Q1) – *B2. Cells, B11. Organisms And Their Environment, B5. Plant Nutrition*

(a)	*any two of the following correctly labelled:* chloroplast ; (large) vacuole ; cell wall ;	2
(b)	(presence of) cilia ; move mucus ;	2
(c)(i)	an organism that gets its energy by feeding on other organisms ;	1
(c)(ii)	(tertiary consumers) foxes **and** frogs **and** owls ; (explanation) organisms are at the fourth trophic level ;	2
(c)(iii)	(grass) → insects → spiders → frogs → foxes ;	1
(c)(iv)	transfer of energy ;	1
(d)	light (energy is transferred into) chemical (energy) ; chlorophyll ;	2

2 – (0653/43_Winter_2020_Q1) – *B2. Cells, B7. Transport, B8. Gas Exchange And Respiration*

(a)(i)	*any one from:* biconcave disc / large surface area (to volume ratio) for maximum oxygen absorption ; no nucleus so more space for oxygen transport ; contains haemoglobin ;	1
(a)(ii)	produce antibodies ; phagocytosis ;	2
(b)(i)	there is a circulation to the lungs and a circulation to the body (tissues) ;	1
(b)(ii)	*any two from:* enables blood to go to the body tissues at high pressure ; enables blood to go to the lungs at low pressure ; keeps oxygenated blood separate from deoxygenated blood ; enables faster blood flow ;	2
(c)	(increase in breathing rate) enables more oxygen to, diffuse into / enter, the blood (at the lungs) ; (increase in heart rate) transports oxygenated blood faster ;	2
(d)	coronary heart disease (CHD) ; COPD ;	2

3 – (0653/41_Winter_2021_Q1) – *B2. Cells, B5. Plant Nutrition*

(a)	 one correct line ; three lines correct ;	2
(b)(i)	vacuole / cell wall ;	1
(b)(ii)	root hair (cell) ;	1
(b)(iii)	water moves by osmosis ; from high water potential to a low water potential / down a water potential gradient / (because) cell **X** has a lower water potential than cell **Y** ORA ; through a partially permeable membrane ;	3
(c)	evaporation from (surface of) mesophyll cells ; diffusion (of water vapour) through stomata ;	2
(d)	(magnesium deficiency causes) leaves (to) turn yellow ; (because magnesium) needed to make chlorophyll ;	2

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4 – (0653/43_Winter_2021_Q4) – *B11. Organisms And Their Environment, B2. Cells*

(a)(i)	arrow drawn pointing from grasshopper to eagle ;	1
(a)(ii)	grasshopper / squirrel ;	1
(a)(iii)	*any two from:* energy is lost between trophic levels ; named example of energy loss ; the longer the chain the less energy is available ;	2
(b)	soil has a higher water potential / water moves from area of high water potential to low water potential ; reference to osmosis ; across a partially permeable membrane ;	3

5 – (0653/43_Summer_2023_Q4) – *B2. Cells, B5. Plant Nutrition, B7. Transport*

(a)(i)	*any **two** from:* (large) vacuole ; cell membrane ; cell wall ; nucleus ; cytoplasm ;	1
(a)(ii)	large surface area ; increases (rate of) absorption of, water / mineral ions ;	2
(a)(iii)	ref to (large numbers of) chloroplasts ; that contain chlorophyll ; transfers light energy to chemical energy ;	3
(b)(i)	170 – 54 / 116 ; (170 – 54) ÷ 54 × 100 / 116 ÷ 54 × 100 / (170 ÷ 54 × 100) – 100 / 214.814 ; 215 (%) ;	3
(b)(ii)	*any three from:* rate of transpiration decreases ; (idea of higher humidity causes) increased concentration of water surrounding leaves / lower concentration gradient ; decrease in evaporation (from mesophyll cells) ; decrease in diffusion from, **stomata** / **leaves** ;	3

6 – (0653/43_Winter_2023_Q7) – *B2. Cells*

(a)(i)	support ; transport (of, water / minerals) ;	2
(a)(ii)	large surface (area) ;	1
(b)(i)	chemical ; photosynthesis ;	2
(b)(ii)	*any three from:* due to eutrophication ; increase in growth of producers / plants on surface (of pond **B**) ; (increased) decomposition of producers (after death) ; (increased aerobic) respiration by decomposers ; (aerobic respiration/decomposers) uses up the oxygen (in pond **B**) ; AVP ;	3

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