

IGCSE Cambridge Topical Past Papers

BIOLOGY 9-1

0970 | Paper 6

2020 — 2025

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1 - (0970/62_Winter_2020_Q2)

Fig. 2.1 is a photomicrograph showing several cells from an *Elodea sp.* aquatic plant.

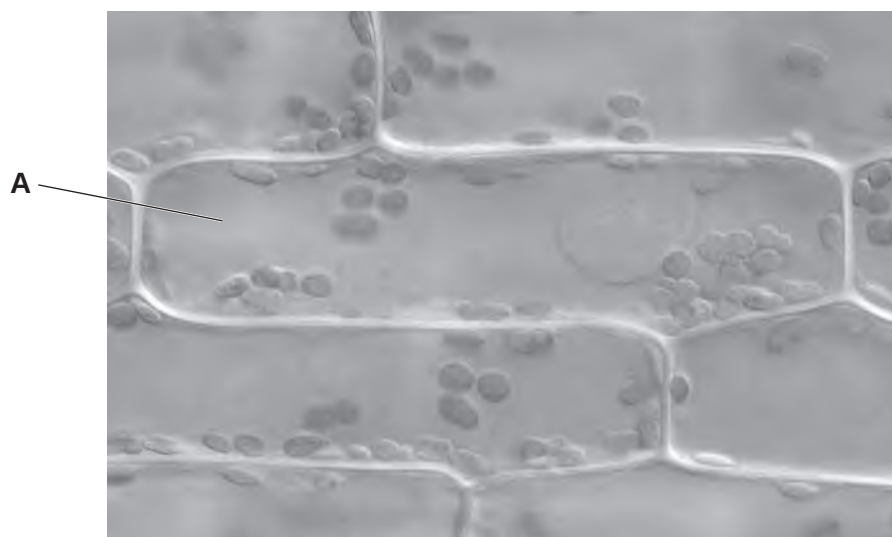


Fig. 2.1

(a) (i) Draw a large diagram of the cell labelled **A** in Fig. 2.1.

(ii)

**Fig. 2.2**

Measure the length of the line **PQ** on Fig. 2.2.

length of **PQ** mm

Calculate the actual length of the cell using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ}}{\text{actual length of cell}}$$

Include the unit.

Space for working.

.....
[3]

- (b) A student investigated the effect of light intensity on the rate of photosynthesis in *Elodea sp.* They changed the light intensity by placing a light source at different distances from the plant. The student counted the number of bubbles of oxygen produced in three minutes.

The results of the investigation are shown in Table 2.1.

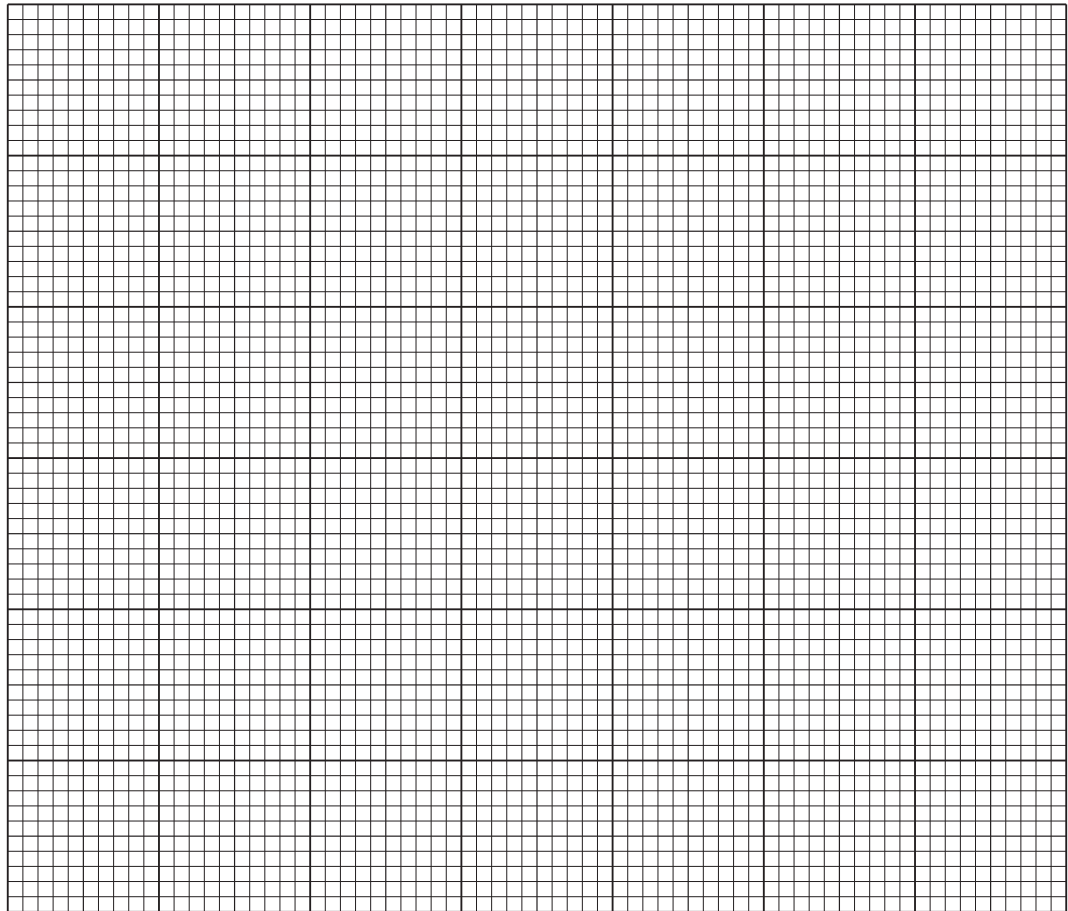
Table 2.1

distance of the light source from the plant/cm	number of bubbles produced in three minutes	rate of bubble production /bubbles per minute
80	312	104
100	312	104
120	309	
140	264	88
160	162	54
180	96	32
200	57	19

- (i) Calculate the rate of bubble production when the light source was 120 cm from the plant.

..... bubbles per minute [1]

- (ii) Plot a line graph on the grid to show the relationship between the distance of the light source from the plant and the **rate** of bubble production.



[4]

- (iii) Estimate, using your graph, the **rate** of bubble production per minute if the distance from the light source was 170 cm.

..... bubbles per minute [1]

- (iv) Describe the trends shown on your graph.

.....

.....

.....

.....

..... [2]

- (v) The student repeated the experiment described in **2(b)** at a higher temperature. The student left the plant for ten minutes at the new temperature before starting to measure the rate of bubble production.

Suggest why the student waited for ten minutes before taking measurements.

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

- (vi) Table 2.1 shows that when the light source was 140cm from the plant, the rate of bubble production was 88 bubbles per minute at the original temperature. At the higher temperature, the rate of bubble production when the light source was 140cm from the plant was 122 bubbles per minute.

Calculate the percentage change in the number of bubbles when the temperature was increased.

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

[Total: 19]

2 - (0970/62_Summer_2022_Q2)

Nautilus are a genus of marine animals that live in shells. Fig. 2.1 is a photograph of a nautilus shell.



Fig. 2.1

- (a) (i)** Make a large drawing of the shell shown in Fig. 2.1.

[4]

- (ii) Line **AB** represents the width of the nautilus shell.

Measure the length of line **AB** in Fig. 2.1.

length of line **AB** in Fig. 2.1 mm

The actual width of the shell is 130 mm.

Calculate the magnification of the shell in Fig. 2.1.

$$\text{magnification} = \frac{\text{length of line AB in Fig. 2.1}}{\text{actual width of the shell}}$$

Give your answer to **two** significant figures.

Space for working.

.....
[3]

- (b) Fig. 2.2 shows a fossilised nautilus shell.



Fig. 2.2

Describe **one** visible similarity and **one** visible difference between the nautilus shell in Fig. 2.1 and the fossilised nautilus shell in Fig. 2.2.

similarity

.....

difference

.....

[2]

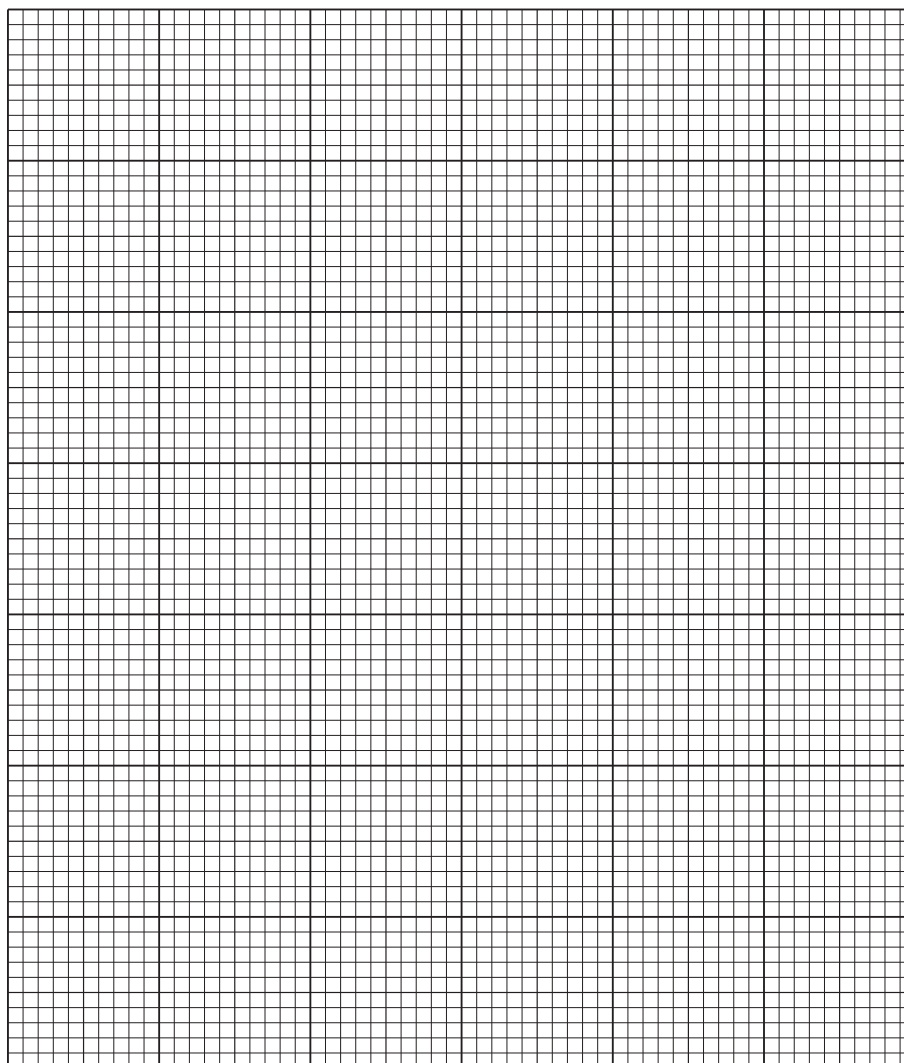
- (c) A population of one species of nautilus was studied. The widths of the nautilus shells were measured and recorded.

The results are shown in Table 2.1.

Table 2.1

width of shell/mm	number of shells
101–110	8
111–120	84
121–130	138
131–140	98
141–150	22

- (i) Plot a histogram on the grid of the data in Table 2.1.



[4]

- (ii) Using the information in your graph, describe the results of this study.

.....

.....

.....

.....

..... [2]

- (iii) The study measured the width of 350 nautilus shells.

Suggest why such a large number of shells were measured.

.....

.....

..... [1]

- (iv) Using the data in Table 2.1, calculate the percentage of the population of nautilus that have shells that are wider than 130 mm.

Give your answer to **one** decimal place.

Space for working.

.....%

[3]

- (d) The nautilus feeds on fish which are an important source of protein.

State the name of the test for protein. Give the result of a positive test.

test for protein

positive test result

[2]

[Total: 21]

3 - (0970/62_Summer_2024_Q2)

(a) When a seed germinates it grows into a seedling.

Fig. 2.1 is a photograph of a seedling.



Fig. 2.1

(i) Make a large drawing of the seedling shown in Fig. 2.1.

[4]

- (ii) Line **AB** represents the width of the seedling.

Measure the length of line **AB** on Fig. 2.1.

length of line **AB** mm

The actual width of the seedling is 9 mm.

Calculate the magnification of the seedling in Fig. 2.1 using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line AB in Fig. 2.1}}{\text{actual width of the seedling}}$$

Give your answer to **two** significant figures.

Space for working.

.....
[3]

(iii) Fig. 2.2 shows photographs of two different seedlings, **P** and **Q**.

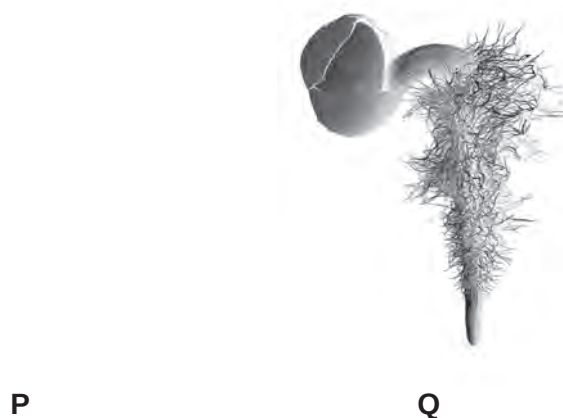


Fig. 2.2

Describe **one** visible similarity and **two** visible differences between seedling **P** and seedling **Q** in Fig. 2.2.

similarity 1

.....

difference 1

.....

difference 2

.....

[3]

(b) As seedlings grow, they change starch into reducing sugars.

Describe the methods you would use to test a sample of seedlings for starch and reducing sugars.

starch test

.....

.....

reducing sugar test

.....

.....

[3]

- (c)** When light shines from one side, seedlings grow towards the light.

Fig. 2.3 shows a diagram of a seedling growing towards a light source. The angle of growth is shown on the diagram.

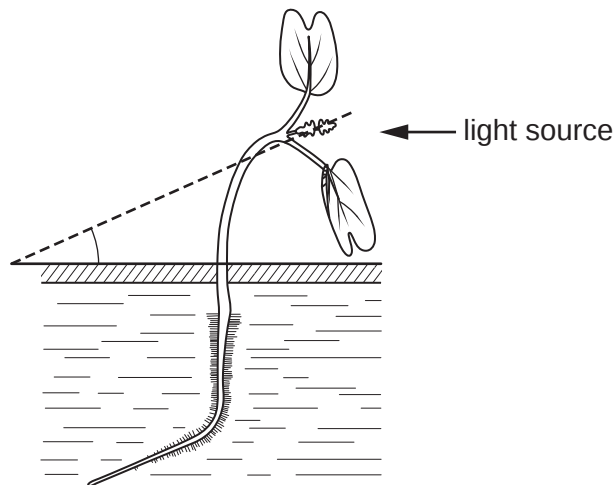


Fig. 2.3

Plan an investigation to find out how light intensity affects the angle at which the seedling grows.

[6]

[Total: 19]

4 - (0970/62_Winter_2024_Q1)

Photosynthesis occurs in chloroplasts. Students investigated the effect of light intensity on the rate of photosynthesis in a chloroplast suspension.

The blue dye DCPIP can be used to investigate photosynthesis. During photosynthesis, the dark-blue colour of the DCPIP changes and gradually disappears so that it becomes colourless.

A chloroplast suspension that is made from spinach leaves has a green colour.

The students used this method:

- Step 1 Prepare a chloroplast suspension from fresh spinach leaves.
- Step 2 Label one test-tube **A** and another test-tube **B**.
- Step 3 Put 1 cm³ of the green chloroplast suspension into test-tube **A** and into test-tube **B**.
- Step 4 Put test-tubes **A** and **B** into an ice-cold water-bath for two minutes.
- Step 5 Put 5 cm³ of the blue **DCPIP** solution into test-tube **A**. Put a test-tube rack 10 cm from a bright light. Put test-tube **A** into the test-tube rack.
- Step 6 Turn on the light and start the stop-clock.
- Step 7 Measure the time taken for the blue liquid in test-tube **A** to return to a green colour.
- Step 8 Reset the stop-clock to zero.
- Step 9 Move the test-tube rack so that it is 30 cm from the bright light.
- Step 10 Put 5 cm³ of the blue **DCPIP** solution into test-tube **B**.

Put test-tube **B** into the test-tube rack and start the stop-clock.

- Step 11 Measure the time taken for the blue liquid in test-tube **B** to return to a green colour.

The times measured in step 7 and step 11 are shown in Fig. 1.1.



time recorded for test-tube **A**



time recorded for test-tube **B**

Fig. 1.1

- (a) (i)** Prepare a table and record the results of the investigation.

Convert the times on the stop-clocks in Fig. 1.1 to seconds and record these times in your table.

[4]

- (ii)** State a conclusion for the results.

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

- (iii)** State the dependent variable in this investigation.

..... [1]

- (iv) Identify the possible source of error present in step 7 and step 11.

Suggest an improvement to the method to reduce this error.

error

.....

.....

improvement

.....

.....

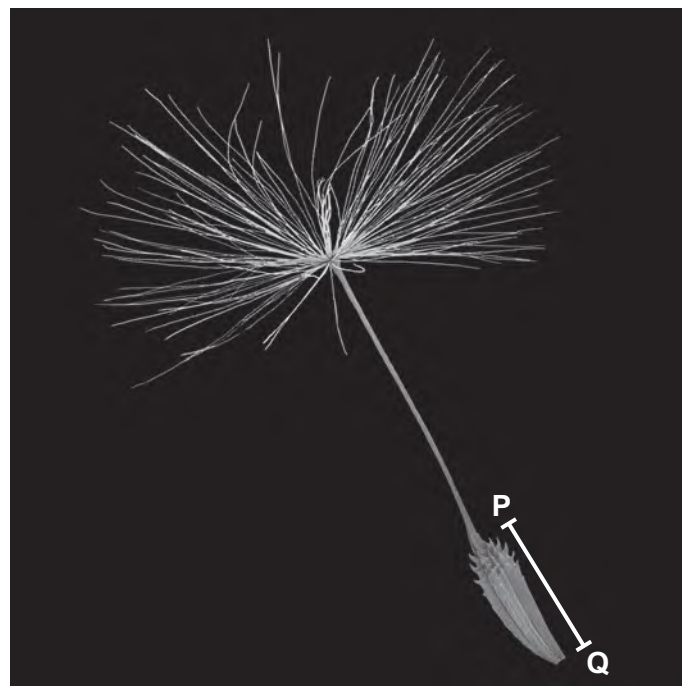
[2]

- (b) DCPIP can be used in food testing.

State which substance present in food can be identified using DCPIP.

..... [1]

- (c) Fig. 1.2 is a photograph of a seed from a dandelion plant, *Taraxacum officinale*.



magnification $\times 15$

Fig. 1.2

- (i) Draw a large diagram of the whole dandelion seed shown in Fig. 1.2.

[4]

- (ii) Line **PQ** in Fig. 1.2 represents the length of the achene of the dandelion seed.

Measure the length of line **PQ** in Fig. 1.2.

length of **PQ** mm

Calculate the actual length of the achene, using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ in Fig. 1.2}}{\text{actual length of the achene}}$$

Give your answer to **two** significant figures.

Space for working.

..... mm
[3]

- (d) Fig. 1.3 shows photographs of a dandelion seed and a seed taken from a milk thistle plant, *Silybum marianum*. The magnifications of the photographs are **not** the same.



dandelion



milk thistle

Fig. 1.3

State **one** similarity and **two** differences, visible in Fig. 1.3, between the two seeds.

Do **not** include references to size in your answer.

similarity

.....

difference 1

.....

difference 2

.....

[3]

- (e) Dandelion roots are used to flavour drinks.

Students tested a sample of a colourless drink for starch and reducing sugar. They found that the drink did **not** contain starch but did contain reducing sugar.

- (i) State the expected colour of the iodine solution after it was mixed with a sample of the drink.

..... [1]

- (ii) Describe how the students should test the sample of the drink for reducing sugar.

.....

.....

.....

.....

..... [2]

- (f) Some types of weedkiller prevent seeds from germinating.

Plan an investigation to determine the effect of weedkiller concentration on the germination of seeds.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 28]

1 - (0970/62_Winter_2020_Q2)

(a)(i)	single clear outline and no shading ; cell at least 10 cm from left to right ; <i>details:</i> two clusters of chloroplasts (minimum of three in left cluster and four in right cluster) ; two 'protrusions' in cell wall at cell junctions top and bottom ;	4	
(a)(ii)	(length of PQ) = 94 ± 1 (mm) ; 0.078 / 0.08 mm ;;	3	MP1 correct measurements MP2 correct calculation MP3 correct unit
(b)(i)	<u>103</u> (bubbles per minute) ;	1	
(b)(ii)	axes labelled with units ; even scale and with plots using at least half the grid in one direction ; six points plotted accurately $\pm$ half a small square ; suitable line drawn ;	4	
(b)(iii)	43 ± 1 (bubbles per minute) ;	1	A candidate's line at 170 cm $\pm$ $\frac{1}{2}$ small square
(b)(iv)	<i>as plant moves further away from the light: ora</i> number of bubbles remains constant and then decreases ; change in rate, after 100–139 cm / after the first two readings (either distance or bubbles) / after the first three readings / AW ;	2	
(b)(v)	idea of plant equilibrating to the new conditions / AW ;	1	

(b)(vi)	39 (%) ;;;	3	MP1 selection of correct data MP2 correct calculation MP3 correct rounding to a whole number
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2 - (0970/62_Summer_2022_Q2)

(a)(i)	clear and continuous outline, no shading ; size greater than half of space provided ; detail 1: position of stripes drawn ; detail 2: central hole visible with inner and outer edge of shell joining to enclose the central hole ;	4	
(a)(ii)	(×)0.62 / 0.61		MP1 correct measurement of line AB as 80(mm) ±1 mm MP2 correct answer calculated to any number of significant figures. R if incorrect unit given MP3 correct rounding to two significant figures
(b)	<i>similarity:</i> (both have) a spiral / same direction of spiral ; <i>difference:</i> smooth versus rough / fossilised has ridges or bumps or segments / different number of whorls / different construction material (described) / solid versus hollow / non-fossilised shell has stripes / non-fossilised shell has a hole / full spiral versus partial spiral ;	2	
(c)(i)	axes labelled, unit included ; linear scale for number of shells and either a linear scale or categories from the table for width of shell and graph to fill half or more of the grid in both dimensions ; <u>all</u> plotted points accurate to ± half small square ; bars present ;	4	
(c)(ii)	<i>any two from:</i> as width increases the number of shells (at that width) increases and then decreases ; the most common shell width is 121–130 (mm) / the least common width is 101–110 (mm) ; all shells (measured) were between 101–150 (mm wide) ; fewer nautilus have smaller shells than larger shells / ora ;	2	

(c)(iii)	to give a representative sample / to avoid bias / AW ;	1	
(c)(iv)	34.3(%) ;;;	3	MP1 selection of correct data from Table 2.1 (98 and 22, or 120) MP2 correct answer calculated MP3 correct answer rounded to one decimal place
(c)	biuret ; lilac / purple / mauve / violet ;	2	

3 - (0970/62_Summer_2024_Q2)

(a)(i)	single clear unbroken outline ; size greater than half of space provided ; detail 1: proportions plumule vs radical ; detail 2: two outermost curved leaves ;	4	
(a)(ii)	31 $\pm$ 1(mm) ; ($\times$) 3.4 ;;	3	MP1 correct measurement of line AB MP2 correct calculation to any number of significant figures MP3 correct rounding to two significant figures ecf from previous mark point if supported by workings R MP2 if unit of measurement given with the calculated value ($\times$) 3.3 (for AB of 30 mm) ($\times$) 3.5 or 3.6 (for AB of 32 mm)

(a)(iii)	one similarity from: • root / radicle / AW, present • (any) structure, pointing / AW, downwards • seed coat / seed covering / testa / AW, present / split • side roots / root hairs, present ;	3	MP1 similarity 1 MP2 difference 1 MP3 difference 2																					
	two differences from: <table><tr><th>P</th><th></th><th>Q</th></tr><tr><td>marks on / darker, seed coat / AW</td><td>OR</td><td>no marks on / paler, seed coat / AW</td></tr><tr><td>shoot / plumule / stem / stalk</td><td>OR</td><td>no, shoot / plumule / stem / stalk</td></tr><tr><td>(root is) not, hairy / furry / fibrous / feathery / branched</td><td>OR</td><td>(root is) hairy / furry / fibrous / feathery / more branched</td></tr><tr><td>thick (side) roots / AW</td><td>OR</td><td>thin (side) roots / AW</td></tr><tr><td>has leaves</td><td>OR</td><td>has no leaves</td></tr><tr><td>oval, seed / AW</td><td>OR</td><td>round, seed / AW</td></tr><tr><td>larger / longer</td><td>OR</td><td>smaller / shorter</td></tr></table> ;;			P		Q	marks on / darker, seed coat / AW	OR	no marks on / paler, seed coat / AW	shoot / plumule / stem / stalk	OR	no, shoot / plumule / stem / stalk	(root is) not, hairy / furry / fibrous / feathery / branched	OR	(root is) hairy / furry / fibrous / feathery / more branched	thick (side) roots / AW	OR	thin (side) roots / AW	has leaves	OR	has no leaves	oval, seed / AW	OR	round, seed / AW
P		Q																						
marks on / darker, seed coat / AW	OR	no marks on / paler, seed coat / AW																						
shoot / plumule / stem / stalk	OR	no, shoot / plumule / stem / stalk																						
(root is) not, hairy / furry / fibrous / feathery / branched	OR	(root is) hairy / furry / fibrous / feathery / more branched																						
thick (side) roots / AW	OR	thin (side) roots / AW																						
has leaves	OR	has no leaves																						
oval, seed / AW	OR	round, seed / AW																						
larger / longer	OR	smaller / shorter																						

(b)	<i>starch</i>: iodine solution ; <i>reducing sugar</i>: Benedict's solution ; heat ;	3	
(c)	<i>any six from:</i> 1 <i>independent variable</i>: use at least two different light intensities ; 2, 3 and 4 <i>variables kept constant</i> ;;; <i>max three from:</i> • age of plant • type / species, of plant • (starting) surface area / number of leaves / size / height • temperature • wind speed / humidity • light, wavelength / colour • soil type / AW / fertiliser / soil minerals / soil pH • volume / amount, of water supplied • time 5 and 6 <i>detail of method</i> ;; <i>max two from:</i> • method of changing the light intensity e.g. different lamp distances / dimmer switch altered / different bulbs / different lamps / different power lamps / different light sources • method of measuring angle of seedling e.g. use a protractor / measure on a photograph / use a ruler to measure from the soil to the top of the seedling • use of a heat shield 7 repeat the whole investigation at least two more times ; 8 relevant safety point ;	6	

4 - (0970/62_Winter_2024_Q1)

(a)(i)	table drawn with minimum of two columns and a header line ; appropriate column / row headings, with units for time and distance (if given) ; recording two numbers for time in a table ; recording of <u>97</u> for, test-tube A / 10 cm and <u>343</u> for, test-tube B / 30 cm ;	4	
(a)(ii)	<i>any one from:</i> as light (intensity) increases, (rate of) photosynthesis increases ; (rate of) photosynthesis is, <u>faster</u> / AW, at a high(er) light (intensity) ;	1	
(a)(iii)	time (for colour change) ;	1	
(a)(iv)	<i>error:</i> difficult to judge the end point / AW ; <i>improvement:</i> use a, colorimeter / colour standard / colour chart / compare the colour to a test-tube of chloroplast suspension with no DCPIP present ;	2	
(b)	vitamin C ;	1	
(c)(i)	outline: single clear line for beak and achene ; size: drawing at least 90 mm long ; detail 1: pappus, beak (stalk) drawn as a double line and achene (seed) with spikes clearly shown ; detail 2: ridge down the achene shown as a double line ;	4	

(c)(ii)	PQ is 19 ± 1 mm ; 1.3 ;;	3	MP1 correct measurement of line PQ MP2 dividing their measurement by 15 MP3 answer correctly rounded to two significant figures ecf from previous step if workings shown PQ of 18 mm gives 1.2 PQ of 20 mm gives 1.3
(d)	<i>similarity max one from:</i> both have a parachute / AW ; both have an achene / AW ; both have, an achene / a seed, that is longer than it is wide ; <i>differences max two from:</i> dandelion has a, stem / stalk / AW (and milk thistle, does not / is shorter) ; dandelion (achene) has, spikes / ridges / AW or milk thistle (achene), is smooth ; dandelion (achene shape) is square-ended / blunt-ended or milk thistle (achene shape) is round(ed) ; milk thistle, parachute / AW, is, thicker / more hairs / AW / ora ; dandelion (achene) is light or milk thistle (achene) is dark / mottled ;	3	correct terminology is not expected for description of the parts

(e)(i)	yellow-brown / orange-brown / brown ;	1	A red-brown
(e)(ii)	add Benedict's (reagent / solution) ; heat ;	2	
(f)	<i>independent variable</i> 1 (at least) 2 different concentrations of weedkiller ; <i>dependent variable ;</i> 2 counting, number / percentage, seeds germinated or time taken for, seed / seeds, to germinate 3 and 4 detail of method ;; <i>max two from:</i> - growing medium e.g. cotton wool, filter paper, soil - description of how they can tell the seed has germinated e.g. appearance of plumule <i>idea of</i>, watering / providing water / maintaining humidity - method to create different concentrations of weedkiller 5, 6 and 7 constant variables ;;; <i>max three from:</i> - same time (unless time is the DV) - same temperature - same, species / type / age, of seed / named plant seeds - same pH - same volume of weedkiller - same (type of) weedkiller - same concentration / amount, of oxygen 8 relevant safety precaution ; 9 two or more repeats / idea of at least 3 seeds at each concentration <i>if measuring time for germination ;</i>	6	e.g. gloves / goggles / mask

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