

1.1 Characteristics of living organisms

1. 0610_w16_qp_62 Q: 1

Maize (corn) is an important food crop that produces grain. Fig. 1.1 shows a maize grain that has germinated to form a seedling.

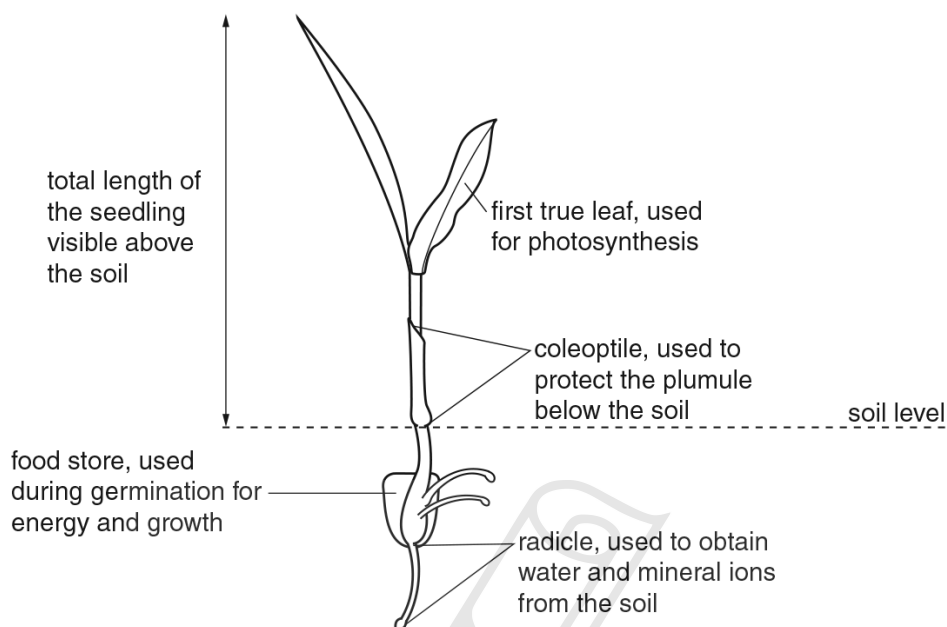


Fig. 1.1

Some students investigated the effect of light on the germination and early growth of maize. The students measured and observed maize grown in the light and maize grown in the dark.

Fig. 1.2 shows the surface of two pots containing maize seedlings, one set grown in the light and the other set grown in the dark.

The seedlings were grown at 20°C and watered every day for ten days.

Step 1 Observe the appearance of the seedlings carefully.

(a) Complete Table 1.1 to record two **visible** differences in the seedlings grown in the light and the seedlings grown in the dark shown in Fig. 1.2.

Table 1.1

feature	seedlings grown in the light	seedlings grown in the dark

[2]

1.1. CHARACTERISTICS OF LIVING ORGANISMS

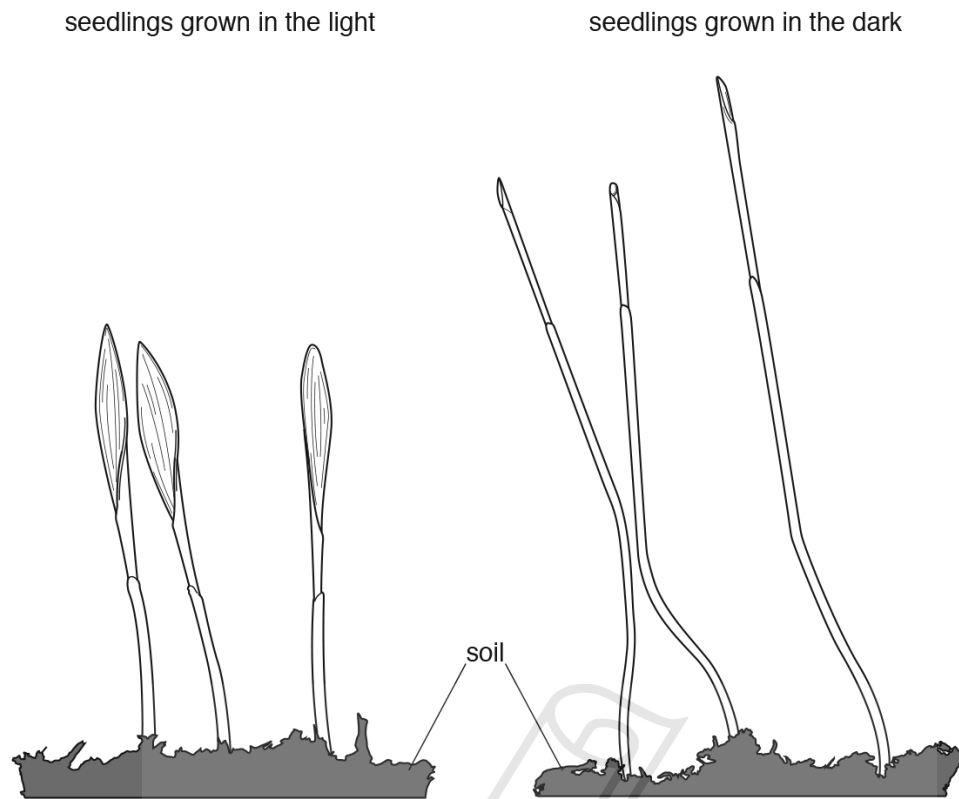


Fig. 1.2

You are going to measure the length of the coleoptiles and the total length of the seedlings visible above the soil. You will measure **all** the seedlings grown in the light and **all** the seedlings grown in the dark.

(b) (i) Prepare a table to record your results in the space below.

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- Step 2 Use a ruler to measure the length of the coleoptile and the total length of the seedling visible above the soil for each seedling.

Record your results in your table.

- (ii) State **two** conclusions that can be made about the effect of light on the germination and early growth of maize.

1

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2

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[2]

- Step 3 A line was marked down the centre of a white tile and labelled **L** on one side and **D** on the other side.

- Step 4 The three seedlings grown in the light and the three seedlings grown in the dark were dug out from each pot after ten days.

- Step 5 The remains of the food store was cut away from each of the seedlings and washed in water. The outer skin was removed.

- Step 6 The food stores were then placed on the white tile. The food stores from the seedlings grown in the light were placed on the side of the tile labelled **L** and the food stores from the seedlings grown in the dark were placed on the side labelled **D**.

- Step 7 A clean spatula was used to crush together the three food stores from the seedlings grown in the light. This was then separated into three equal parts on the **L** side of the tile, as shown in Fig. 1.3.

- Step 8 The spatula was cleaned and used to crush together the three food stores from the seedlings grown in the dark. This was also separated into three equal parts on the **D** side of the tile, as shown in Fig. 1.3.

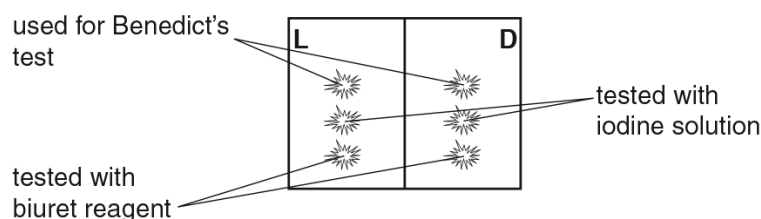


Fig. 1.3

- Step 9 One of the food stores from the seedlings grown in the light was placed into a test-tube labelled **L** and 2 cm³ of water added, taking care to wash the crushed food store to the bottom of the test-tube.

1.1. CHARACTERISTICS OF LIVING ORGANISMS

Step 10 Step 9 was repeated using one of the food stores from the seedlings grown in the dark and a test-tube labelled **D**.

Step 11 A Benedict's test was carried out on the contents of test-tube **L** and test-tube **D**.

Step 12 A drop of iodine solution was added to one of the remaining food stores from the seedlings grown in the light and to one of the remaining food store from the seedlings grown in the dark on the white tile.

Step 13 A drop of biuret reagent was added to each of the remaining food stores.

Fig. 1.4 shows the results of these tests.

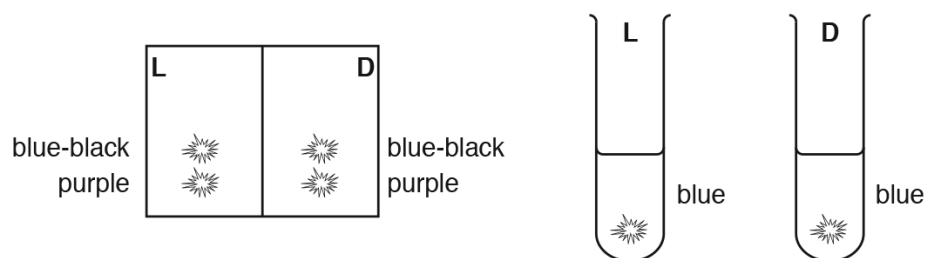


Fig. 1.4

(c) (i) Record the results of these tests in Table 1.2.

Table 1.2

test	seedlings grown in the light	seedlings grown in the dark
Benedict's		
iodine		
biuret		

[3]

(ii) State the conclusion for the results shown in Table 1.2.

.....
[1]

- (d) A group of students investigated the changes in dry mass during germination and growth of maize grown in the light and maize grown in the dark.

The dry mass is the total mass left after all the water has been evaporated.


Table 1.3 shows the results of the investigation for the maize seedlings grown in the light.

Table 1.3

	time /days										
	0	2	4	6	8	10	12	14	16	18	20
dry mass of 10 maize seedlings/g	22	20	17	12	10	8	11	13	14	15	17

- (i) Describe a method the students could have used to carry out this investigation.

Use the information on **page 2** to help you.



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[6]

- (ii) Suggest why the students measured the dry mass instead of the mass including water in their investigation.

..... [1]

[Total: 21]

Appendix A

Answers

1. 0610_w16_qp_62 Q: 1

	Answer	Mark	Partial Marks																		
(a)	any two from: <table><tr><th>feature</th><th>seedlings grown in light</th><th>seedlings grown in dark</th></tr><tr><td>total height (of shoot / seedling / seed)</td><td>short</td><td>tall;</td></tr><tr><td>coleoptile height</td><td>short</td><td>long;</td></tr><tr><td>leaves</td><td>leaf opened out / present</td><td>leaf still curled / not opened out / not present;</td></tr><tr><td>position of shoot / stem / coleoptile</td><td>almost vertical</td><td>bent;</td></tr><tr><td>AVP, e.g. width of stem / shoot / coleoptiles</td><td>wider</td><td>narrower;</td></tr></table>	feature	seedlings grown in light	seedlings grown in dark	total height (of shoot / seedling / seed)	short	tall;	coleoptile height	short	long;	leaves	leaf opened out / present	leaf still curled / not opened out / not present;	position of shoot / stem / coleoptile	almost vertical	bent;	AVP, e.g. width of stem / shoot / coleoptiles	wider	narrower;	2	
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	Answer	Mark	Partial Marks
(b)(i)	<p>1 one table drawn with (ruled) lines;</p> <p>2 column and row headings with units in the header only;</p> <p>3 three trials identified;</p> <p>4 twelve measurements entered;</p> <p>5 all measurements taken in the light within the ranges: coleoptiles 19–26/1.9–2.6 total lengths 57–65/5.7–6.5</p> <p>6 all measurements taken in the dark within the ranges: coleoptiles 64–80/6.4–8.0 total lengths 83–111/8.3–11.1</p>	6	

	Answer	Mark	Partial Marks												
(b)(ii)	1 light not needed for germination / seeds can germinate in the dark; 2 (in the light) leaf is visible / open / ora ; 3 (in light) seedlings are shorter / do not grow as tall / ora ; 4 (in light) coleoptiles are shorter / ora ; 5 (in the light) seedlings grow upright / AW / seedlings grow slanted in the dark; 6 (in the light) stem / coleoptiles is wider / ora ;	2													
(c)(i)	<table><tr><th>test</th><th>seedlings grown in light</th><th>seedlings grown in dark</th></tr><tr><td>Benedict's</td><td>blue</td><td>blue;</td></tr><tr><td>iodine</td><td>blue-black</td><td>blue-black;</td></tr><tr><td>biuret</td><td>purple</td><td>purple;</td></tr></table>	test	seedlings grown in light	seedlings grown in dark	Benedict's	blue	blue;	iodine	blue-black	blue-black;	biuret	purple	purple;	3	
test	seedlings grown in light	seedlings grown in dark													
Benedict's	blue	blue;													
iodine	blue-black	blue-black;													
biuret	purple	purple;													
(c)(ii)	starch and protein present but not (simple) sugars;	1													
	Answer	Mark	Partial Marks												
(d)(i)	1 ref to using same species / age, etc. maize; 2 ref. to finding starting (dry) mass; 3 ref. to method of drying; 4 ref. to planting maize (grains) in soil / AW; 5 ref. to planting two sets of at least 100 maize / seeds; 6 ref. to keeping (both sets) in a warm room at / given °C / constant temperature; 7 one other valid detail of the method; 8 ref. to one set of seeds placed in light ref. to one set of seeds placed in dark; 9 ref to removing (10) seedlings (from each set) every two days for drying and weighing 10 repeat <u>and</u> calculate the mean / average;	6													
(d)(ii)	water content in, seeds / seedlings, is variable; for comparisons to be valid;	1													
		Total: 21													

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