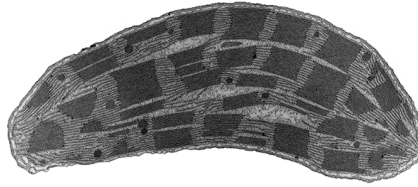


- 4 The diagram shows an image of a chloroplast. The image is 5 cm long.



The actual length of the chloroplast is $5\text{ }\mu\text{m}$.

What is the magnification of the image?

- A** $\times 10$ **B** $\times 1000$ **C** $\times 10\,000$ **D** $\times 100\,000$

- 4 In a human, the diameter of the aorta as it leaves the heart is 36 mm.

The thickness of the wall of the aorta at this point is 9 mm.

What is the diameter of the lumen of the aorta at this point?

- A** 1800 m **B** $2700\text{ }\mu\text{m}$ **C** $18\,000\text{ }\mu\text{m}$ **D** $27\,000\text{ }\mu\text{m}$

- 3 (a) Fig. 3.1 is a photograph of a necklace starfish, *Fromia monilis*.

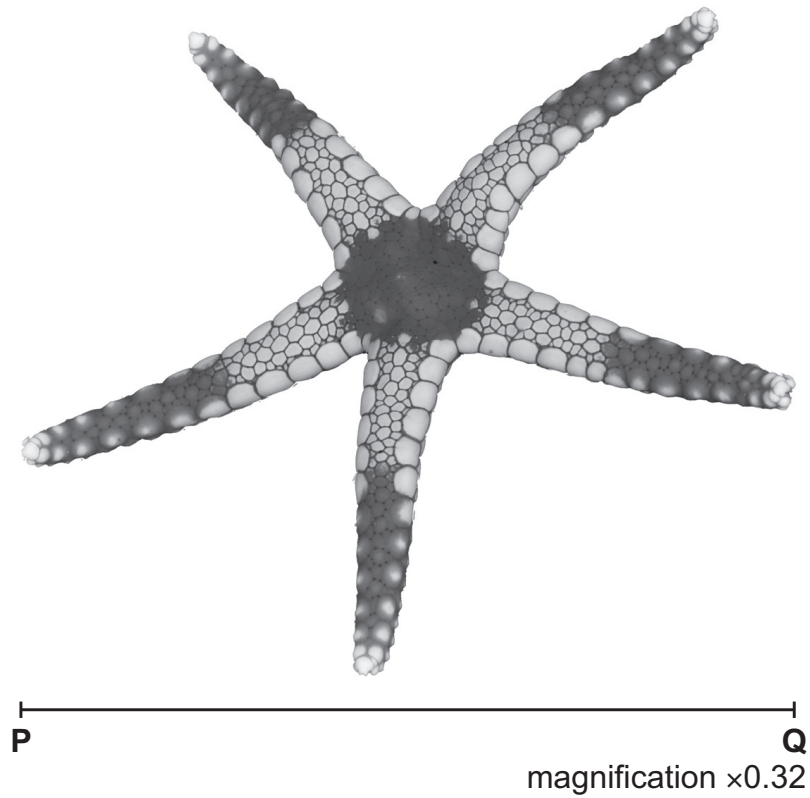


Fig. 3.1

- (i) Draw a large diagram of the necklace starfish shown in Fig. 3.1.

(ii) Line **PQ** in Fig. 3.1 represents the diameter of the necklace starfish.

Measure the length of line **PQ** in Fig. 3.1.

length of line **PQ** mm

Calculate the actual diameter of the necklace starfish using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ in Fig. 3.1}}{\text{actual diameter of the necklace starfish}}$$

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

Space for working.

..... mm
[3]

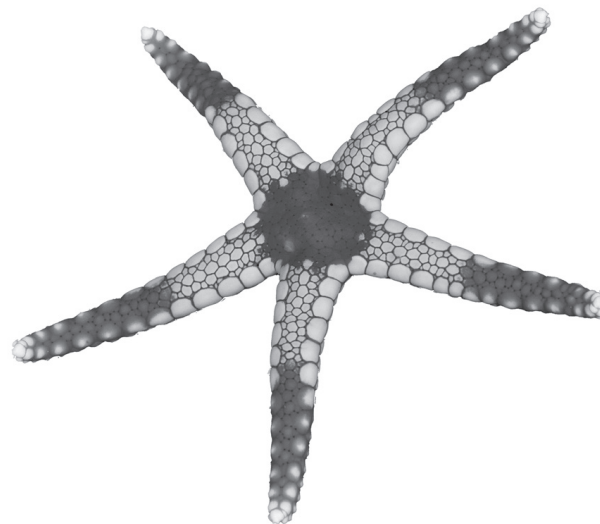
- (iii) Fig. 3.2 is a photograph of a spiny starfish, *Marthasterias glacialis*. Fig. 3.3 is a photograph of a necklace starfish.

The magnifications of the photographs are **not** the same.



spiny starfish

Fig. 3.2



necklace starfish

Fig. 3.3

State **two** ways the spiny starfish in Fig. 3.2 differs from the necklace starfish in Fig. 3.3, and **one** way it is similar.

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

difference 1

.....

difference 2

.....

similarity 1

.....

[3]

(b) Seven-armed starfish live in the sea.

Scientists investigated the distribution of seven-armed starfish, *Luidia ciliaris*, in one region.

- Photographs of 20 m² areas of seabed were taken at different depths.
- The depth of the water in each area was measured when the water was at its highest level (high tide).
- The numbers of seven-armed starfish in each photograph were counted.
- All photographs were taken on the same day in July.

(i) State **two** ways that the method used by the scientists ensured that the numbers of seven-armed starfish counted at different depths could be compared.

1

.....

2

.....

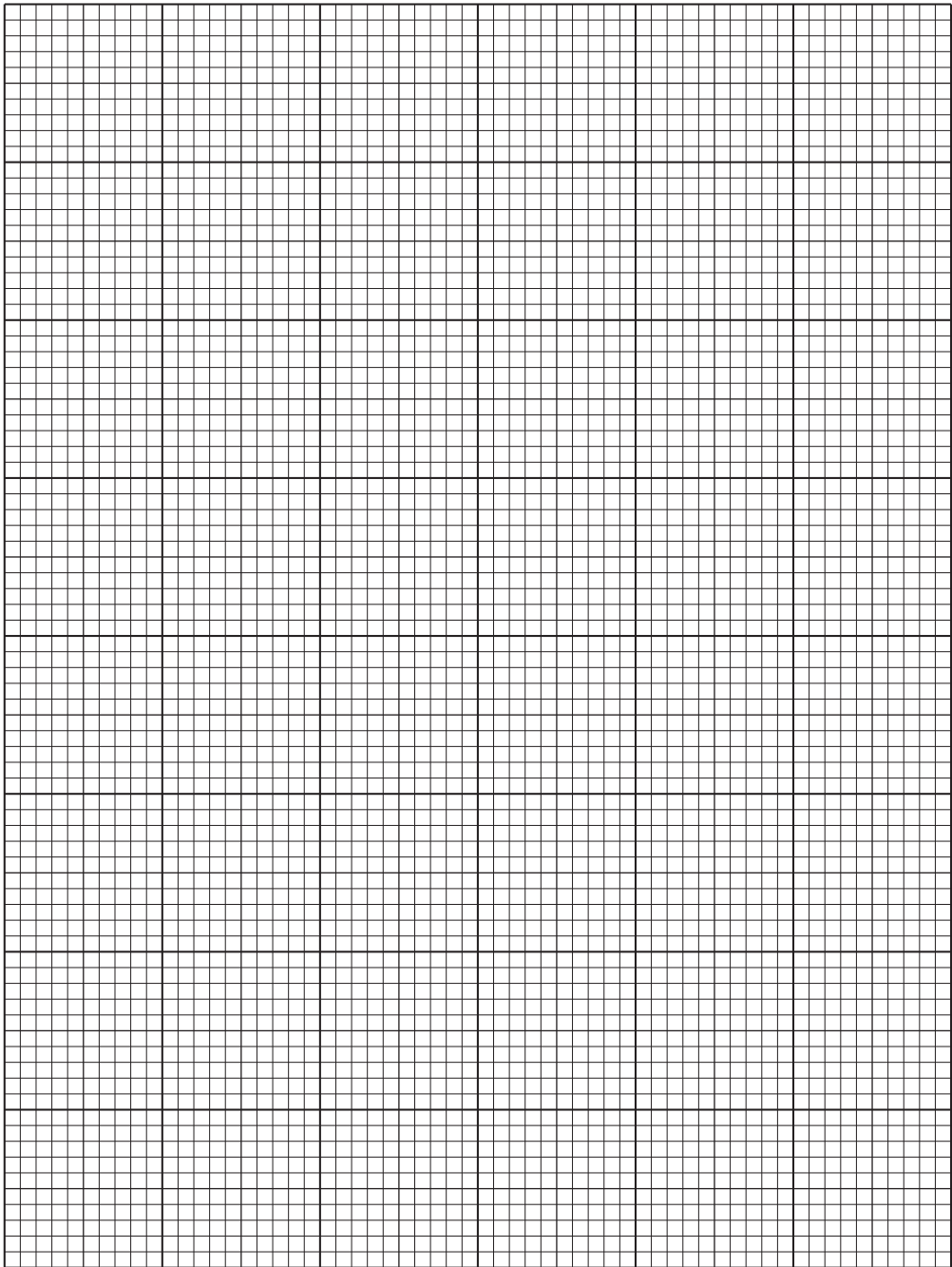
[2]

The results of the investigation are shown in Table 3.1.

Table 3.1

depth / m	number of seven-armed starfish counted
0.0–9.9	337
10.0–19.9	1486
20.0–29.9	1243
30.0–39.9	241
40.0–49.9	121

(ii) Plot a histogram on the grid of the data in Table 3.1.



(iii) State the depth range in Table 3.1 at which most seven-armed starfish were found.

.....m [1]

(iv) Using the information in Table 3.1, calculate the total number of seven-armed starfish that were photographed at all depths, and use this value to calculate the percentage of starfish that were photographed in the 0.0–9.9 m range.

Express the percentage as a whole number.

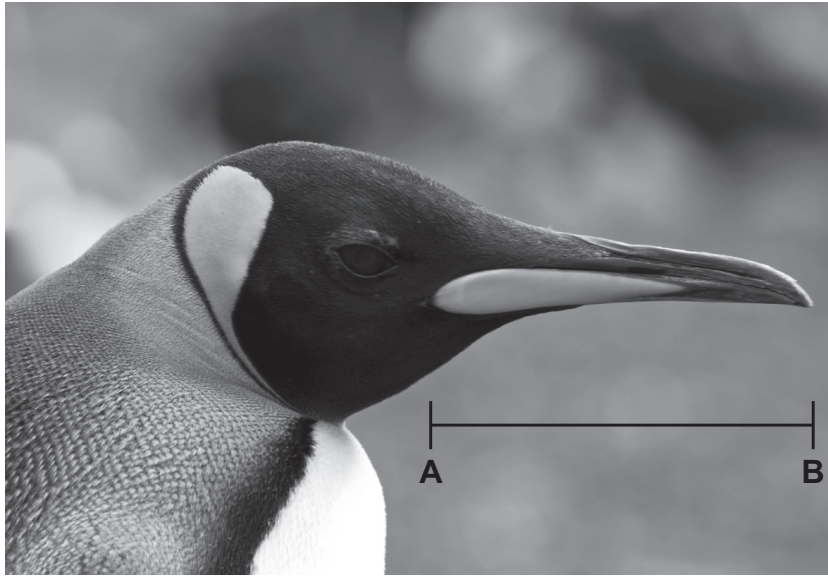
Space for working.

total number of seven-armed starfish photographed

percentage of seven-armed starfish photographed at 0.0–9.9 m%
[3]

[Total: 20]

- 3 (a) Fig. 3.1 is a photograph of the head of a king penguin.



magnification $\times 0.42$

Fig. 3.1

- (i) Make a large drawing of the head of the king penguin shown in Fig. 3.1.

(ii) The length of line **AB** represents the length of the penguin’s beak.

Measure the length of line **AB** in Fig. 3.1.

length of line **AB** mm

Use your measurement and the formula to calculate the actual length of the penguin’s beak.

magnification =
$$\frac{\text{length of line **AB** in Fig. 3.1}}{\text{actual length of the penguin’s beak}}$$

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

Space for working.

..... mm

[3]

(b) Fig. 3.2 shows the heads of a gentoo penguin and a black-footed penguin.



gentoo



black-footed

not to scale

Fig. 3.2

Other than size, state **two** ways the gentoo penguin differs from the black-footed penguin in Fig. 3.2.

1

.....

2

.....

[2]

(c) Penguins are covered in feathers. The feathers reduce heat loss by insulating the birds from the cold.

A beaker of hot water can be used to represent a penguin.

Plan an investigation to determine the effect of the thickness of an insulating material on heat loss in a beaker of hot water.

..... [6]

[Total: 15]

5 A student measured the length of a structure using a microscope.

The magnification used was $\times 250$.

The image size of the structure was 5.00 mm.

What was the actual length of the structure?

- A** $1.25 \times 10^3 \text{ mm}$
B $1.25 \times 10^3 \mu\text{m}$
C $2.00 \times 10^1 \mu\text{m}$
D $2.00 \times 10^{-5} \mu\text{m}$

4 A cell is $65\text{ }\mu\text{m}$ across.

What is this measurement in mm?

- A** 0.00065 mm **B** 0.0065 mm **C** 0.065 mm **D** 0.65 mm