

Past-paper walk-through

Size of specimens ■ 2.2

eXercise

Questions in this set

- 0610/21 N25 Q4 ■ 1 mark
- 0610/23 N25 Q4 ■ 1 mark
- 0610/62 N25 Q3 ■ 20 marks
- 0610/63 N25 Q3 ■ 15 marks
- 0610/22 J25 Q5 ■ 1 mark
- 0610/22 M25 Q4 ■ 1 mark

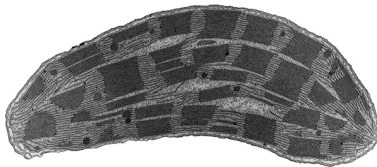
Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 4

0610/21 N25 ■ Q4 ■ 1 mark

- 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?

Question 4

A $\times 10$

B $\times 1000$

C $\times 10\,000$

D $\times 100\,000$

Solution 4

Answer: **C**

Why

- Magnification = image size $\div$ actual size, with both in the same units.
- 5 cm is 50 000 μm and the chloroplast is 5 μm .
- $50\,000/5 = 10\,000$.

Question 4

0610/23 N25 ■ Q4 ■ 1 mark

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 μm

C 18 000 μm

D 27 000 μm

Solution 4

Answer: **C**

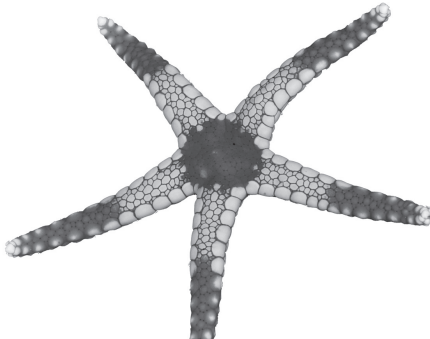
Why

- The wall runs all the way round, so it is crossed *twice* along a diameter.
- Total wall thickness across the vessel = $2 \times 9 = 18$ mm.
- Lumen diameter = $36 - 18 = 18$ mm.

Question 3

0610/62 N25 ■ Q3 ■ 20 marks

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



Question 3



Fig. 3.1

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

Question 3

Question 3

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

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

Question 3

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.

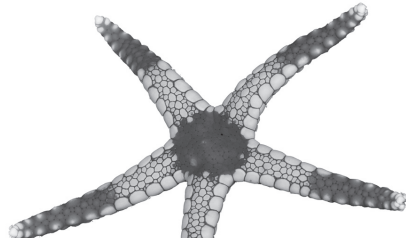
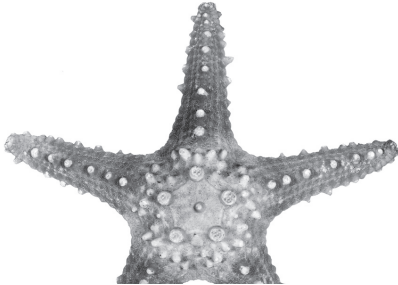
Space for working.

Question 3

[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.



Question 3



Question 3



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.

Question 3

Question 3

Question 3

Question 3

Question 3

Question 3

[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 m^2 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.

Question 3

Question 3

Question 3

Question 3

[2]

The results of the investigation are shown in Table 3.1.

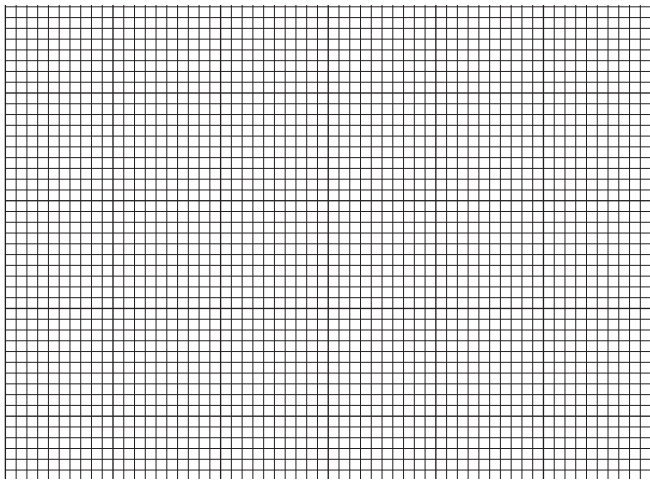
Table 3.1

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

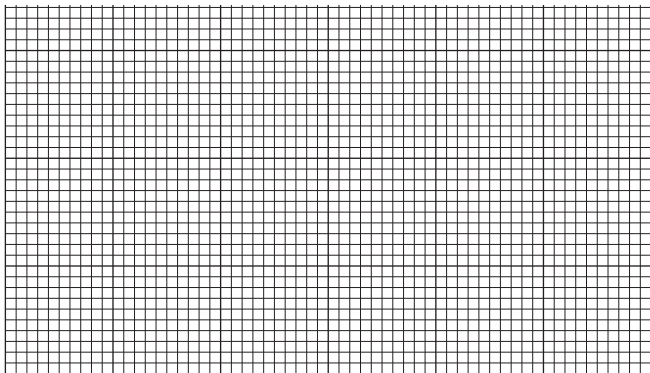
- (ii) Plot a histogram on the grid of the data in Table 3.1.



Question 3



Question 3



Question 3

[4] _

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

Question 3

- (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.

Question 3

[3]

[Total: 20]

Solution 3

(a)(i)

Mark scheme

- single clear outline with no shading ;
- width of drawing greater than 93 mm ;
- detail 1: 5 arms and enclosed shape in middle that doesn't touch the
- edges ;
- detail 2: indication of where colour changes on all limbs
- 4

Solution 3

(a)(ii) Mark scheme

- length of line PQ: 93 ± 1 (mm) ;
- 290 ;;
- 3 MP1 correct measurement of line PQ
- MP2 correct calculation i.e. $PQ \div 0.32$
- MP3 correct rounding to two significant figures
- ecf from previous step
- 0610/62
- October/November 2025

Solution 3

- Guidance

Solution 3

(a)(iii) Mark scheme

- max two differences from:
- spiny starfish
- / Figure 3.2
- necklace starfish
- / Figure 3.3
- spines / AW
- AND smooth / scales / no spines ;
- light / bright, in centre

Solution 3

- AND dark in centre ;
- has five, ossicles / AW,
- in the centre or has a
- central pentagon
- shape
- AND
- does not have five,
- ossicles / AW, in the centre
- or no central pentagon
- shape ;

Solution 3

- no white ends to the
- limbs
- AND white ends to the limbs ;
- more uniform shaped
- limbs
- AND less uniform shaped limbs ;
- straight limbs
- AND bent / curved / AW, limbs ;
- lines going down the
- arms

Solution 3

- AND no lines going down the
- arms ;
- max one similarity from:
- (both have)
- five, arms / AW ;
- circle in the middle ;
- dark arms / arms that are a different colour to the centre ;
- tapering limbs ;
- radial symmetry ;
- 3

Solution 3

- one mark per correct row
- 0610/62
- October/November 2025
- Guidance

Solution 3

(b)(i) Mark scheme

- any two from:
- same region ;
- same size of area / 20 m², (sampled) ;
- same day / same time of year / both in July / same date ;
- depth measured at, same time of tide / high tide / when water at its
- highest ;
- 2

Solution 3

(b)(ii) Mark scheme

- axes labelled with units ;
- suitable linear scale on number of starfish axis and ranges given for
- depth axis and data occupies at least half the grid in both directions ;
- five accurate plots $\pm$ half a small square ;
- bars of equal width $\pm$ half a small square with no gaps between them ;
- 4 i.e. depth / m and number of starfish OR
- frequency density

Solution 3

(b)(iii)

Mark scheme
■ 10–19.9
■ 1

Solution 3

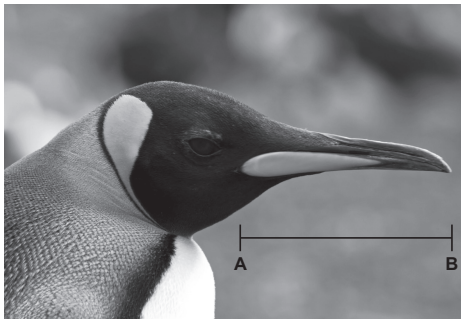
(b)(iv) Mark scheme

- total number of starfish photographed: 3428 ;
- percentage in the 0.0–9.9m range: 10 (%) ;;
- 3 MP1 correct total number of starfish
- MP2 correct calculation to any number of
- decimal places e.g. $(337 \div 3428) \times 100 = 9.831$
- MP3 correct rounding to a whole number
- ecf from previous step

Question 3

0610/63 N25 ■ Q3 ■ 15 marks

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



magnification $\times 0.42$

Question 3

magnification x5.12

Fig. 3.1

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

Question 3

Question 3

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

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

Question 3

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

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

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

Space for working.

Question 3

Question 3

Question 3

[3]

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



gentoo



black-footed

Question 3

-

Question 3

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.

Question 3

Question 3

Question 3

Question 3

[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.

Question 3

[Total: 15]

Solution 3

(a)(i)

Mark scheme

- outline clear and continuous, no shading ;
- size greater than half of space provided ;
- detail 1: tear-shaped white patch on the left with a border
- and tear-shaped white patch below the beak ;
- detail 2: two or more lines on the beak ;
- 4

Solution 3

(a)(ii) Mark scheme

- 46 ± 1 (mm) ;
- 109.5 (mm) ;;
- 3 MP1 correct measurement of line AB
- MP2 correct calculation to any number of decimal places
- i.e. $46 \div 0.42 = 109.5238$
- MP3 correct rounding to one decimal place
- ecf from previous MP

Solution 3

(b) Mark scheme

- any two from:
- Gentoo has:
- less white area / white patch around eye is triangular-
- shaped vs semicircular-shaped ;
- rounder / bigger / wider eye ;
- slimmer / narrower / thinner / sharper, beak ;
- larger pale area on beak / no stripe vs black-footed has a
- stripe ;

Solution 3

- smoother beak ;
- 2
- 0610/63
- October/November 2025
- Guidance

Solution 3

(c) Mark scheme

- 1 independent variable
- at least two different thicknesses of insulation (used as an
- insulator) ;
- 2 dependent variable
- change in temperature / time taken for a stated fall in
- temperature ;
- 3 and 4 method ;;
- ■

Solution 3

- method of insulating beaker with named material
- ■
- measure the starting temperature and final temperature
- 5, 6 and 7 variables kept constant ;;;
- ■
- volume of water
- ■
- size
- ■
- type of beaker

Solution 3

- ■
- time left to cool / stated fall in temperature
- ■
- starting temperature
- ■
- type of insulator
- ■
- same surroundings / environmental temperature
- 8 repeat investigation twice more / at least two replicates ;
- 9 relevant safety precaution ;

Solution 3

■ 6

Question 5

0610/22 J25 ■ Q5 ■ 1 mark

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 1.25×10^3 mm

B 1.25×10^3 μm

Question 5

C $2.00 \times 10^1 \mu\text{m}$

D $2.00 \times 10^{-5} \mu\text{m}$

Solution 5

Answer: **C**

Why

- Actual size = image size $\div$ magnification.
- $5.00 \text{ mm} \div 250 = 0.0200 \text{ mm}$.
- That is $20 \mu\text{m}$.

Question 4

0610/22 M25 ■ Q4 ■ 1 mark

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

Solution 4

Answer: **C**

Why

- There are 1000 micrometres in a millimetre.
- So divide by 1000: $65/1000$.
- That gives 0.065 mm.