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MARINE SCIENCE

0697/03

Paper 3 Practical Assessment Paper

May/June 2023

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 60.
- The number of marks for each question or part question is shown in brackets [].

This document has **12** pages. Any blank pages are indicated.

1 Fig. 1.1 is an image of a unicorn fish.



Fig. 1.1

(a) Make a large accurate drawing of the specimen shown in Fig. 1.1.

[4]

(b) On your drawing label each of the following features:

- the lateral line
- **two** named median fins (for example the anal fin).

[3]

(c) (i) The actual total length of the fish is 43 cm.

Add a scale line to Fig. 1.1 to show the total length of the fish. [1]

(ii) Calculate the magnification of the image using the formula shown.

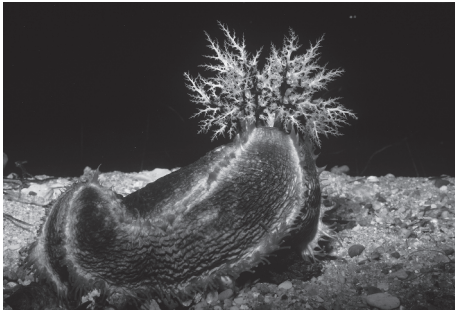
$$\text{magnification} = \frac{\text{image length}}{\text{actual length}}$$

Show your working.

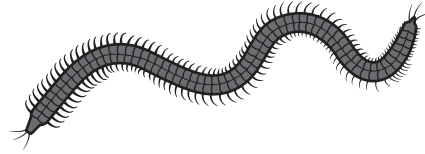
..... [3]

[Total: 11]

2 Fig. 2.1 **A** and **B** shows two different marine invertebrates. These are **not** to the same scale.



A



B

Fig. 2.1

(a) State the phylum that each of organism **A** and organism **B** belong to.

A

B

[2]

(b) Table 2.1 shows some features used to help identify marine organisms.

Complete Table 2.1 by:

- placing a tick (✓) in the box if the feature is present in the organism.
- placing a cross (✗) in the box if the feature is **not** present in the organism.

Table 2.1

feature	organism A	organism B
tube feet		
setae		
segmented body		
pentaradial symmetry		

[4]

- (c) A sea cucumber hatchery collects data on length and mass of juvenile sea cucumbers. Table 2.2 shows their results.

Table 2.2

	length / mm	mass / g
	69	24.2
	74	29.6
	64	22.1
	83	31.8
	78	30.3
mean		27.6

- (i) Use the data in Table 2.2 to calculate the mean length of the juvenile sea cucumbers.

Show your working.

..... mm [2]

- (ii) State the ratio of mean length to mean mass of the juvenile sea cucumbers in its simplest form. Give your answer to one decimal place.

..... [2]

[Total: 10]

3 (a) A student is given three different food samples to test for the presence of nutrients.

(i) Describe the biochemical test and the positive result for non-reducing sugars.

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..... [4]

(ii) Describe the biochemical test and the positive result for protein.

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..... [2]

- (b) Fig. 3.1 shows different stages in an experiment to demonstrate the difference in density between samples of sea water and fresh water. In stage 1, the fresh water is coloured. In stage 2, colourless sea water is added to the bowl.

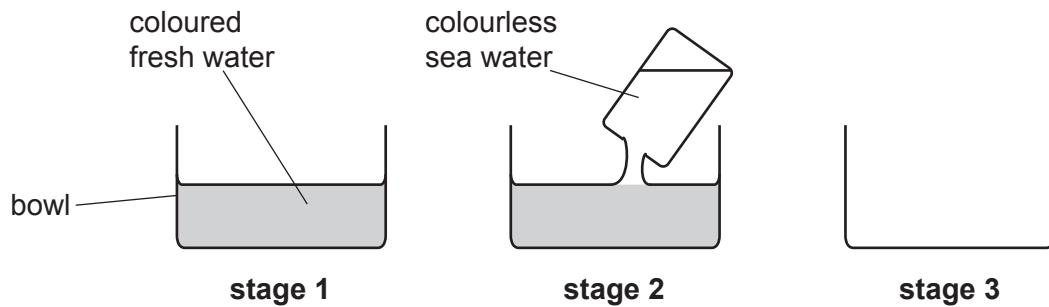


Fig. 3.1

- (i) On Fig. 3.1 draw the final observation in stage 3 when all the colourless sea water has been added to the coloured fresh water in the bowl. [1]

- (ii) Explain your answer to (i).

.....

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..... [2]

- (iii) State the name of the instrument used to measure density of a liquid.

..... [1]

[Total: 10]

- 4 Scientists investigated the relationship between female fish mass and the total number of eggs in the ovaries (fecundity) of a sample of herring fish.

(a) Fig. 4.1 shows results taken from their notebook.

247g	110 000
132g	43 000
105g	34 000
215g	92 000
170g	60 000

Fig. 4.1

- (i) Draw a table of results for the data shown in Fig. 4.1.

In your table rank by fish mass, from smallest to largest.

[3]

- (ii) The scientist has the data for one other fish.

The total mass of the ovaries is 11 g.

In a 0.1 g sample she counts 425 eggs.

Calculate the total number of eggs in the ovaries of this fish.

..... [1]

(b) Fig. 4.2 is a graph grid on which you will plot the data from Fig. 4.1.

(i) Complete Fig. 4.2 by adding a label and scale for the y-axis. [2]

(ii) Plot the data from Fig. 4.1 onto Fig. 4.2. Use x to mark your points. [2]

(iii) Draw a single straight line of best fit for the data on Fig. 4.2. Use a ruler. [1]

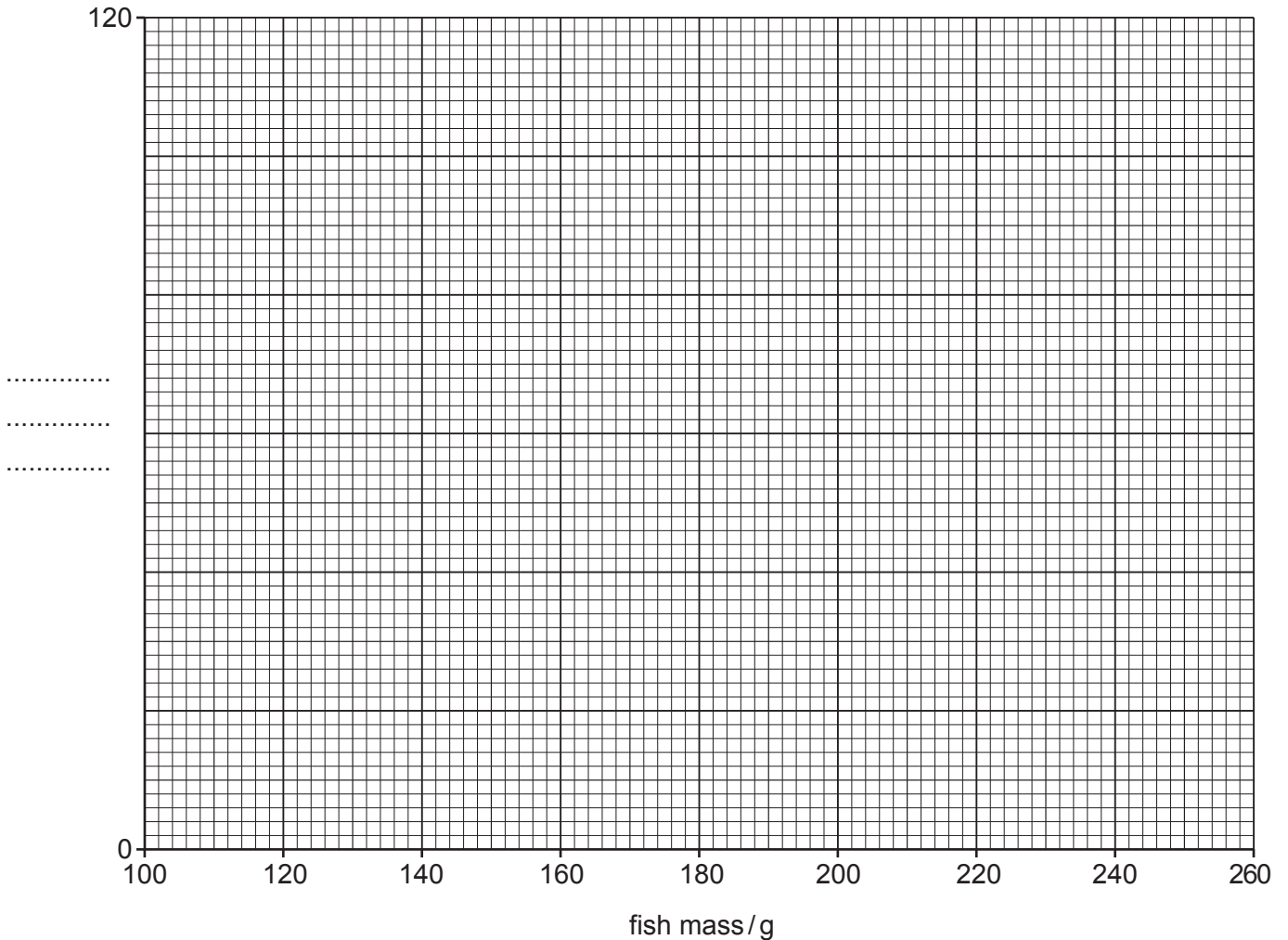


Fig. 4.2

(iv) Use the graph to predict the fecundity of a female fish with a mass of 200g.

..... [1]

(c) State the relationship between the mass of female fish and fecundity, shown in Fig. 4.2.

.....
 [1]

[Total: 11]

5 A student observed that the distribution of red algae was **not** uniform on a rocky shore.

The student formed the following hypothesis.

Red algae populations decrease as the distance from the waterline increases up the rocky shore.

Design and describe an investigation which you could carry out to test this hypothesis. Use the headings given to structure your answer.

- method, including all the equipment needed and a safety precaution
- presentation and analysis of the results

(a) method, including all the equipment needed and a safety precaution

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presentation and analysis of the results

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[13]

(b) Describe the limitations of your method and suggest improvements. Suggest further work to extend the investigation.

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[5]

[Total: 18]

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