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MARINE SCIENCE**0697/23**

Paper 2 Theory and Practical Skills

May/June 2025**1 hour 45 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 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **24** pages. Any blank pages are indicated.

1 Fig. 1.1 shows shrimps on sale at a fish market.

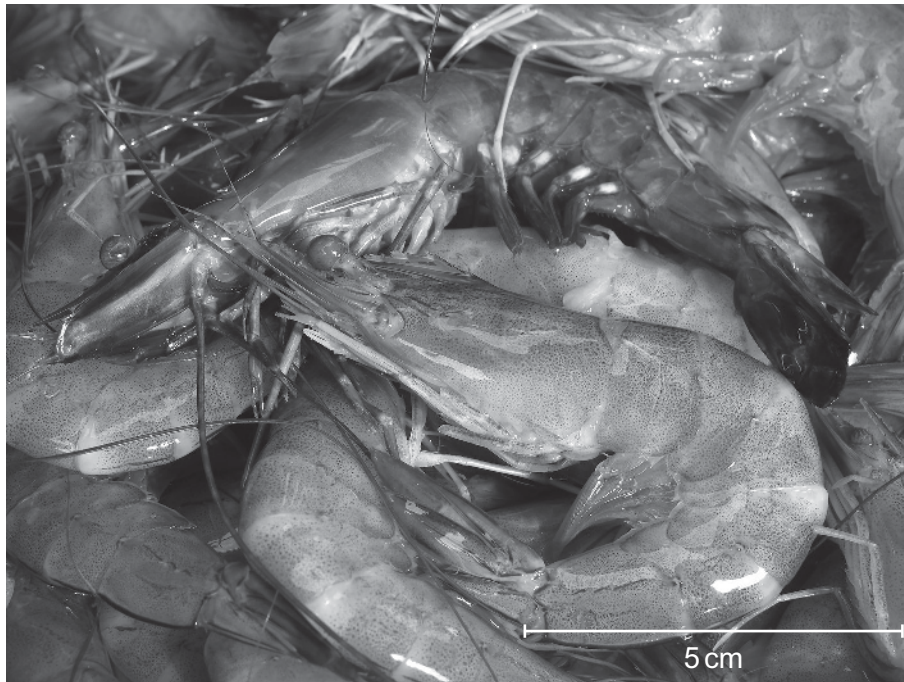


Fig. 1.1

(a) Shrimps are crustaceans.

State **two** main characteristic features of crustaceans.

1

2 [2]

(b) Shrimps are a source of essential nutrients such as lipids.

(i) Name **one other** major nutrient group that is needed by animals.

..... [1]

(ii) Describe a method to test a sample of shrimp for the presence of lipids.

.....

.....

.....

.....

.....

..... [3]



(iii) Explain the importance of lipids in the diet of animals.

.....

.....

.....

..... [2]

[Total: 8]



- 2 A student investigates the effect of temperature on the solubility of carbon dioxide gas in water.

The student uses this method.

- Place a bottle of fizzy, carbonated water in a refrigerator at a temperature of 4°C .
- Pour 100 cm^3 of the carbonated water into a beaker.
- Measure the mass of the beaker and carbonated water.
- Place the beaker into a water-bath at a temperature of 5°C , as shown in Fig. 2.1.
- Leave the carbonated water, stirring it occasionally until it stops releasing bubbles of carbon dioxide gas.
- Reweigh the beaker and the carbonated water.
- Calculate the change in mass.
- Repeat the experiment at other temperatures up to 50°C .

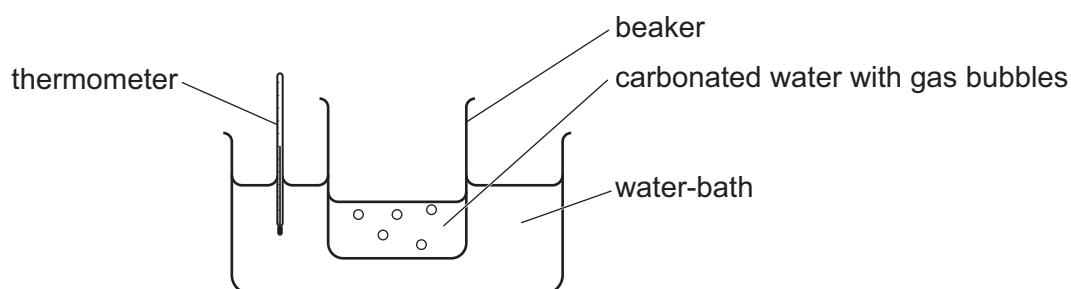


Fig. 2.1

- (a) (i) Name **one** piece of apparatus that the student can use to measure 100 cm^3 of carbonated water.

..... [1]

- (ii) Suggest **two** changes to the student's method to obtain more accurate results.

1

.....

2

.....

[2]



(b) Fig. 2.2 shows a graph of the student's results.

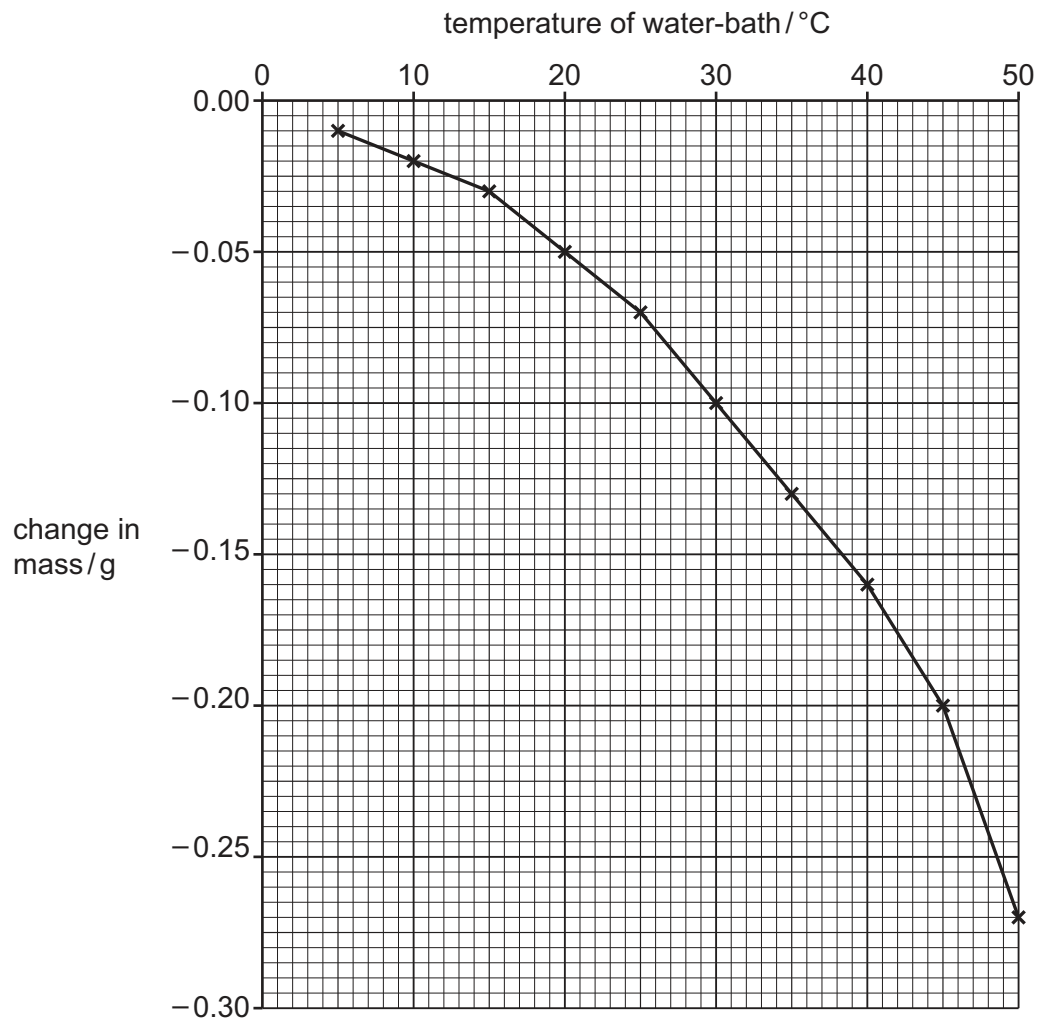


Fig. 2.2

Explain the effect of increasing the temperature on the change in mass shown in Fig. 2.2.

.....

.....

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..... [3]





(c) Explain why warm water usually lies above cold water in the ocean.

.....

.....

.....

.....

.....

..... [3]

[Total: 9]



3 Fig. 3.1 shows an ocean food web.

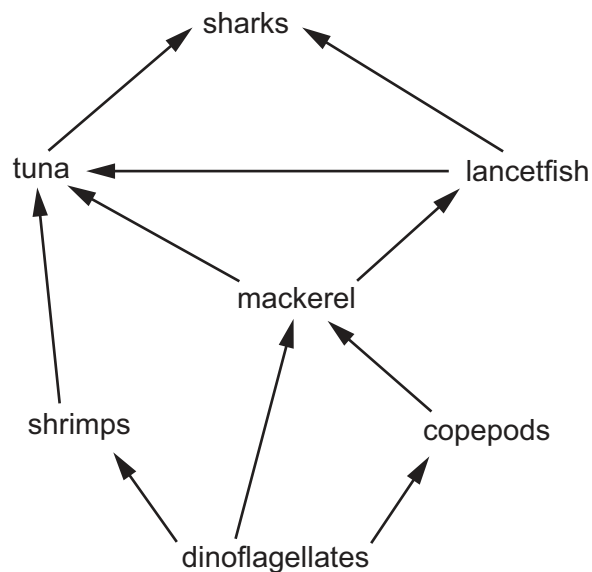


Fig. 3.1

(a) (i) Name **one** primary consumer in the food web shown in Fig. 3.1.

..... [1]

(ii) Draw the longest food chain in the food web shown in Fig. 3.1.

[2]



(b) Fig. 3.2 shows a dinoflagellate from this ocean food web.

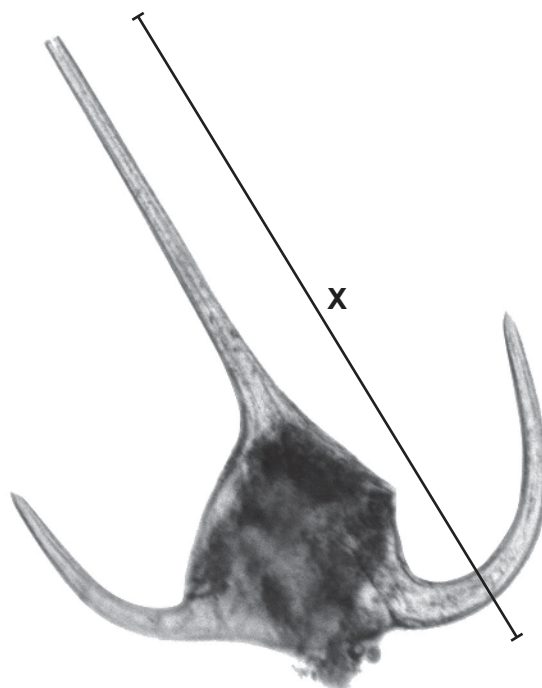


Fig. 3.2

- (i) In the space, make a large, accurate drawing of the dinoflagellate shown in Fig. 3.2.

Do **not** draw internal structures of the dinoflagellate.



- (ii) The magnification of the image in Fig. 3.2 is $\times 360$.

Calculate the actual length of the dinoflagellate in Fig. 3.2 along the length of the line labelled **X**.

Give your answer in mm and to **two** significant figures.

Show your working.

actual length = mm [3]

- (iii) State the kingdom that dinoflagellates belong to.

..... [1]

- (iv) All dinoflagellates have two flagella.

Give **one other** main feature of dinoflagellates.

..... [1]

- (c) (i) Dinoflagellate blooms can occur at different times of the year.

Outline how a Secchi disc can be used to compare population sizes of dinoflagellates.

.....
.....
.....
.....
.....
..... [3]

- (ii) Suggest **one** reason why using a Secchi disc does **not** provide an accurate measure of the population size of dinoflagellates.

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

[Total: 16]





4 Fig. 4.1 shows the structure of the Earth with the core and the crust labelled.

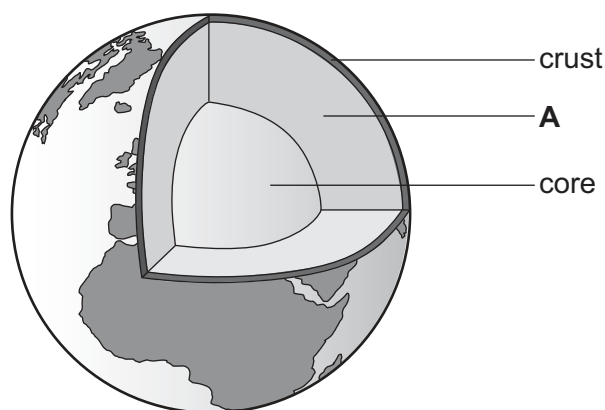


Fig. 4.1

(a) (i) Name the section labelled **A** in Fig. 4.1.

..... [1]

(ii) Describe the structure of the Earth's core shown in Fig. 4.1.

.....

 [2]

(b) The spinning of the Earth and prevailing winds are two factors that cause oceanic currents.

(i) State what is meant by the term oceanic current.

.....
 [1]

(ii) State **one other** factor that causes oceanic currents.

.....
 [1]



- (c) A student investigates how wind speed and wind direction affect the speed of an oceanic current.

The student measures the mean speed of the current, the wind speed and the wind direction each day for five days.

Fig. 4.2 shows the results in the student's notebook.

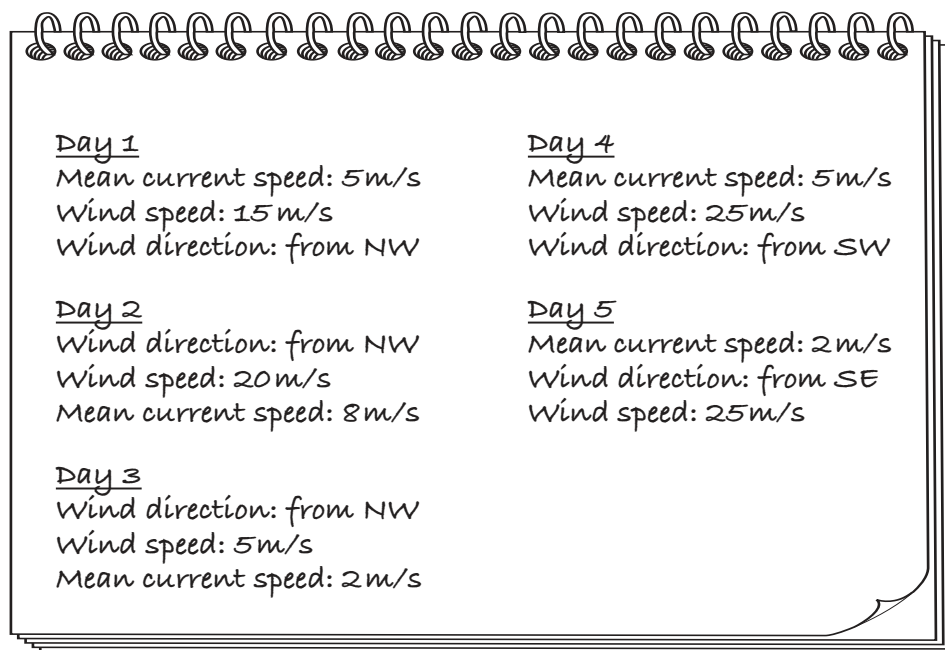


Fig. 4.2

- (i) Complete Table 4.1 to show the student's results from Fig. 4.2.

Write the data in order of increasing day number.

Table 4.1

day number			

[3]





(ii) Name an independent variable measured by the student in the investigation.

..... [1]

(iii) The student releases an orange float from a boat into the water to measure the current speed.

Describe the measurements and calculations the student needs to make to determine the mean current speed.

.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

(iv) The student concludes that increasing prevailing wind speed increases the current speed.

Discuss whether the student's data in Fig. 4.2 supports this conclusion.

.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

[Total: 15]





5 Fig. 5.1 shows an oil tanker.



Fig. 5.1

(a) Oil tankers must be built in line with the MARPOL standards for ship design.

Describe how the MARPOL standards reduce the environmental impacts of transporting oil.

.....

.....

.....

.....

.....

.....

..... [3]



- (b) Dispersant sprays contain chemicals that are used to scatter oil through water following an oil spill.

Scientists investigated how changing the ratio of dispersant to oil affects the dispersal effectiveness.

The scientists' results are shown in Table 5.1.

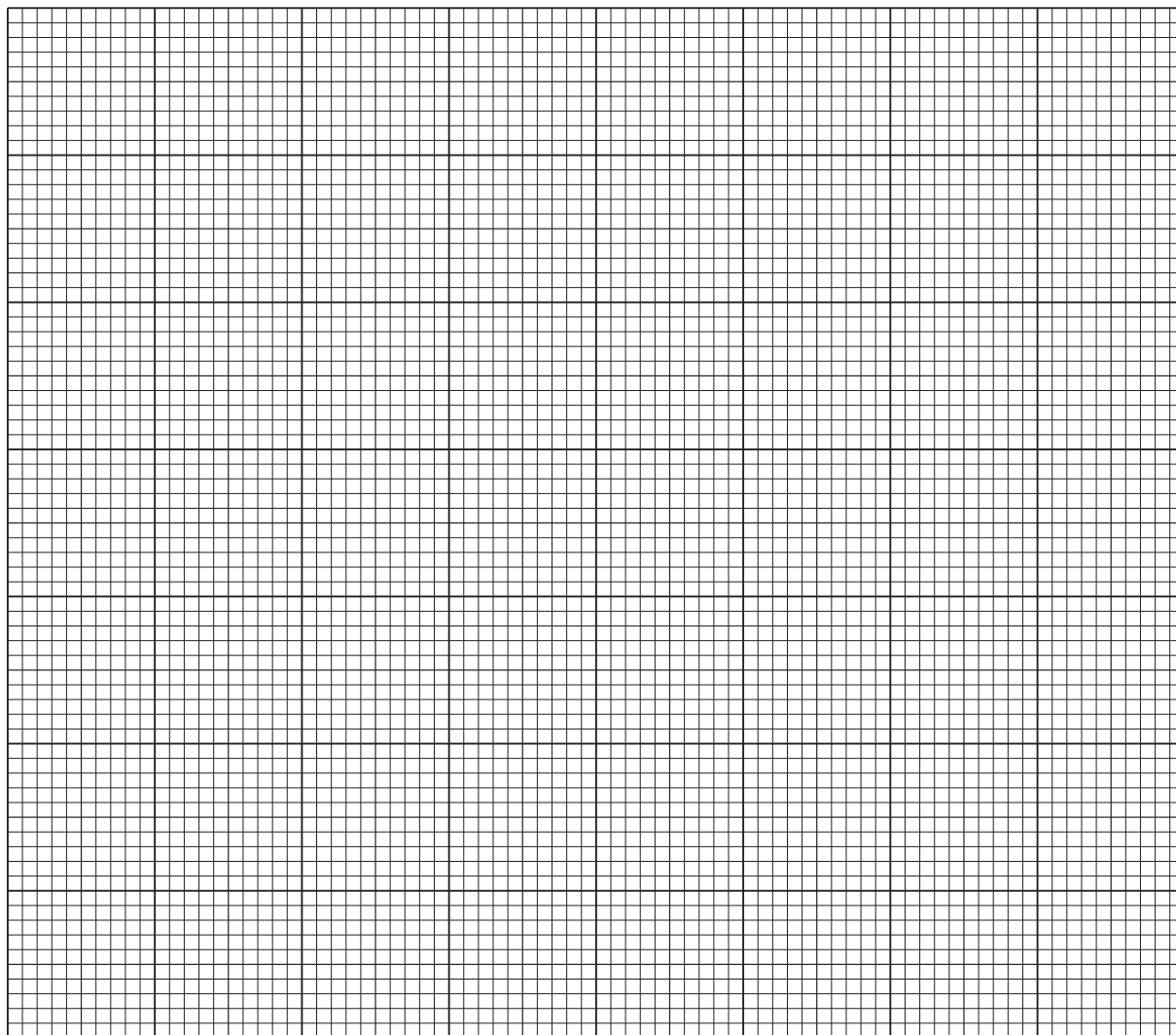
Table 5.1

ratio of dispersant to oil	dispersal effectiveness /arbitrary units
0.00	0.15
0.01	0.25
0.05	0.55
0.10	0.60
0.15	0.62
0.20	0.62



- (i) Draw a line graph to show how increasing the ratio of dispersant to oil affects the dispersal effectiveness.

Join your points with ruled, straight lines.



[4]



- (ii) Use the information in Table 5.1 to describe the effect of increasing the ratio of dispersant to oil on the dispersal effectiveness.

.....

.....

.....

..... [2]

- (iii) The ratio of dispersant to oil is calculated using the formula shown.

$$\text{ratio of dispersant to oil} = \frac{\text{mass of dispersant}}{\text{mass of oil}}$$

Use the information in Table 5.1 to calculate the mass of dispersant needed to produce a dispersal effectiveness of 0.55 if 5000 kg of oil is spilled into water.

Show your working and state the unit.

$$\text{mass of dispersant} = \dots\dots\dots [2]$$

- (iv) The scientists stated that a ratio of dispersant to oil of 0.05 is the best ratio to use to scatter oil following an oil spill.

Suggest why the scientists stated that this is the best ratio to use.

.....

.....

.....

..... [2]





(c) Wind turbines placed into areas of ocean can provide a renewable source of energy.

Discuss the environmental advantages **and** disadvantages of using wind turbines placed into oceans.

..... [4]

[Total: 17]





- 6 Female leatherback turtles lay eggs in nests on sandy shores.

Fig. 6.1 shows eggs in a turtle nest.



Fig. 6.1

- (a) Explain the role of migration in the life cycle of the leatherback turtle.

.....

.....

.....

.....

.....

..... [3]



- (b) The temperature of the nest that eggs are laid in affects the sex of the offspring produced.

Fig. 6.2 shows the effect of temperature on the percentage of eggs that develop into female turtles.

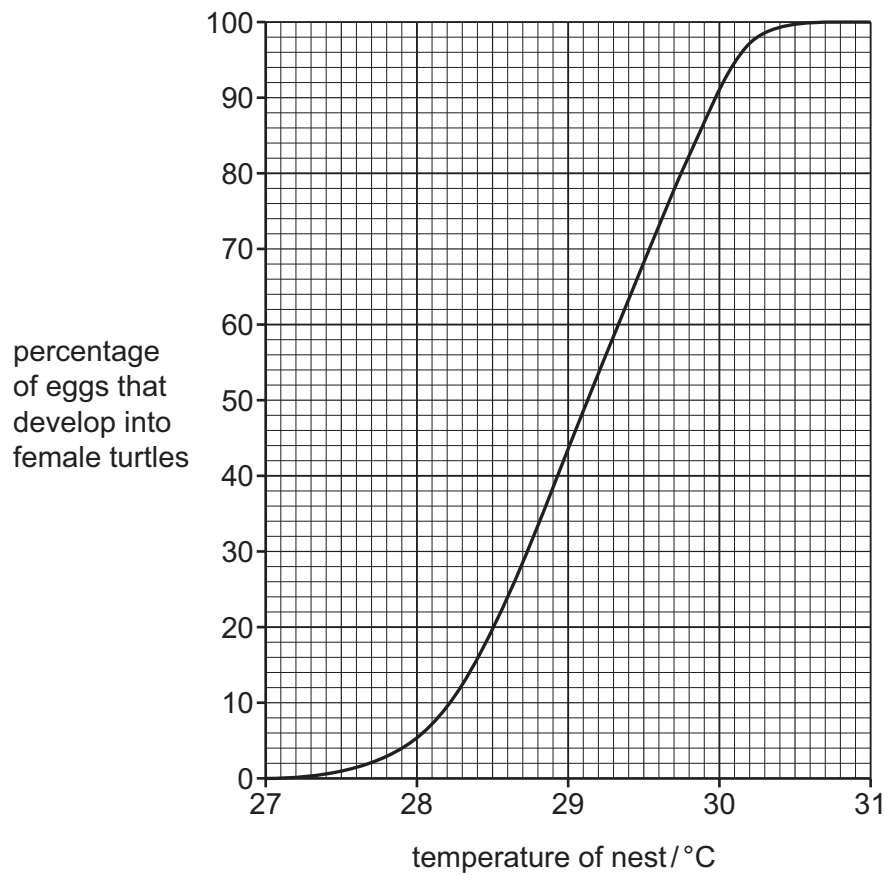


Fig. 6.2





- (i) Use Fig. 6.2 to determine the percentage of eggs that develop into female turtles from a nest at a temperature of 30 °C.

percentage = % [1]

- (ii) Use your answer in (b)(i) to calculate the number of male turtles and of female turtles that will hatch from 500 eggs placed at a temperature of 30 °C.

Show your working.

number of male turtles =

number of female turtles = [2]

- (iii) Explain why increased combustion of fossil fuels can reduce the populations of turtles.

Use Fig. 6.2 and your answer in (b)(ii) to support your answer.

.....
.....
.....
.....
.....
..... [3]





- (c) Describe an investigation you could safely carry out to test if the profile of a sandy shore affects the number of leatherback turtle nests laid on it.

[6]

[Total: 15]

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