



Cambridge International AS & A Level

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MARINE SCIENCE

9693/11

Paper 1 AS Level Theory

May/June 2024

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 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

Section A

Answer **all** questions in this section.

1 Fig. 1.1 shows an atom of calcium.

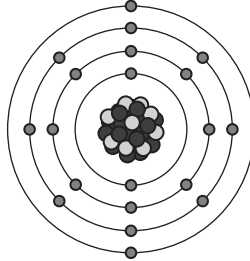


Fig. 1.1

(a) (i) Complete Table 1.1 with the names of the particles found in the nucleus **and** the charge of each type of particle.

Table 1.1

name of particle	charge of particle

[2]

(ii) Marine organisms use dissolved calcium salts for production of bones and shells.

State the name **and** formula of **one** calcium salt commonly used by marine organisms.

name

formula

[1]

(iii) Explain the role of hydrogen bonding as sodium chloride dissolves in water.

.....

[4]

(b) (i) The density of water changes as it freezes.

Explain the changes that occur as water freezes.

Include kinetic particle theory in your answer.

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..... [3]

(ii) Calculate the volume of a mass of water of 14 863 g and a density of 1022 kg m⁻³.

Show your working.

..... m³ [2]

[Total: 12]

- 2 Fig. 2.1 shows an ascidian and Fig. 2.2 shows a reef shark. Both organisms are in the phylum Chordata.

NOT TO SCALE



Fig. 2.1

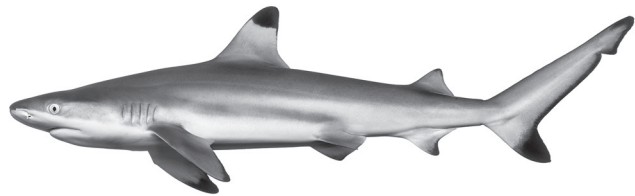


Fig. 2.2

- (a) (i) State **two** features both organisms have in common during their early development.
- 1
- 2 [2]
- (ii) On Fig. 2.2, label on the reef shark **one** visible feature typically found **only** in cartilaginous fish. [1]
- (b) (i) The binomial name of the blacktip reef shark is *Carcharhinus melanopterus*.
Complete Table 2.1 with the classification for the blacktip reef shark.

Table 2.1

group	classification for the blacktip reef shark
domain	Eukarya
.....	Animalia
phylum	Chordata
class	Chondrichthyes
order	Carcharhiniformes
family	Carcharhinidae
.....
species

[2]

(ii) Shark species have a large amount of lipids in their liver to provide buoyancy.

State the names of the molecules which combine to form lipids.

..... and [1]

(iii) Sharks use the ion PO_4^{3-} .

Give the name of PO_4^{3-} **and** state **one** function of this ion in the shark.

name

function

[2]

(c) Some sharks are predators of ascidians.

Some ascidians have a mutualistic species of bacteria living in their tissues. The bacteria produce a toxin. The toxin is only harmful to predators.

Suggest how this relationship benefits the ascidians and the bacteria.

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..... [2]

[Total: 10]

3 (a) Describe how weathering and erosion give rise to the morphology of a rocky shore.

weathering

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erosion

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[4]

(b) Muddy estuaries have high sedimentation rates.

Red mangrove propagules settle in muddy areas.

Describe **three** root adaptations that allow the red mangrove to survive the muddy conditions.

- 1
-
- 2
-
- 3
-

[3]

(c) Fig. 3.1 shows the global loss of mangrove forests between 2000 and 2015.

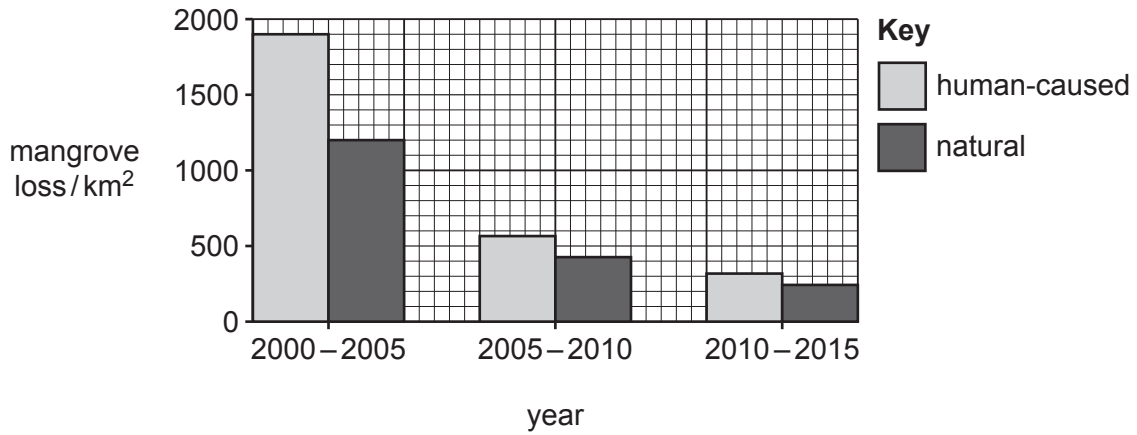


Fig. 3.1

(i) Suggest **two** different causes of natural mangrove loss.

- 1
 - 2
- [1]

(ii) Suggest **two** different causes of mangrove loss due to human activity.

- 1
 - 2
- [1]

(iii) Calculate for the period 2000–2005 the loss of mangrove due to natural causes as a percentage of the human-caused loss.

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

Show your working.

..... % [3]

[Total: 12]

4 (a) Fig. 4.1 shows a world map.

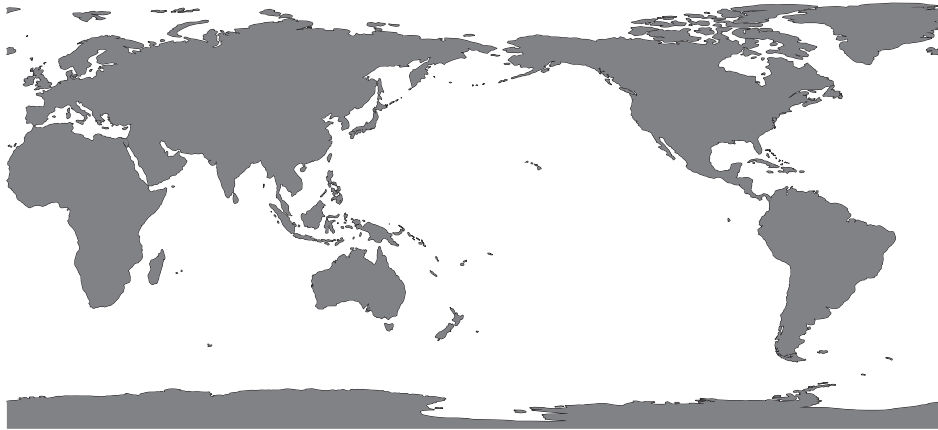


Fig. 4.1

On Fig. 4.1, label the Pacific Ocean **and** the Southern Ocean.

[1]

(b) Fig. 4.2 shows the relationship between temperature and depth for one area of ocean in the northern hemisphere during four months of the year.

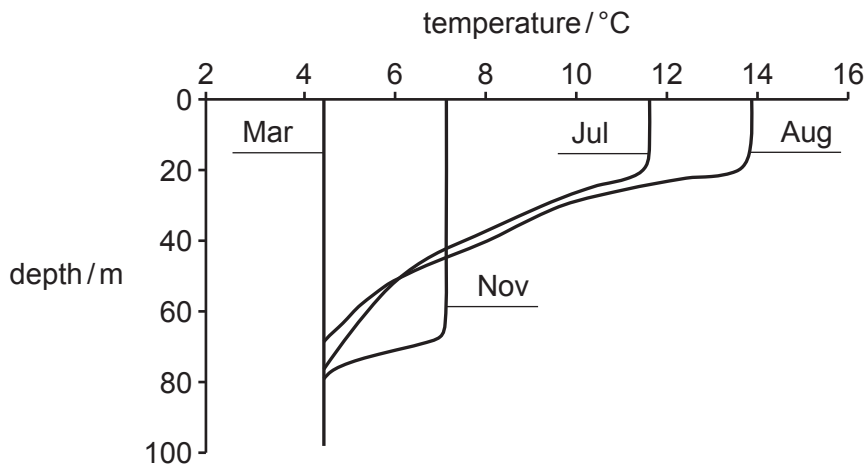


Fig. 4.2

(i) Explain how Fig. 4.2 shows that the data were collected from a temperate region and **not** a tropical or polar region.

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[4]

(ii) Use Fig. 4.2 to state the month in which the water density is highest at 20m depth.
..... [1]

(iii) Explain how **and** why primary productivity differs between March and August.
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..... [4]

(iv) State the word equation for photosynthesis.
..... [1]

[Total: 11]

7 Fig. 7.1 is a world map.



Fig. 7.1

(a) Fig. 7.1 shows the location of the Greenland ice sheet.

The global ocean conveyor belt is the constantly moving system of deep and surface water ocean circulation. Some scientists believe the global ocean conveyor belt is slowing down due to the melting of the Greenland ice sheet.

Suggest why the melting of the ice sheet may slow down the global ocean conveyor belt.

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[6]

(b) Fig. 7.1 shows the east coast of Australia.

Describe the effects of El Niño on the east coast of Australia.

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[5]

[Total: 11]

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