Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2611726427

MARINE SCIENCE **9693/11**

Paper 1 AS Level Theory **May/June 2022**

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.

[Turn over

BLANK PAGE

Section A

Answer **all** questions in this section.

1 Table 1.1 lists four environmental factors that affect the solubility of gases.

Complete Table 1.1 by placing **one** tick in each row.

Table 1.1

environmental factor	increases gas solubility	decreases gas solubility
decreasing water temperature		
increasing water depth		
increasing salinity		
decreasing atmospheric pressure		

[2]

2 **(a)** Fig. 2.1 shows a yellowfin tuna and Fig. 2.2 shows a spotted dolphin. These are not to scale.

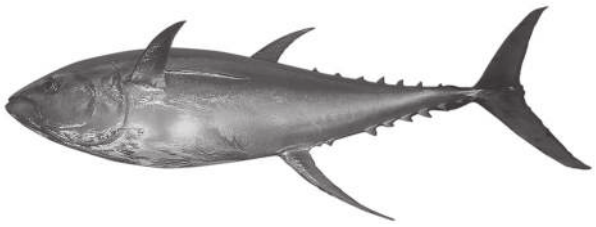

Fig. 2.1

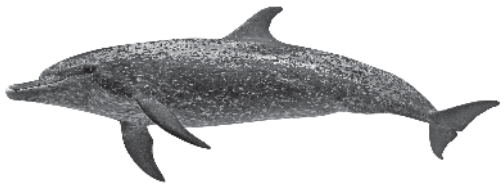

Fig. 2.2

(i) Label Fig. 2.1 to show the:

- operculum
- lateral line.

[2]

(ii) State **two** features common to all organisms in the phylum Chordata, that would be present in the embryos of both species.

1 .....

2 .....

[2]

(iii) Yellowfin tuna reproduce through external fertilisation. The fertilised eggs and larvae become part of the zooplankton.

Explain the meaning of the term zooplankton.

.....

.....

.....

..... [2]

(b) Groups of adult yellowfin tuna sometimes swim with groups of spotted dolphins.

The adult yellowfin tuna swim just above the thermocline.

Spotted dolphins swim at depths of up to 20 m in daylight.

(i) Use this information to suggest why yellowfin tuna are sometimes found with spotted dolphins **only** in tropical regions.

.....

.....

.....

..... [2]

(ii) Dolphin populations can be estimated using a modified form of mark-release-recapture.

All dolphins seen on the first day (first sample) of monitoring along a transect in a specific area are photographed.

The dolphins are identified by their dorsal fin size, scarring and dorsal fin notches or body markings, which are unique to each individual.

Fig. 2.3 shows a dolphin with notches and scarring on its dorsal fin.

Fig. 2.3

Individuals are again identified on the second monitoring day (second sample).

The Lincoln index is then applied to this data.

Discuss the limitations of this method for determining dolphin populations over a five-year period.

.....

.....

.....

.....

.....

..... [3]

[Total: 11]

3 Fig. 3.1 shows the location of Madagascar.

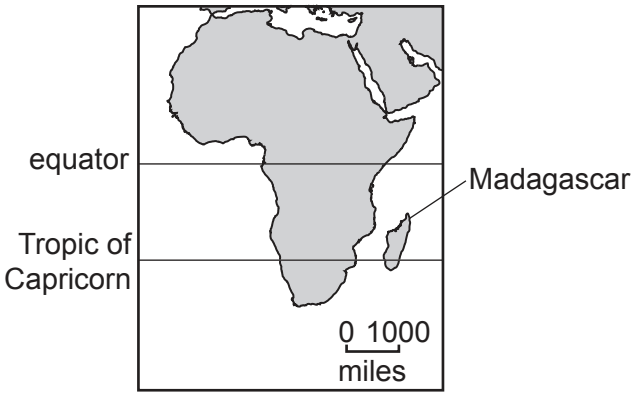

Fig. 3.1

Fig. 3.2 shows the location of mangroves around the island of Madagascar.

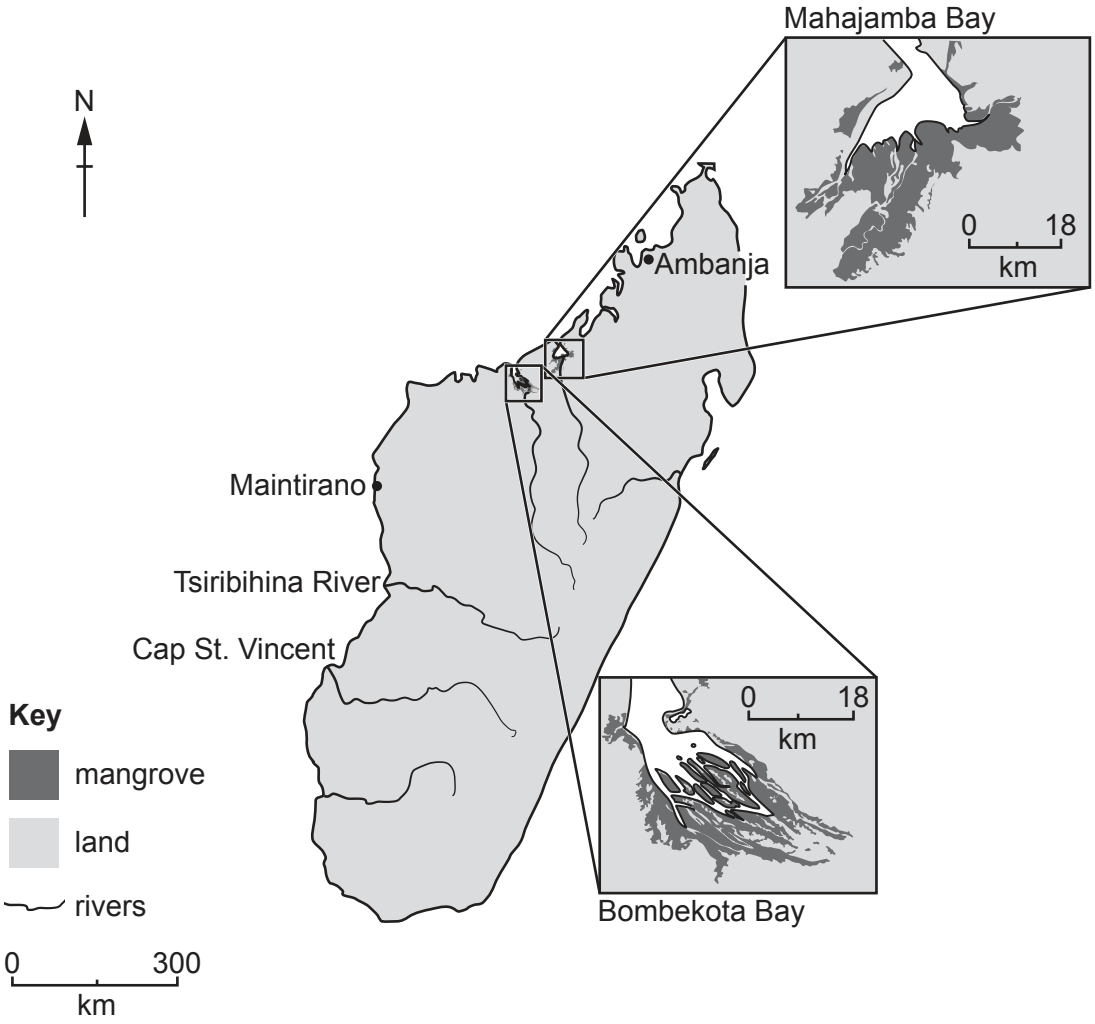

Fig. 3.2

(a) (i) Outline the conditions in Mahajamba Bay that make it suitable for the development of a mangrove forest.

.....

.....

.....

.....

.....

..... [3]

(ii) Some mangrove species on Madagascar use the same method of reproduction as the red mangrove tree.

Explain this method of reproduction **and** how it is an advantage to these mangrove trees.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Table 3.1 shows the changes in mangrove forest areas in different regions of Madagascar between 1975 and 2005.

Table 3.1

	change in mangrove forest area / km^2		
region	**1975–1990**	**1990–2000**	**2000–2005**
Bombekota Bay	–66	–87	–68
Mahajamba Bay	+1	–63	+14
coast of Ambanja	+75	–12	+18
Cap St. Vincent	–8	–11	–35
Tsiribihina River	–32	–19	–83

(i) Use Table 3.1 to calculate the total changes in mangrove forest area between 1975 and 2005 in:

Bombekota Bay .....

.....

coast of Ambanja .....

.....

[2]

(ii) Suggest **three** reasons for changes in mangrove forest area in Madagascar over the period 1975 to 2005.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Coral reefs and seagrass beds are present off the west coast of Madagascar.

Suggest **one** ecological impact of the loss of mangrove forest in Bombekota Bay **and** the impact this could have on the local human community.

.....

.....

.....

..... [2]

[Total: 14]

4 **(a)** Describe how the processes of erosion and sedimentation cause the formation of a sandy shore.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) **(i)** Sandy shores act as a biological filter for sea water.

Suggest **two** other services the sandy shore could provide.

1 .....

2 .....

[2]

(ii) Diatoms are part of the first trophic level on sandy shores.

Describe the role of diatoms in the food chain.

.....

.....

.....

..... [2]

[Total: 8]

5 Sea water is a mixture of water, salts and gases.

(a) State the name of **two** salts found in abundance in sea water.

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

(b) Fig. 5.1 shows a hydrogen atom and Fig. 5.2 shows an oxygen atom.

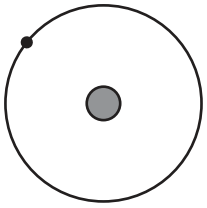

Fig. 5.1

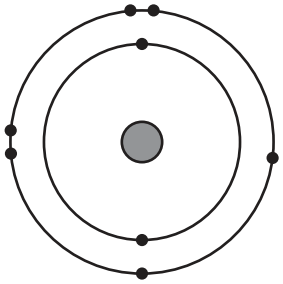

Fig. 5.2

(i) Explain how bonding occurs between hydrogen atoms and oxygen atoms in a water molecule.

You may use diagrams in your answer.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Explain how hydrogen bonds form between water molecules.

You may use diagrams in your answer.

.....

.....

.....

.....

.....

..... [3]

(iii) Sea ice is less dense than sea water, so it floats.

Explain the importance to organisms of sea ice floating on sea water.

.....

.....

.....

..... [2]

[Total: 10]

Section B

Answer **all** questions in this section.

6 Discuss the relationships formed between each of the following pairs of organisms.

coral polyps and zooxanthellae .....

.....

.....

.....

copepods and marine fish .....

.....

.....

.....

manta rays and remora fish .....

.....

.....

.....

[6]

7 **(a)** Discuss plate tectonic theory **and** the evidence used to support the theory.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]

(b) Explain the formation of the global ocean conveyor belt.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]

[Total: 14]

8 Explain the processes which replenish dissolved nutrients in sea water.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [10]