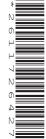


Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



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.

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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] State two features common to all organisms in the phylum Chordata, that would be present in the embryos of both species. 1 [2] 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. 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 five-year	the peri	limitatior od.	ns of	this	method	for	determining	dolphin	populations	over	а
										[3]

[Total: 11]

3 Fig. 3.1 shows the location of Madagascar.

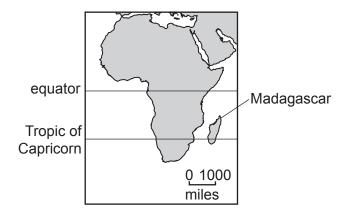


Fig. 3.1

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

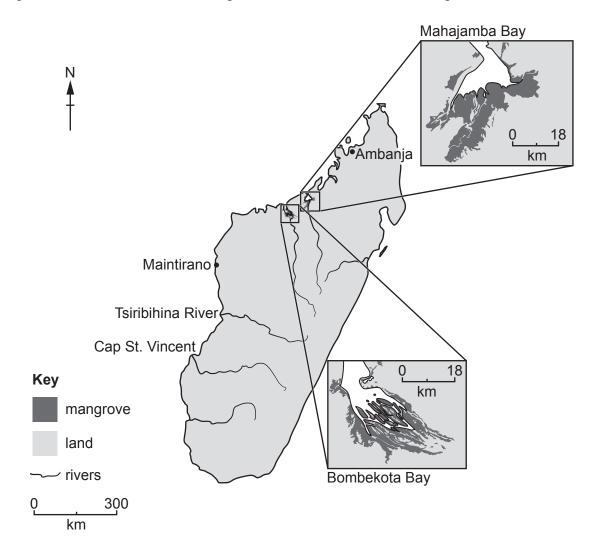


Fig. 3.2

(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/km²							
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 a 2005 in:	ınd
	Bombekota Bay	
	coast of Ambanja	
		[2]
(ii)	Suggest three reasons for changes in mangrove forest area in Madagascar over period 1975 to 2005.	the
	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)		cribe h		the	proce	esses	of	erosior	and	sedim	nentation	cause	the	formation	of	а
																[4	4]
	(b)	(i)	Sandy	shor	res a	ct as	a biol	ogic	al filter	for se	a wate	r.					
			Sugge	st tw	otl	her se	ervice	s th	e sandy	shore	could	provide.					
			1														
			2														 2]
		(ii)	Diaton	ns ar	e pa	rt of th	ne firs	t tro	phic lev	el on	sandy	shores.				L.	-,
			Descri	be th	ne rol	le of c	diaton	ns in	the foo	d cha	in.						
																[2	2]
															[To	otal:	8]

5

(a) State the	e 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
	FIG. 5.1 FIG. 5.2
	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water ecule.
mol	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water
mol	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water ecule.
mol	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water ecule.
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mol	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water ecule.
mol	lain how bonding occurs between hydrogen atoms and oxygen atoms in a water ecule.

(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: 1	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.

(b)	Explain the formation of the global ocean conveyor belt.
	[7]
	[Total: 14]

 	 	•••••	 •
 	 		 [1

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