



Cambridge International AS & A Level

CANDIDATE
NAME

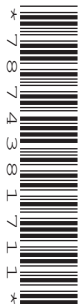
--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



MARINE SCIENCE

9693/12

Paper 1 AS Level Theory

May/June 2023

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 a map of the Mediterranean Sea.

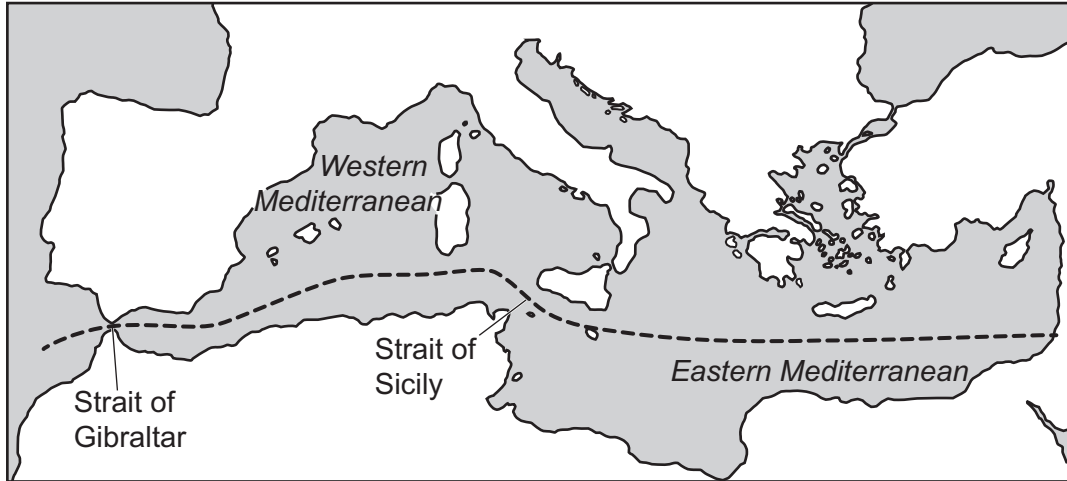


Fig. 1.1

A cross-section of the Mediterranean Sea along the dashed black line is shown in Fig. 1.2. The arrows show the direction of movement of water.

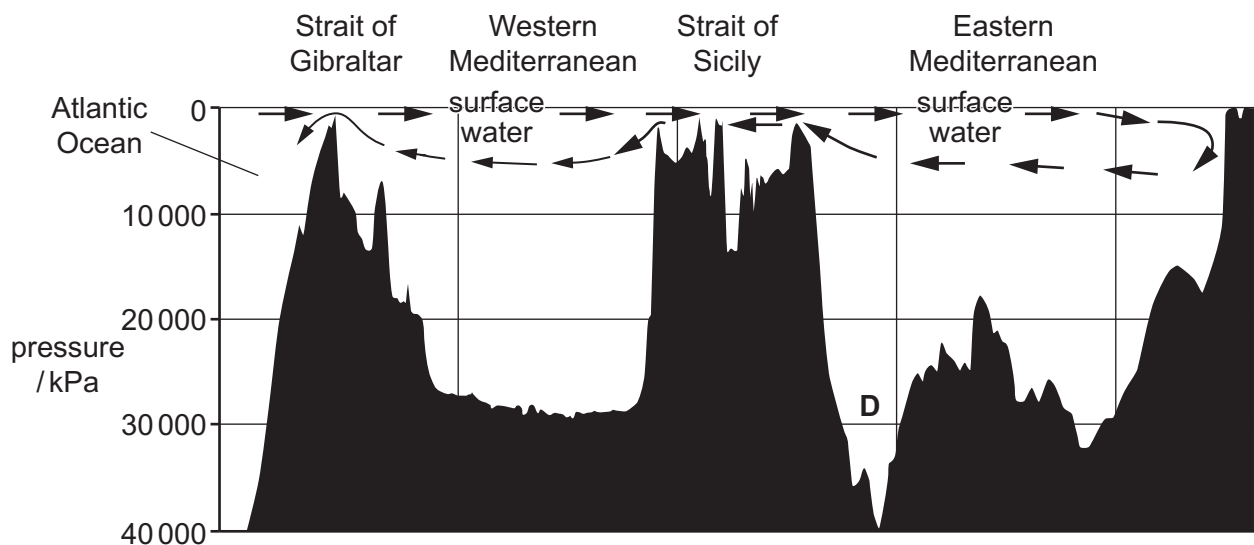


Fig. 1.2

- (a) (i) Label Fig. 1.2 to show:
- the trench
 - the abyssal plain.

[2]

(ii) Describe how an abyssal plain is formed.

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

(b) Every 10 metres of depth increases the pressure by 100 kPa.

Use the information provided to calculate the maximum depth shown in Fig. 1.2.

..... m [1]

(c) The Strait of Gibraltar is 13 km wide. The Strait of Sicily is 145 km wide.

The highest salinity is found at point **D** in Fig. 1.2.

Use the information provided to explain why the salinity is highest at point **D**.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

[Total: 10]

2 Fig. 2.1 shows a map of the Pacific Ocean and the surrounding countries.

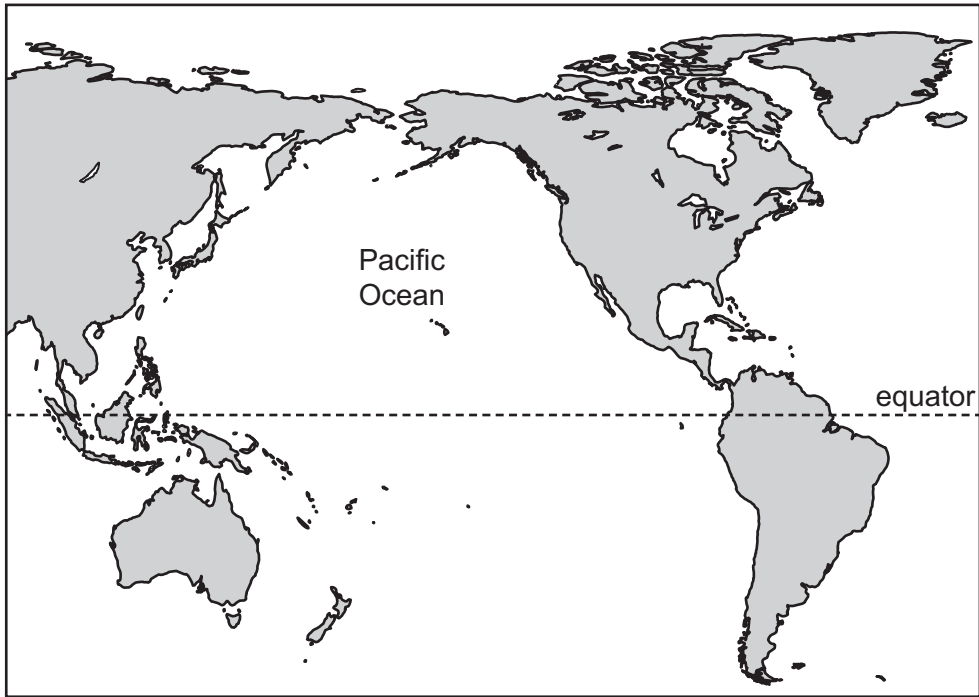


Fig. 2.1

(a) The El Niño Southern Oscillation, ENSO, occurs in the Pacific Ocean. ENSO has two different phases, El Niño and La Niña.

Complete Table 2.1 to state if the factors listed **increase** or **decrease** during El Niño and La Niña events.

Table 2.1

factors	El Niño	La Niña
sea surface temperature in the eastern Pacific
speed of easterly winds
rainfall in the western Pacific

[3]

(b) During the 2016 El Niño event, tidal ranges were higher than expected in some coastal areas of western South America. This was because higher than predicted high tides were experienced.

(i) Explain what is meant by tidal range.

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

(ii) Suggest reasons for higher than predicted tides during an El Niño event in western South America.

.....
.....
.....
..... [2]

(c) (i) Suggest why increased fish populations are observed in the eastern Pacific during La Niña event years.

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

(ii) Tuna are predators of anchoveta.

Suggest **one** method that can be used to monitor tuna population sizes during La Niña events.

..... [1]

[Total: 10]

3 (a) Fig. 3.1 shows a view from above of paleomagnetic stripes on part of a sea bed.

The key shows the ages of the rocks.

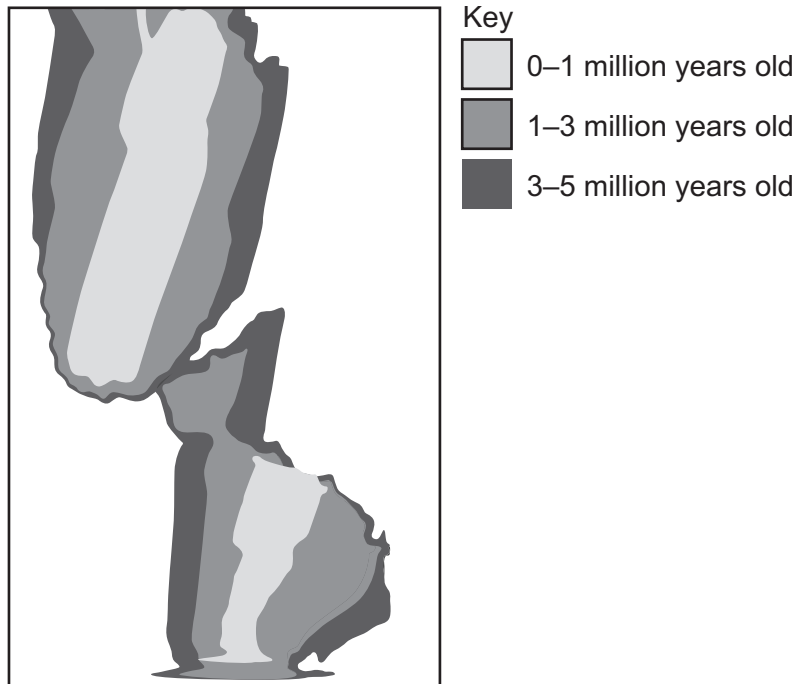


Fig. 3.1

(i) On Fig. 3.1, draw a single straight line along the position of the transform boundary. [1]

(ii) Define the term transform boundary.

.....
 [1]

(iii) On Fig. 3.1, label with an X the zone where a mid-ocean ridge would be found. [1]

(iv) Paleomagnetic stripes in the rocks on the ocean floor provide evidence for the theory of plate tectonics.

State **three** other pieces of evidence for this theory.

1

 2

 3

[3]

4 (a) Manta rays live in a close relationship with remora fish.

Describe the relationship between manta rays and remora fish.

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

(b) (i) Manta rays are cartilaginous fish. Remora fish are bony fish.

State **two** features of remora fish that are **not** found in manta rays.

1
2 [2]

(ii) Both species belong to the same phylum.

State **two** features that would be seen in the development of **all** species of this phylum.

1
2 [2]

(c) Killer whales prey on manta rays.

Manta rays feed on zooplankton.

(i) Explain the term zooplankton.

.....
.....
.....
..... [2]

- (ii) Draw a food chain with four trophic levels, using the information given in (b) and (c), to show how the killer whale obtains energy.

[2]

[Total: 11]

BLANK PAGE

The boundaries and names shown, the designations used and the presentation of material on any maps contained in this question paper/insert do not imply official endorsement or acceptance by Cambridge Assessment International Education concerning the legal status of any country, territory, or area or any of its authorities, or of the delimitation of its frontiers or boundaries.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.