Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2830345581

MARINE SCIENCE **9693/11**

Paper 1 AS Structured Questions **May/June 2020**

1 hour 30 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. Blank pages are indicated.

Answer **all** the questions in the spaces provided.

1 **(a)** The marine environment includes many different ecosystems. In each ecosystem there is a variety of food chains.

(i) Explain the meaning of the term *ecosystem*.

.....

.....

.....

..... [2]

(ii) Explain the role of a producer in a food chain.

.....

.....

.....

..... [2]

(b) Seagrass is a producer that grows attached to the sea bed in shallow water around coastlines. Seagrass grows well where there are low levels of nitrogen in the water.

Fig. 1.1 shows a seagrass bed.

Fig. 1.1

(i) State **one** function of each of the following nutrients in seagrass.

nitrogen .....

magnesium .....

phosphorus .....
[3]

(ii) Algae are small producers that float in the surface layers of the ocean.

River run-off can lead to a huge increase in the population of algae in areas where seagrass grows.

Explain the impact this could have on the seagrass.

.....

.....

.....

..... [2]

(c) Productivity was measured in an area of the mid-North Atlantic Ocean, and in a second area near the coast of Peru. These areas are shown in Fig. 1.2.

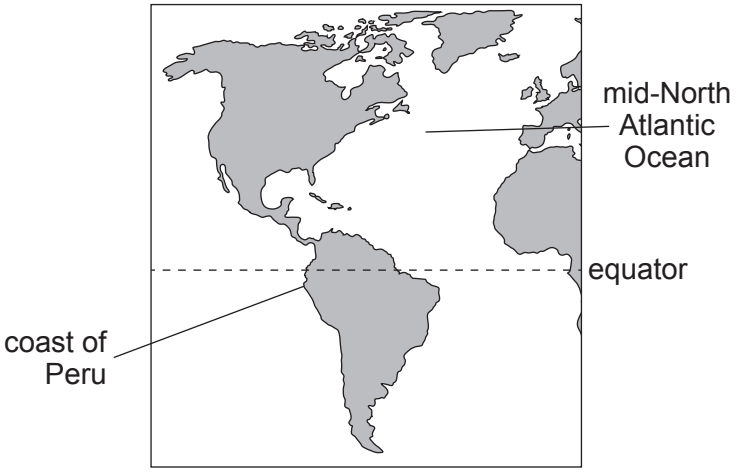


Fig. 1.2

The productivity was measured in grams of carbon per m^2 per year ($g m^{-2} y^{-1}$).

The productivity in the mid-North Atlantic Ocean was $0.2 g m^{-2} y^{-1}$.

The productivity in the ocean near the coast of Peru was $10 g m^{-2} y^{-1}$.

(i) Calculate productivity in the mid-North Atlantic Ocean as a percentage of the productivity near the coast of Peru.

.....%
[1]

(ii) This research was not carried out during an El-Niño event.

Suggest reasons for the high productivity in the ocean near the coast of Peru, compared with the mid-North Atlantic Ocean.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 14]

2 Fig. 2.1 is a map showing the mid-Atlantic ridge in the Atlantic Ocean.

The arrows show the direction of tectonic plate movement.

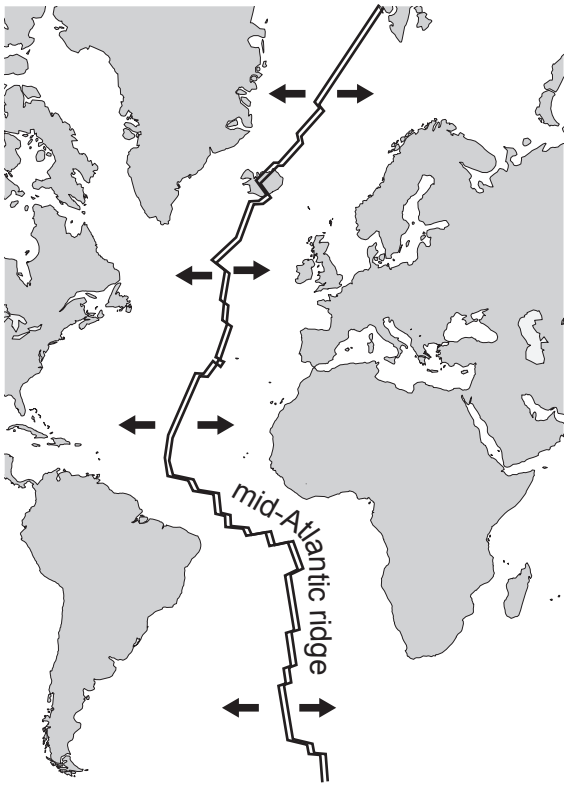


Fig. 2.1

(a) In the Atlantic Ocean scientists found rock that was 3 800 000 years old at a distance of 43 km from the centre of the mid-Atlantic ridge.

1 km = 1 000 000 mm

(i) Use the formula speed = distance ÷ time, to calculate the average speed of movement of each plate in mm per year.

..... mm per year
[2]

(ii) Use your answer from **(a)(i)** to calculate how far from the centre of the ridge each plate has moved since the year 2000. Include the unit.

.....
[1]

(iii) State the area of the sea floor where the oldest rocks are located.

..... [1]

(b) Fig. 2.2 shows a different type of tectonic plate boundary to the one found in the mid-Atlantic.

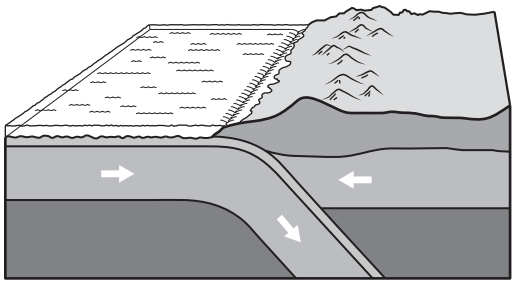


Fig. 2.2

(i) Name this type of tectonic plate boundary.

..... [1]

(ii) Explain how earthquakes may occur at this type of tectonic boundary.

.....

.....

.....

.....

.....

..... [3]

(iii) Explain how this type of tectonic boundary can also lead to the formation of a tsunami following an earthquake.

.....

.....

.....

..... [2]

[Total: 10]

3 **(a)** Fig. 3.1 shows part of a general nutrient cycle in the ocean.

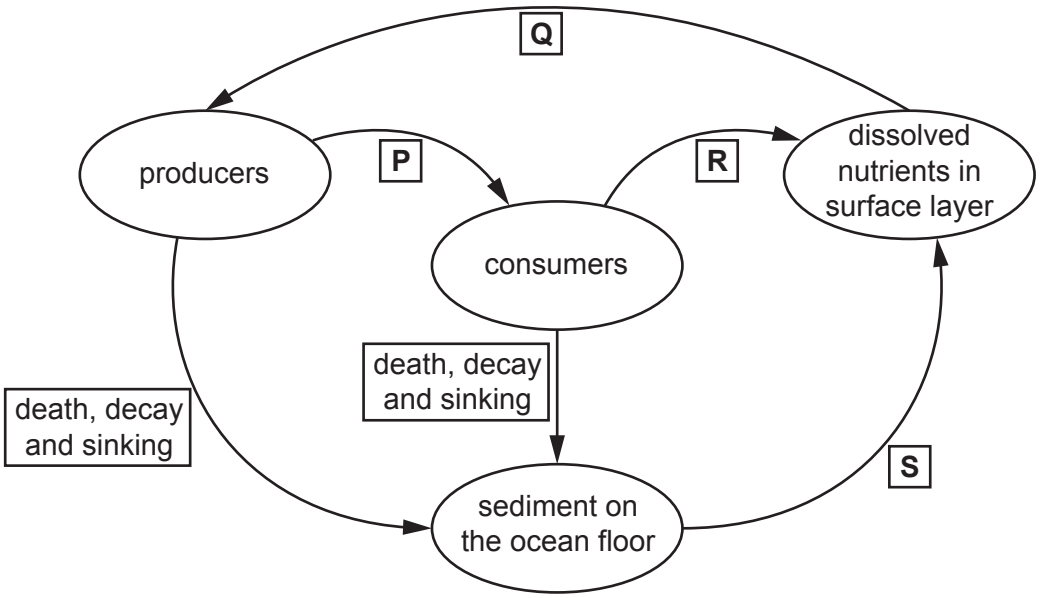


Fig. 3.1

Name, or describe, processes **P**, **Q**, **R** and **S**.

P .....

Q .....

R .....

S .....

[4]

(b) Primary productivity is the rate of production of new biomass by producers.

Table 3.1 shows the relationship between sea bed depth and the percentage of biomass produced from primary productivity that reaches the sea bed sediment.

Table 3.1

sea bed depth / m	percentage of biomass produced from primary productivity that reaches the sediment
5	55
15	20
2200	12
4000	1

(i) State the relationship between sea bed depth and percentage of biomass produced from primary productivity that reaches the sediment.

.....

..... [1]

(ii) Suggest **one** reason for this relationship.

.....

..... [1]

[Total: 6]

4 Tropical cyclones require specific factors to be present in order to form and be sustained.

(a) State another term used for tropical cyclones.

..... [1]

(b) Describe the role played by each of the following in the formation of a tropical cyclone.

(i) sea water temperature of at least 26.5 °C

.....

.....

.....

..... [2]

(ii) Coriolis effect

.....

..... [1]

(iii) low wind shear

.....

..... [1]

[Total: 5]

5 Fig. 5.1 shows the locations of four of the world's oceans.

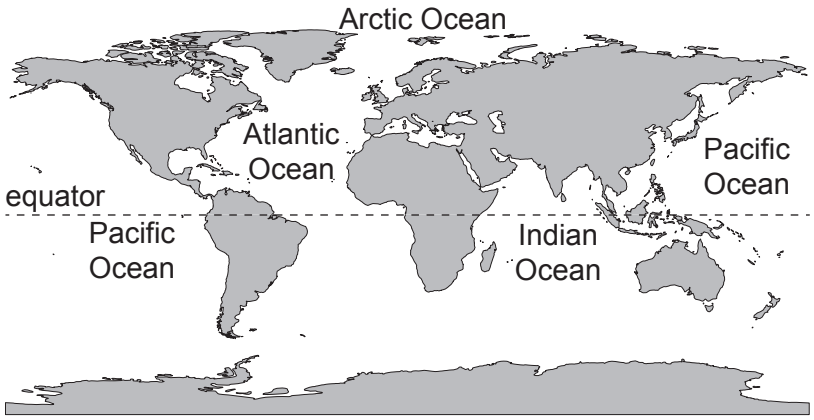


Fig. 5.1

Table 5.1 shows the rate of precipitation and evaporation in these four oceans.

Table 5.1

ocean	precipitation (P) / mm per year	evaporation (E) / mm per year	P – E / mm per year	other freshwater input / mm per year
Arctic	97	53	+44	307
Indian	1043	1294	–251	72
Pacific	1292	1202	+90	69
Atlantic	761	1133	–372	197

(a) (i) Suggest reasons for the difference in evaporation rates in the Arctic Ocean and the Indian Ocean.

.....

.....

.....

..... [2]

(ii) Fig. 5.2 shows the salinities in the world's oceans.

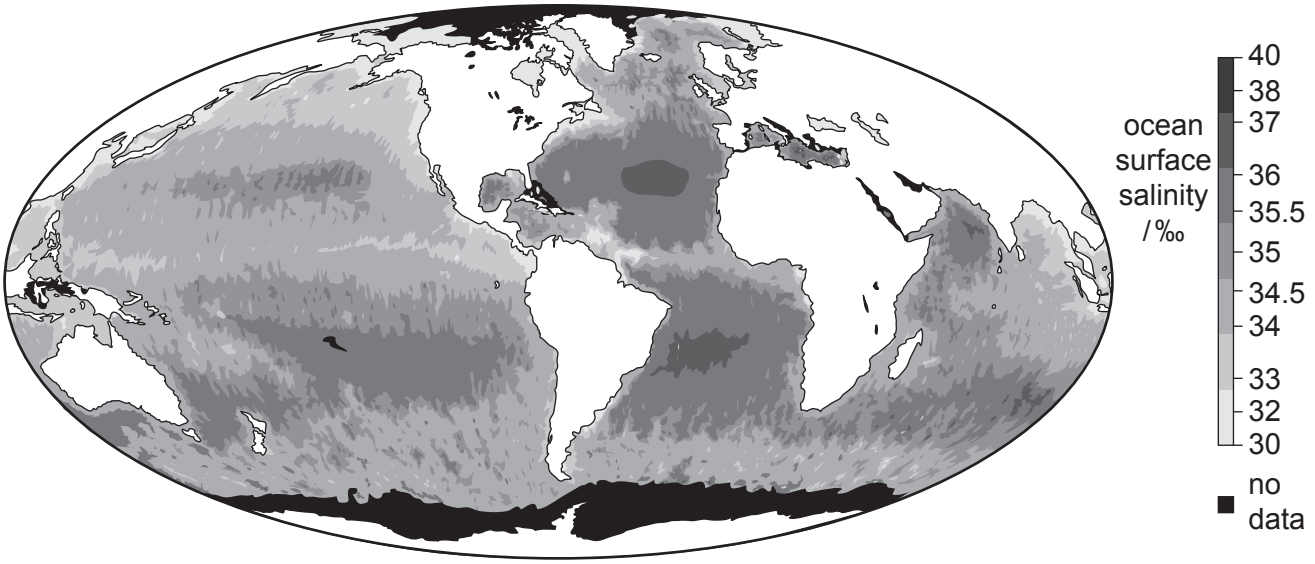


Fig. 5.2

Use the information in Table 5.1 and Fig. 5.2 to state **and** explain how the salinity of the Atlantic Ocean differs from the salinity of the Pacific Ocean.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Precipitation is one example of a fresh water input which causes a reduced salinity in the oceans.

Suggest **two** other sources of fresh water input into the oceans, and for each suggest a different impact on the ocean in that area.

source .....

impact .....

source .....

impact .....

[4]

[Total: 10]

6 **(a)** Tropical coral polyps live in a close relationship with photosynthetic organisms.

(i) Name the photosynthetic organisms that live within tropical coral polyps.

..... [1]

(ii) Describe the relationship between the tropical coral polyp and these photosynthetic organisms.

.....

.....

.....

.....

.....

..... [3]

(iii) Suggest **two** reasons why tropical coral polyps rarely grow at an ocean depth below 50 m.

1 .....

.....

2 .....

.....

[2]

(b) Tropical coral polyps can be killed by:

- temperature change
- storms.

(i) Name **two** other environmental conditions that can kill tropical coral polyps and lead to coral reef erosion.

1 .....

.....

2 .....

.....

[2]

(ii) Following the death of the tropical coral polyps, storm events may pull the reef structure apart.

Suggest why it may be difficult for tropical corals to naturally recolonise habitats following storm damage.

.....

.....

.....

..... [2]

(iii) A temperature change caused the death of 80% of the tropical coral polyps on a coral reef. An artificial reef was installed as part of a conservation programme.

Scientists proposed to colonise it with only the tropical coral species that survived the temperature change.

Suggest **one** advantage and **one** disadvantage of using this species.

advantage

.....

.....

disadvantage

.....

.....

[2]

(c) Explain the effect that the loss of a tropical coral reef has on the local coastal area.

.....

.....

.....

.....

.....

.....

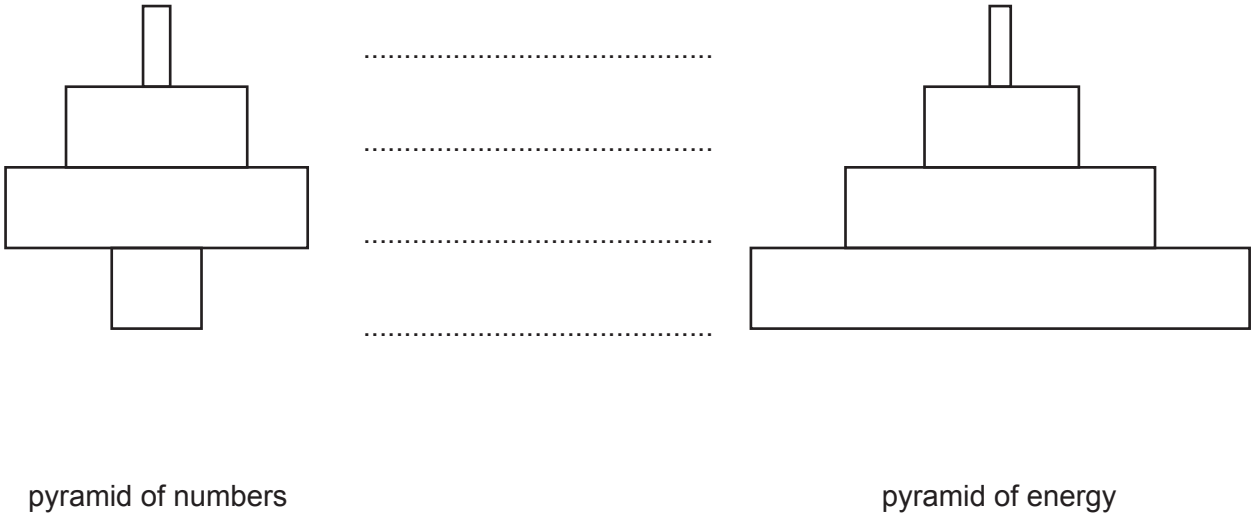
.....

..... [4]

[Total:16]

7 **(a)** Fig. 7.1 shows a pyramid of numbers and a pyramid of energy for the following food chain in the middle of summer.

phytoplankton ⟶ zooplankton ⟶ blue damselfish ⟶ skipjack tuna



pyramid of numbers pyramid of energy

Fig. 7.1

(i) Label the dotted lines in Fig. 7.1 with the names of the four organisms in the food chain to show which organism occupies each trophic level. [1]

(ii) Name the organism occupying the third trophic level.

..... [1]

(iii) Tuna are often infected with parasitic nematodes.

Add **one** bar to **each** pyramid to represent the parasitic nematodes. [3]

(iv) Describe the parasitic relationship between skipjack tuna and nematodes.

.....

.....

.....

..... [2]

(b) The percentage energy transfer efficiency of the food chain is shown in Table 7.1.

Table 7.1

energy transfer	percentage transfer efficiency
surface solar energy to phytoplankton	2.0
phytoplankton to zooplankton	16.1
zooplankton to blue damselfish	8.9
blue damselfish to skipjack tuna	10.3

(i) Suggest **one** reason for the low percentage transfer efficiency of surface solar energy to phytoplankton.

.....

..... [1]

(ii) Typical percentage energy transfer efficiencies from one trophic level to the next are estimated at 10%.

Suggest **two** reasons why the value for percentage energy transfer efficiency from phytoplankton to zooplankton, shown in Table 7.1, is greater than 10%.

1 .....

.....

2 .....

.....

[2]

(c) Skipjack tuna are a shoaling fish.

Explain why it is an advantage to skipjack tuna to form shoals.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 14]

BLANK PAGE