



Cambridge International AS & A Level

CANDIDATE
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MARINE SCIENCE

9693/12

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 **20** pages. Blank pages are indicated.

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

- 1 The red alga, *Delisea pulchra*, is a seaweed that is part of the community on a rocky shore. This alga is eaten by sea urchins and other consumers, including marine snails.

- (a) (i) Explain the meaning of the term *community*.

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..... [2]

- (ii) State the trophic level of consumers that eat red algae.

..... [1]

- (iii) Suggest **and** explain the effect on the population of marine snails if the sea urchin population increases.

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..... [2]

- (iv) Explain why all of the energy stored within the red algae is **not** passed to consumers.

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..... [3]

- (b) Some species of alga contain chemicals that deter animals from eating the algae.

Suggest the effect of these chemicals on the efficiency of energy transfer between trophic levels.

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..... [1]

[Total: 9]

- 2 The formation of a delta is affected by the balance between erosion and sedimentation.

- (a) Describe the processes that lead to the formation of a delta.

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[4]

- (b) Fig. 2.1 shows two satellite images of part of a delta.

Image **A** was taken before a tropical cyclone (hurricane or typhoon), and image **B** was taken two days after the tropical cyclone.

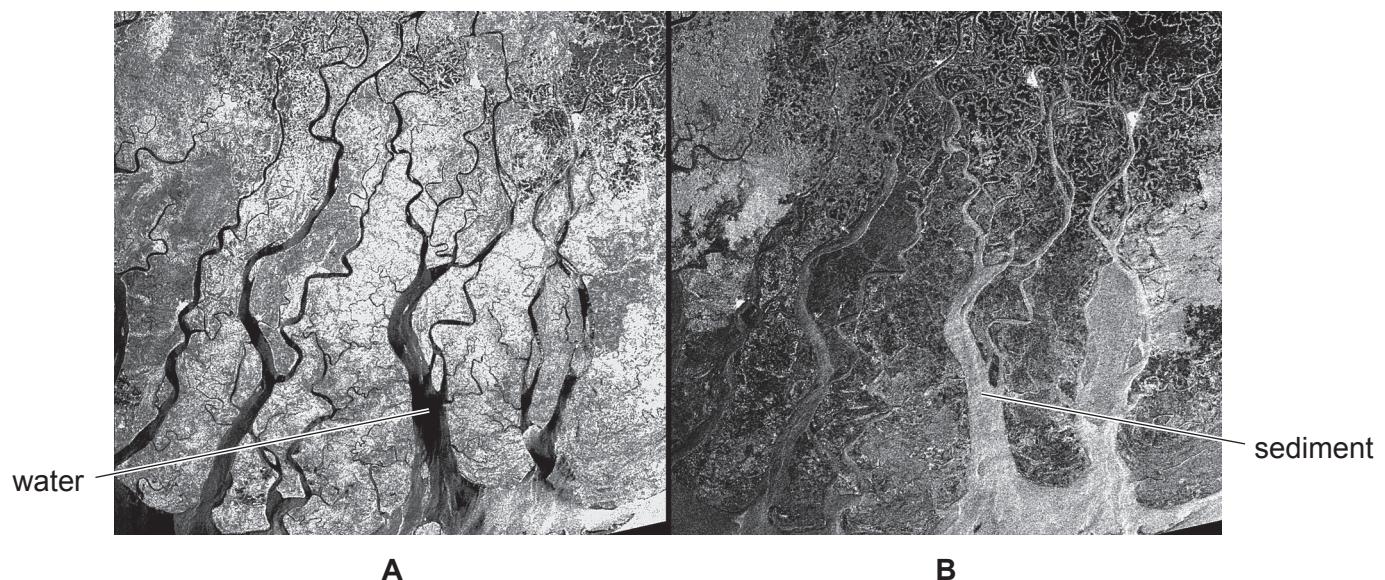


Fig. 2.1

With reference to Fig. 2.1, suggest the effects of the tropical cyclone on the human coastal communities on the delta.

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[4]

- (c) Tropical cyclones lead to an increase in precipitation.

Explain the effect of precipitation on the salinity of sea water.

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[2]

[Total: 10]

- 3 (a) Fig. 3.1 shows part of a marine food web.

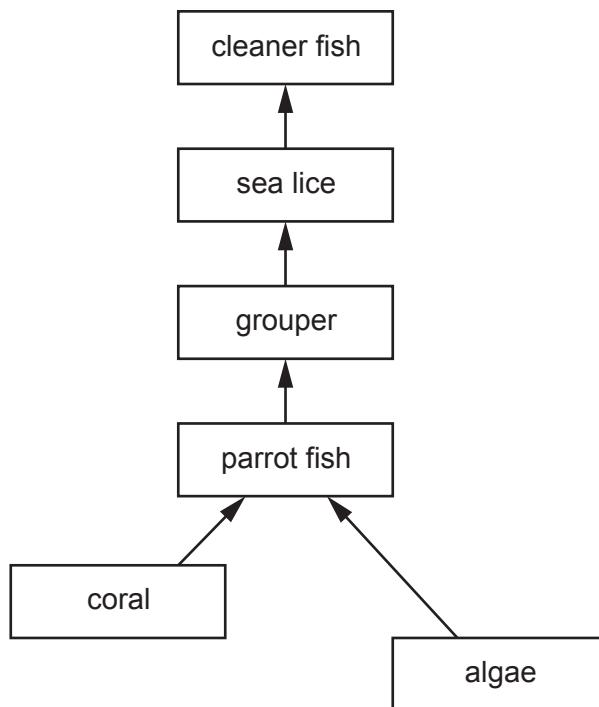


Fig. 3.1

- (i) Sea lice are small animals that live and feed on the body of grouper and other fish.

Name the type of relationship between sea lice and grouper.

..... [1]

- (ii) Damselfish and surgeonfish both eat algae and are both the prey of grouper.

Use this information to add damselfish and surgeonfish to Fig. 3.1.

[3]

- (iii) Explain how the relationship between cleaner fish and grouper shows mutualism.

.....

 [3]

- (b) Pyramids of energy always have a large base, narrowing towards the top.

Explain, with reference to a marine example, why pyramids of numbers are not always this shape.

You may use a diagram to help with your answer.

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[3]

[Total: 10]

- 4 (a) Fig. 4.1 shows two types of artificial reef.

Reef **A** is made from a metal structure and old bicycles.

Reef **B** is made from specially manufactured blocks of concrete.



A



B

Fig. 4.1

- (i) Explain how artificial reefs protect shores from storm damage.

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

- (ii) Suggest **one** advantage and **one** disadvantage of using reef **A** rather than reef **B** for protecting shorelines.

advantage of reef **A**

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.....

disadvantage of reef **A**

.....
.....

[2]

- (iii) Scientists have investigated artificial reefs that are made of a mixture of both reef **A** and reef **B**, and artificial reefs made of just one type of reef. They measured the effect of mixing the types of reef on biodiversity.

State **one** possible hypothesis for this investigation.

.....
.....

[1]

- (b) State **three** factors, other than storm damage, that can lead to coral reef erosion.

1

2

3

[3]

[Total: 9]

5 Producers in food webs at hydrothermal vents use chemosynthesis.

(a) Outline **one** difference and **one** similarity between chemosynthesis and photosynthesis.

difference

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.....

similarity

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[2]

(b) Describe how hydrothermal vents form.

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[3]

(c) Marine mining companies are planning to explore hydrothermal vents.

(i) Suggest why the conditions at hydrothermal vents make exploration difficult.

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[2]

(ii) Suggest why mining companies are interested in exploring hydrothermal vents.

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[1]

- (iii) Explain how mining at hydrothermal vents could affect productivity in the surrounding food webs.

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[3]

[Total: 11]

- 6 Parts of the Southern Ocean are described as high nitrate low chlorophyll (HNLC) regions.

Nitrates contain nitrogen.

- (a) State a biological use of nitrogen.

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..... [1]

- (b) Scientists investigated the effect of volcanic ash on phytoplankton growth. Phytoplankton are small photosynthetic organisms.

Scientists collected samples of surface water from a Southern Ocean HNLC region.

The samples were divided into two groups.

- The samples in group **A** had nothing added.
- The samples in group **B** had volcanic ash added.

The samples were incubated for 48 hours to allow phytoplankton growth.

- (i) State the function of the samples in group **A**.

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

- (ii) The samples in group **A** and group **B** were kept at the same light intensity.

State **one** other factor that should have been kept constant.

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

Fig. 6.1 shows the mean concentration of phytoplankton after 48 hours.

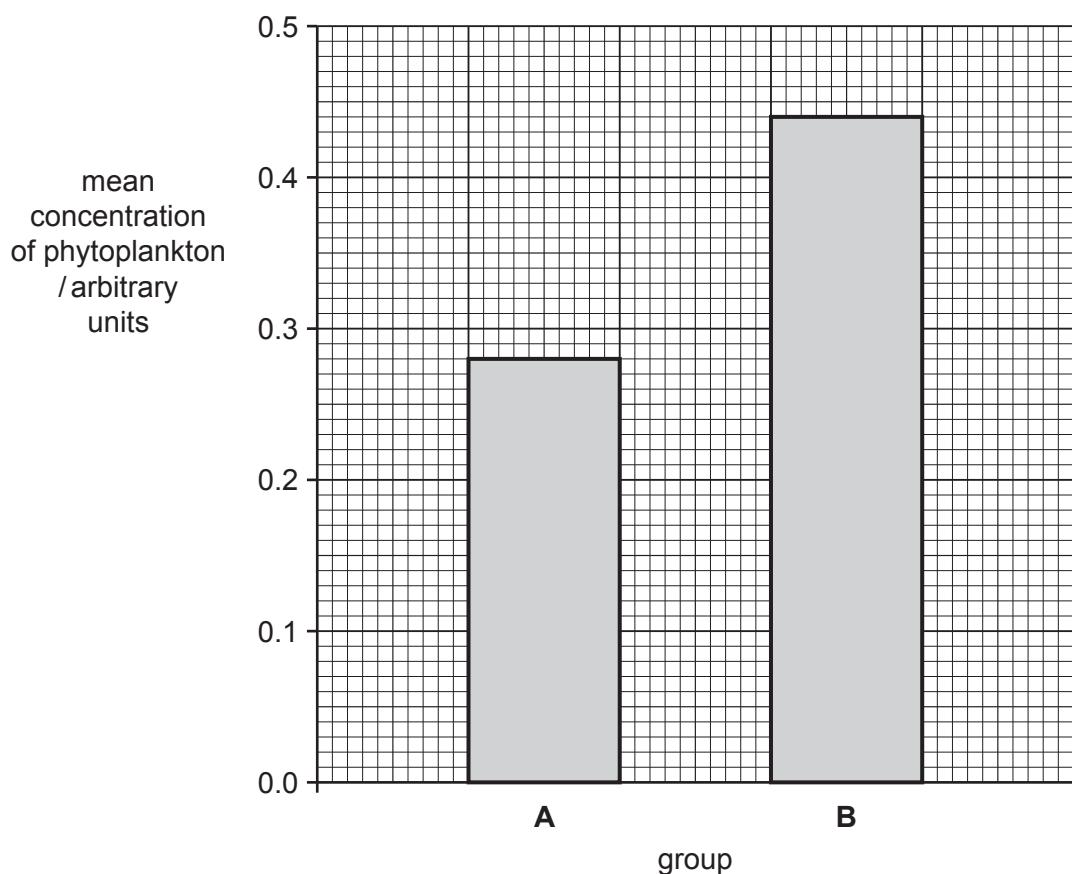


Fig. 6.1

- (iii) Calculate the difference between the mean concentration of phytoplankton in group **A** and group **B**.

..... a.u.
[1]

- (iv) Use your answer from (b)(iii) to calculate the percentage increase in mean concentration of phytoplankton between group **A** and group **B**.

..... %
[1]

- (v) Volcanic ash contains many nutrients, including magnesium.

Explain the effect of adding volcanic ash containing magnesium to the samples of phytoplankton in group **B**.

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..... [3]

- (c) Describe how minerals in ash from volcanoes on land can enter sea water.

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- (d) Explain how calcium in the sea water can become part of sediments on the sea bed.

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..... [4]

[Total: 14]

- 7 Fig. 7.1 shows the mean surface temperatures in two locations, on land and in the Indian Ocean, in summer.

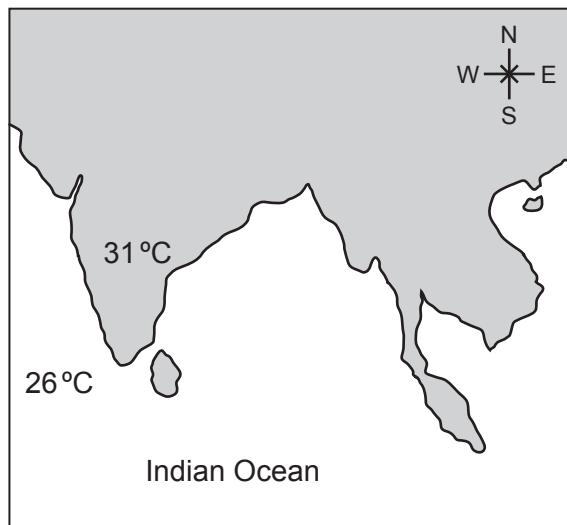


Fig. 7.1

- (a) (i) Describe how the temperatures of the land and Indian Ocean shown in Fig. 7.1 give rise to the summer monsoon winds.

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..... [4]

- (ii) Outline how the temperatures of the land and Indian ocean shown in Fig. 7.1 differ in winter compared with summer.

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..... [2]

- (b) In the Indian Ocean, the depth of the thermocline changes between summer and winter.

Suggest **two** reasons why the depth of the thermocline changes.

1

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2

[2]

- (c) Tropical cyclones (hurricanes or typhoons) can form in the Indian Ocean.

Describe the role of latent heat in the formation of tropical cyclones.

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[4]

[Total: 12]

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