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## 9693/12

May/June 2021

**1 hour 30 minutes**

You must answer on the question paper.

No additional materials are needed.

- 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.

- 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.

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

**1** A food web at one hydrothermal vent has four trophic levels.

**(a)** Which term describes the hydrothermal vent **and** all the organisms in the food web at the hydrothermal vent?

Draw a circle around the correct term.

**ecosystem**

**community**

**population**

**habitat**

[1]

**(b)** At the hydrothermal vent:

- tube worms obtain energy from chemosynthetic bacteria
- clams also obtain energy from chemosynthetic bacteria
- clams are eaten by crabs and octopuses
- tube worms are eaten by fish
- fish are eaten by octopuses.

**(i)** Use the information provided to sketch the food web at this hydrothermal vent.

[2]

**(ii)** Sketch and label the pyramid of energy for the food chain with **four** trophic levels at this hydrothermal vent.

[3]

(iii) State **two** ways in which energy is lost between tube worms and fish.

- 1 .....
- 2 ..... [2]

(c) Describe how chemosynthetic bacteria and tube worms at hydrothermal vents show mutualism.

.....

.....

..... [2]

(d) Describe **one** example of succession at a hydrothermal vent.

.....

..... [1]

(e) Explain why algae and plants are **not** found at hydrothermal vents.

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..... [3]

(f) Hot water rises up through fissures in the sea floor at hydrothermal vents. The flow of hot water from hydrothermal vents sometimes suddenly stops.

Suggest why this happens.

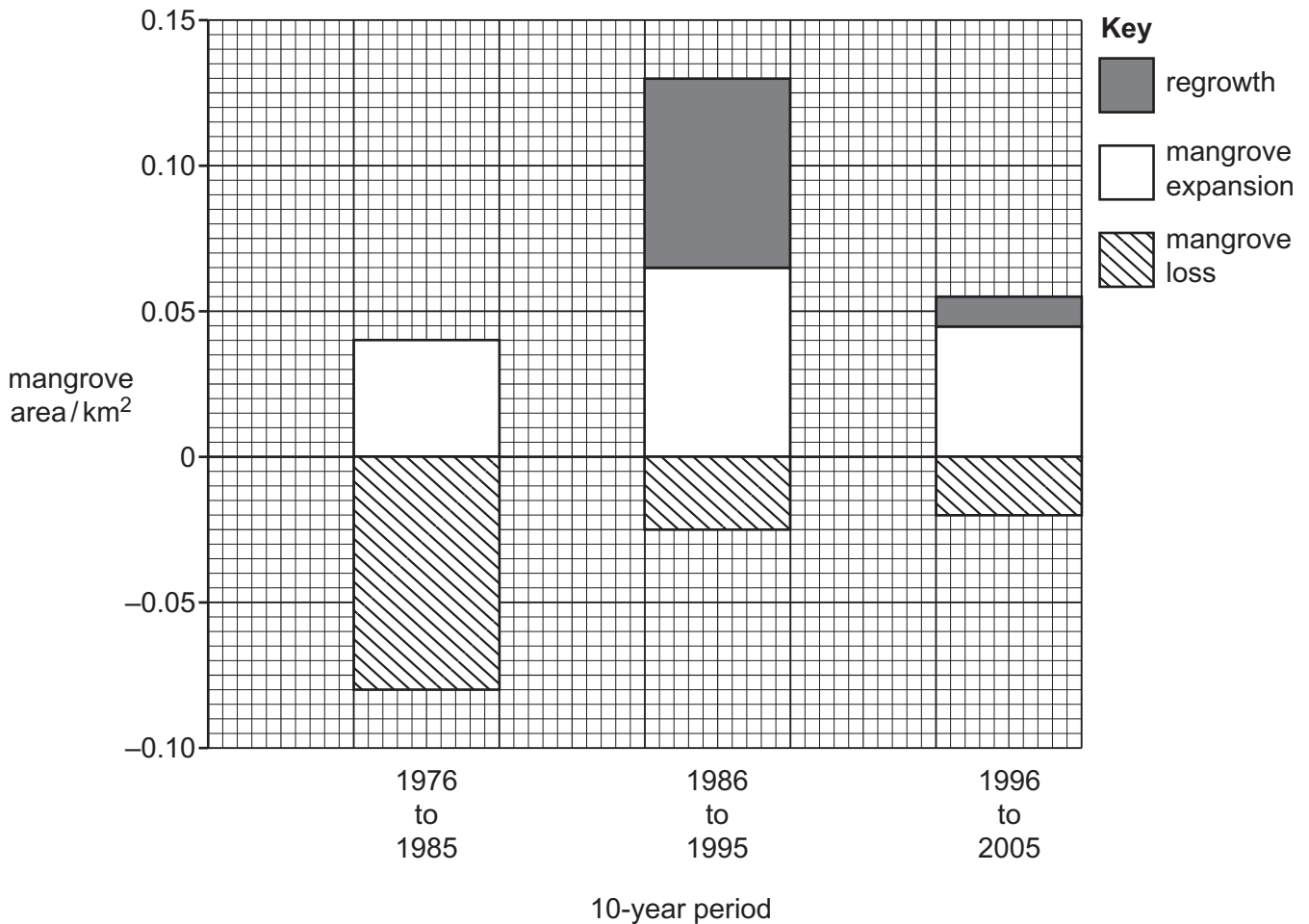
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..... [1]

[Total: 15]

- 2 (a) Fig. 2.1 shows the change in the area of mangrove forest on one small island between 1976 and 2005.

For each 10-year period, the area of mangrove loss, mangrove expansion and mangrove regrowth is shown.



**Fig. 2.1**

- (i) Describe the data shown in Fig. 2.1 for 1976 to 1985.

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

- (ii) Calculate the overall change in mangrove area for between 1996 and 2005. State the unit.

..... [3]

- (b) All plants require light, carbon dioxide and minerals for growth.

Describe the **other** environmental factors needed for the formation of mangrove forest.

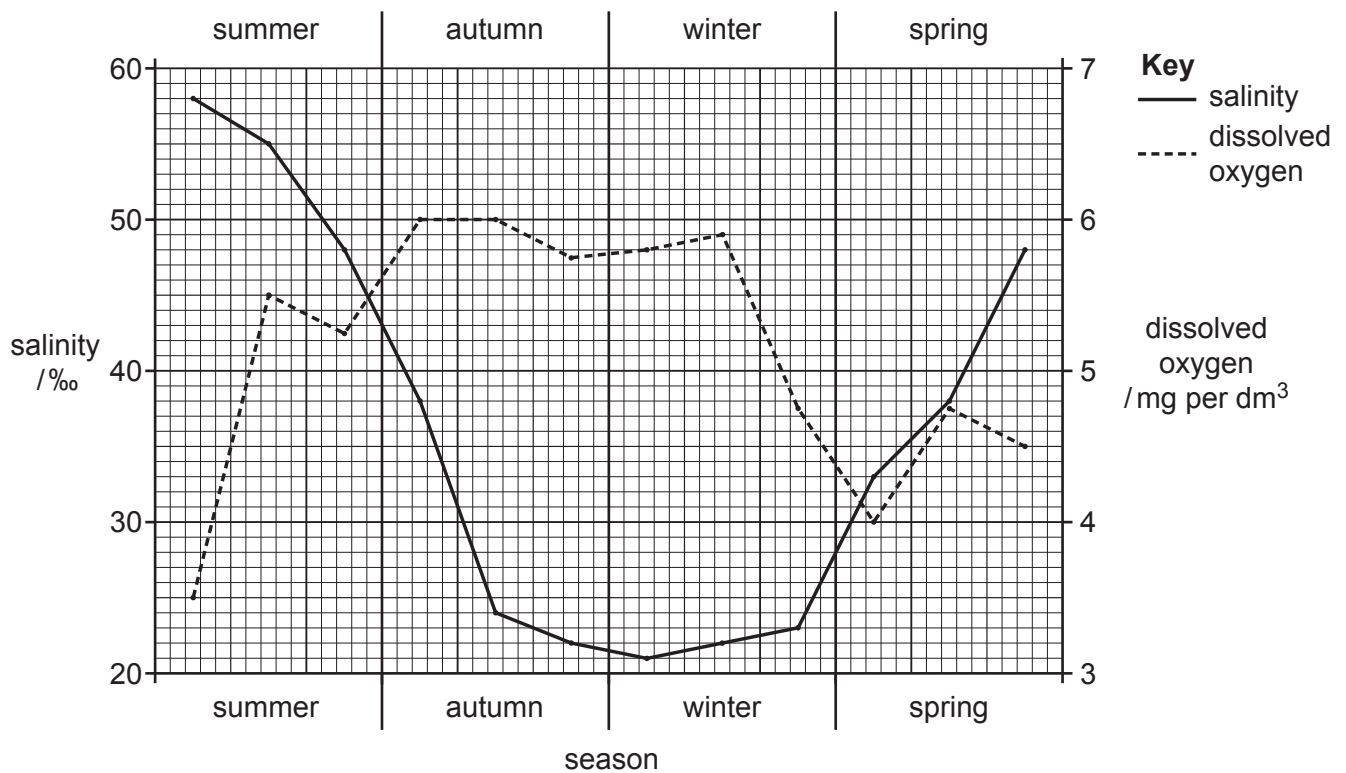
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..... [2]

- (c) Fig. 2.2 shows the mean monthly salinity and mean concentration of dissolved oxygen in the water of a mangrove forest in the northern hemisphere, over a 12-month period.



**Fig. 2.2**

- (i) Suggest reasons for the changes in salinity shown in Fig. 2.2.

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..... [4]

- (ii) Suggest why, other than changes in salinity, the concentration of dissolved oxygen is higher in autumn and winter compared to spring and summer.

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.....

..... [2]

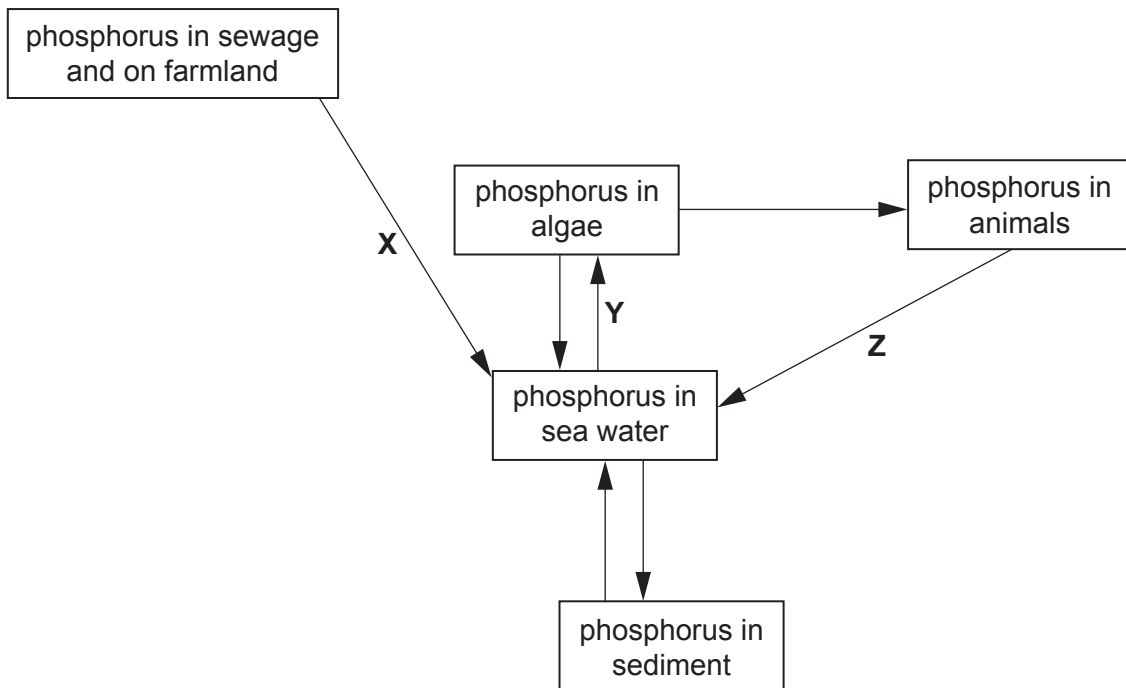
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- 3 (a) State **one** use of phosphorus in organisms.

..... [1]

- (b) Fig. 3.1 represents the phosphorus cycle.



**Fig. 3.1**

- (i) Name processes **X**, **Y** and **Z** shown in Fig. 3.1.

**X** .....

**Y** .....

**Z** .....

[3]

- (ii) Scientists have investigated growing algae near a coastline so that algae can be harvested to provide phosphorus for human use.

Suggest the advantages of harvesting phosphorus from algae near a coastline instead of harvesting phosphorus from sediment.

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

- (c) (i) Explain what is meant by productivity of a food web.

.....

.....

.....

..... [2]

- (ii) Suggest why the harvesting of algae for phosphorus could decrease the productivity of a marine food web.

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.....

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..... [2]

[Total: 10]

- 4 Fig. 4.1 shows an image taken by a satellite of a tropical cyclone (hurricane or typhoon).

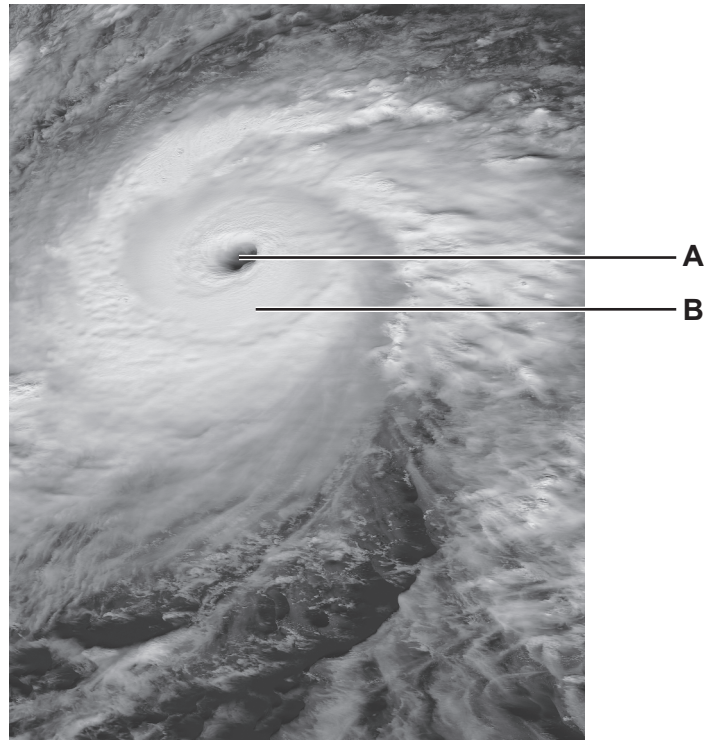


Fig. 4.1

- (a) Describe the differences in the weather conditions at sea level at location **A**, compared with location **B**.

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.....

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.....

.....

..... [3]

(b) Maximum wind speed in a tropical cyclone is used to predict the damage that may be caused when the tropical cyclone reaches coastal communities.

(i) List **three** factors that can affect the maximum wind speed in a tropical cyclone.

- 1 .....
- 2 .....
- 3 ..... [3]

(ii) Other than wind speed, suggest **two** pieces of information about a tropical cyclone that are needed to predict the extent of storm damage.

- 1 .....
- 2 ..... [2]

(c) Suggest how the impact of a tropical cyclone on coastal communities can be reduced.

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

[Total: 10]

- 5 Fig. 5.1 shows a blue shark feeding on shoaling anchovies.



**Fig. 5.1**

- (a) The shoaling behaviour of anchovies has advantages for both the anchovies and the shark feeding on the anchovies.

- (i) State **three** advantages of shoaling for the **anchovies**.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

- (ii) State **one** advantage of anchovies shoaling for the **shark**.

.....

..... [1]

- (b) Anchovies feed on microscopic algae called phytoplankton. During El Niño events, changes in the anchovy population have been recorded in the Pacific Ocean.

Explain how an El Niño event could affect the population of blue sharks.

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..... [4]

- (c) (i) Define parasitism.

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.....

..... [3]

- (ii) Suggest why parasites are more common on fish that shoal than on fish that do not shoal.

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..... [2]

[Total: 13]

6 (a) (i) Outline the theory of plate tectonics.

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..... [3]

(ii) Describe **three** types of evidence to support the theory of plate tectonics.

1 .....

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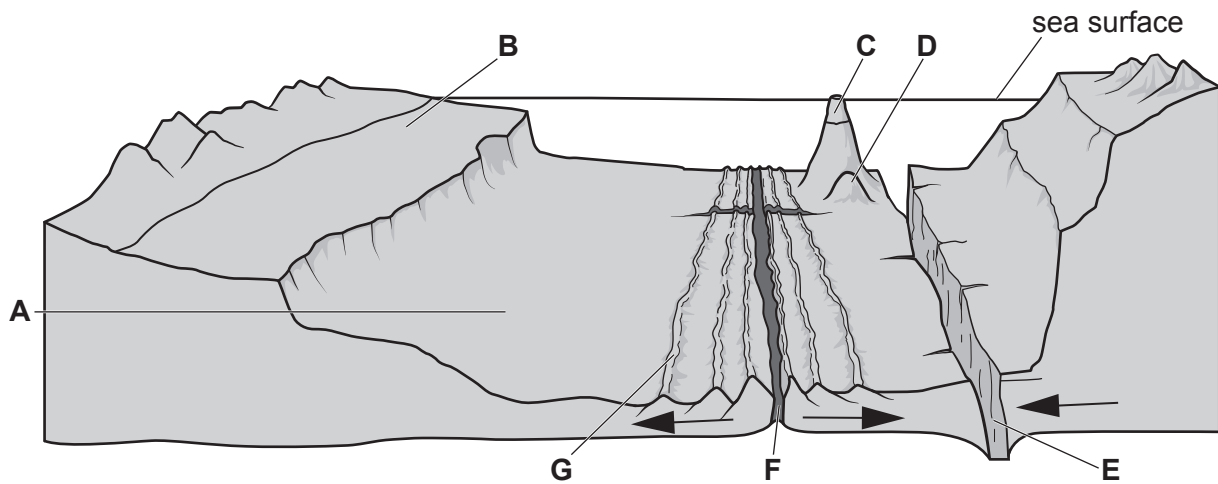
2 .....

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3 .....

..... [3]

(b) Fig. 6.1 shows features of the ocean floor.



**Fig. 6.1**

(i) Complete Table 6.1 to identify the features shown on Fig. 6.1.

**Table 6.1**

| feature                  | letter in Fig. 6.1 |
|--------------------------|--------------------|
| an ocean trench          |                    |
| an abyssal plain         |                    |
| a volcanic island        |                    |
| an area of littoral zone |                    |

[4]

(ii) Name the type of plate boundary that produces a mid-ocean ridge.

..... [1]

(c) Explain how isostasy produces shallow seas at the edge of continents.

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..... [3]

[Total: 14]

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