

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
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MARINE SCIENCE

9693/03

Paper 3 A2 Structured Questions

May/June 2015

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **15** printed pages and **1** blank page.

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

- 1 (a) Fig. 1.1 shows the results of investigations into the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis.

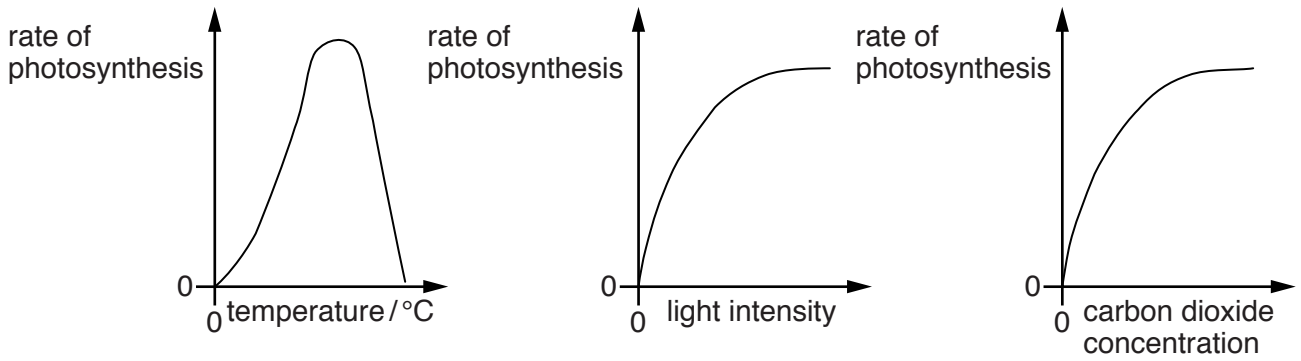


Fig. 1.1

With reference to Fig. 1.1, describe and explain the effect of each of these environmental factors on the rate of photosynthesis.

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light intensity

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carbon dioxide concentration
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(b) Explain how these environmental factors influence the depth at which phytoplankton are found in the open ocean.

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.....[3]

[Total: 12]

- 2 (a) Table 2.1 shows the osmotic concentration of sea water, fresh water and the blood plasma of two species of fish.

Table 2.1 also shows the concentrations of two mineral ions that contribute to the total osmotic concentration of these solutions.

Table 2.1

solution	osmotic concentration /arbitrary units	mineral ion concentration /arbitrary units	
		sodium	chloride
sea water	1050	450	513
fresh water	1 to 20	0.30 to 5	0.23 to 10
blood plasma of salmon	330 to 390	135 to 185	120 to 138
blood plasma of tuna	434 to 460	198 to 220	169 to 173

- (i) Using the information in Table 2.1, explain why, in sea water, both salmon and tuna need to swallow sea water to maintain a suitable osmotic concentration in their bodies.

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- (ii) Using the information in Table 2.1, explain why, in sea water, both salmon and tuna excrete chloride ions from the gills.

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3 Table 3.1 shows some features of the life cycles of grouper and salmon.

Table 3.1

feature of life cycle	grouper	salmon
spawning	migrate to offshore sea water in large groups of adults; eggs and sperm released into water	migrate in large numbers to fresh water streams; eggs and sperm released inside nests
fertilisation	external	external
larvae	fry with yolk sac develop into pelagic larvae and move in ocean currents to nursery areas	alevins with yolk sac stay inside nest and develop into fry feeding in fresh water
juveniles	migrate to sea grass meadows and mangroves and move to offshore coral reefs after growth	parr feed in fresh water and then migrate towards estuaries, becoming smoults before they enter the sea
adults	live in offshore reefs and mature as females	live in the sea until sexual maturity and then return to fresh water to spawn

(a) Fertilisation in grouper and salmon is external.

(i) State **one** disadvantage of external fertilisation.

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[1]

(ii) Suggest why the spawning habits of salmon might increase the chances of fertilisation.

.....
[1]

(iii) Compared to salmon, a smaller proportion of grouper larvae survive to become juveniles. Suggest **one** reason why.

.....
[1]

(b) Using the information in Table 3.1, explain why the spawning behaviour of grouper and salmon may increase the risk of overfishing.

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(c) Suggest the advantages to juveniles of both salmon and grouper of migrating from one habitat to another.

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.....[2]

[Total: 7]

- 4 (a) Sonar works by sending a sound wave through water at fixed time intervals. Fig. 4.1 shows how sonar is used to locate fish.

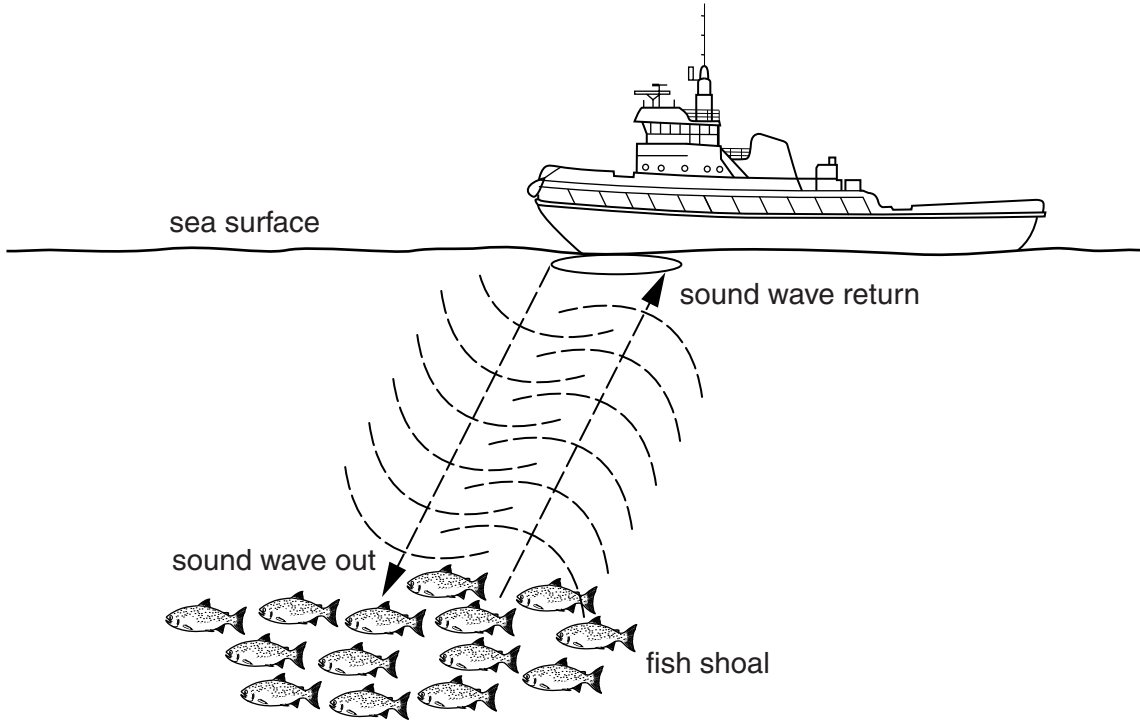


Fig. 4.1

When the sound wave strikes fish, it rebounds and is detected as an echo by the sonar equipment.

As sound travels through water at 1440 metres per second, the time difference is used to work out the distance of the fish.

It takes three seconds for the sound wave to reach the fish **and return** to the sonar equipment. The fish are 2160 metres away.

- (i) Using the formula, **distance = speed × time**, calculate the distance to the fish if the time difference is 15 seconds.
Show your working.

distance =[2]

- (ii) State what information about the fish, other than distance, can be found by using sonar.

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.....[1]

(b) Benthic trawling and purse seine fishing are common fishing techniques.

For each of these methods, describe their impact on non-target species.

(i) benthic trawling
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(ii) purse seine fishing
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(c) Suggest **two** advantages to a fishery of using factory ships.

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2
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[Total: 11]

- 5 (a) Giant clams are an important food source in Japan. Most clams are fished locally although some cultured clams are imported.

Fig. 5.1 shows the annual catch and the mean price of giant clams in one region of Japan over a 20 year period.

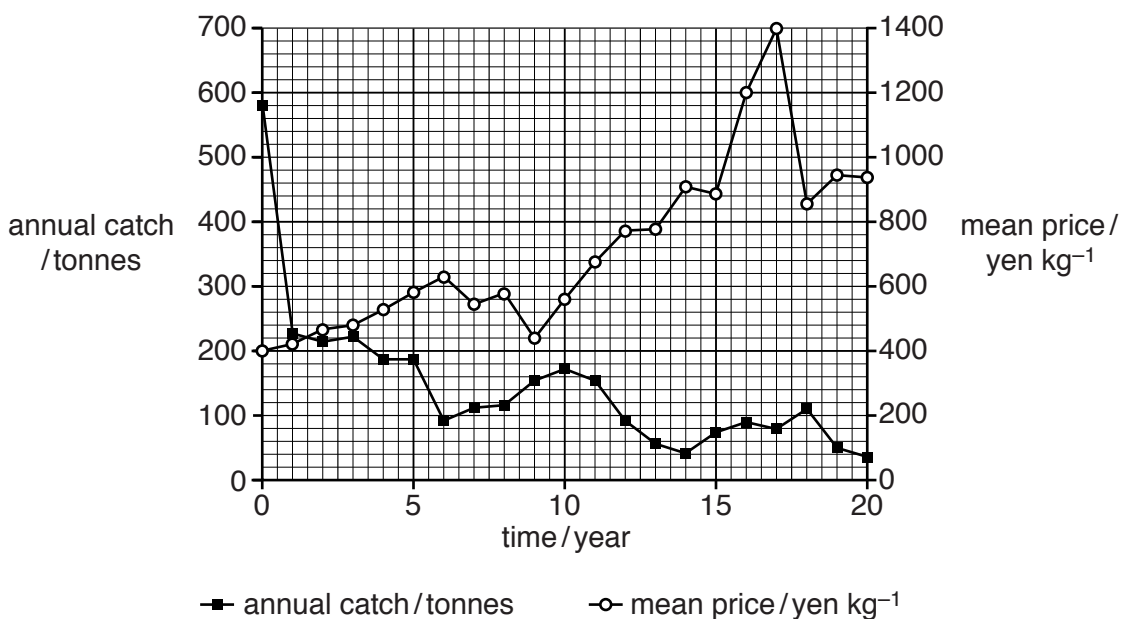


Fig. 5.1

- (i) Describe the trends in the annual catch of giant clams and the mean price of giant clams.

annual catch

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mean price

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 [5]

- (ii) Suggest an explanation for the relationship between the annual catch and the mean price of giant clams.

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 [2]

(b) A proposal for an aquaculture trial in Australia to rear giant clams included the following information.

1. Start-up breeding adults will be collected from the wild population by a licensed fisher.
2. Water from the surrounding sea will be pumped into the rearing tanks.
3. Larvae will be fed at first using algae grown in an algal laboratory.
4. After metamorphosis and the establishment of zooxanthellae by the juvenile clams, only new sea water will be supplied at a constant daily rate.
5. The juvenile clams will be raised in land based tanks until they reach market size.
6. Some juveniles will be retained to provide new breeding stock.
7. The use of sea cages will be trialled for future use.
8. Successful rearing could result in expansion of clam aquaculture and involve local people.

(i) Identify **two** features of this proposed aquaculture system that are typical of an intensive system.

1

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2

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(ii) Suggest why sea water is pumped through the rearing tanks.

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(iii) If this proposed aquaculture trial is successful and expanded, explain why it is unlikely to have an effect on the wild population of giant clams.

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[Total: 13]

6 Fig. 6.1 shows some of the indicators that are believed to be the result of global warming.

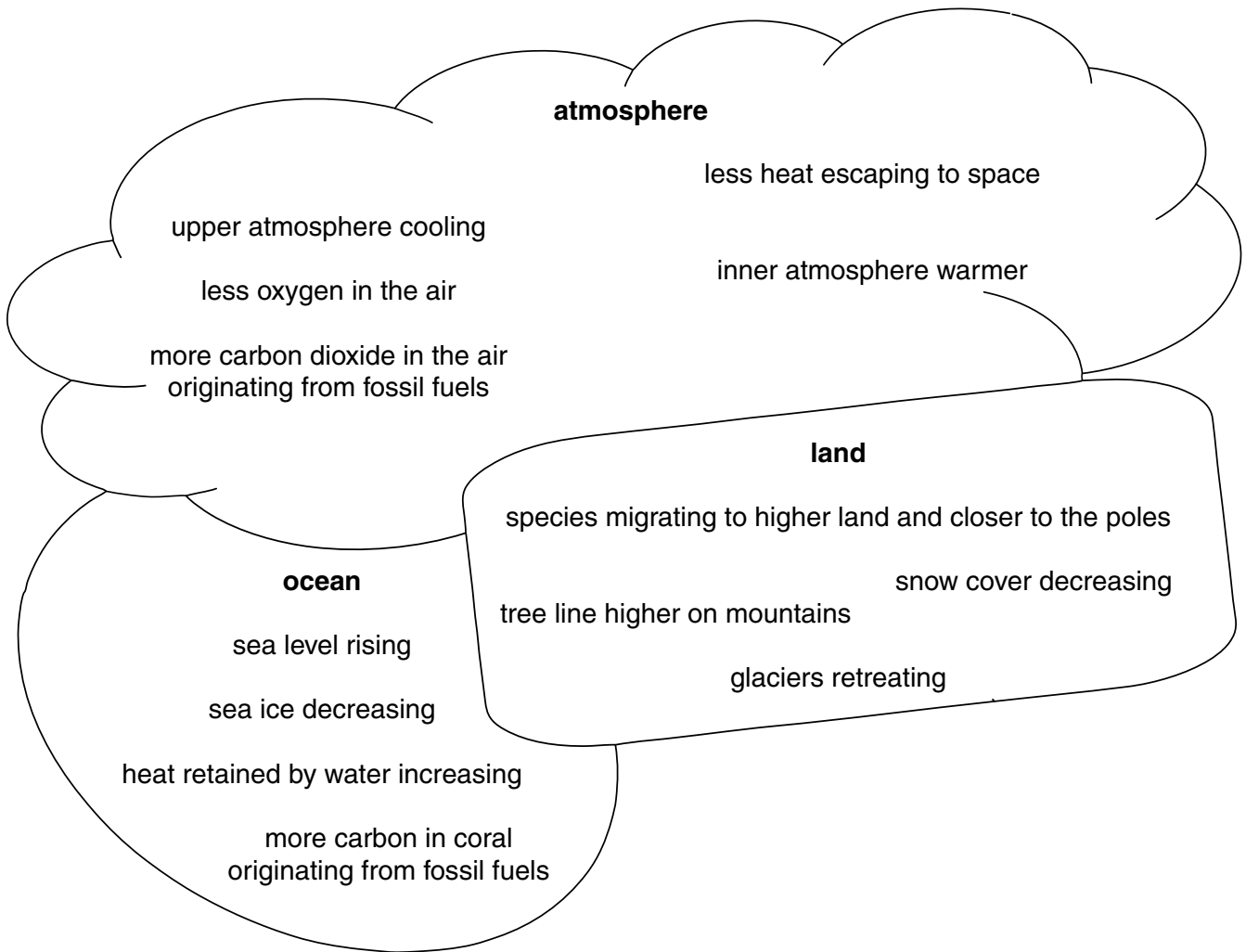


Fig. 6.1

(a) State **two** indicators that can be **directly** linked to human activity.

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- 2
-[2]

7 The Coral Reef Alliance is an organisation that was originally developed to encourage awareness in divers about the need for conservation. It is now an international organisation that focuses on three areas where change may occur:

- marine protected areas
- marine recreation tourism
- local communities.

(a) The Coral Reef Alliance provides training for active management of marine protected areas in order to protect reefs from human interference.

(i) Suggest **three** ways in which human interference can cause damage to coral reefs.

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(ii) Suggest what is meant by *active management*.

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(b) Marine protected areas may be a major economic resource for marine recreation tourism.

Suggest **one** possible source of conflict between the management of a marine reserve and the providers of marine recreation tourism. Give a reason for your answer.

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.....[2]

- (c) Local communities have different interests in how the resources in a marine protected area might be used.

Suggest **three** examples of conflict between conservation groups, hotel operators, local fishermen and local shopkeepers about the management of a marine protected area.

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.....[3]

[Total: 10]

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