



Cambridge International AS & A Level

CANDIDATE
NAME

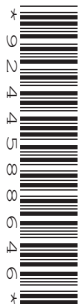
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CENTRE
NUMBER

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MARINE SCIENCE

9693/31

Paper 3 A Level Theory

October/November 2022

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 **12** pages.

Section A

Answer **all** questions in this section.

- 1 (a) There is continuous movement of substances through the cell membranes of cells of marine organisms. Substances move from cell to cell or are exchanged with the surrounding sea water.

Table 1.1 shows three processes by which substances pass through a cell membrane.

- (i) Complete the table by placing a tick (✓) in the correct boxes.

Table 1.1

process	movement from a higher concentration to a lower concentration	is a passive process	used for glucose uptake
diffusion			
facilitated diffusion			
active transport			

[3]

- (ii) Osmosis involves movement of particles by diffusion.

Explain why osmosis is sometimes described as a 'special case' of diffusion.

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[1]

- (b) Fig. 1.1 shows a plant cell and an animal cell under normal conditions.

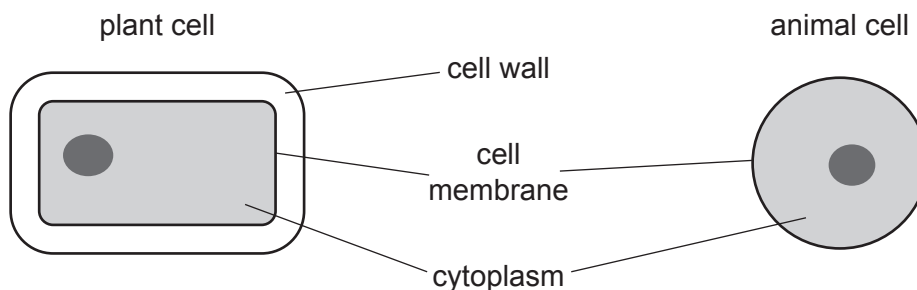


Fig. 1.1

- (i) Sketch diagrams to show how the plant cell and the animal cell would look after being placed in a concentrated sugar solution for five hours.

plant cell

animal cell

[2]

- (ii) Label the cell membrane on **both** cells you have drawn in (b)(i). [1]

- (iii) Explain the changes in the plant cell **and** the animal cell when placed in a concentrated sugar solution for five hours.

Use the term water potential in your answer.

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..... [4]

[Total: 11]

2 (a) Fig. 2.1 shows part of a food web at a hydrothermal vent.

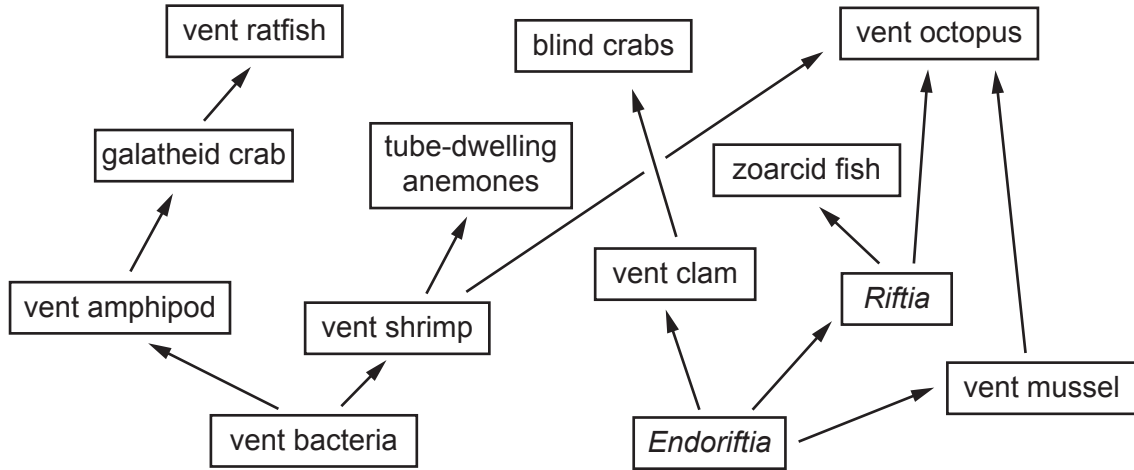


Fig. 2.1

(i) Describe how vent bacteria and *Endoriftia* carry out chemosynthesis.

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..... [4]

(ii) Describe the relationship between *Endoriftia* and *Riftia*.

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(iii) Vent octopus and vent ratfish are both top predators.

Use Fig. 2.1 to explain why the food chains involving vent octopus are more energy efficient than the food chain involving vent ratfish.

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..... [2]

(b) An oil seep is the natural escape of oil and gas such as methane up through the sea bed. Oil seeps account for almost half of the oil released into the ocean every year. Natural oil seeps release oil slowly over time, allowing ecosystems to adapt. Ecosystems around oil seeps are very similar to those shown in Fig. 2.1.

Drilling companies use oil seeps as indicators for possible large oil deposits.

(i) Explain how construction of an oil drilling platform would affect the water quality, with reference to the impact on the community of marine organisms in the immediate area.

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..... [3]

(ii) Methane in the atmosphere contributes to the enhanced greenhouse effect. The sea bed is an important sink for methane gas. Few of the small bubbles that escape from methane gas seeps reach the ocean surface.

Suggest why some scientists are concerned that drilling for methane at gas seeps could affect climate change.

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..... [3]

[Total: 15]

- 3 (a) Marine mussels can tolerate a wide range of salinities.

State the term used for organisms that can tolerate a wide range of salinities.

..... [1]

- (b) Fig. 3.1 shows the life cycle of marine mussels.

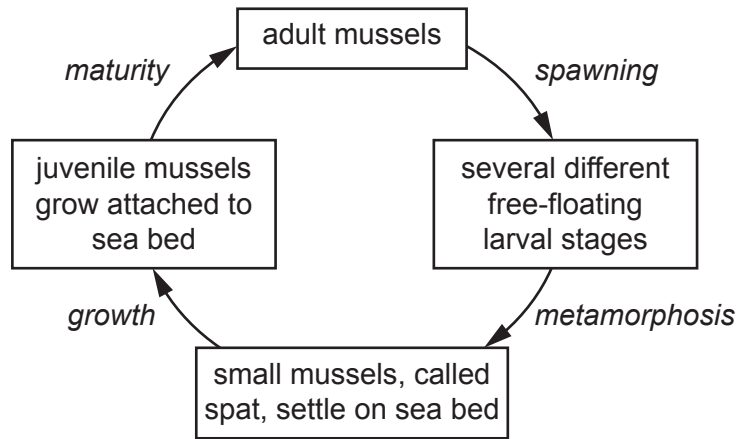


Fig. 3.1

- (i) Use Fig. 3.1 to identify **two** features which show that marine mussels have a complex life cycle.

1

2

[2]

- (ii) Use Fig. 3.1 to identify a stage that is non-sessile.

..... [1]

- (c) Mussel aquaculture takes place in temperate waters, mainly in Europe and North America. Growers either collect spat from natural mussel beds on the sea bed or use hatchery-produced spat. Natural mussel beds are important feeding areas for ducks and other wild birds.

Suggest **two** advantages and **two** disadvantages of producing spat in a hatchery instead of collecting spat from the sea bed.

advantages:

1.....

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2

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disadvantages:

1

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2

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[4]

- (d) One method used for mussel culture involves wooden poles which are attached to the muddy sea bed in rows. Coconut fibre rope is wrapped in a spiral around the poles and mussels attach themselves to the rope by threads produced from the shell.

Fig. 3.2 shows this type of culture.

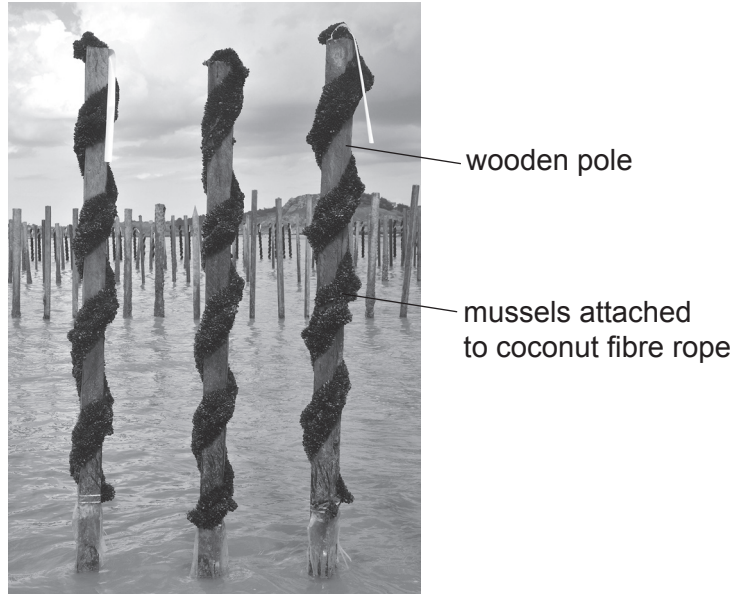


Fig. 3.2

The mussels are grown in intertidal areas in shallow bays and estuaries. They are left for 12 to 15 months before harvesting.

Suggest **and** explain **two** advantages and **two** disadvantages of growing mussels in intertidal areas and estuaries instead of offshore in cages or on the sea bed.

advantages:

1

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2

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disadvantages:

1

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2

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[4]

[Total: 12]

4 (a) Fig. 4.1 shows an atom of oxygen.

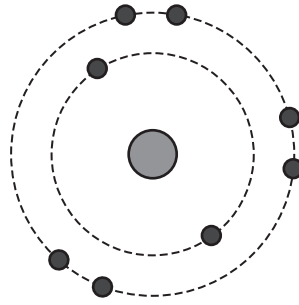


Fig. 4.1

Complete Fig. 4.1 to show a molecule of oxygen, O₂. [2]

(b) A study by the conservation group IUCN (International Union for Conservation of Nature) has found that around 700 ocean sites are now suffering from low oxygen levels compared with 45 in 1960. The amount of oxygen dissolved in oceans has declined globally by an average of 2%. However, in some tropical locations it has declined by 40%.

Some scientists think that climate change is one of the main causes of this decline.

(i) Explain how climate change could cause the decline in oxygen levels.

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..... [2]

(ii) Suggest why, in tropical waters, species such as sharks and tuna are more at risk from declining oxygen levels than species such as jellyfish and sponges.

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[Total: 7]

6 (a) Describe ventilation in grouper during inflow of water.

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(b) Explain why sharks and grouper are classified in the same phylum but in different classes.

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[Total: 11]

