



ATAR course examination, 2021

Question/Answer booklet

MARINE AND MARITIME STUDIES

Please place your student identification label in this box

WA student number: In figures

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In words

Time allowed for this paper

Reading time before commencing work: ten minutes

Working time: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer booklet

Multiple-choice answer sheet

Number of additional
answer booklets used
(if applicable):

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination
Section One Multiple-choice	20	20	20	20	20
Section Two Short answer	6	6	90	99	50
Section Three Extended answer	4	2	70	40	30
Total					100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2021: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Section Two: Write your answers in this Question/Answer booklet. Wherever possible, confine your answers to the line spaces provided.

Section Three: Consists of four questions. You must answer two questions. Write your answers in this Question/Answer booklet.

3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Section One: Multiple-choice

20% (20 Marks)

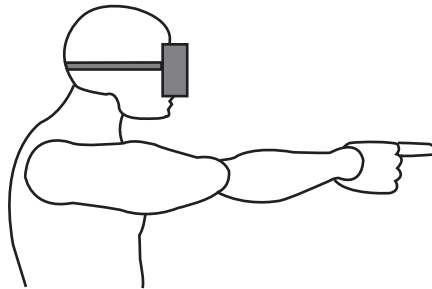
This section has **20** questions. Answer **all** questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 20 minutes.

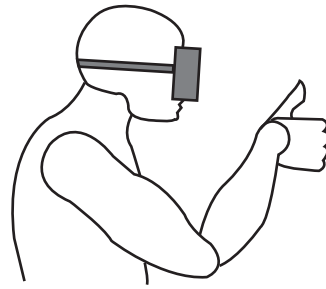
1. As a diver gets close to the surface while ascending she tilts her head back to look at the surface and then breathes gently out into her snorkel. This describes which snorkel clearing method?

- (a) clearing a slightly-flooded mask
- (b) blast method
- (c) equalisation method
- (d) displacement method

2. The diagrams below show two hand signals used when diving. What is the diver signalling to a person in a group of divers when Signal A is followed by Signal B?



Signal A



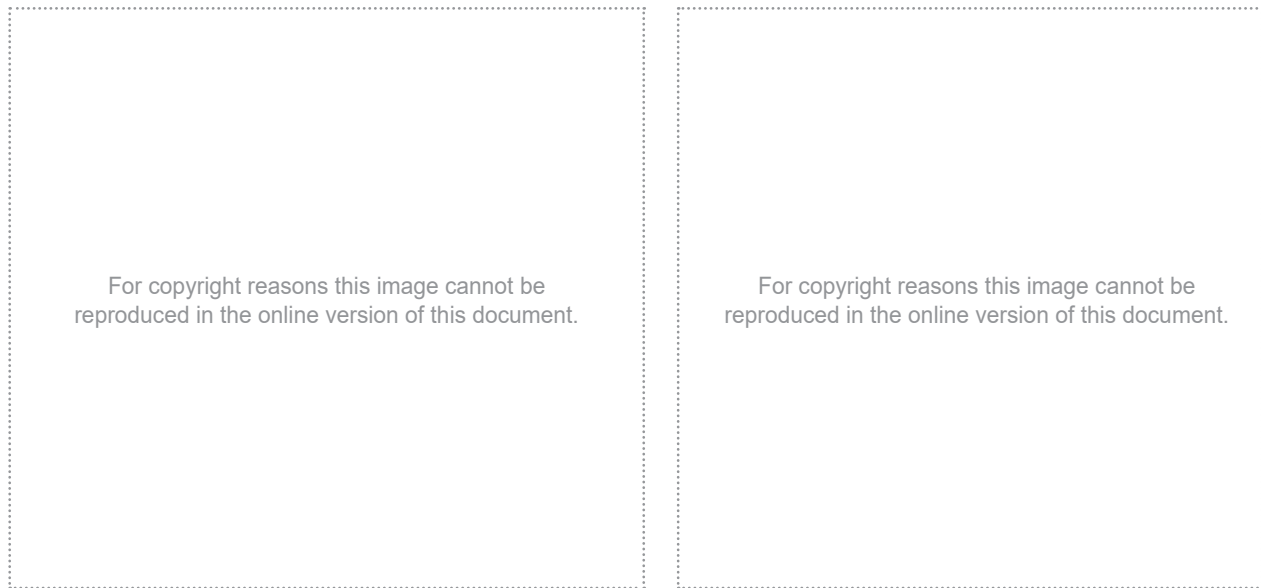
Signal B

- (a) Are you OK?
 - (b) You, look up.
 - (c) You, go up.
 - (d) You, I am OK.
3. When taking photographs to be used for identifying a whale shark, what is the **best** area of the shark to photograph?
- (a) on the left side behind the pectoral fin
 - (b) on the right side behind the pectoral fin
 - (c) the head from the front or close to it
 - (d) any area of the head, with plenty of spots

4. The main importance of coral polyps to a reef system in the short-term is
- (a) they provide structure for the reef.
 - (b) they start many food chains around the reef.
 - (c) by being coloured they provide camouflage for fish.
 - (d) they provide protection for other organisms.
5. Which of the following organisations is/are primarily responsible for policy regarding Marine Protected Areas (MPAs) from outside the 3 nm (three nautical mile) limit to the outer edge of the Australian Exclusive Economic Zone?
- (a) local government(s) bordering the MPA
 - (b) State Governments
 - (c) Federal Governments
 - (d) both State and Federal Governments
6. One sign of carbon dioxide poisoning is
- (a) a slower breathing rate.
 - (b) feeling cold.
 - (c) headaches.
 - (d) lowered heart rate.
7. Shallow water blackout is a problem for free-divers that can arise due to
- (a) hyperventilation prior to a dive.
 - (b) a decrease in carbon dioxide levels in the brain.
 - (c) an increase in oxygen levels in the brain.
 - (d) too many breath-hold dives.
8. Boyle's Law helps explain a number of problems associated with diving. This Law shows the relationship between
- (a) pressure and temperature of a gas at constant volume.
 - (b) pressure and volume of a gas at constant temperature.
 - (c) temperature, pressure and volume of a gas.
 - (d) volume and temperature of a gas at constant pressure.
9. From discovery to recovery of an object on a wreck site, what is the **best** sequence of events to follow?
- (a) notify the museum, then raise it to surface
 - (b) notify the museum, then leave it in its location
 - (c) remove it carefully from surrounds, then notify the museum
 - (d) leave it in its location, then notify the museum

10. Which of the following search methods is **least** effective in locating a World War II wreck in very deep water off the continental shelf of Western Australia?
- (a) aerial search
 - (b) search using snorkellers
 - (c) magnetometer
 - (d) sonar
11. Why is each successive level of a biomass pyramid smaller than the one below it?
- (a) There are fewer organisms in each level as you rise up the pyramid.
 - (b) Predators cannot eat all the animals in the previous level.
 - (c) There is only so much energy available for that ecosystem.
 - (d) Less than 100% of the energy is transferred to the next level up.
12. Organisms are classified as plankton on the basis of
- (a) their ability to swim.
 - (b) the time spent in each stage of their life cycle.
 - (c) the time spent in the water column during their life cycle.
 - (d) the size of the animal.
13. A snorkeller dives to 20 m. As they ascend to 15 m they experience pain in one of their ears (a reverse squeeze). Which of the actions listed below is **most** likely to prevent a barotrauma?
- (a) race to the surface to minimise the time the eardrum is under pressure
 - (b) hold the nose and gently blow air into the ears
 - (c) straighten the neck and massage it near the ear
 - (d) partially flood the mask and snort some saltwater up the nose to clear the blockage
14. There are **two** methods for towing a tired snorkeller. What do they have in common?
The tired
- (a) snorkeller is on their back for the tow.
 - (b) snorkeller's weight belt is removed.
 - (c) snorkeller's mask is taken off.
 - (d) snorkeller's snorkel is left in the mouth.

Question 15 refers to the following diagram.



15. The type of plankton shown in the diagram above is
- (a) meroplankton.
 - (b) nekto plankton.
 - (c) benthoplankton.
 - (d) holoplankton.
16. Heavy metals are a problem pollutant in the marine environment because of
- (a) bioaccumulation in food chains, toxicity at low concentrations and alteration of dissolved gas ratios.
 - (b) bioaccumulation in food chains, toxicity at low concentrations and accumulation in sediments.
 - (c) toxicity at low concentrations, accumulation in sediments and alteration of dissolved gas ratios.
 - (d) toxicity at low concentrations, accumulation in sediments and effect on sea water's response to climate change.
17. Which of the following ocean currents flows eastward along the southern coast of Western Australia?
- (a) West Australian
 - (b) South Australian
 - (c) Leeuwin
 - (d) Zeehan

18. Building a solid structure out into the water along a sandy coast will result in long-term changes to the coast. The reason for this is
- (a) nearshore currents are affected by the structure and so influence sand movement.
 - (b) the structure changes the effects of the wind and so influences sand movement.
 - (c) construction of the structure will disturb the beach and disrupt sand movement.
 - (d) the structure changes the factors influencing sand movement.
19. In Western Australia, most artificial reefs, other than deliberately-sunk vessels, are constructed and/or installed primarily to
- (a) increase fish habitats.
 - (b) protect a coastal area.
 - (c) create surf breaks.
 - (d) concentrate fishing effort.
20. One of the islands in the Houtman Abrolhos Islands group has the nickname of 'Batavia's Graveyard'. To which island does this name refer?
- (a) West Wallabi Island
 - (b) Beacon Island
 - (c) Pelsaert Island
 - (d) Hill Island

End of Section One

See next page

Section Two: Short answer**50% (99 Marks)**

This section has **six** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 90 minutes.

Question 21**(16 marks)**

In 1629 the Dutch ship the Batavia was wrecked off the coast of Western Australia. Many of the survivors were later killed due to a mutiny.

- (a) Complete the table below by identifying the missing information. The first row has been completed as an example. In the '(In)famous' box there may be more than one possible response. Only **one** response is required for each box. (6 marks)

Person's family name	Position on Batavia	(In)famous for ...
(Gijsbert) Bastiaensz	Preacher	Kept detailed diary of the mutiny events that occurred.
	Commander/Senior Merchant	
(Adrian) Jacobsz		
	Under Merchant	Stayed on board the wreck until last minutes before the ship broke up.
(Wiebbi) Hayes		Informed Pelsaert of mutiny and massacres.

See next page

- (b) Outline the process involved in the degradation of iron objects found on the Batavia shipwreck. (4 marks)

- (c) Describe the processes that would be carried out to preserve/restore iron objects found on the Batavia shipwreck in the laboratory. (6 marks)

Question 22

(20 marks)

A group of researchers were investigating phytoplankton distribution off the coast of Western Australia. The researchers decided to focus their investigation into the distribution of these organisms on the distance between 5 nm (nautical miles) and 200 nm from the shoreline.

For this part of their overall experiment assume they were sampling only at a depth of 3 metres.

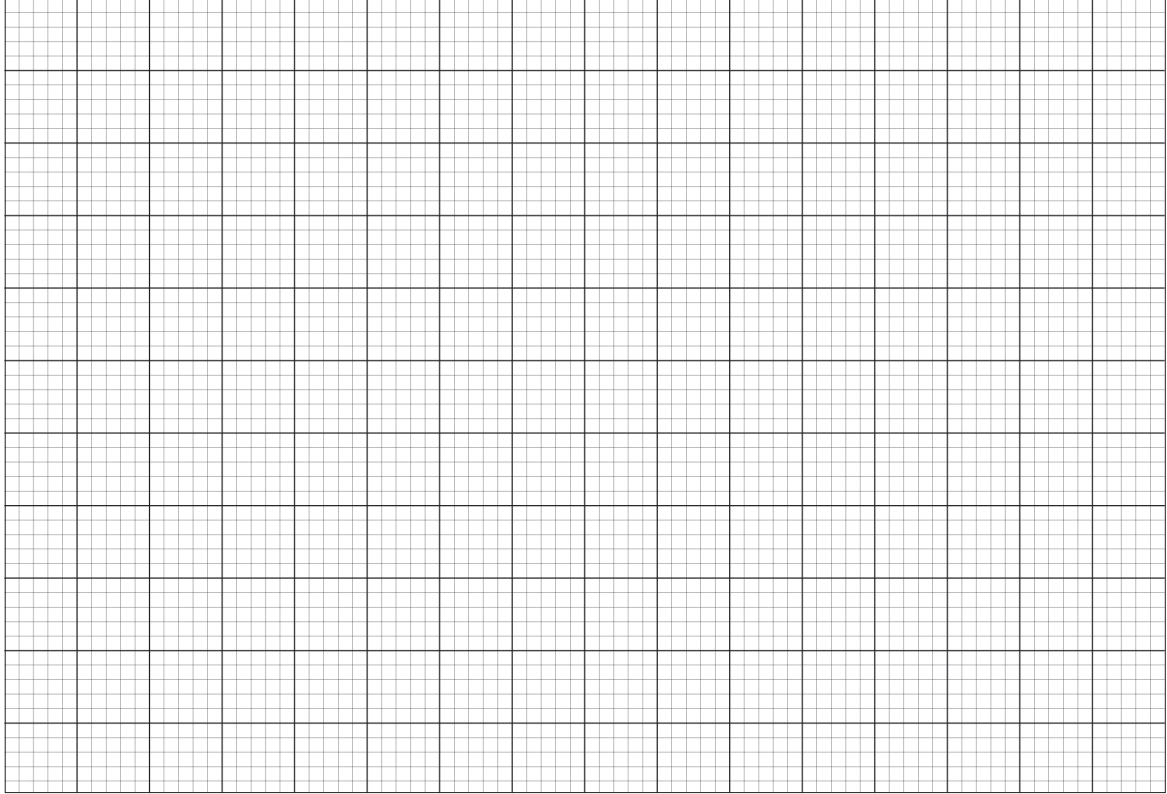
- (a) The researchers hypothesised that as the distance from the shoreline increased there would be no change in phytoplankton numbers. Identify the independent and dependent variables in this hypothesis. (2 marks)

independent variable: _____

dependent variable: _____

- (b) Outline **one** possible experimental method that could be used for testing the hypothesis from part (a). (4 marks)

- (c) On the grid below, sketch a graph to illustrate the expected results from the hypothesis in part (a). (5 marks)



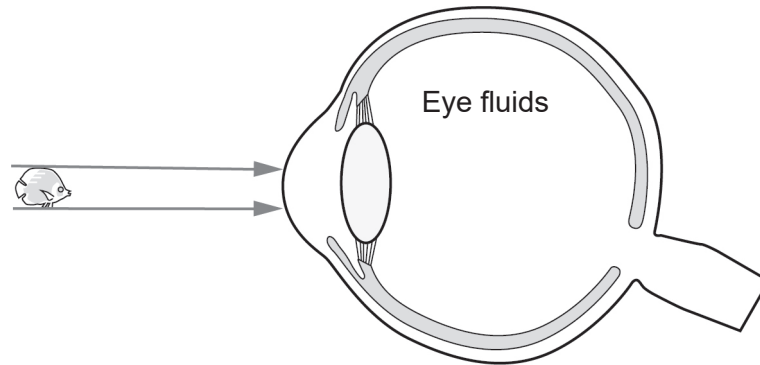
A spare grid is provided at the end of this Question/Answer booklet. If you need to use it, cross out this attempt and indicate that you have redrawn it on the spare grid.

See next page

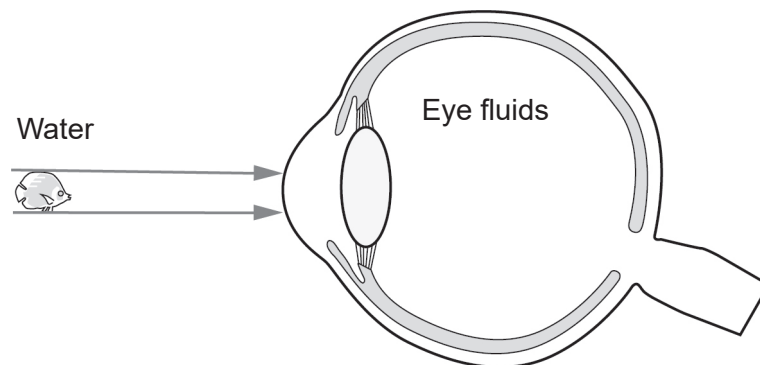
Question 23**(17 marks)**

Snorkellers face a number of problems with their vision when underwater. Without a mask (or similar eye protection) an object will appear blurry and magnified.

- (a) With the aid of the diagram below, explain how an image is formed when the viewer is out of water. (3 marks)



- (b) When the eye is underwater, the image is magnified. With the aid of the diagram below, describe how this occurs. (2 marks)



Question 23 (continued)

(c) Explain why there is a difference between the image on the land and in the water. (3 marks)

(d) Outline the necessary pre-dive and post-dive care for snorkelling equipment.

(i) Pre-dive care: (2 marks)

(ii) Post-dive care: (3 marks)

(e) When duck diving, while there are a number of boats moving slowly about your area, outline the precautions you should take

(i) prior to submerging. (2 marks)

(ii) when ascending. (2 marks)

Question 24

(13 marks)

A worldwide program of research studies plankton and the environmental factors that influence them. This revolves around the use of continuous plankton recorders, which commenced in 1927. Australia has been involved in this research for a number of years, both around the coast and in the Antarctic region through a program titled Australian Continuous Plankton Recorder Survey (AusCPR).

Much of the data for the AusCPR database is collected by ships of opportunity.

- (a) Outline what a 'ship of opportunity' is and how it is used in collecting samples for this AusCPR database. (2 marks)

- (b) Summarise the method used by a ship of opportunity to collect samples for the AusCPR database. (4 marks)

- (c) Explain how the data collected for the AusCPR can be used to aid in the sustainable management of fish stocks. (4 marks)

A finding from the AusCPR was that the temperature of the oceans has tended to increase over the past few years from the Equator to the Poles. Associated with this has been a general trend within plankton, that as the water temperature increases, the average size of the different plankton species has decreased. For example, in general, the plankton species at the Equator are smaller than those species nearer the polar regions.

- (d) Explain how the gradual increase in water temperature could affect whale feeding habits and whale numbers in the future. (3 marks)

- (c) Explain, with the aid of a diagram(s), the operation of a sand budget. (6 marks)

Question 26

(20 marks)

Humpback whales (Baleen whales) filter sea water for their food. While they mainly consume krill, whales will eat anything that gets trapped in their mouths when they gulp in the water to filter the food from it.

Krill live in cold waters and as a result, many humpback whales feed in Antarctic and Arctic waters.

For a number of years, krill was harvested without controls or regulation, until 2006 when it was realised that this harvesting was non-sustainable and, if left unchecked, there would be untold damage to the Antarctic environment. Many nations decided to regulate the krill fishery to make it more sustainable and hence less damaging to the environments surrounding the Antarctic.

- (a) Explain how unrestricted krill harvesting could affect the humpback whale population that migrates up and down the Western Australian coast. (3 marks)

Another important development in attempting to achieve whale population sustainability was the establishment of the International Whaling Commission (IWC) in 1946.

- (b) Explain the role of the IWC and how it fulfils this role. (3 marks)

In Western Australia there is a growing tourism industry associated with swimming with and watching whales. To protect whales and ensure their continued living patterns are maintained, a set of rules has been created and is continuously monitored and modified. There is one set of rules for the general public and another for licensed whale-watching vessels.

(c) Outline **seven** rules for controlling human interaction with whales for an unlicensed vessel and **four** rules for swimmers associated with licensed vessels within Western Australia.

(i) Unlicensed vessels (7 marks)

One: _____

Two: _____

Three: _____

Four: _____

Five: _____

Six: _____

Seven: _____

(ii) Swimmers with licensed vessels (4 marks)

One: _____

Two: _____

Three: _____

Four: _____

See next page

Question 26 (continued)

- (d) Explain how the rules from part (c) help to ensure whale populations are protected and hence encourage whale tourism in Western Australia. (3 marks)

End of Section Two

See next page

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See next page

Section Three: Extended answer**30% (40 Marks)**

This section contains **four** questions. You must answer **two** questions. Write your answers on the lined pages provided following Question 30.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 70 minutes.

Question 27**(20 marks)**

Some timber was found within a reef area, leading to the discovery of a shipwreck. On being reported to the museum, museum officers, believing they knew the name of the ship, felt the timber could be used to confirm its identity.

The museum officers carried out an exploratory inspection at the site and decided to excavate the timber to study it further. It was determined that, if the wreck was old enough, the site would be fully excavated and the salvaged materials displayed, with a history of the ship, at the museum.

- (a) Outline the processes that would be carried out from prior to excavation of the timber until it was displayed. (10 marks)

Next to the piece of timber was a football-sized piece of rock-like material attached to the reef. Due to its shape, this material appeared not to be a natural part of the original reef structure.

- (b) Outline the steps museum officers would take to determine what was inside this rocky lump and whether it contained any artefact(s) from the wreck. (6 marks)

A small cannon was located on this wreck site.

- (c) Describe **two** factors to be considered when calculating the volume of air required at the surface to raise the small cannon from this site using a lift bag. (4 marks)

Question 28**(20 marks)**

The marine environment needs protection from pollution and other factors that can and do lead to its degradation. If left unchecked, irreversible damage can occur.

Monitoring, planning and implementation are necessary to reduce or prevent this harm. Once a plan has been developed and implemented, it requires long-term monitoring to allow for review and, if necessary, changes to the initial plan to achieve its intended outcomes.

Three issues can affect the marine environment:

- overfishing
- agriculture
- loss of habitat.

- (a) Explain how each issue can affect a marine environment. (12 marks)
- (b) Explain, using an example, why it is necessary to monitor and review a plan over the longer-term and change it if it is not achieving the intended outcomes. (4 marks)
- (c) Explain, using an example, how sustainable fisheries management can achieve the purpose of maintaining or improving biodiversity. (4 marks)

Question 29**(20 marks)**

The enhanced greenhouse effect is due to increased amounts of carbon dioxide and other greenhouse gases in the atmosphere, causing the average temperatures of the Earth to rise.

- (a) Explain how the enhanced greenhouse effect impacts coral reef health **and** global sea levels. (10 marks)
- (b) Explain with the aid of a diagram how melting ice caps could affect a thermohaline current. (10 marks)

Question 30**(20 marks)**

Biosecurity is defined by Australia's Intergovernmental Agreement on Biosecurity as: 'the management of risks to the economy, the environment and the community of pests and diseases entering, emerging, establishing or spreading.'

- (a) Explain, with reference to the environmental processes involved, how climate change could make it more difficult for Australia to maintain its maritime biosecurity. (5 marks)

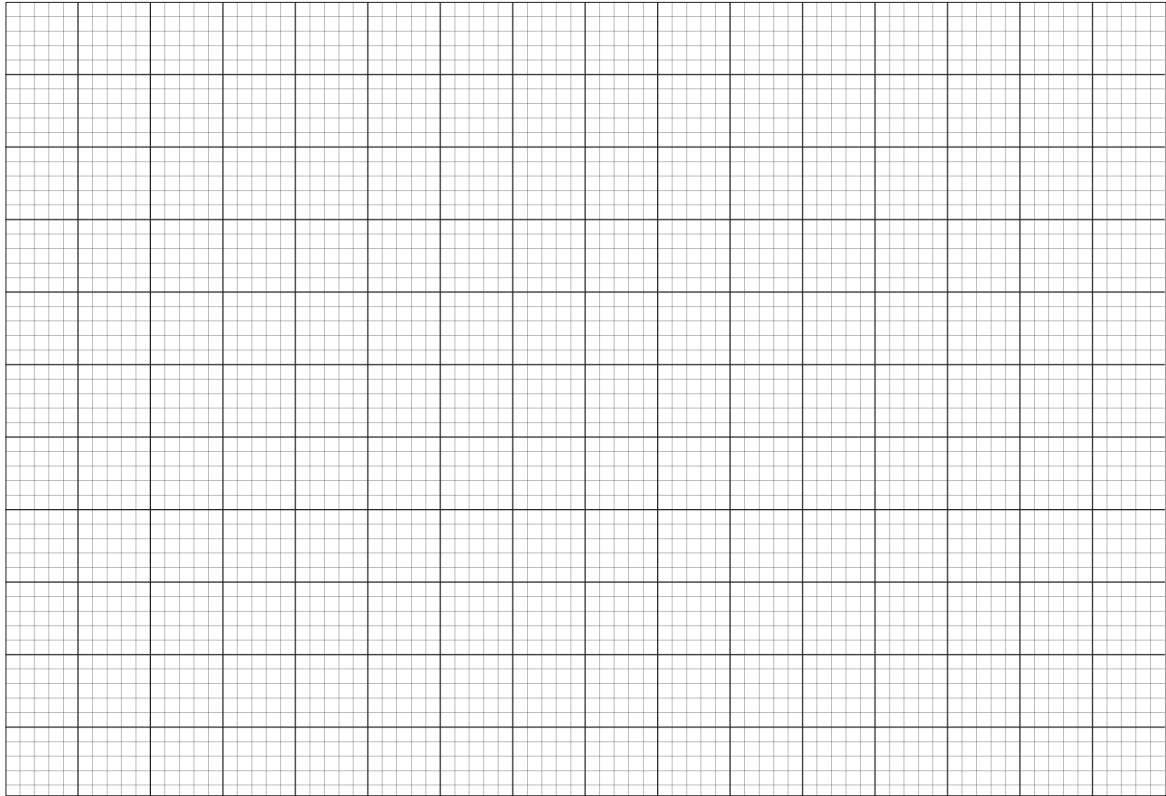
- (b) Describe **three** ways in which a marine disease could be introduced into the Australian marine environment and how each way could be prevented. (6 marks)

Australia's National System for the Prevention and Management of Marine Pest Incursions (the National System) aims to prevent new marine pests arriving, guides responses when a new pest arrives and seeks to minimise the spread and impact of pests already established in Australia.

- (c) Explain how the National System endeavours to prevent new pest arrivals and responds to, and minimises, the effect of marine pests in Australia. (9 marks)

End of questions

Spare grid



ACKNOWLEDGEMENTS

- Question 15** Adapted from: [Illustration of copepod life cycle and its life stages]. (n.d.). Retrieved March, 2021, from: <https://www.st.nmfs.noaa.gov/copepod/about/>
Adapted from: PolarTREC (n.d.). *There can be up to twelve stages in the life cycles of some krill* [Diagram]. Retrieved June, 2021, from <https://www.polartrec.com/files/members/jillian-worssam/images/10thescience-ofkrillgrazing.jpg>
- Question 23 (a)(b)** Adapted from: Moffatt, B. (2000). *Snorkelling workbook* (2nd ed., p. 23.) [Diagram]. Wetpaper Publishers and Consultants. Retrieved June, 2021, from https://www.wetpaper.com.au/files/Workbooks/Snork_sample_pages.pdf
- Question 24** Information from: Integrated Marine Observing System. (2021). *Australian continuous plankton recorder (AusCPR) survey* [Fact sheet]. Retrieved June, 2021, from https://imos.org.au/fileadmin/user_upload/shared/IMOS_General/documents/IMOS/Fact_Sheets/IMOS_Factsheet_AUSCPR_website2.pdf
- Question 30** Definition from: Commonwealth of Australia. (2019). *Intergovernmental Agreement on Biosecurity* (p. 3.). Retrieved June, 2021, from https://www.coag.gov.au/sites/default/files/agreements/2019-IGA-biosecurity_1.pdf
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Information from: Department of Agriculture, Water and Environment. (2021). *Marine pest*. Retrieved June, 2021, from <https://www.agriculture.gov.au/pests-diseases-weeds/marine-pests>

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