Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course examination, 2017

Question/Answer booklet

MARINE AND MARITIME STUDIES

Please place your student identification label in this box

Student number: In figures | | | | | | | | |

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: non-programmable calculators approved for use in this 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.

Ref: 17-044

2018/1916
Web version of 2017/63870

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	70	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 2017*. 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. 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.

   Sections 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 the use of planning/continuing your answer to a question have been 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.

See next page

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. 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.

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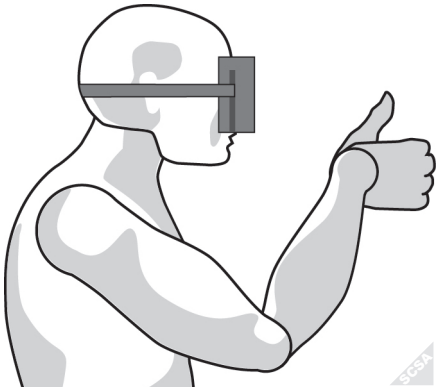
1. What does the acronym ‘AusCPR’ stand for?

   (a) Australian Continuous Plankton Recorder
   (b) Australian Collecting Plankton Recorder
   (c) Australian Continuous Phytoplankton Recorder
   (d) Australasian Copepod and Plankton Recorder

2. The AusCPR project uses ‘ships of opportunity’ to collect water samples. What is meant by the term ‘ships of opportunity’?

   (a) hired research ships
   (b) hired cargo ships
   (c) small research ships
   (d) volunteer ships

3. The diagram below shows a hand signal used when diving.



   What is the diver telling a buddy?

   (a) I am OK
   (b) Look up there
   (c) I want to go up
   (d) Danger over there

4. One unexpected benefit of an offshore artificial reef could be that

   (a) fish come to the area for protection.
   (b) it decreases wave action on the beach.
   (c) it stimulates fish breeding.
   (d) it attracts fish to it.

5. One type of current found in oceans is called a thermohaline current. The 'haline' part of the term 'thermohaline' refers to what aspect of the ocean that causes the current?

   (a) acidity of the water
   (b) salinity of the water
   (c) carbon dioxide in the water
   (d) heat of the water

6. After the *Batavia* was wrecked, the mutineers sent a group of survivors to the nearby West Wallabi Island. Who was the main leader of this group?

   (a) Francisco Pelsaert
   (b) Ariaen Jacobsz
   (c) Jeronimus Cornelisz
   (d) Wiebbe Hayes

7. A lift bag is often used to raise objects from the bottom of the ocean, especially when a solid object is too heavy for a diver to raise on their own. As the lift bag rises through the water column it changes in size. How does this change effect the buoyancy of the lift bag and attached solid object?

   (a) a decrease in buoyancy of the lift bag and no change in buoyancy of the object
   (b) an increase in buoyancy of the lift bag and the object
   (c) a decrease in buoyancy of the lift bag and the object
   (d) an increase in buoyancy of the lift bag and no change in buoyancy of the object

8. It has been claimed that the demographics of whale sharks can serve as an indicator of biodiversity. Why?

   (a) They consume many of the lower order consumers in the food web.
   (b) Their size indicates that an abundance of food is present to feed them.
   (c) Because of their size they frighten other consumers away.
   (d) They are first order consumers in many food webs.

9. Which one of the following shows the importance of coral polyps to a marine environment? Coral polyps

   (a) provide food and protection to other organisms living on a reef.
   (b) are the start of many food chains.
   (c) provide food and add to a reef's structure.
   (d) provide colour (and so camouflage) for other animals.

See next page

10. An old iron shipwreck breaks up slowly and decays. Which one of the following leads to the **fastest** corrosion of a vessel and its contents?

(a) water movement, salts in the water, bacteria, dissimilar metals
(b) oxygen in the water, water movement, salts in the water, bacteria
(c) oxygen in the water, salts in the water, water movement
(d) water movement, dissimilar metals, salts and oxygen in the water

11. In what order are colours lost from an object as a diver goes deeper?

(a) blue, green yellow, orange, red
(b) red, orange, yellow, green, blue
(c) red, blue, orange, yellow, green
(d) blue, red, yellow, orange, green

12. A diver wants to raise an outboard motor that has a volume of 20 L and a mass of 75 kg (on land) from 20 m of seawater. He decides to use a lift bag to help him raise the motor. What volume of air will he need to start to raise the motor to the surface? (Assume the density of seawater is close to 1 kg per litre.)

(a) 165 L
(b) 55 L
(c) 110 L
(d) 75 L

13. When clearing a partially flooded mask, where is the **best** place to hold the mask to push it against your face when you are under the water?

(a) the bottom of the mask
(b) the top of the mask
(c) on the glass of the mask
(d) the sides of the mask

14. Boyle's Law involves the relationship between

(a) volume and temperature.
(b) pressure and temperature.
(c) pressure and volume.
(d) volume, pressure and temperature.

15. After a day of snorkelling you develop a bad headache but you have been keeping your fluid levels high. Which one of the following is a possible cause of this headache?

(a) carbon dioxide build-up in the blood
(b) carbon monoxide build-up in the blood
(c) low sugars in the blood
(d) swallowing too much seawater

See next page

16. Which one of the following is a buddy responsibility when diving?

(a) checking each other's gear after the dive for problems
(b) staying near your buddy and observing them during the dive
(c) helping your buddy swim during the dive
(d) sharing equipment while one of you goes for a snorkel

17. Shallow water blackout is a concern to free divers and people who snorkel while frequently holding their breath when diving. This problem is frequently fatal unless the diver is rescued quickly. To reduce the chance of shallow water blackout, the breath-hold diver should **not**

(a) snorkel or free dive alone.
(b) resist the urge to breath underwater.
(c) hyperventilate before a dive.
(d) do many breath-hold dives.

18. When an object from an old shipwreck is brought to the surface it needs to be stabilised while it is stored prior to being conserved. This stabilisation of the object involves

(a) removal of oxygen from the storage system to stop corrosion.
(b) immersing it in water from the wreck site to stop the object from drying out.
(c) removal of salts from the object to stop further corrosion.
(d) drying the object to stop further corrosion.

19. Many people are interested in finding the wreck of the *Aagtekerke (*the sister ship of the *Batavia)* which was lost on its maiden voyage somewhere between Cape Town and Batam (Batavia). What early methods could be used to assist in locating possible wreck sites or locations of this vessel?

(a) walking along the shorelines of possible locations looking for evidence of the wreck
(b) searching areas thought to be involved with the wreck with a magnetometer
(c) searching areas thought to be involved by diving on them looking for wreckage
(d) going through historical records about the vessel and its sailing information

20. A magnetometer is a device that can be used to locate shipwrecks. It can detect the presence of which material(s) at a wreck site?

(a) silver and gold
(b) brass and bronze
(c) iron
(d) wood

End of Section One

See next page

Section Two: Short answer **50% (70 Marks)**

This section has **six (6)** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for the use of planning/continuing your answer to a question have been 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 **(17 marks)**

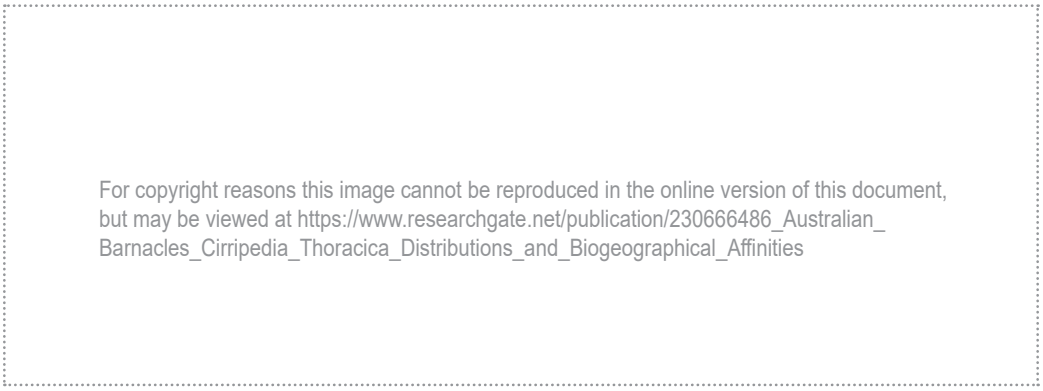
(a) Define phytoplankton. (2 marks)

(b) Name **two** groups of animals other than fish larvae that may be present in plankton. (2 marks)

(c) Biologists sometimes refer to a plankton bloom. What do they mean by the term ‘bloom’? (2 marks)

Question 21 (continued)

Two warm currents flow from the tropics south down the eastern and western coasts of Australia: the East Australian Current and the Leeuwin Current.



The Leeuwin Current usually flows south in autumn and winter and is normally low in nutrients. This current has a dramatic effect on the sea life, especially where the ocean depth is 200 m or less.

(d) Comment on the amount of plankton you would expect to find in this current and give **one** reason for this amount of plankton. (2 marks)

When eddies form in this warm current there is a mixing of this warm surface current and the nutrient rich, deeper and colder Western Australian Current.

(e) What would you expect to happen in these eddies to each of the following groups of organisms? State why you make each claim.

(i) Plankton present (2 marks)

(ii) Fish larvae present (2 marks)

With the enhanced greenhouse effect the strength of a south flowing current (for example, the East Australian Current) has increased and has caused it to flow further south. This change results in a number of plankton species appearing much further south than in the past.

Within this current, scientists have found a number of plankton aggregations. Associated with one of these aggregations is a small, restricted entry fishery with a quota system for professional fishers. This fishery has special boundaries that surround it as set by that State's relevant Fisheries Department.

(f) Propose a change to this fishery's specific boundaries that may need to be made if this change in the south flowing current continues. (1 mark)

(g) Explain why you have made the proposal in part (f) above. (4 marks)

See next page

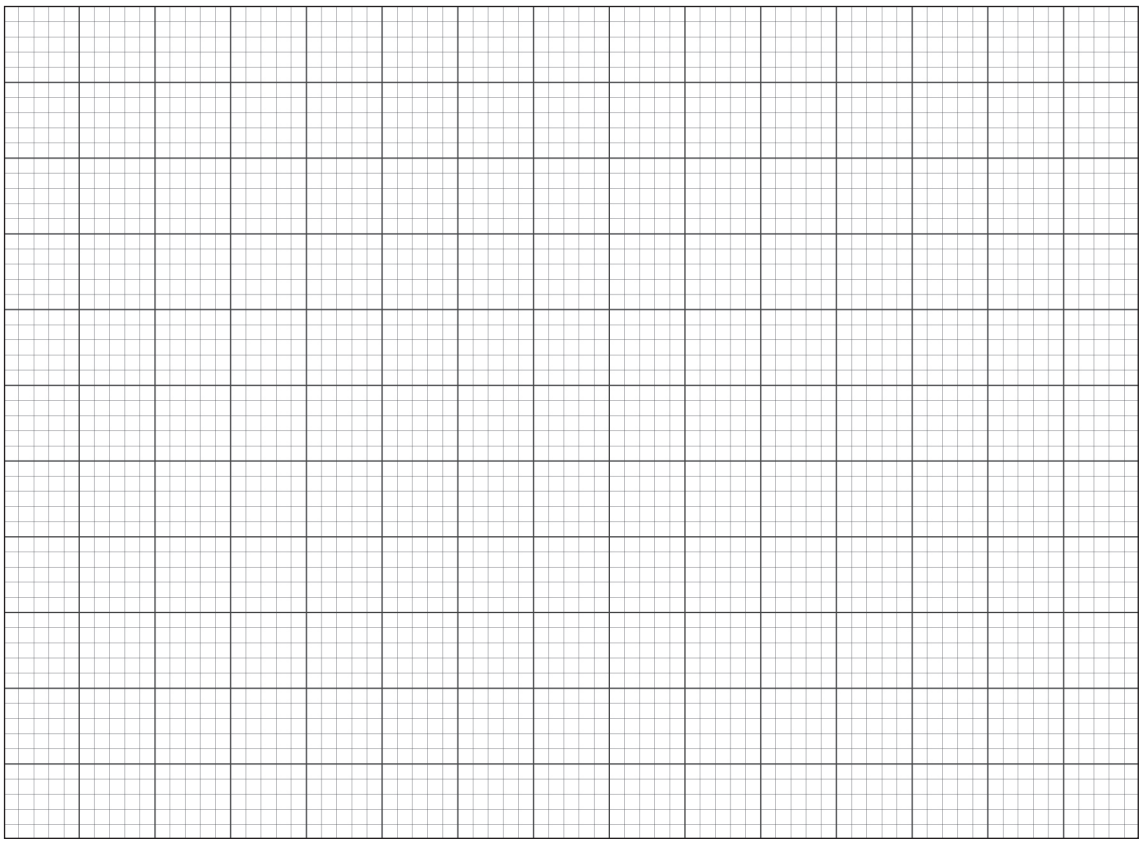
Question 22 **(12 marks)**

Fish larvae are found near the beginning of many marine food webs. A group of students were investigating fish larvae activity and recorded their observations in the table below.

The method they employed was to collect 10 fish larvae, place them in an aquarium that was temperature regulated and observe their activity. They set the aquarium temperature and let the fish larvae adjust to the new temperature before they observed larvae activity at each new temperature. Each observer scored the activity level and then an average of the activity levels were calculated. These average scores were used as the larval activity level for that temperature. (Before the students started observations they agreed on what the larvae would be doing for each level of activity.)

Water temperature (°C)	Activity level (arbitrary units)
15	3
20	18
25	25
30	22
35	2

(a) Graph these results on the grid provided below. (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.

See next page

(b) Write an hypothesis that the students may have been investigating in this experiment. (2 marks)

(c) List **two** variables the students should have controlled in this experiment. (2 marks)

(d) Name **one** way in which the reliability of this experiment could be improved and explain how this would improve the reliability. (3 marks)

Question 23 **(9 marks)**

Scientists are worried about the rise in seawater temperature and its effect on coral. Research was carried out on the Myrmidon Reef from November 2015 to April 2016.

Figure 1 shows the relationship between water temperatures and coral bleaching while Figure 2 shows the water temperature at the same location.

The bleach threshold is the combination of temperature and duration at which coral bleaching commences.

Figure 1

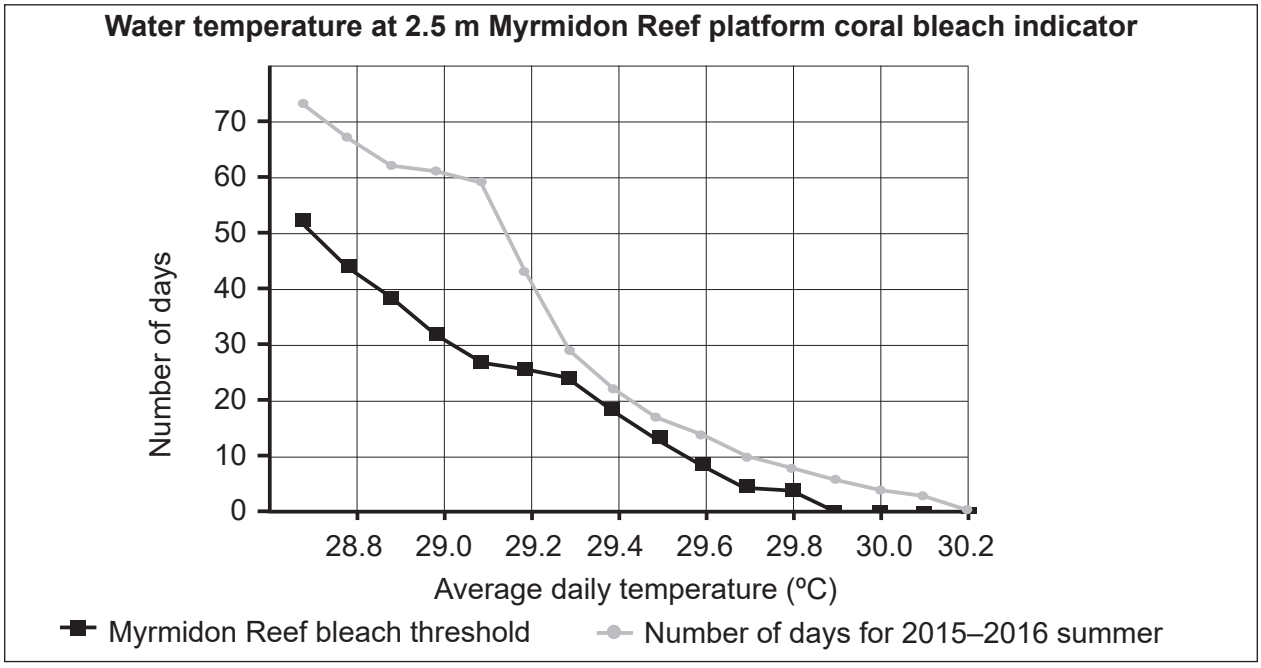
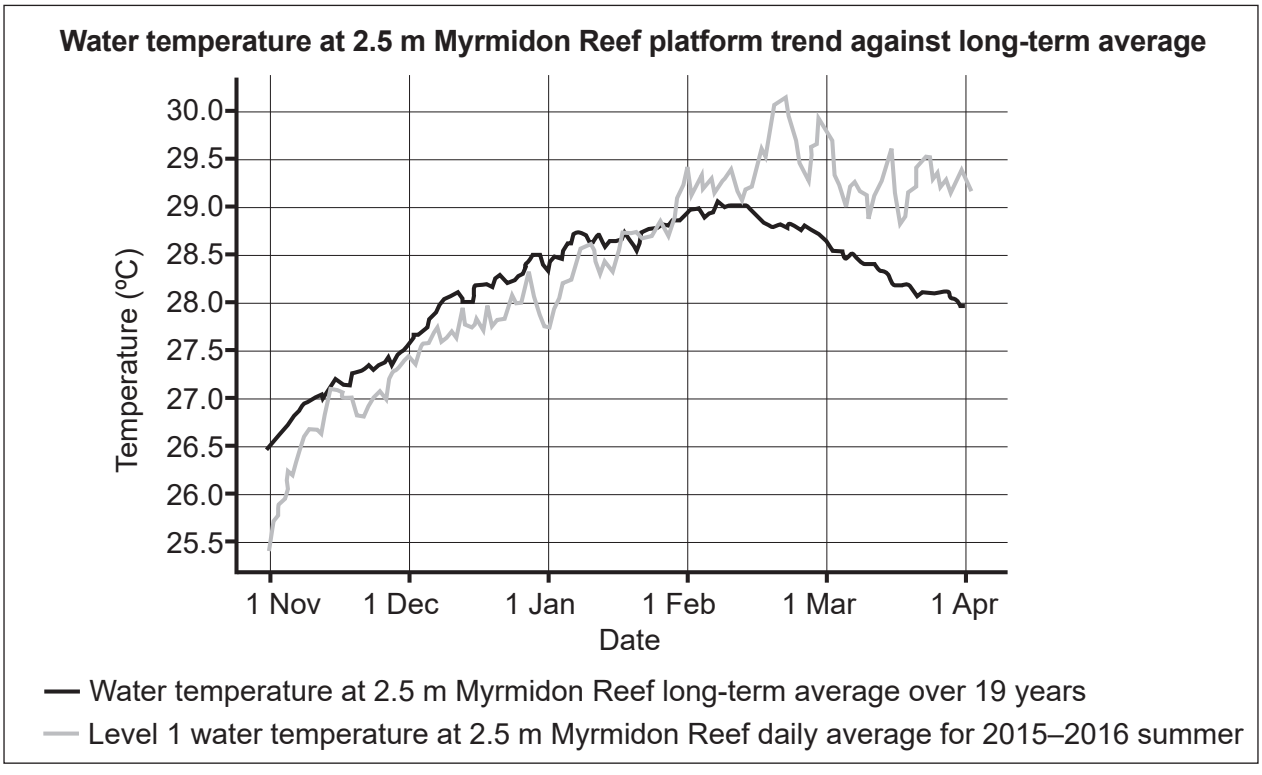


Figure 2



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Use data from both of these figures to answer part (a) and part (b).

(a) Predict what you would expect to occur to the coral from 1 February to 1 April. (1 mark)

(b) Explain why you have made the prediction in part (a). (3 marks)

(c) Outline the process of coral bleaching leading to polyp death. (5 marks)

See next page

Question 24 **(9 marks)**

Biosecurity is extremely important in Australia. In the aquatic environment this can be difficult to ensure and police. The Australian federal and state governments have legislation to prevent the introduction of foreign (introduced) species.

(a) Define an introduced species. (1 mark)

(b) Why is it important to prevent introduced species from entering the marine environment as a whole? (1 mark)

(c) If an introduced species is discovered, list **three** steps the authorities could take to prevent it from spreading? (Do **not** use the examples given in part (d) of this question.) (3 marks)

See next page

Read the scenario below and answer parts (d) and (e).

White Spot Disease (WSD) is a virus found in prawn populations in many parts of Asia and has now been discovered in Queensland commercial prawn growing ponds and a nearby river. While it poses no known problem to humans, it rapidly infects and kills prawns and other crustaceans and can wipe out whole prawn growing ponds in a few days. It is transmitted by:

- direct contact with infected prawns
- birds carrying infected prawns to another pond
- water carrying the virus contaminating another region.

It is not yet found in Western Australia, but if it did get into our waters it could not only infect prawns but a number of other crustaceans such as crayfish, yabbies, marron and crabs.
After WSD was found in some Queensland prawn ponds, the Department of Fisheries (Western Australia) took several precautions. These include:

- the banning of imports of prawn material unless certified clean by the authorities
- asking fishers not to use food grade prawns as bait
- requesting members of the public to retain potentially infected prawns in the freezer and notifying the Department of Fisheries.

(d) State **one** way in which each of these actions could assist to stop the spread of WSD into Western Australia.

(i) banning the import of prawns (1 mark)

(ii) not using food grade prawns as bait (1 mark)

(iii) notifying the Department of Fisheries of any suspected cases of WSD (1 mark)

It is legal to use prawns that are not fit for human consumption as bait.

(e) Give **one** reason for these prawns not being included in this prawn ban. (1 mark)

See next page

Question 25 **(13 marks)**

You have some friends who are new to snorkelling and you are telling them what and how to do things safely so they can enjoy snorkelling. As part of this process you are showing them how to prepare a new mask before using it.

(a) Outline the processes needed to prepare a newly purchased mask before using it for the first time. (2 marks)

After two dives one of your friends is complaining about having sore ears each time she does a duck dive. She wants to know why this happens.

(b) Explain with the aid of diagram(s), what is occurring to cause this pain in the diver's ears. (5 marks)

(c) List **two** methods a person snorkelling can use to try to prevent this pain. Explain how these methods work. (4 marks)

(d) (i) Give **one** advantage of using a mask when snorkelling. (1 mark)

(ii) Give **one** limitation of using a mask when under water. (1 mark)

See next page

Question 26 **(10 marks)**

Along the coast of Western Australia there are a number of shipwrecks. Some have been found and identified while others are yet to be located. It was claimed recently that the wreck of the *Zeewijk*, which has been investigated extensively, could actually be two wrecks.

This claim is based on the suggestion that there are too many cannons at the wreck site.

(a) How could the actual number of cannons that should be on the identified wreck site be determined? (1 mark)

(b) At the wreck site, describe what needs to be done to locate and identify the cannons that are present. (2 marks)

(c) Give **one** conclusion that can be made for each of the following situations if

(i) the number of cannons at the wreck site matches the *Zeewijk*? (1 mark)

(ii) the number of cannons at the wreck site does **not** match the *Zeewijk*? (1 mark)

(d) If the cannon tally at the wreck site is greater than that shown in known records, what **five** actions could be taken to draw the conclusion that there are two wrecks? (5 marks)

End of Section Two

See next page

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

This section contains **four (4)** questions. You must answer **two (2)** questions. Write your answers on the lined pages provided following Question 30.

Supplementary pages for the use of planning/continuing your answer to a question have been 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)**

Throughout Western Australia (and in many other locations around Australia) there are tourist interactions with whales, dolphins, whale sharks and a number of other animals. Many of these animals are considered vulnerable and are protected by legislation. Care is taken to ensure interactions with these animals is such that there is a minimal impact upon them. The Parks and Wildlife Service has a set of rules to be adhered to by everybody who interacts with these animals.

(a) List **four** rules governing human behaviour around whales or whale sharks (especially those rules to be followed by tour operators) and discuss how these rules impact human interaction with these animal(s). (8 marks)

Western Australia has a number of fisheries that are controlled to maintain their viability for either commercial and/or recreational fishers. The Department of Fisheries has a policy called ‘Fish for the Future’. This involves a number of management methods to ensure that all fisheries are maintained. Some controls involve areas of water and others set rules governing specific fish species.

(b) Name **one** method of fishery management involving a volume or area of water and describe how this can help a fishery to remain viable. (3 marks)

(c) Name **two** fishery management methods that involve a species directly and describe how each method can help that fishery remain viable. (6 marks)

(d) Name **one** method that is used by the Department of Fisheries to monitor species stocks in a fishery and describe a problem with this monitoring method. (3 marks)

See next page

Question 28 **(20 marks)**

As part of your work as a young marine archeologist, you are given a concretion recovered from the wreck site of a vessel believed to be a Dutch East Indiaman. It feels too heavy to be only rock and so it is thought to contain some other material(s).

(a) Describe the processes to be undertaken from prior to the recovery of the concretion from the wreck site through to its recovery and analysis to identify the type and condition of any objects within it. (8 marks)

After this initial analysis of the concretion you suspect that the objects are made of silver or iron.

(b) Describe the steps to be taken to prepare and preserve these objects for display. (8 marks)

(c) Explain what you would do if the metal objects were found to be so corroded that they could not be prepared for display. (4 marks)

Question 29 **(20 marks)**

Surfers Paradise and a number of other cities built along the coast are potentially at risk due to the enhanced greenhouse effect (global warming). Surfers Paradise is built on sand beaches and sand dune areas.

(a) Draw a labelled diagram(s) of a beach area in which a 'sand budget' is in equilibrium. (5 marks)

(b) Describe **three** reasons why cities such as Surfers Paradise are at possible risk due to the enhanced greenhouse effect (global warming). (6 marks)

(c) Name **three** engineering solutions and outline how each might reduce the impact of the enhanced greenhouse effect (global warming) on cities such as Surfers Paradise. (9 marks)

See next page

Question 30 **(20 marks)**

It is proposed to build a new port in a sheltered sound that is a known breeding area and nursery region for a variety of marine animals such as whiting, snapper, mussels and seals.

This major project would involve dredging a deep channel from the open ocean to the wharf area for ships to berth, installing a series of buoys and beacons along the channel and building associated land based wharves and structures.

(a) Describe **three** problems that dredging a channel might create for the surrounding abiotic environment. (6 marks)

(b) Explain what effects this dredging could have on the biomass pyramids (food chains and webs) based in this sound. (5 marks)

Once the port is built and in use, a number of problems could arise due to vessel movements and port operations.

(c) Identify **three** potential pollutants, their sources and what management actions could be taken to reduce their impact. (9 marks)

End of questions

Question number: _____

Question number: _____

Question number: _____

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Supplementary page

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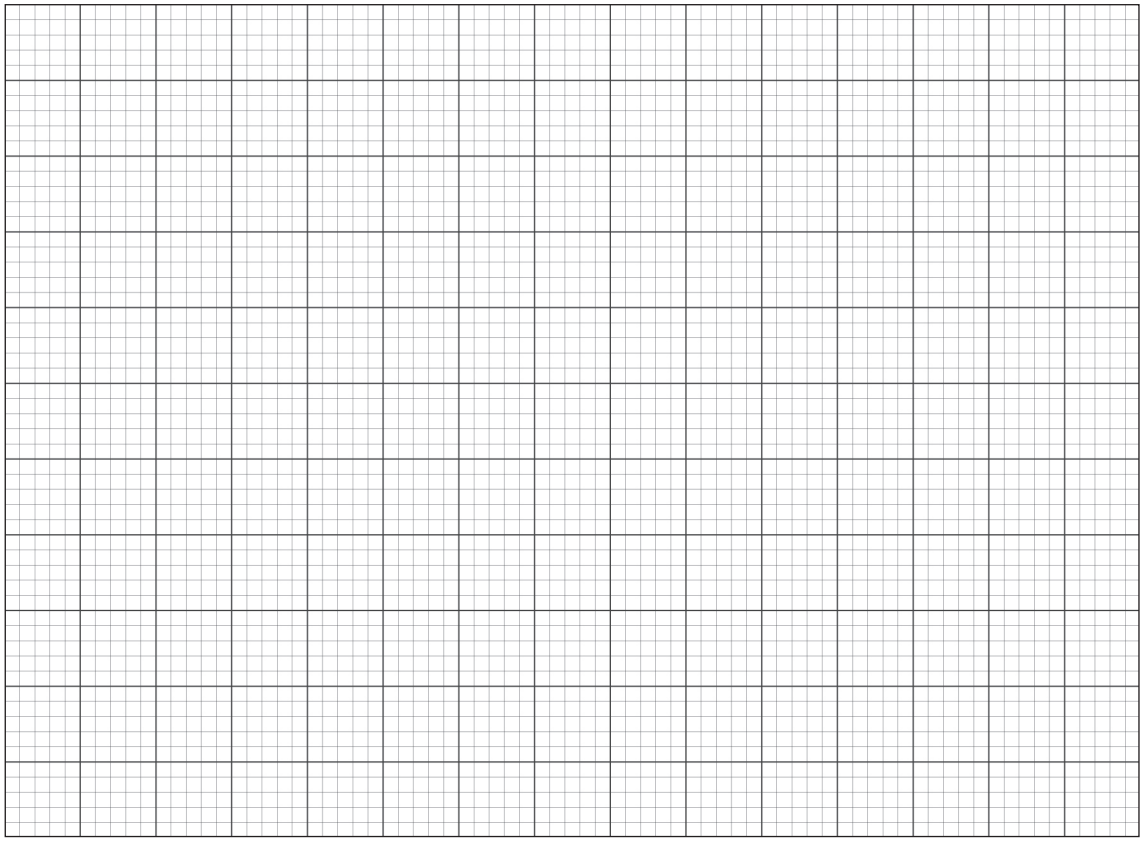
Supplementary page

Question number: _____

Spare grid



ACKNOWLEDGEMENTS

Question 21 Diagram: Oceanic and coastal currents of Australia. Adapted from 'Australian barnacles (Cirripedia: Thoracica), distributions and biogeographical affinities', by D. Jones, 2012, *Integrative and Comparative Biology*, *52*(3), p. 367. Retrieved July, 2017, from https://www.researchgate.net/publication/230666486_Australian_Barnacles_Cirripedia_Thoracica_Distributions_and_Biogeographical_Affinities © CSIRO

Question 23(a) Graphs adapted from: Australian Institute of Marine Science (AIMS). (2017). *Myrmidon Reef coral bleaching risk indicators and summer sea water temperature for 2015–16*. Retrieved January, 2017, from http://data.aims.gov.au/aimsrtds/coralbleaching.xhtml?fromDate=2015&dataLevel=1

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