



ATAR course examination, 2019

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: 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.

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	7	7	90	98	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 2019*. 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. 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. Which ocean current is **best** described as flowing south from areas of low salinity to areas of high salinity?
 - (a) Leeuwin
 - (b) West Australian
 - (c) South Equatorial
 - (d) Circumpolar

2. The increase in ocean acidification over the last fifty years has seen the pH shift from what pH to a new pH?
 - (a) 7.1 to 6.0
 - (b) 8.2 to 8.1
 - (c) 5.2 to 6.2
 - (d) 6.5 to 7.6

3. When entering the water with a moderate swell to start a snorkel or scuba dive from shore, which of the following recommendations would be **most** suitable? Stay
 - (a) negatively buoyant to get to the bottom as quickly as possible.
 - (b) positively buoyant to maintain surface positioning.
 - (c) negatively buoyant to lessen the effect of waves.
 - (d) neutrally buoyant to be ready for changing conditions.

4. Divers can be towed by a number of techniques. Which of the following techniques will allow the fastest swimming by enabling both divers to fin at the same time?
 - (a) underarm
 - (b) leg
 - (c) tank
 - (d) jaw

See next page

5. In 1816, the ship *Correio da Azia* struck Ningaloo Reef because of inadequate navigational ability and sank to a depth of three metres.

The **best** method for locating this wreck today would be by the use of

- (a) magnetometer.
 - (b) historical records.
 - (c) sonar.
 - (d) aerial survey.
6. Formation of algal blooms and the subsequent reduction in oxygen levels in waterways is called
- (a) nitrification.
 - (b) hypotrophication.
 - (c) eutrophication.
 - (d) phosphate contamination.
7. This image by the artist Robert Cleworth, entitled '*Memento Mori – Two Hands*' (2017), depicts two hands on a blue background. This was inspired by the lead mutineer on the *Batavia*.



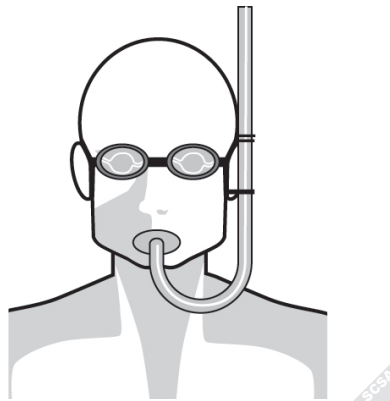
To whom did the painter assume the hands belonged?

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

8. The Ships of Opportunity program uses a combination of volunteer commercial and research vessels to collect measurements related to physical, chemical and biological oceanography and ecology. Which of the following would **not** be suitable to be recorded on these vessels?
- (a) temperature profiles of the oceans surrounding Australia using high-resolution repeat lines samples
 - (b) partial pressure of CO₂ measured in surface seawaters
 - (c) samples of plankton, by trapping them on a spool of silk
 - (d) measuring pelagic fish movements in a set area with acoustic tag technology
9. Users breathing in air through a snorkel may inhale air that wasn't removed from the snorkel during the previous breath, despite the snorkel being open to the air. A snorkel's dead space can increase by adding even more air in the snorkel that doesn't contribute to complete gas interchange.
- This 'dead space' of a snorkel can be reduced by
- (a) increasing the volume.
 - (b) increasing the bore width.
 - (c) decreasing the number of corrugations.
 - (d) decreasing the length.
10. Surface blackout, or surface samba, is a freediving condition in which a diver will black out on the surface during or just after the first inhalation upon surfacing. This is caused by which of the changes below?
- (a) decreasing partial pressures of oxygen to the brain
 - (b) decreasing partial pressures of oxygen to the lungs
 - (c) increasing partial pressures of oxygen to the brain
 - (d) increasing partial pressures of oxygen to the lungs
11. Wetsuits help to reduce heat loss in water. Traditionally, scuba divers wear closed-cell suits that are lined. Freedivers tend to use open-cell suits. These are thinner, have no lining and fit closer to the skin. An advantage of open-cell suits is that they
- (a) increase movement of water between the skin and water.
 - (b) are easier to put on and take off.
 - (c) provide more warmth at greater depths.
 - (d) require fewer weights to achieve neutral buoyancy.
12. Which of the following statements is **true** with regard to Archimedes' Principle?
- (a) Archimedes' Principle applies only to liquids and acts at the centre of the mass of the displaced liquid.
 - (b) If the weight of the fluid displaced is less than the weight of the object, the object will sink.
 - (c) When an object is immersed in a liquid, the liquid exerts a downward force, which is known as the 'buoyant force'.
 - (d) When submarine tanks are emptied of water, the weight of the submarine increases by comparison with the weight of the water displaced and the submarine surfaces.

See next page

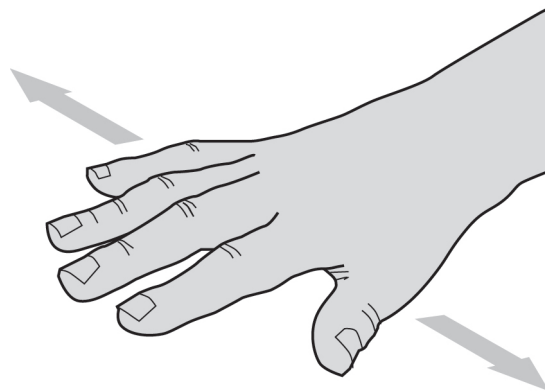
13. Which of the following would have the **least** effect on coral reefs in Australia?
- (a) land-based run off
 - (b) plastic in waterways
 - (c) sewage release
 - (d) sediment and nutrient release
14. If an object has a volume of 100 litres and is neutrally buoyant in saltwater, its weight would be
- (a) 97 kg.
 - (b) 100 kg.
 - (c) 101.3 kg.
 - (d) 103 kg.
15. Carbon dioxide poisoning occurs when the partial pressure of carbon dioxide in the air we breathe increases. What effect is usually the first sign of this?
- (a) drowsiness
 - (b) mild narcosis
 - (c) reduced hearing
 - (d) muscle tremors
16. The diagram below shows a diver wearing **incorrect** eye protection.



- This eye protection is likely to cause what sort of physiological disease?
- (a) barotrauma
 - (b) gas narcosis
 - (c) gas embolism
 - (d) gas toxicity
17. The problem affecting river mouths subject to sand erosion and drift are **best** addressed by
- (a) physical barriers.
 - (b) a sand bypass system.
 - (c) an artificial reef.
 - (d) a canal.

See next page

18. Which of the following would be **least** likely to contribute a dive mask fogging?
- (a) temperature of air inside and outside the mask
 - (b) relative humidity of air inside the mask
 - (c) skin temperature of the face
 - (d) breathing out through the nose
19. The Recreational Scuba Training Council has a standardised set of hand signals. What would the following signal indicate?



- (a) level off at this depth
 - (b) take it easy
 - (c) end the dive
 - (d) dangerous situation
20. Methods for locating underwater wrecks are subject to continuous improvement. The search for the wrecks of lost aeroplanes has seen many innovative techniques being tried. If one plane was lost in deep water and was largely made of aluminium, which technique may prove to be **most** successful?
- (a) a magnetometer to look for large amounts of ferrous materials
 - (b) underwater microphones to listen for underwater sound waves
 - (c) surveillance from aircraft
 - (d) observations of people who saw the plane crash

End of Section One

See next page

Section Two: Short answer

50% (98 Marks)

This section has **seven** 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

(12 marks)

The 'Australian National Guidelines for Whale and Dolphin Watching 2017' are underpinned by ethical guidelines.

- (a) Give **two** ethical behaviours humans can demonstrate within areas occupied by cetaceans. (2 marks)

- (b) Identify **three** rules relating to vessels' 'no approach zones' for dolphins and for each rule state how it is considered ethical. (6 marks)

- (c) Describe **two** ways in which the guidelines maintain the sustainability of the dolphin tourism industry. (4 marks)

Question 22

(12 marks)

Snorkelling requires equipment that allows it to be conducted safely and enjoyably.

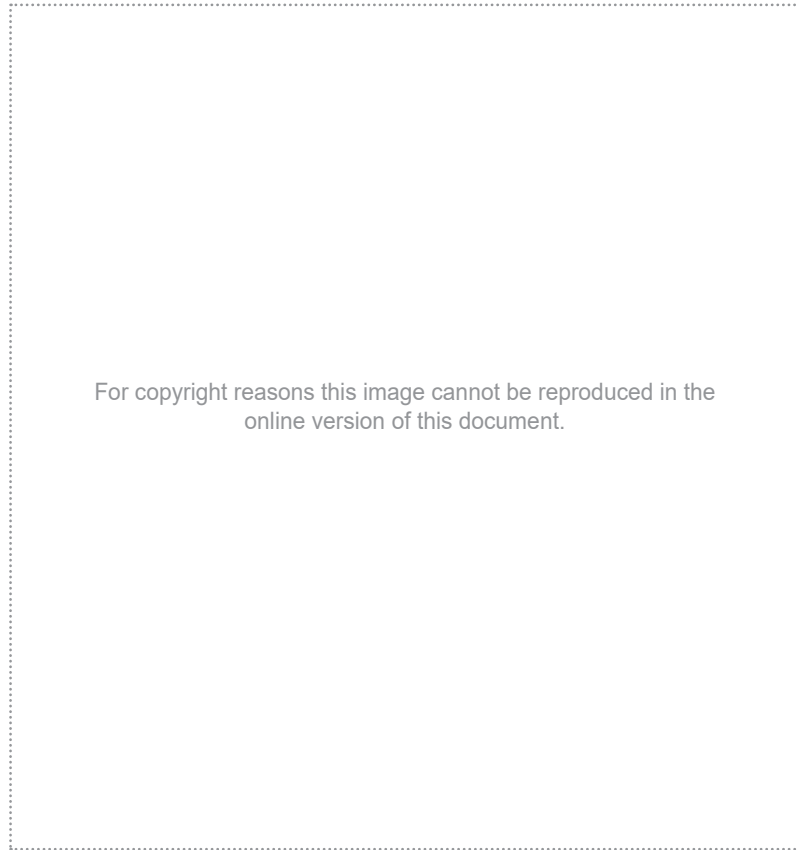
Complete the following table by naming **four** items of snorkelling equipment. For each item listed, state why it is required for snorkelling and how it is used when snorkelling.

Item	Why it is required for snorkelling	How it is used when snorkelling

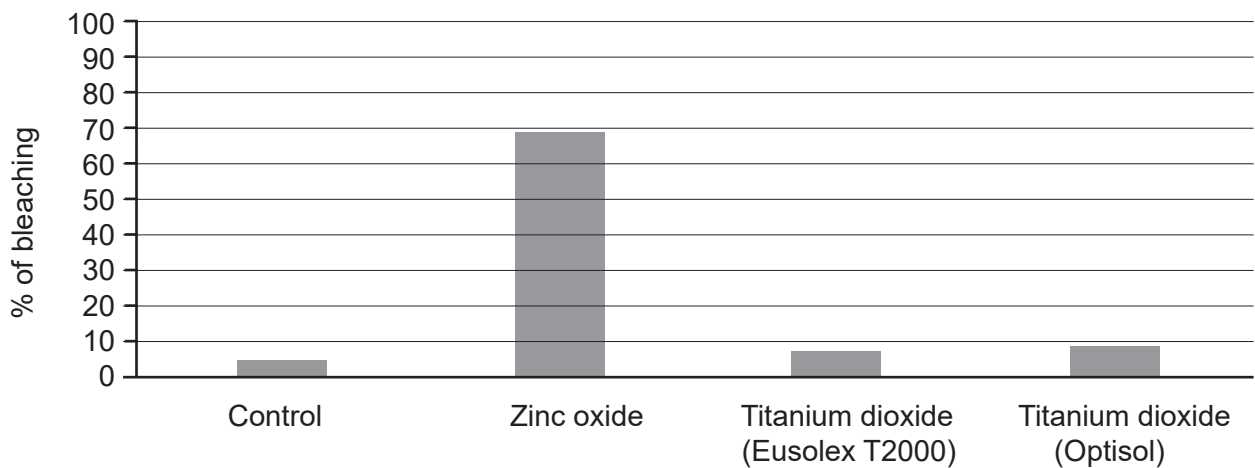
See next page

Question 23**(13 marks)**

The following images show the effects of zinc oxide and titanium dioxide on Acropora corals. Both are found in sunscreens used by beachgoers to reduce the effects of the sun's rays. These sunscreens wash off and remain in the ocean. The two oxides have varying effects on corals.



The scientists investigating the effects produced the following graph of their results.



- (a) Give a title for the graph above. (2 marks)

See next page

Question 23 (continued)

- (b) Propose an hypothesis for the experiment on which this graph is based. (2 marks)

- (c) List **three** variables the scientists should have controlled while obtaining their data. (3 marks)

- (d) Explain how the control coral increases the reliability of the experiment. (3 marks)

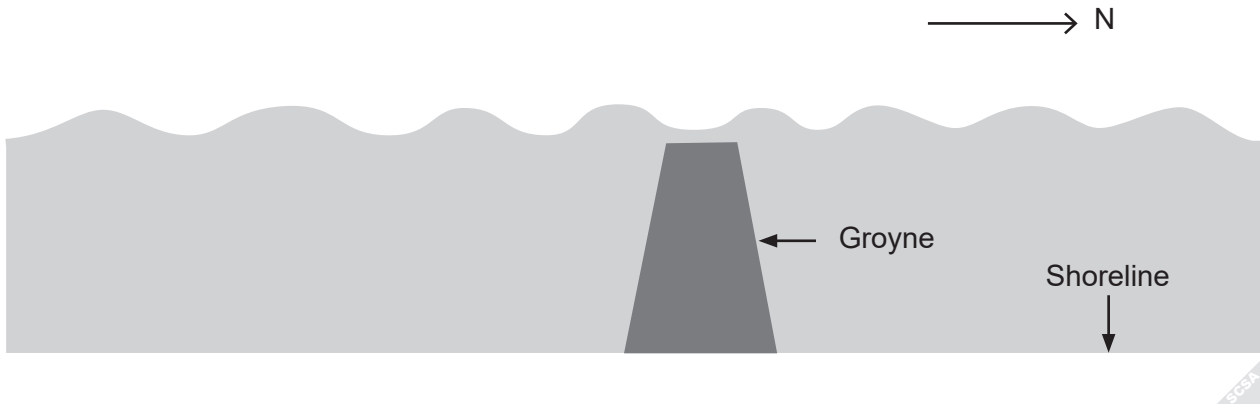
If the sunscreens are removed from the environment before excessive damage is caused, the coral may recover.

- (e) Explain the process that occurs when a coral recovers from bleaching. (3 marks)

Question 24

(10 marks)

The diagram below represents a shoreline and a coastal groyne.



- (a) On the diagram, show with a labelled arrow the direction of the prevailing south westerly wind. (1 mark)
- (b) On the diagram, show with a labelled arrow the direction of longshore drift resulting from the prevailing wind. (1 mark)
- (c) On the diagram, draw and label areas of erosion and deposition. (4 marks)
- (d) Describe how the length of the groyne could affect the erosion and accretion of sand. (4 marks)

Question 25

(12 marks)

Define the following terms used in relation to the protection of marine environments. For each, state how it benefits a fishery.

(a) State marine parks. (3 marks)

(b) Commonwealth-protected areas. (3 marks)

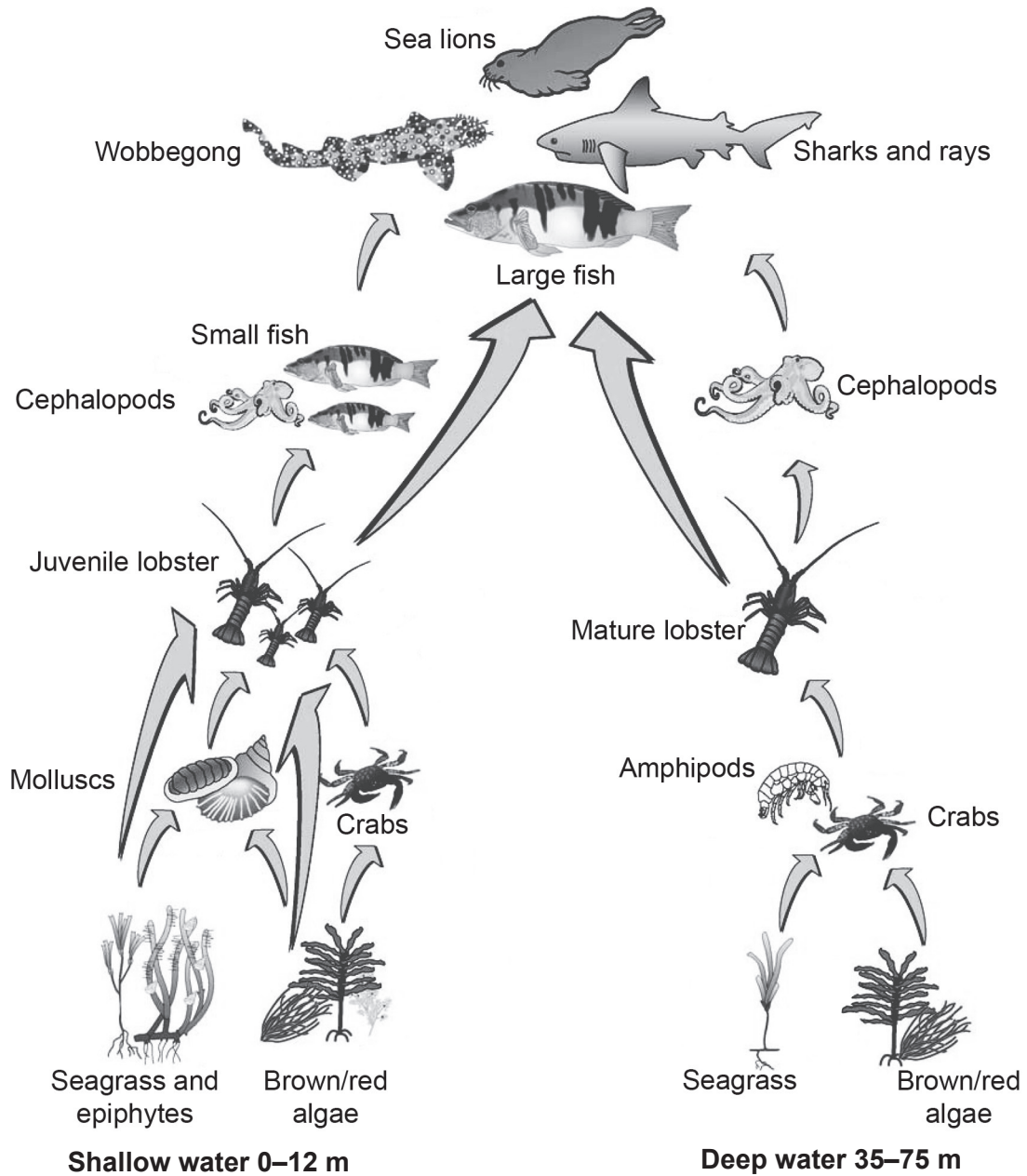
(c) Fish habitat-protected areas. (3 marks)

- (d) Explain the role of scientific research in assisting governments to decide on strategies for maintaining sustainable fisheries. (3 marks)

Question 26

(16 marks)

The following is a food web for a Western Australian marine environment.



(a) What do the arrows in the food web indicate?

(2 marks)

- (b) Draw a biomass pyramid for the shallow water section of the food web. (4 marks)

The juvenile lobsters in the diagram form part of a life cycle that involves zooplankton.

- (c) What type of plankton spend only part of their life cycle as plankton? (1 mark)

See next page

Question 26 (continued)

- (d) Describe how planktonic Western Australian rock lobster populations are measured by scientists and then used to determine their likely abundance in future years. (3 marks)

- (e) Explain the seasonal patterns that are seen among Western Australian rock lobster, describing how the lobster are dispersed in the environment. (6 marks)

Question 27

(23 marks)

(a) Explain the term 'refraction'.

(3 marks)

(b) Complete the table below by drawing the refraction of light as it:




(i) enters the eye in air

(ii) enters the eye underwater without a mask

(iii) enters the eye underwater with a mask.

(iv) Explain the role of the mask in allowing clear water vision.

(12 marks)

	Refraction in air	Refraction underwater without a mask	Refraction underwater with a mask
Diagram			
Explanation	<p>(iv)</p>		

(c) Describe why a mask full of water prevents the diver from seeing clearly.

(2 marks)

Question 27 (continued)

- (d) Identify the steps to be followed to clear a partially-flooded mask and state why each step is conducted. (6 marks)

End of Section Two

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 31.

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 28**(20 marks)**

Research scientists from the Australian Institute of Marine Science (AIMS) believed a shipwreck was located off Western Australia's northern coastline.

- (a) Describe **four** steps that could have been followed to locate the site of this wreck. (8 marks)

In 2018, a large shipwreck was found off Western Australia's northern coastline. The ship appeared to be resting upright 60 metres under the surface, and is 37 metres long and 7 metres wide.

- (b) Describe **three** steps that scientists would be able to follow to explore the site before excavating and salvaging items. (6 marks)

Iron anchors found on shipwrecks are valuable in identifying them and giving indications of their history.

- (c) Identify the steps scientists would follow to recover an anchor and the method they would use to prepare it for transport to a laboratory. (6 marks)

Question 29**(20 marks)**

The enhanced greenhouse effect is a well-accepted phenomenon among most scientists.

- (a) Using diagrams, explain the enhanced greenhouse effect. Include how anthropogenic changes have resulted in this phenomenon. (8 marks)

The impacts of the enhanced greenhouse effect vary in the world's oceans.

- (b) Explain the thermohaline current and how the enhanced greenhouse effect is impacting on this current. (5 marks)
- (c) Explain the impact that the enhanced greenhouse effect is having on marine habitats and coastal communities. (7 marks)

See next page

Question 30**(20 marks)**

The National System for the Prevention and Management of Marine Pest Incursions includes a database of information about organisms that can assist in identification and management of pests.

- (a) Describe **five** types of information about the organisms that may be found in the National System and why they are useful in its management. (10 marks)

The Australian Government has a Biosecurity Incident Management System, which has three phases of operations for responding to an introduced pest. These assist in minimising the pest's spread and impact. These three phases are:

- investigation and alert phase
- operational phase
- stand-down phase.

- (b) Describe what would happen at each phase and how it would minimise the spread and impact of a pest. (10 marks)

Question 31**(20 marks)**

An Australian State Government is considering sinking old train carriages to act as artificial reefs off the coast of that State. This is being discussed by various groups with some positive and negative benefits being identified.

- (a) Old train carriages may contain traces of petroleum oil and heavy metals. Describe **two** impacts each of these pollutants have on marine organisms. (4 marks)

- (b) Describe **two** detrimental impacts, other than the presence of petroleum and heavy metals, that a train carriage artificial reef might have on local reefs. (4 marks)

- (c) Describe **six** positive impacts that the artificial reefs in general might have on local reef communities. (12 marks)

ACKNOWLEDGEMENTS

- Question 7** Image from: Cleworth, R. (2016). *Memento mori – two hands* [Painting]. Retrieved May, 2019, from http://www.lwgallery.uwa.edu.au/__data/assets/pdf_file/0010/3052378/Batavia-Exhibition-Media-Release.pdf
- Question 8** First paragraph (first sentence) from: Integrated Marine Observing System (IMOS). (n.d.). *Ships of opportunity*. Retrieved May, 2019, from <http://imos.org.au/facilities/shipsopportunities/>
- Question 19** Image from: Southwood, P. (2011). [...] [Image]. Retrieved May, 2019, from [https://en.wikipedia.org/wiki/Diver_communications#/media/File:Dive_hand_signal_...\].png](https://en.wikipedia.org/wiki/Diver_communications#/media/File:Dive_hand_signal_...].png)
Used under Creative Commons Attribution-ShareAlike 3.0 Unported licence
- Question 23** Image from: Corinaldesi, C., Marcellini, F., Nepote, E., et al. (2018). Impact of inorganic UV filters contained in sunscreen products on tropical stony corals (*Acropora* spp.). *Science of the total environment*, 637–638, p. 1282, fig. 2. Retrieved May, 2019, from [https://www.researchgate.net/profile/Cinzia_Corinaldesi/publication/32534\[...\]](https://www.researchgate.net/profile/Cinzia_Corinaldesi/publication/32534[...)
- Question 26** Food web from: MacArthur, L., Hyndes, G., & Babcock, R. (2007). *Western rock lobster in ecosystem processes of south-western Australia* (p. 24, fig. 4). Retrieved May, 2019, from https://pdfs.semanticscholar.org/5ef7/68085fe8e19257f94fe87b14d21b1a41a1a1.pdf?_ga=2.168026081.1739811717.1558313023-264629132.1558313023
- Question 28(b)** Introductory paragraph adapted from: Parke, E. (2018, April 17). *Mystery shipwreck found off West Australian coast a thrill for mapping team*. Retrieved May, 2019, from <https://www.abc.net.au/news/2018-04-17/mystery-shipwreck-found-off-pilbara-coast/9663740>
- Question 30(b)** Introductory paragraph information from: Department of Agriculture and Water Resources. (2012). *Biosecurity incident management system* (p. 6). Retrieved May, 2019, from <https://www.marinepests.gov.au/sites/default/files/Documents/biosecurity-emergency-management-bimg.pdf>
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- Question 31** First paragraph information from: Caldwell, F. (2019, February 1). *Government considers sinking old trains for a rollingstock reef*. Retrieved May, 2019, from <https://www.brisbanetimes.com.au/politics/queensland/government-considers-sinking-old-trains-for-a-rollingstock-reef-20190201-p50v5a.html>

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