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

ATAR course examination, 2018

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: 18-044

2019/3972
Web version of 2018/54498

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	97	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 2018*. 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.

   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 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.

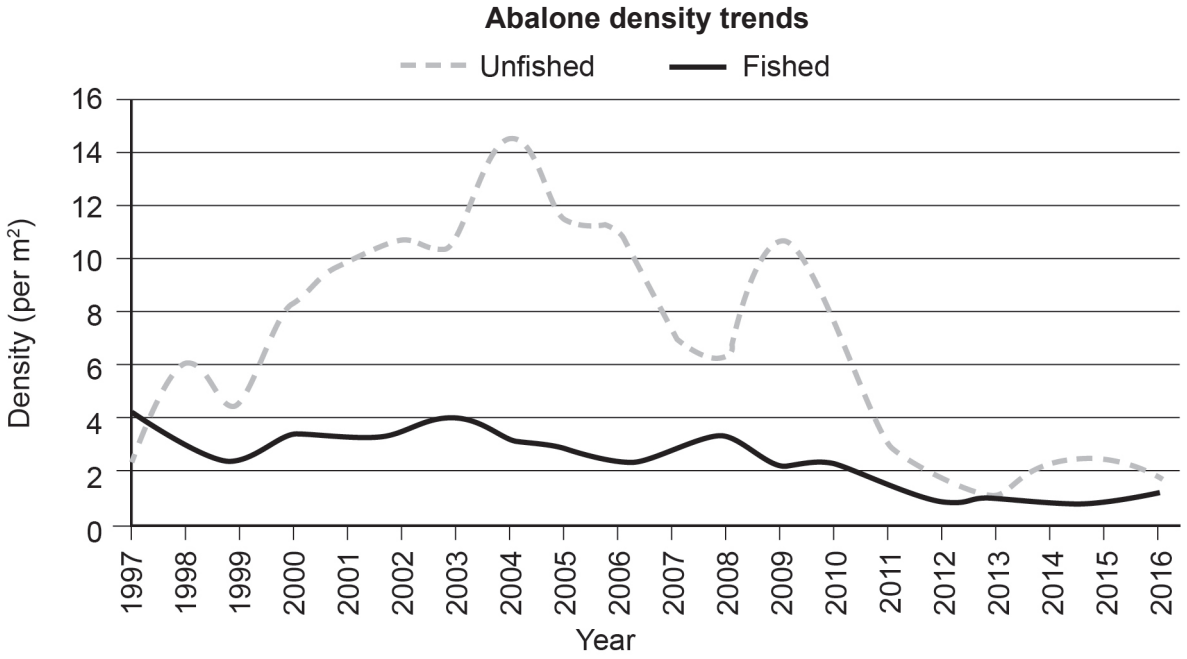
See next page

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. 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.

Questions 1 and 2 refer to the graph below.



1. The above graph of abalone density in the Perth region shows changes over the years. The **most** likely way used to measure abalone density was by which method?

   (a) line transect
   (b) Baited Remote Underwater Video
   (c) ideography
   (d) light traps

2. The graph shows the differences in density on reefs that are fished for abalone, compared to those on which no fishing occurs. From this graph, the **biggest** cause of abalone number differences on Perth reefs would be

   (a) habitat removal.
   (b) abiotic factors.
   (c) biotic factors.
   (d) fishing pressure.

See next page

3. The pressure of a gas changes with depth. This becomes increasingly important to divers to prevent the formation of all the following **except** which associated injury?

(a) barotrauma
(b) embolism
(c) hypothermia
(d) gas narcosis

4. Which of the following in the marine environment is **most** likely to have the biggest effect on all of the following?

- air quality
- surface and benthic organisms
- ocean and shoreline
- short- and long-term effect

(a) heavy metals
(b) petroleum oil
(c) plastics
(d) carbon dioxide

5. Which of the following would be **least** effective in remedying eutrophication?

(a) using booms in the affected area
(b) treating sewage
(c) providing buffer zones between land and waterways
(d) using low nitrogen based fertilisers

6. A piece of wood, with a volume of 0.008 m^3, floats in a freshwater river so that none of it is above the water. If the water it is floating in has a density of 1000 kg/m^3, determine the weight of the piece of wood.

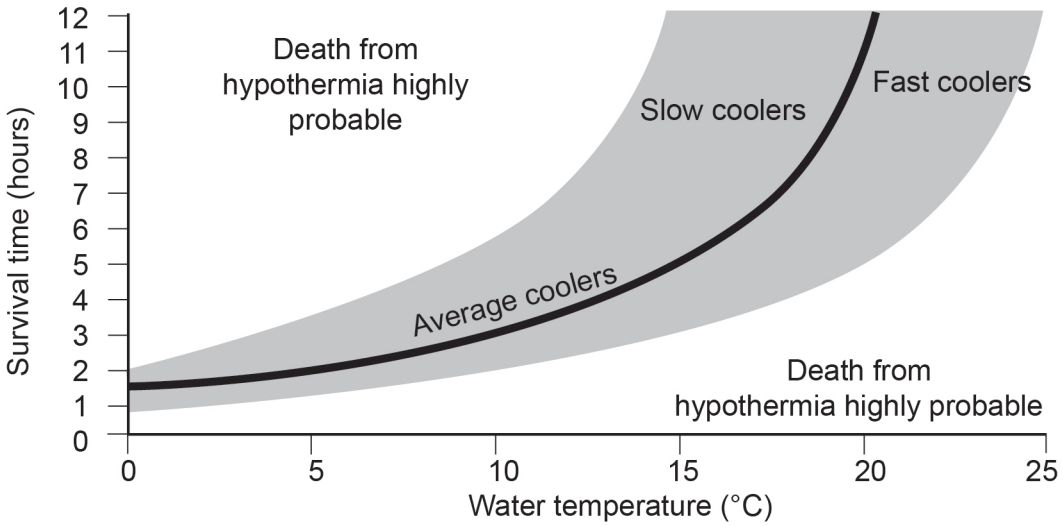
(a) 8 kg
(b) 0.8 kg
(c) 125 kg
(d) 12.5 kg

7. The large-scale ocean circulation driven by global density gradients from salinity and temperature that carries both energy and matter is **most** likely to be called

(a) upwelling.
(b) downwelling.
(c) hydrothermal current.
(d) thermohaline current.

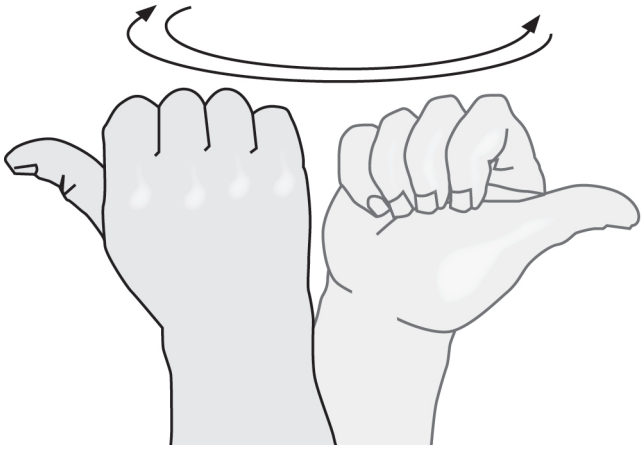
See next page

8. The graph below indicates the survival times for different human body types in various water temperatures. Which of the following conclusions **best** fits the results?



(a) Slow coolers have a survival time of twice the number of hours compared with fast coolers.
(b) Fast coolers cool at twice the rate of slow coolers.
(c) At lower temperatures, slow coolers have a survival time twice that of an average cooling person.
(d) Slow coolers have a higher rate of deaths from hypothermia than fast coolers.

9. What does the following underwater hand signal indicate?

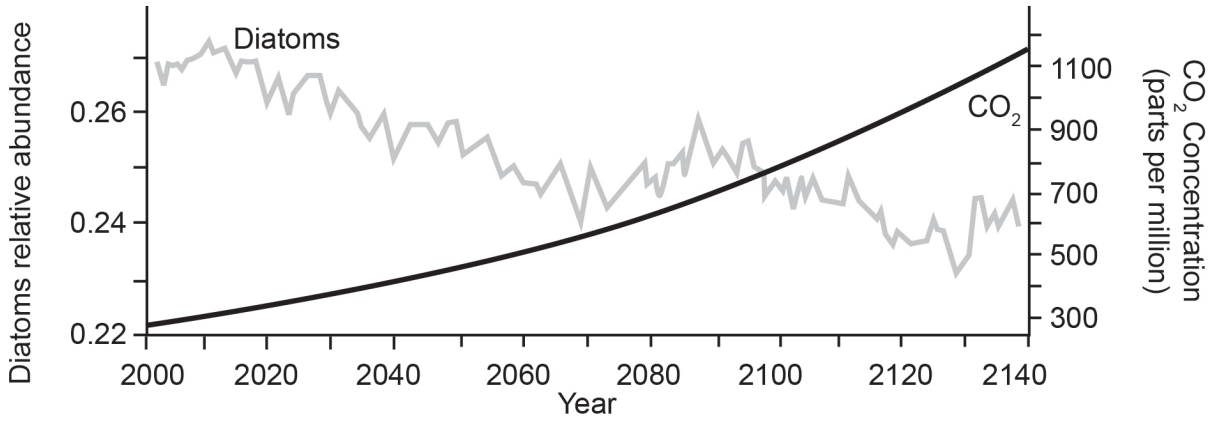


(a) Swim left then right.
(b) Which way should we go?
(c) Go up as soon as possible.
(d) How much air do you have?

See next page

10. The following question relates to this graph.

Relative abundance of diatoms and CO_2 concentration over time



The graph shows the predicted relative abundance of diatoms, a relatively large phytoplankton.

This abundance is **most** likely due to which of the following?

(a) increased ocean temperature and increased stratification of the oceans
(b) decreased ocean temperature and increased stratification of the oceans
(c) increased ocean temperature and decreased stratification of the oceans
(d) decreased ocean temperature and decreased stratification of the oceans

11. The Marine Stewardship Council (MSC) is an International not-for-profit organisation founded in 1996. It has a role in certifying sustainable seafood fisheries. The need for this is **mainly** a response to which of the following issues?

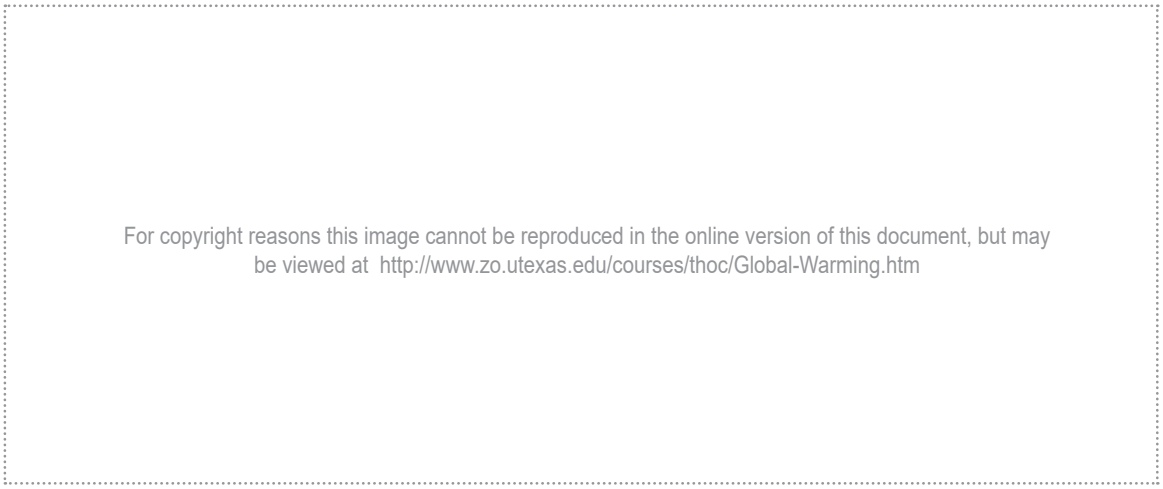
(a) declining water quality
(b) overfishing
(c) introduced species
(d) ocean acidification

12. Which of the following is a piece of advice that would be best to **avoid** with respect to the care and storage of diving masks?

(a) soak in warm fresh water to dissolve salt crystals
(b) store clear silicone models away from other dive gear
(c) rinse thoroughly with fresh water and dry with a dry towel
(d) store in a cool dry place once they have been dried in sunlight

See next page

13. Carbon dioxide and other gases in the atmosphere trap heat, keeping the earth warm. The following is an image of the enhanced greenhouse effect.



The radiation of wavelength Y is most likely to have its biggest impact on which of the following?

(a) global fish populations
(b) thermohaline currents
(c) global sea levels
(d) storm damage

14. The role of marine parks around Australia includes which of the following?

(a) developing emerging fisheries
(b) managing marine biodiversity
(c) providing areas where only research is allowed
(d) reducing tourism to allow fisheries to recover

15. Colour will be absorbed by water at different depths. The first colour to be absorbed under water will be

(a) red.
(b) orange.
(c) green.
(d) blue.

See next page

16. As a diver descends during a dive, the volume of gas in the lungs decreases. The biggest proportional change to the volume of the lungs of a diver descending to 40 metres would be in depths between

    (a) 0 and 10 metres.
    (b) 10 and 20 metres.
    (c) 20 and 30 metres.
    (d) 30 and 40 metres.

17. Taking photographs of whale sharks would provide information about which of the following?

    (a) birthrate
    (b) fertility rate
    (c) life expectancy
    (d) infant mortality rate

18. A coastal engineering structure that is described as smaller water channels, primarily for transport and residential purposes and sometimes resulting in habitat destruction and urban runoff, would be a

    (a) canal.
    (b) artificial reef.
    (c) port.
    (d) groyne.

19. Sound travels through different substances at different rates. Sound travelling through water has been found to bypass our eardrums and to travel through bone in our jaw and then be detected by the hearing mechanism of the ear. As a result, when humans are underwater we are able to better detect sounds of a higher

    (a) volume.
    (b) frequency.
    (c) tone.
    (d) amplitude.

20. Cramp in the legs is frequently experienced while diving. The **most** recommended way to overcome a cramp is to

    (a) relax or stop swimming.
    (b) stretch the cramping muscle.
    (c) abandon the dive straight away.
    (d) keep swimming as it will go away.

End of Section One

See next page

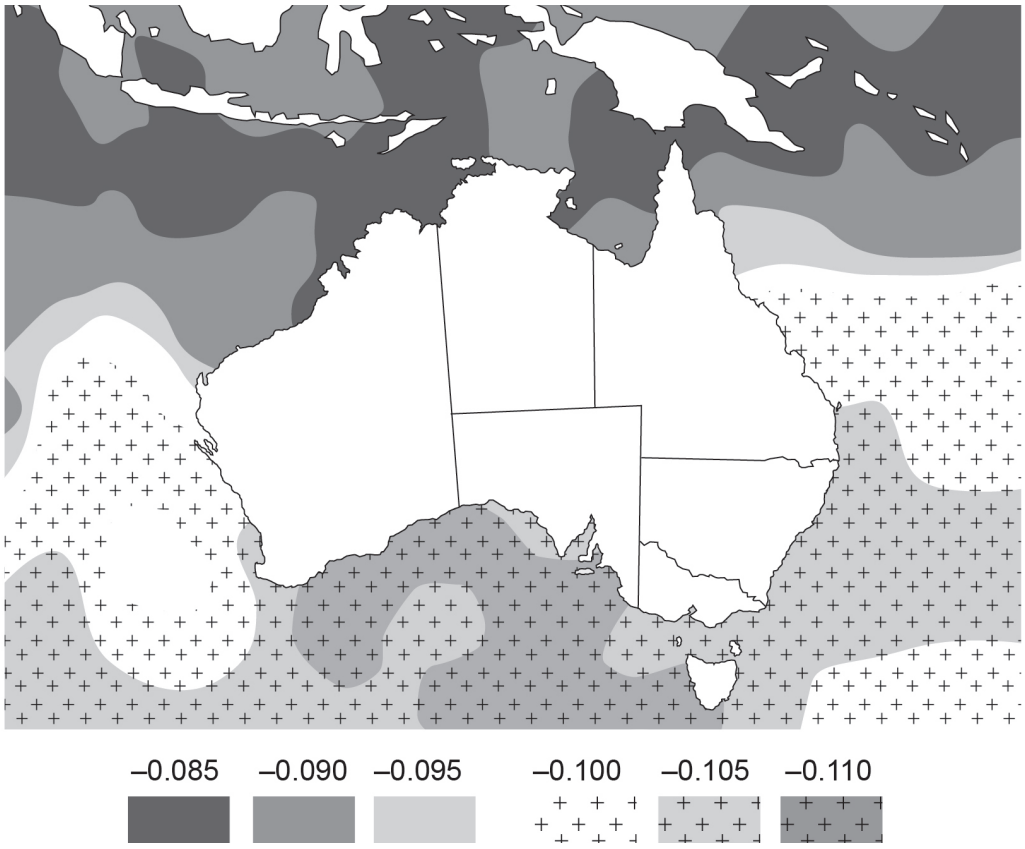
Section Two: Short answer **50% (97 Marks)**

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 **(19 marks)**



The map above shows the average decadal change in surface water pH around Australia from 1880 to 2009.

(a) Explain how ocean acidification is related to the enhanced greenhouse effect. (3 marks)

See next page

Question 21 (continued)

(b) Describe **three** direct consequences for marine organisms from this process of ocean acidification. (6 marks)

(c) Give **two** reasons why Western Australia's Leeuwin Current would have only a mild effect on pH distribution. (4 marks)

See next page

(d) Explain briefly the process of anthropogenic greenhouse effect and explain how it results in changes to global sea levels. (6 marks)

See next page

Question 22 **(16 marks)**

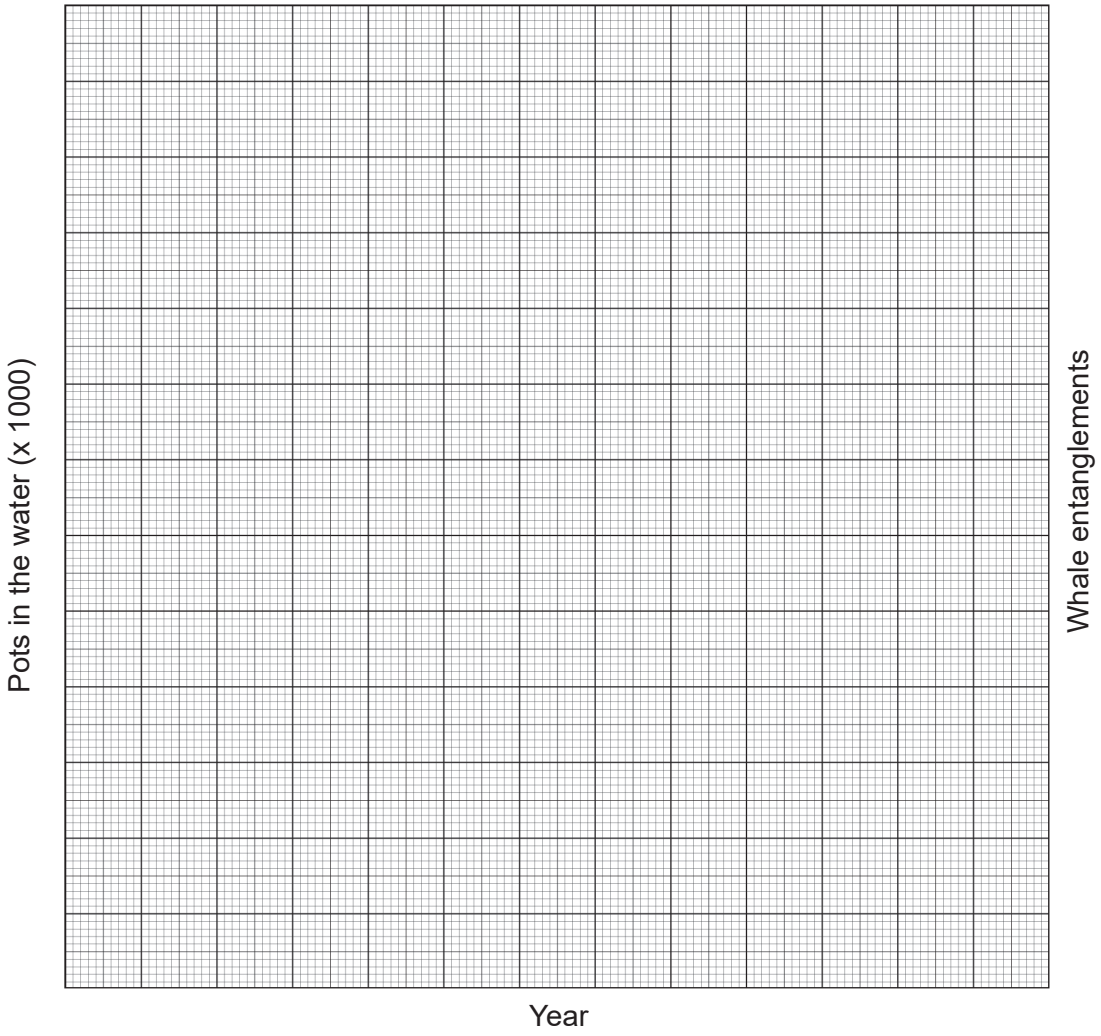
Whale populations have been protected in Australian waters since 1978 and internationally since 1986. Whales migrate north and south along the coast and can become entangled in western rock lobster (WRL) fishing ropes. Scientists have been monitoring this for some years.

The table below shows the confirmed entanglements in WRL fishing equipment and the number of pots being fished, in thousands, multiplied by their number of days in the water during the winter months (May–October inclusive) from 2000 to 2012.

Year	Pots in the water (x 1000)	Whale entanglements
2000	750	3
2001	800	1
2002	800	3
2003	780	0
2004	770	4
2005	600	0
2006	700	6
2007	600	1
2008	550	3
2009	350	1
2010	150	0
2011	1900	8
2012	2500	13

See next page

(a) Graph both of these sets of data on the grid below representing pots in the water as a line graph and whale entanglements as a column graph. (8 marks)



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

(b) Write a hypothesis that the scientists may have been investigating. (2 marks)

See next page

Question 22 (continued)

(c) Identify **two** sources of error that could occur in the collection of this data. (2 marks)

(d) State a conclusion that may be drawn from the data and support your conclusion. (2 marks)

(e) List **two** rules for in-water human interactions to further protect whales. (2 marks)

See next page

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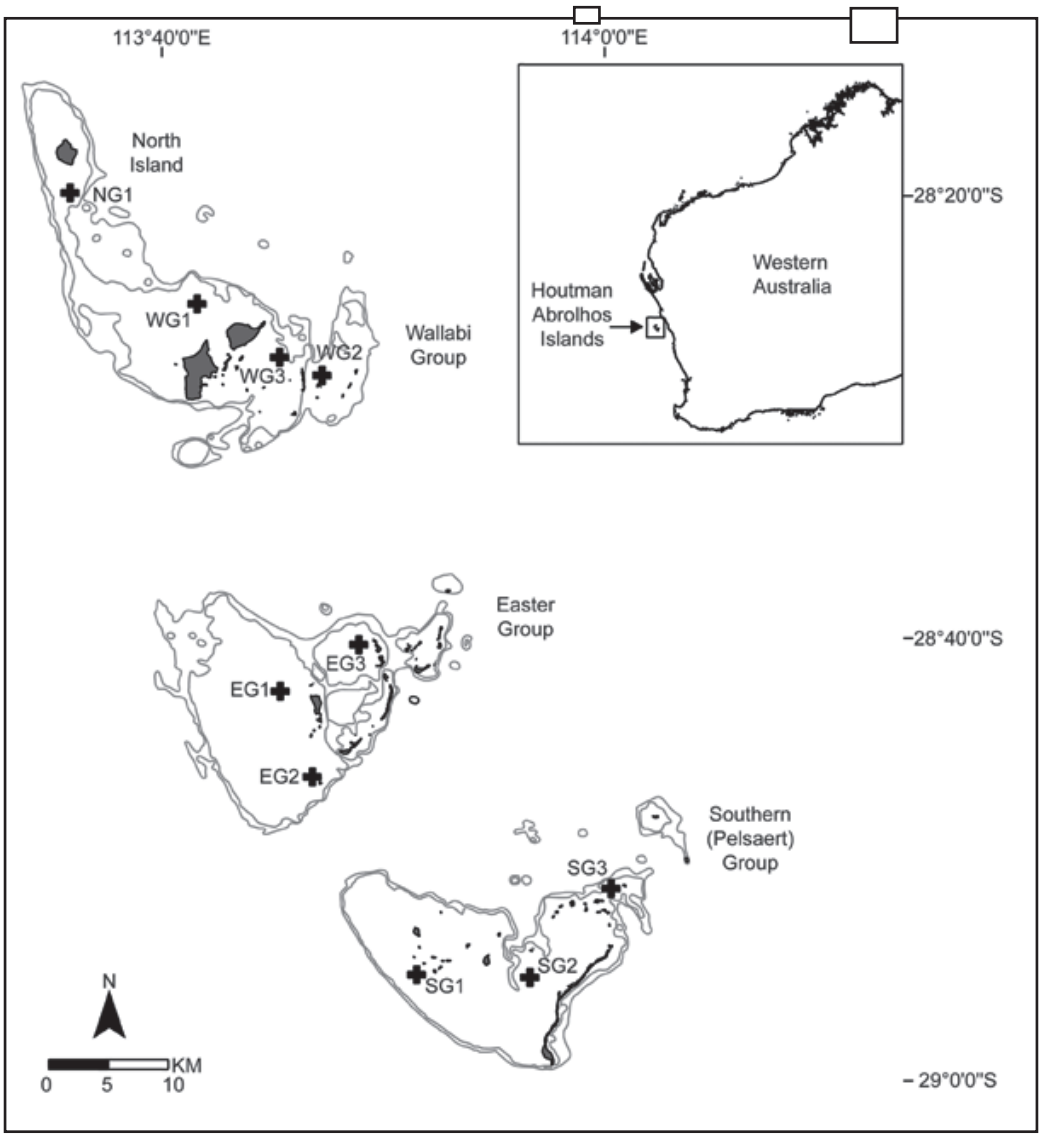
See next page

Question 23 **(16 marks)**

The Houtman Abrolhos Islands have 184 species of coral and a number of these corals have begun to show signs of bleaching.

The map shows sites that have been surveyed for bleaching.



+ areas surveyed

The coral death rates for some of these survey sites is shown below.

Site	Mortality (%)
SG2	99.85
SG3	9.30
EG1	37.02
EG2	58.03
EG3	54.98
WG1	32.27
Mean	48.57

See next page

(a) Describe why coral reefs are considered important to the marine environment. (2 marks)

(b) Explain what occurs to the cells of coral during a bleaching event. (6 marks)

(c) Other than increases in ocean temperature and acidification, describe **two** causes for the coral bleaching at the Houtman Abrolhos Islands. (4 marks)

See next page

Question 23 (continued)

(d) Describe **two** consequences of losing the coral reef at the Houtman Abrolhos Islands.
(4 marks)

See next page

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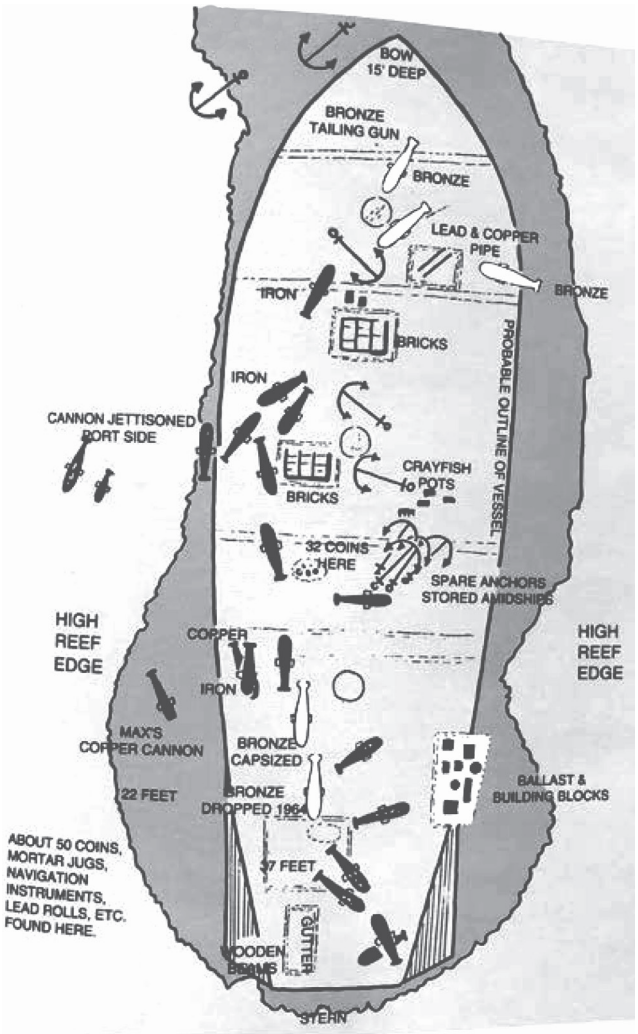
See next page

Question 24 **(17 marks)**

(a) What is the historical cause for so many bones being recovered from the Islands that are attributed to the *Batavia* wreck? (3 marks)

The following is a diagram drawn in 1963 by Lieutenant H. Donohue after underwater surveys.



See next page

(b) Describe **two** survey methods that would have enabled Donohue to draw this diagram. (4 marks)

Following the discovery and later surveys of the wreck site, most items were recovered to the surface by various methods.

(c) Compare the recovery of the 32 coins (in the centre of the vessel) with that of the building blocks. (4 marks)

Most of the recovered timbers were waterlogged and decayed. They had to be treated to preserve them.

(d) (i) Explain how the timbers were treated immediately following removal and why they had to be treated. (2 marks)

See next page

Question 24 (continued)

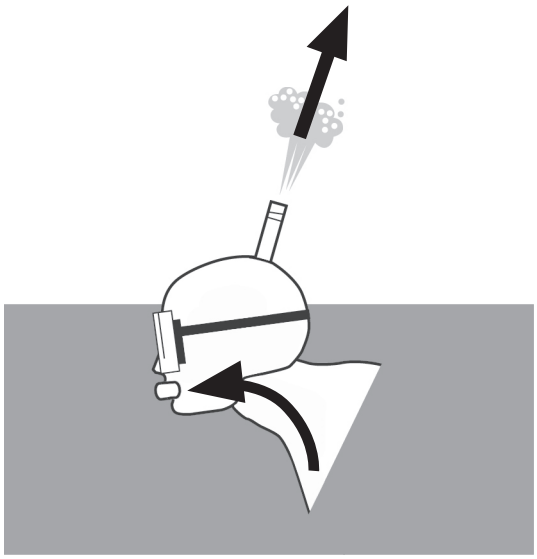
(ii) Identify **two** steps that could be taken to protect the timbers for longer periods of time. (2 marks)

(iii) In some cases the timbers were left untreated and in water. Describe a non-destructive method that could be used to preserve the information that the timbers provide to archaeologists. (2 marks)

See next page

Question 25 **(18 marks)**

The diagram below shows a snorkeller clearing their snorkel.



(a) Name this method and describe the steps used to perform it. (3 marks)

(b) Name and describe another method that can be used to clear a snorkel. (3 marks)

See next page

Question 25 (continued)

(c) Name **two** parts that are added to a modern snorkel to reduce water inside the barrel and state how each part works. (4 marks)

(d) (i) Explain how anti-fogs are used to prevent masks from fogging while in use. (4 marks)

(ii) Describe the steps a snorkeller should take when fitting a mask to stop it from flooding. (2 marks)

See next page

(iii) Describe the steps a snorkeller would take while under water to clear a partially-flooded mask. (2 marks)

See next page

Question 26 **(11 marks)**

(a) State Boyle's Law. (3 marks)

(b) Explain the relevance of Boyle's Law to divers. (4 marks)

(c) Define a barotrauma and give **one** example of this diving problem. (4 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 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)**

'Over 250 introduced marine plants and animals have hitch-hiked to Australian waters on vessels of all types from yachts to commercial ships. Some have displaced our native species from their habitats, changing our coastal areas and damaging our fishing, aquaculture and tourism industries'. The National System for the Prevention and Management of Marine Pest Incursions has certain aims in its charter to minimise further issues with this problem.

(a) Explain **two** ways in which this system aims to prevent new pests arriving in Australia via shipping and the aquarium trade. (8 marks)

When an introduced marine pest is encountered, a response plan is required to minimise any further issues with that pest.

(b) Explain **two** pieces of information that would need to be known about the marine organism itself. How would this information be used to minimise further issues with it? (5 marks)

(c) Explain what information would be required to determine the method to be used to minimise the spread and impact of pests once established. Describe **two** methods that might be used to remove established populations. (7 marks)

Question 28 **(20 marks)**

In 2013, the Western Australian Government installed two artificial reefs on the seabed off Dunsborough and Bunbury. Since then, further reefs have been created off Mandurah and Rottnest Island.

(a) Name **three** community groups that would benefit from the artificial reefs and state how they would benefit. (6 marks)

Artificial reefs can also be used as a method of reducing coastal erosion.

(b) Use diagrams to explain the process of longshore drift and the accreting and eroding of beaches. (8 marks)

(c) Draw a diagram to explain how an artificial reef placed horizontal to the shore could be used as a means of reducing coastal erosion. (6 marks)

Question 29 **(20 marks)**

The following is an excerpt from an item on ABC News.

'…… near Savo Island in the Solomon Islands, *HMAS Canberra* rests upright and intact at the bottom of 'Ironbottom Sound'.
Scuttled after a damaging encounter with the Japanese in August 1942, the wreck was located in 1992 by Robert Ballard (better known for his discovery of *RMS Titanic*).
There is also a mystery hanging over the ship, with some suggesting the possibility that it was the victim of friendly fire.
It is not known whether *HMAS Canberra* is at risk from salvagers, but there is no question that the ship will eventually succumb to natural degradation'.

(a) Describe **three** methods that Ballard may have used to locate the wreck of *HMAS Canberra*. (9 marks)

The item continued 'Well-preserved wrecks such as *HMAS Canberra* are prime candidates for one of the most exciting developments in maritime archaeology: digital preservation through photogrammetry'.

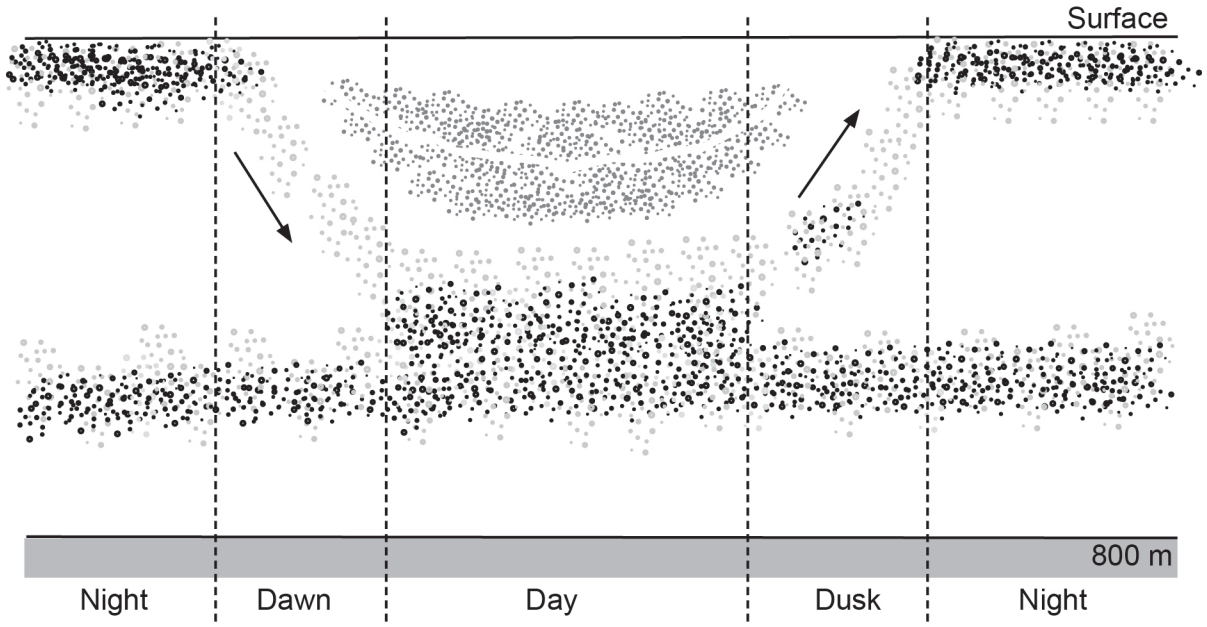
(b) Describe how the process of photogrammetry is carried out and how it can be used as a method of preservation. (5 marks)

(c) Explain the processes of 'natural degradation' that would be occurring on the steel sections of the wreck and state **three** methods that could be used to stabilise them. (6 marks)

See next page

Question 30 **(20 marks)**

The following is a diagram showing plankton diel (diurnal) vertical migration patterns, indicated by the two arrows:



(a) State which type of plankton might be represented by this series of images. For what reasons and benefits might this migration pattern occur? (6 marks)

(b) Explain how another type of plankton would show a different migration pattern to that shown in the image above and why that difference would exist. (4 marks)

Ocean currents are also responsible for the transport of plankton in water.

(c) Explain the characteristics of the Leeuwin and West Australian currents and how both affect the movement of plankton along the Western Australian coast. (10 marks)

End of questions

Question number: _____

Question number: _____

Question number: _____

Question number: _____

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Question number: _____

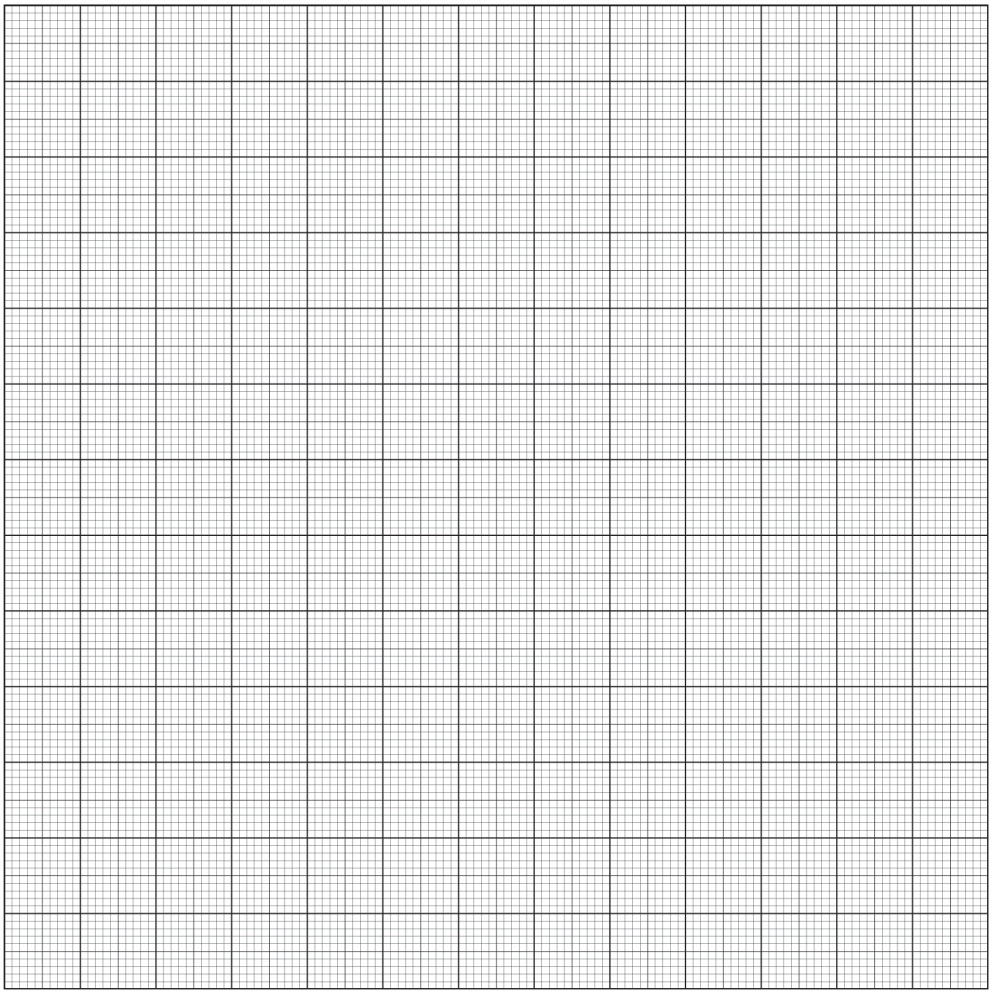
Supplementary page

Question number: _____

Supplementary page

Question number: _____

Spare grid



ACKNOWLEDGEMENTS

Question 1 Graph adapted from: Strain, L., Brown, J., & Walters, S. (2017). West coast Roe's abalone resource status report 2016. In W. J. Fletcher, M. D. Mumme & F. J. Webster, *Status reports of the fisheries and aquatic resources of Western Australia 2015/16: State of the fisheries* (p. 41, fig. 2b). Retrieved May, 2018, from http://www.fish.wa.gov.au/About-Us/Publications/Pages/State-of-the-Fisheries-report.aspx

Question 8 Graph adapted from: United States Coast Guard. (1995). *Figure 6-17: Predicted calm-water survival time […]*. Retrieved May, 2018, from https://aneskey.com/immersion-into-cold-water/

Question 9 Image adapted from: Recreational Scuba Training Council. (2005). *Common hand signals for recreational scuba diving* (p. 11). Retrieved May, 2018, from http://www.neadc.org/scubaresrc1.html (under 'Diving resources')

Question 10 Graph adapted from: Lindsey, R., & Scott, M. (2010). *What are phytoplankton?* (Long-term changes in phytoplankton: Species composition). Retrieved May, 2018, from https://earthobservatory.nasa.gov/Features/Phytoplankton/

Question 13 Image adapted from: [Greenhouse effect graphic]. (n.d.). Retrieved May, 2018, from http://www.zo.utexas.edu/courses/thoc/Global-Warming.htm

Question 21 Diagram adapted from: Evans, K., Bax, N. J., & Smith, D. C. (2016). *Climate change: Marine environment (2016)* (fig. MAR7). Retrieved May, 2018, from https://soe.environment.gov.au/theme/marine-environment/topic/2016/climate-change
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Question 22 Table data source: Stoklosa, R. (2013). *West coast rock lobster fishery ecological risk assessment* (Occasional Publication no. 118) (Attachment 2, fig. 2). Retrieved May, 2018, from http://www.fish.wa.gov.au/About-Us/Publications/Pages/Fisheries-Occasional-Publications.aspx

Question 23 Map from: Abdo, D. A., Bellchambers, L. M., & Evans, S. N. (2012, August). […]. *PLOS ONE*, *7*(8), p. 3, fig. 1. Retrieved May, 2018, from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043878
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Table adapted from: Abdo, D. A., Bellchambers, L. M., & Evans, S. N. (2012, August). […]. *PLOS ONE*, *7*(8), p. 8, table 3. Retrieved May, 2018, from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043878
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Question 24 Introductory text from: Laurie, V. (2017, November 3). Batavia graveyard on Abrolhos Islands gives up secrets. *The Australian*. Retrieved May, 2018, from https://www.theaustralian.com.au/news/nation/batavia-graveyard-on-abrolhos-islands-gives-up-secrets/news-story/e21c00b5a9dc6eb5f910a6650506b81b

Diagram from: Godard, P. (1993). *The first and last voyage of the Batavia*. Perth, WA: Abrolhos Publishing, p. 229.

Question 25 Concept from: How to snorkel (Learning to keep your airway clear: 4). (n.d.). In *WikiHow*. Retrieved May, 2018, from https://www.wikihow.com/Snorkel
Used under Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported licence.

Question 27 Introductory text quote from: Department of Agriculture, Fisheries and Forestry. (n.d.). *Marine pests threaten Australia's unique marine environment and marine industries*. Retrieved May, 2018, from http://www.marinepests.gov.au/Pages/default.aspx

Question 29 Article excerpt: Pearson, N. (2017, November 16). *The race to save up to 50 shipwrecks from looters in South-East Asia*. Retrieved May, 2018, from http://www.abc.net.au/news/2017-11-16/the-race-to-save-dozens-of-wartime-shipwrecks-from-looters/9157016

Question 30 Diagram adapted from: Mapstone, B. (Ed.). (2017). *Oceans: Science and solutions for Australia* (p. 34, fig. 3.4). Retrieved May, 2018, from http://www.publish.csiro.au/book/7724/

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