METHODIST LADIES' COLLEGE

Methodist Ladies' College
Semester 2 Sample Examination

Question/Answer Booklet

MARINE AND MARITIME STUDIES
ATAR Year 12

Student Name: _____

Teacher Name: _____

Time allowed for this paper
Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper
To be provided by the supervisor
This Question/Answer Booklet
Multiple-choice Answer Sheet

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 the WACE examinations

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 notes or other items of a non-personal nature in the examination room. 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 total exam	Your mark
Section One: Multiple-choice	20	20	20	20	20	
Section Two: Short answer	6	6	90	90	50	
Section Three: Extended answer	4	2	70	40	30	
				Total	100	

Instructions to candidates

1. The rules for the conduct of ATAR course examinations are detailed in the Year 12 Information Handbook. 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 the square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answer. No marks will be given if more than one answer is completed for any question.

   Sections Two and Three: Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instruction that are specific to a particular questions.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the questions that you are continuing to answer at the top of the page.

Section One: Multiple-choice **15% (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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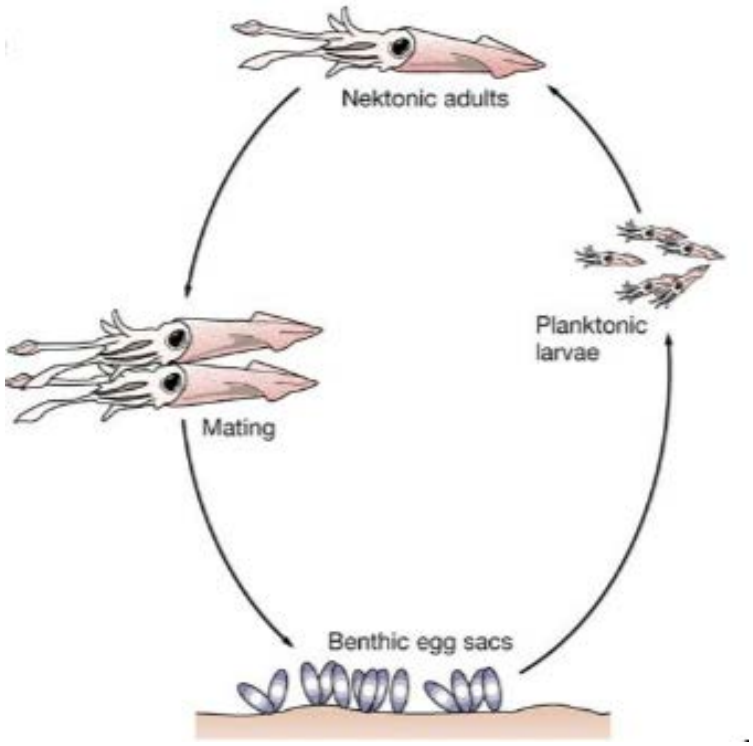
1. The lungs of a diver contains 2L of air at a water depth of 26m, what volume of air would be in this diver's lungs at a depth of 11m?

   a. 1.62L
   b. 3.43L
   c. 3.78L
   d. 4.72L

2. The following diagram shows the life cycle of a marine organism.



   During the different stages of the life cycle shown, this organism forms a part of the:

   a. phytoplankton.
   b. holoplankton.
   c. nanoplankton.
   d. meroplankton.

See next page

3. What does the following signal indicate during a SCUBA/snorkel dive?

a. 'I am cold'
b. 'I have had enough'
c. 'do not touch the marine life'
d. 'this swim-through is a tight squeeze'

4. What was the name of the yacht that was sent to rescue the *Batavia* survivors?

a. *Goede Hope*
b. *Sardam*
c. *Jacatra*
d. *Zeewijk*

5. Green algae are found abundantly in surface waters. Red and brown algae are found at lower depths. Red and brown algae possess large concentrations of accessory pigments such as xanthophyll and phycobilin in addition to the chlorophylls. These accessory pigments optimise the light harvesting capabilities of the algae. However, green algae possess lower concentrations of xanthophylls and phycobilin.

   Which of the following options best accounts for the distribution of the different algae based on your understanding of light attenuation?

   a. Blue wavelengths are attenuated to a greater degree by the seawater and thus red algae are restricted to greater depths of water.
   b. Red light penetrates further in water and therefore can be used by red algae at greater depths.
   c. Green algae mainly absorbs red wavelengths and reflects green wavelengths, thus the algae is restricted to shallow depths of water.
   d. Light wavelengths are preferentially reflected by seawater and therefore as red algae absorbs the shorter wavelengths, they can exist at greater depths of water.

See next page

6. Which of the following is NOT an expected effect of climate change?

   a. Sea levels rising
   b. Flooding in coastal cities
   c. Expanding glaciers
   d. Extreme weather

7. The photo below which shows a coastal engineering structure which is indicated by a red arrow.

   This structure can be correctly identified as a:

   a. breakwater
   b. canal
   c. seawall
   d. groyne

8. You plan to recover a 50 kg item from a wreck in seawater. This item displaces 40L of sea water.

   Assuming the density of seawater is 1.03 kg/L, how much air would you need to put in a lifting device to make the item neutrally buoyant?

   a. 8.8L
   b. 10L
   c. 10.3L
   d. 50L

9. Coral poylps supply their symbiont with:

   a. glycerol and lipids.
   b. mucous.
   c. oxygen.
   d. a home.

See next page

10. When operating as a licensed Whale watching charter business in Australian waters, how close is your vessel allowed to approach a female whale swimming with a calf?

    a. 50m
    b. 100m
    c. 250m
    d. 300m

11. Which of the following statements is correct in terms of the impacts associated with a loss of habitat?

    a. A loss of habitat will result in an increase in species diversity and abundance for that community.
    b. As organisms are resilient to change, a habitat loss will have little effect on species diversity and abundance.
    c. A loss of habitat will result in a significant loss of species diversity and abundance in that area.
    d. Species diversity and abundance is unrelated to habitat loss as all populations in an ecosystem will experience fluctuations over time.

12. When conserving and restoring sliver coins recovered from a historic Dutch shipwreck site such as the *Batavia*, which of the following solutions would give the best result?

    a. sodium hydroxide
    b. alkaline dithionite
    c. hydrochloric acid
    d. acetic acid

13. Why is it difficult to ascertain the source location of a noise underwater?

    a. Sound waves are reflected and refracted underwater and as water is a dense medium, this distortion makes it difficult for the human ear to decipher the signal properly.
    b. When underwater, water enters the inner part of the human ear and distorts the sound, therefore making the signal confusing.
    c. Air pressure increases with depth underwater and this changes the way in which the human ear detects sound signals.
    d. Water is a denser medium than air thus sound waves reach both ears at the same time making it difficult to judge the direction and therefore location of the source.

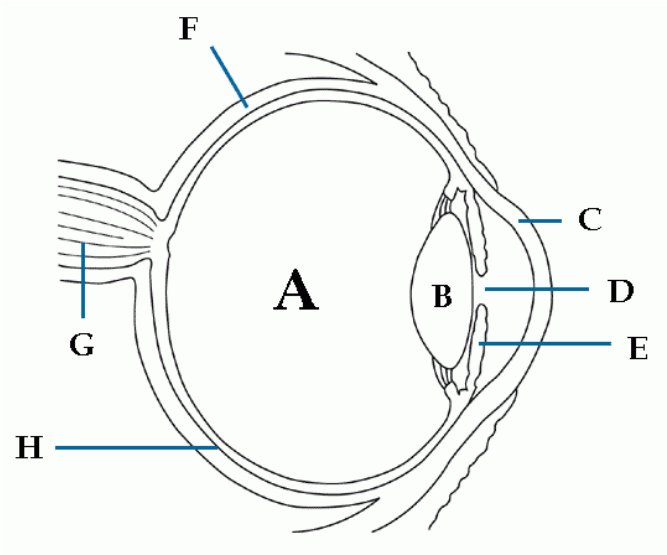
14. A snorkeller was found to have a volume of 58 L and a mass of 55 kg, when weighed in air on a set of bathroom scales. She gained one kilogram when she put on her wetsuit and displaced 65 L of seawater when submerged.

    Assuming the density of seawater is 1 kg/L, how much weight would she need to wear on her weight belt to make her neutrally buoyant?

    a. 6kg
    b. 7kg
    c. 9 kg
    d. 10 kg

See next page

15. Consider the following diagram of a human eye.



In order for a human to see an object clearly, the image needs to be focused on which part of the eye?

a. B
b. F
c. G
d. H

16. Dugongs are marine mammals that feed on large quantities of sea grasses in shallow coastal waters. In one study area, small concentrations of agricultural pesticides have been measured in both the sea grasses and in the sediments in which they grow.

A food chain for dugongs is:

Seagrasses → Dugongs → Sharks

Dugong numbers have seriously declined in the study area but shark numbers have remained stable.

What is the most likely cause of the decline in the number of dugongs?

a. Bioaccumulation of pesticides in the dugongs
b. Biomagnification of pesticides in the sediments
c. Biomagnification of pesticides in the sea grasses
d. Increased predation by the sharks

17. Which of the following **best** exemplifies an hypothesis?

a. If the seawater temperature rises, coral bleaching will occur.
b. Seawater temperature affects coral bleaching.
c. Coral bleaching is caused by an increase in seawater temperature.
d. An increase in seawater temperature causes the coral polyp to expel the zooxanthellae.

See next page

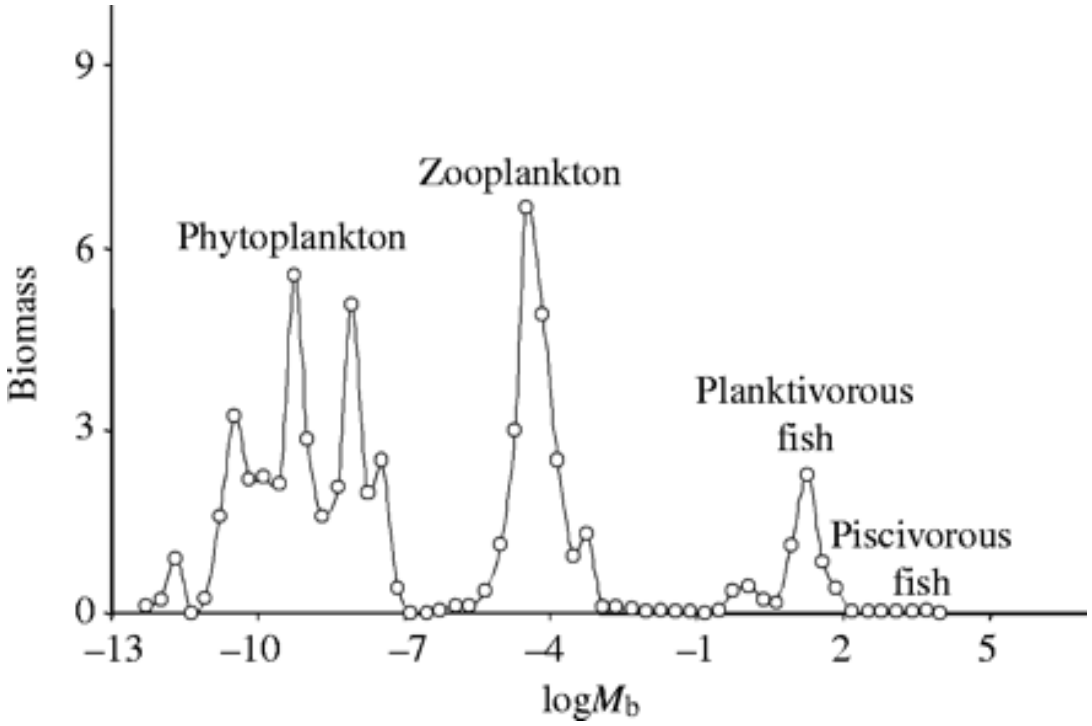
18. Which of the following signs and symptoms indicates that a SCUBA diver is perhaps suffering from a pulmonary barotrauma?

    a. Pain on descent
    b. Dizziness
    c. Abdominal discomfort
    d. Shortness of breath

19. A source of income for sand in the sand budget is:

    a. offshore wind.
    b. cliff erosion.
    c. damming of rivers.
    d. longshore drift (out).

20. Consider the following graph that illustrates the production of biomass in an open ocean community.



Which of the following statements is correct?

    a. A smaller biomass of phytoplankton can support a larger biomass of zooplankton due to high replacement rates of the phytoplankton.
    b. There is a greater loss of efficiency in the transfer of energy at the higher trophic levels thus causing the reduction in biomass for the higher order consumers.
    c. There is a smaller biomass of the fish because, unlike the plankton, they actively swim against the ocean currents and thus expend energy on movement rather than gaining body mass.
    d. Due to overfishing and the depletion of marine resources, there are fewer fish present in the open ocean and therefore there is less biomass present in the whole community.

End of Section One

See next page

Section Two: Short answer **50% (90 marks)**

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

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare page for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 90 minutes.

Question 21 **(19 marks)**

According to researchers, nutrient enrichment and climate change are yet another concern of growing importance: an apparent increase in the toxicity of some algal blooms in lakes and estuaries around the world.

Of particular concern is *Microcystis* sp., a near-ubiquitous cyanobacterium that thrives in warm, nutrient-rich and stagnant waters around the world.

a. Explain how the enhanced greenhouse effect is thought to cause an increase in global water temperatures.

_____

_____

_____

_____

_____

_____

_____

_____

6 marks

b.

i. Outline the consequences of an increase in the nutrient load of a body of water, such as a poorly flushed estuary.

_____

_____

_____

_____

_____

_____

_____

_____

_____

7 marks

ii. Describe two strategies that could be used to manage and control an increase of nutrients in a poorly flushed estuary.

_____

_____

_____

_____

_____

_____

_____

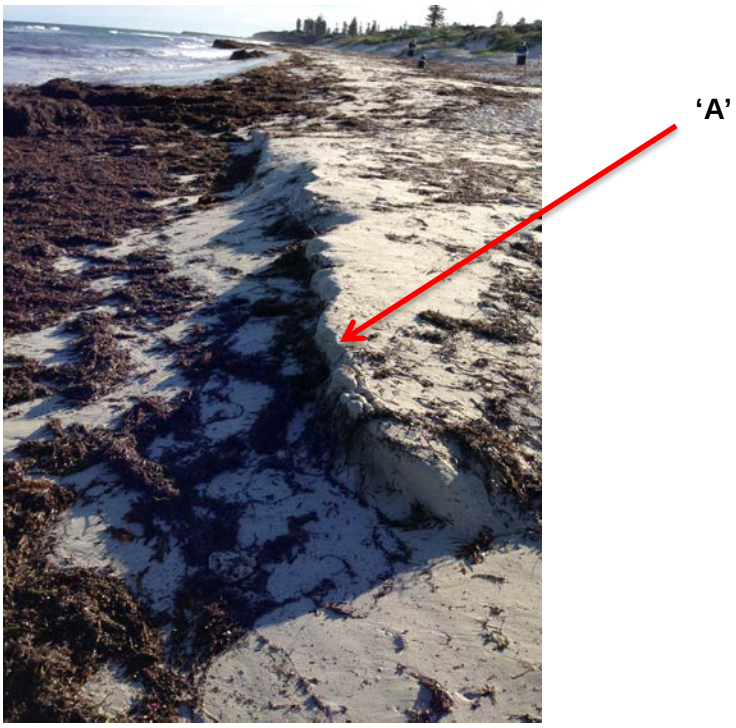
_____

6 marks

See next page

Question 22 **6 marks**

The following picture was taken at South Cottesloe Beach in late June this year.



a.

i. Name the coastal morphological feature that is indicated by the red arrow labelled 'A' in the picture above.

_____

1 mark

ii. Explain how this feature is formed.

_____

_____

_____

_____

3 marks

iii. Why is this feature more commonly occurring in the Winter months?

_____

_____

2 marks

See next page

Question 23 **14 marks**

The following graph (Figure 23) illustrates the changes in the concentration of carbon dioxide in the atmosphere, the concentration of carbon dioxide in sea water and the pH of sea water from 1990 to 2010.

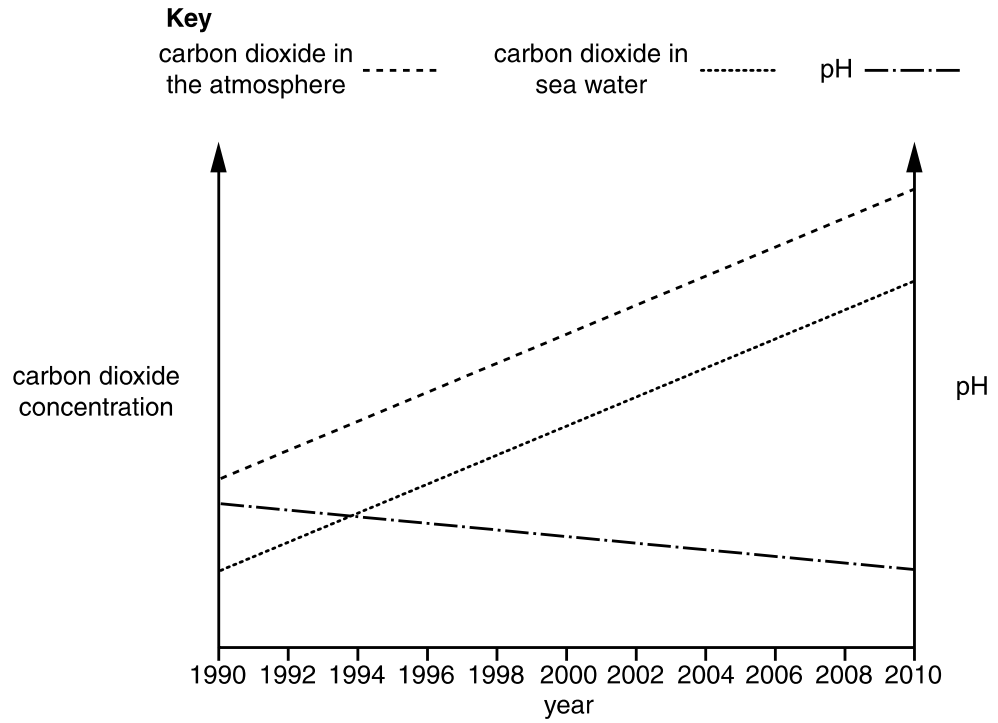


Figure 23

a.

i. Describe the relationship between the concentration of carbon dioxide in the atmosphere and the concentration of carbon dioxide in seawater as shown by Figure 23.

_____

_____

1 mark

ii. Suggest an explanation for this relationship.

_____

_____

_____

_____

3 marks

See next page

b.

i. State the relationship between the concentration of carbon dioxide in seawater and the pH of seawater as shown by Figure 23.

_____

_____

1 mark

ii. Suggest an explanation for this relationship.

_____

_____

_____

_____

3 marks

c.

i. If the concentration of carbon dioxide in seawater continues to rise at the current rate, experts predict that coral growth rates will be reduced by as much as 50% by 2050.

Explain how an increase in seawater carbon dioxide concentrations is responsible for a reduction in coral growth rates.

_____

_____

_____

_____

_____

4 marks

ii. State two potential consequences for coastal communities if coral growth rates are reduced.

_____

_____

_____

2 marks

See next page

Question 24 **12 marks**

The picture below (Figure 24) is a combined true-colour/chlorophyll SeaWiFS image (collected on April 5, 2002) that shows several eddies spinning off the western coast of Australia.

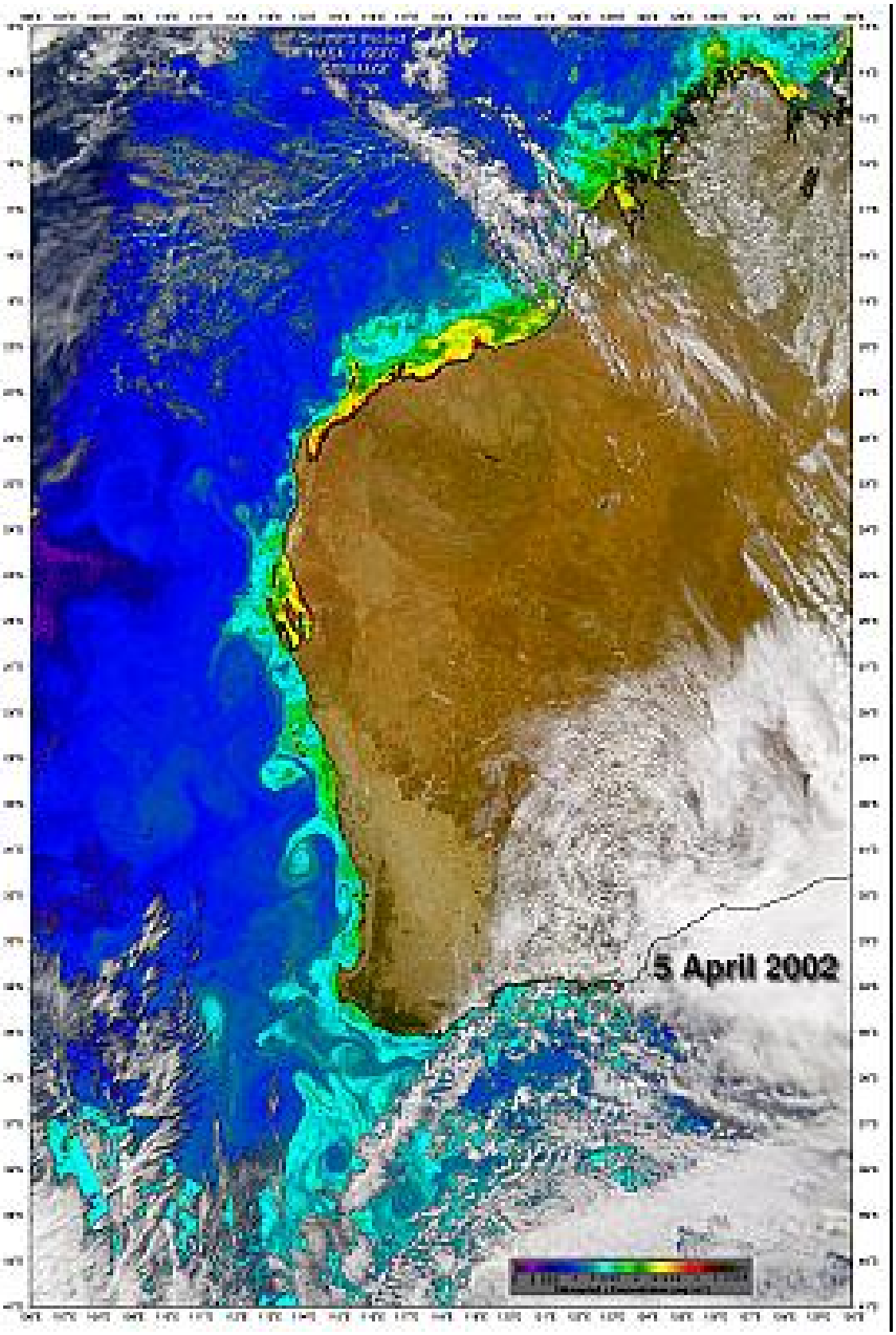


Figure 24

See next page

a. Explain what the dark blue areas indicate on the image (Figure 24).

_____

_____

_____

2 marks

b. Explain what the yellow areas indicate on the image (Figure 24).

_____

_____

_____

2 marks

c. Explain why are there very few orange or red areas indicated on the image (Figure 24).

_____

_____

_____

_____

3 marks

d. Describe the role that eddies play in oceanic productivity.

_____

_____

_____

_____

3 marks

e. State two pieces of scientific information that an Australian Continuous Plankton Recorder (AusCPR) survey could add to the combined true-colour/chlorophyll SeaWiFS image shown by Figure 24.

_____

_____

2 marks

See next page

Question 25 **18 marks**

The *Batavia* was built in Amsterdam in 1628, armed with 24 cast iron cannons and a number of bronze guns.

a.

i. What are concretions and why do they form on maritime artefacts such as cannons and guns?

_____

_____

_____

2 marks

ii. Describe the process that is used to remove concretions from an artefact such as a cannon.

_____

_____

_____

_____

_____

4 marks

b. In terms of conservation, explain why different approaches are taken when stabilising iron artefacts versus bronze artefacts.

_____

_____

_____

_____

_____

4 marks

See next page

c. The following photograph shows an iron cannon being raised by a crane to the surface.

i. Give two likely reasons to explain why lift bags were not used to raise this cannon from the *Batavia* wreck site.

_____

_____

_____

2 marks

ii. Explain the steps that were taken by maritime archaeologists to stabilise an iron cannon from the *Batavia* wreck site, preparing it for display in a museum.

_____

_____

_____

_____

_____

_____

_____

_____

_____

6 marks

See next page

Question 26 **21 marks**

a. Whilst in Exmouth, you plan to swim with whale sharks in the Ningaloo Marine Park as a part of an all-day boat cruise.

Describe how you would prepare the three pieces of snorkelling equipment that you will need for this activity.

_____

_____

_____

_____

3 marks

b. How many swimmers are permitted in the water within the exclusive contact zone?

_____

1 mark

c. Even though you are not alone in the water, explain whether or not it is necessary to have a 'buddy' (as per the buddy system) whilst swimming with a whale shark.

_____

_____

_____

_____

4 marks

d. You are swimming in the water with a whale shark and your mask has fogged up.

Describe the steps that you would take to defog your mask so that you could see this beautiful animal.

_____

_____

_____

_____

_____

4 marks

See next page

e. The photograph below shows a person swimming with a whale shark off the coast of Mexico.

This swimmer would not be compliant with the code of conduct that regulates interactions between humans and whale sharks in the Ningaloo Marine Park.

i. Identify two issues with the swimmer's interaction with the whale shark shown.

_____

_____

2 marks

ii. State three behaviours that a whale shark could display as a result of this type of interaction with a human.

_____

_____

_____

3 marks

f. Why is it necessary to regulate the interactions between humans and whale sharks?

_____

_____

_____

_____

_____

4 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.

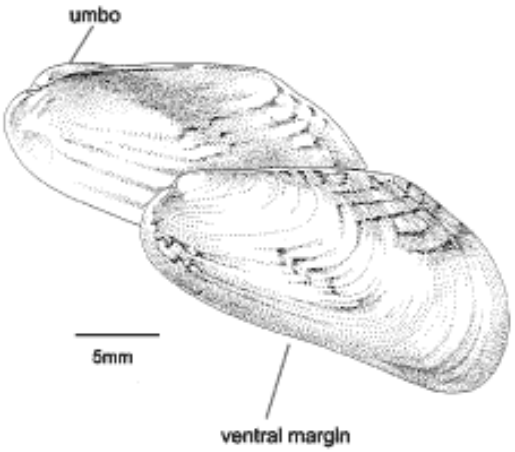
Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 27 **20 marks**

The Asian date mussel *Musculista senhousia*, is an introduced marine pest that was first detected in Fremantle Harbour in 1982.



KEY FEATURES

- maximum shell length 30mm
- 15-16 radiating stripes above keel originating at umbo
- purple-brown stripes beneath olive-green shell, interior with wavy purple-red lines
- central stripe thickest
- 6-10 small teeth close to umbo

a. Define the term 'introduced marine pest' and explain how an organism such as the Asian date mussel could cause harm to a marine ecosystem.

6 marks

b. Suggest two ways in which the Asian date mussel was most likely introduced into the waters of Fremantle Harbour.

4 marks

c. Outline two strategies that could be used to minimise or eradicate the occurrence of the Asian date mussel in Australian waters.

10 marks

See next page

Question 28 **20 marks**

a. Explain the role that marine protected areas and zones play in the management of marine biodiversity.

5 marks

b. Using a fisheries management example, explain how scientific research is used to make sound environmental management decisions.

6 marks

c. The majority of WA's new oil developments are located in the Exmouth Sub-basin. These fields are situated close to an environmentally sensitive area: the Ningaloo Marine Park.

Both internationally and in Australian waters, the Oil and Gas Industry is committed to oil spill prevention, preparedness and response.

Give one named example of a mechanical, chemical and biological method that is used to mitigate the effects of an oil spill. Describe how each of these processes work and identify an advantage that each method provides in the effort to minimise damage to the marine environment.

9 marks

Question 29 **20 marks**

a. Once a wreck site has been located, the next step is to survey the area. Describe the steps that maritime archaeologists would take to properly document the final resting place of a shipwreck.

6 marks

b. You are about to dive on the *Batavia* wreck site with a group of five other maritime archaeologists. Outline the details that you would deliver in a dive safety brief to ensure the success of the dive.

6 marks

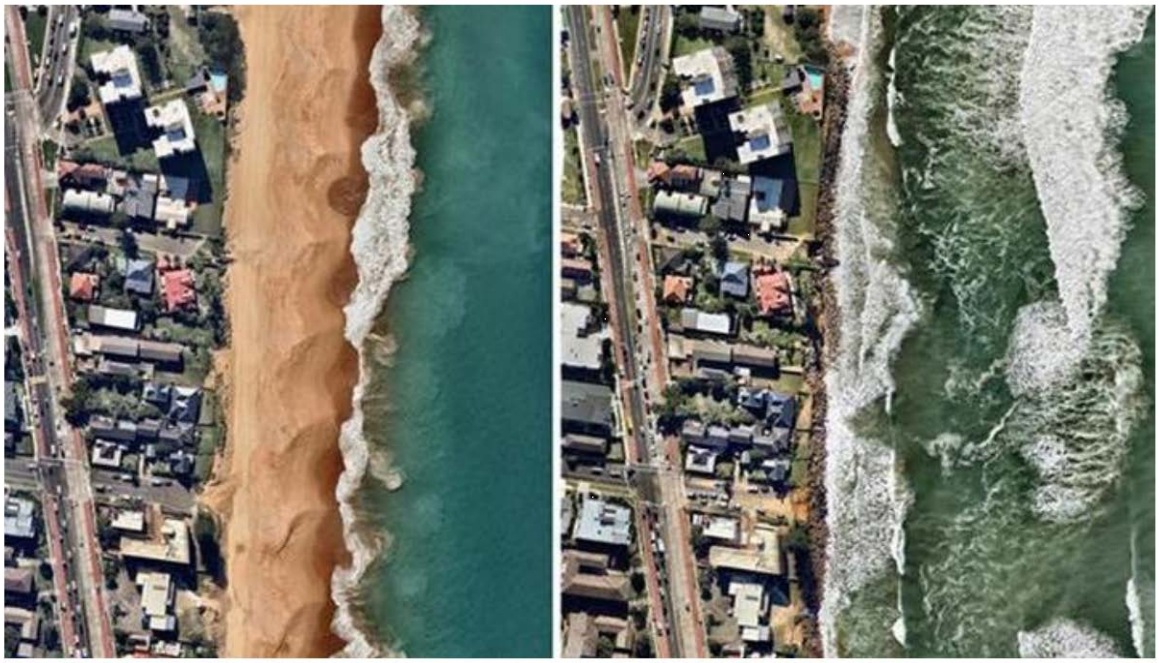
c. Using your understanding of Archimedes principle and Boyles Law, explain how a lift bag containing 5L of air is used to raise maritime artefacts from a depth of 10m, for example.

8 marks

See next page

Question 30 **20 marks**

The two images below (A and B) were taken at Narabeen Beach before (A) and after (B) a massive storm event, dubbed 'Stormageddon' by the press, hit the NSW coastline in June this year.



A (May 2016) **B (June 2016)**

The photos (taken by *Nearmap*) reveal a vanishing beach and an advancing sea at Sydney's Narambeen Beach.

a. Describe the coastal morphological processes that would have occurred during 'Stormageddon', which transformed the beach from image A to image B.

8 marks

b. Provide three coastal management strategies that could be used to transform Narambeen Beach back to a state such as that shown by image A.

For each strategy given, you must clearly outline the processes used, including an expected time frame, and explain how this action will ultimately achieve the aim.

12 marks

End of questions

See next page

Question number: _____

See next page

Question number: _____

Question number: _____

See next page

Question number: _____

Question number: _____

See next page

Question number: _____

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Question number: _____

Spare working space

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