Government of **Western Australia**
Curriculum Council

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2010

Question/Answer Booklet

MARINE AND MARITIME TECHNOLOGY

Stage 2

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 for paper: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet
Multiple-choice Answer Sheet
Appendix 1: King George Sound

To be provided by the candidate

Standard items: pens, pencils, eraser, correction fluid/tape, ruler, highlighters
Special Items: non-programmable calculator satisfying the conditions set by the Curriculum Council for this course; 360° protractors or Douglas protractors; compasses

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.

2011/5392
Web version of 2010/31661

Ref: 10-074

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	20	20	30	20	20
Section Two: Short answer	8	8	70	80	40
Section Three: Extended answer	4	2	80	80	40
				Total	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2010*. 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, do not erase or use correction fluid, and shade your new answer. 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 and Three: Write answers in this Question/Answer Booklet.

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

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 question(s) that you are continuing to answer at the top of the page.

See next page

Section One: Multiple-choice **20% (20 Marks)**

This section has **twenty (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, do not erase or use correction fluid, and shade your new answer. 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: 30 minutes.

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1. Which one of the following electronic aids is the most efficient at determining ocean depth?

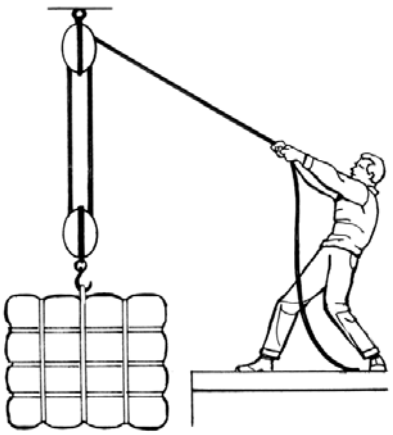
   (a) Electronic Position Indicator Radio Beacon (EPIRB)
   (b) Global Positioning System (GPS)
   (c) Sacrificial anode
   (d) Sound Navigation and Ranging (SONAR)

2. Which of the following precautions should be taken on observing a leak in a boat's fuel line while underway (moving)?

   (i) switch off the motor
   (ii) isolate the battery
   (iii) remove the ignition key
   (iv) shut off ventilation

   (a) all of the above except (i)
   (b) all of the above except (ii)
   (c) all of the above except (iii)
   (d) all of the above except (iv)

3. The image below is of a block and tackle in use.



   As it is shown here, a block and tackle can best be described as a simple machine made up of which other simple machines?

   (a) rope and lever
   (b) axle and purchase
   (c) axle and pulleys
   (d) rope and axle

See next page

4. If you see the following structure while at sea, it means that

(a) a cable or pipeline is near.
(b) the water nearby is free from obstructions.
(c) there is an isolated danger so do not pass close.
(d) another lead marker is close to assist navigation.

5. The function of a zinc anode placed on a boat's hull or on an outboard engine is to reduce corrosion of

(a) metals less reactive than zinc.
(b) metals more reactive than zinc.
(c) all other metals.
(d) bronze and steel when on an aluminium hull.

6. You have planned a fishing trip to a narrow passage between two islands but you know that a tidal current between the islands is too strong for anchoring your boat when it is flowing at its maximum. The tide chart reveals that high tide is at 1300h and low tide is at 1910h. When will the tidal flow be the fastest?

(a) one hour each side of 1300h
(b) one hour each side of 1710h
(c) between 1300h and 1500h
(d) between 1600h and 1800h

7. Which statement is true in relation to the legislated requirements of Personal Flotation Devices (PFDs)?

(a) Type 2 PFDs provide more buoyancy than Type 1 and have a collar.
(b) Type 3 PFDs are recognised by the single colour of orange and are different from all other types.
(c) All PFDs are acceptable as life jackets in unprotected waters.
(d) Type 1 PFDs must display a label with the Australian Standards logo and the number AS 1512.

See next page

8. The main decay process that breaks down metal artefacts in an underwater shipwreck is

(a) chemical corrosion by seawater.
(b) biological breakdown by burrowing animals.
(c) physical degradation by wave action.
(d) physical breakdown by human interference.

9. The effect that is caused by the interaction of a ship's metallic structure and local magnetic fields with the earth's magnetic field is

(a) magnetic variation.
(b) magnetic deviation.
(c) compass correction.
(d) compass error.

10. Below is the transcript of the beginning of a call made by marine radio and received at a local sea rescue station:

"Pan Pan; Pan Pan; Pan Pan"
"Hello all stations; Hello all stations; Hello all stations"

This type of radio call is used to transmit

(a) emergency information about boating safety, such as weather warnings.
(b) urgent information about the safety of a person or a vessel breakdown.
(c) distress information when a boat is in grave and imminent danger of sinking.
(d) contact information to ascertain which other boats are in the area.

11. The following boat design provides certain benefits.

The two main benefits that are provided by this catamaran style design are

(a) speed and carrying capacity.
(b) speed and stability.
(c) stability and power.
(d) stability and carrying capacity.

See next page

12. Shown below are four portable fire extinguishers

Foam

Carbon Dioxide

Water

Powder Type ABE

Which one of the following is the best match for the type of fire extinguisher and the fuel on which it should be used.

(a) foam – electrical equipment fires
(b) carbon dioxide – cooking oil
(c) water – flammable gases
(d) powder type ABE – flammable and combustible liquids

13. Local marine rescue groups monitor two channels for VHF radio users. Channels may vary depending on location, but will always include a particular channel, regardless of location in Western Australia. Which channel is the same regardless of location in the state?

(a) 11
(b) 12
(c) 16
(d) 64

14. The most likely cause of a tsunami that arrives along the Western Australian coast is

(a) the large tidal range, particularly in the Kimberley region.
(b) undersea volcanic eruptions, earthquakes or landslides.
(c) extreme storm events in the Great Southern Ocean.
(d) constructive interference of several smaller waves to produce a large wave.

15. 'Whipping' a rope is the term used to describe

(a) binding the end of a piece of rope to prevent fraying of strands.
(b) twisting multiple strands of fibre together to make a rope.
(c) beating the rope on a hard surface to soften it and improve its handling.
(d) separating the strands of a rope and inserting a metal eye into them.

See next page

16. Currents in Western Australia have an impact on the natural environment by

(a) all flowing in a southerly direction.
(b) affecting the distribution of larval and adult life forms.
(c) determining the sex of different fish species.
(d) influencing shipping routes.

17. Water particles in a deep-water wave

(a) move rapidly toward the shore.
(b) move in circular orbits.
(c) do not move; only the wave form moves.
(d) move in flat elliptical circles.

18. Integrated Fisheries Management (IFM) in Western Australia determines the allocation of fish resources to

(a) rock lobster and abalone fishermen.
(b) commercial and recreational fishermen.
(c) the non-fishing section of the community.
(d) recreational, commercial and customary fishers.

19. 'Sustainability' in relation to Australian marine ecosystems means that

(a) the marine environment must be conserved at any cost.
(b) humans are only able to use marine resources that are economically viable.
(c) the social, economic and environmental needs of the community are met and maintained for future generations.
(d) marine resources can only be used for recreation and conservation.

20. The tidal event resulting in a large range, i.e. very high water level at high tide and very low water level at low tide, is known as a

(a) spring tide.
(b) neap tide.
(c) normal high tide.
(d) normal low tide.

End of Section One

See next page

Section Two: Short answer **40% (80 Marks)**

This section has **eight (8)** 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.

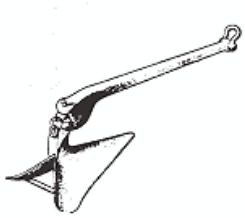
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s)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

Suggested working time: 70 minutes.

Question 21 **(10 marks)**

(a) When anchoring a boat, some important decisions need to be made to ensure that it is secured safely.

Name each type of anchor shown below, describe the type of ocean floor it would be best used in and give one advantage of the type.

	Name	Suitable for use in	One advantage
			
			

(6 marks)

(b) Describe one advantage of using chain to connect to the anchor. (1 mark)

Advantage: _____

_____

(c) What precaution should be taken with the scope when securing a vessel in a high tidal area? Explain why. (3 marks)

Precaution: _____

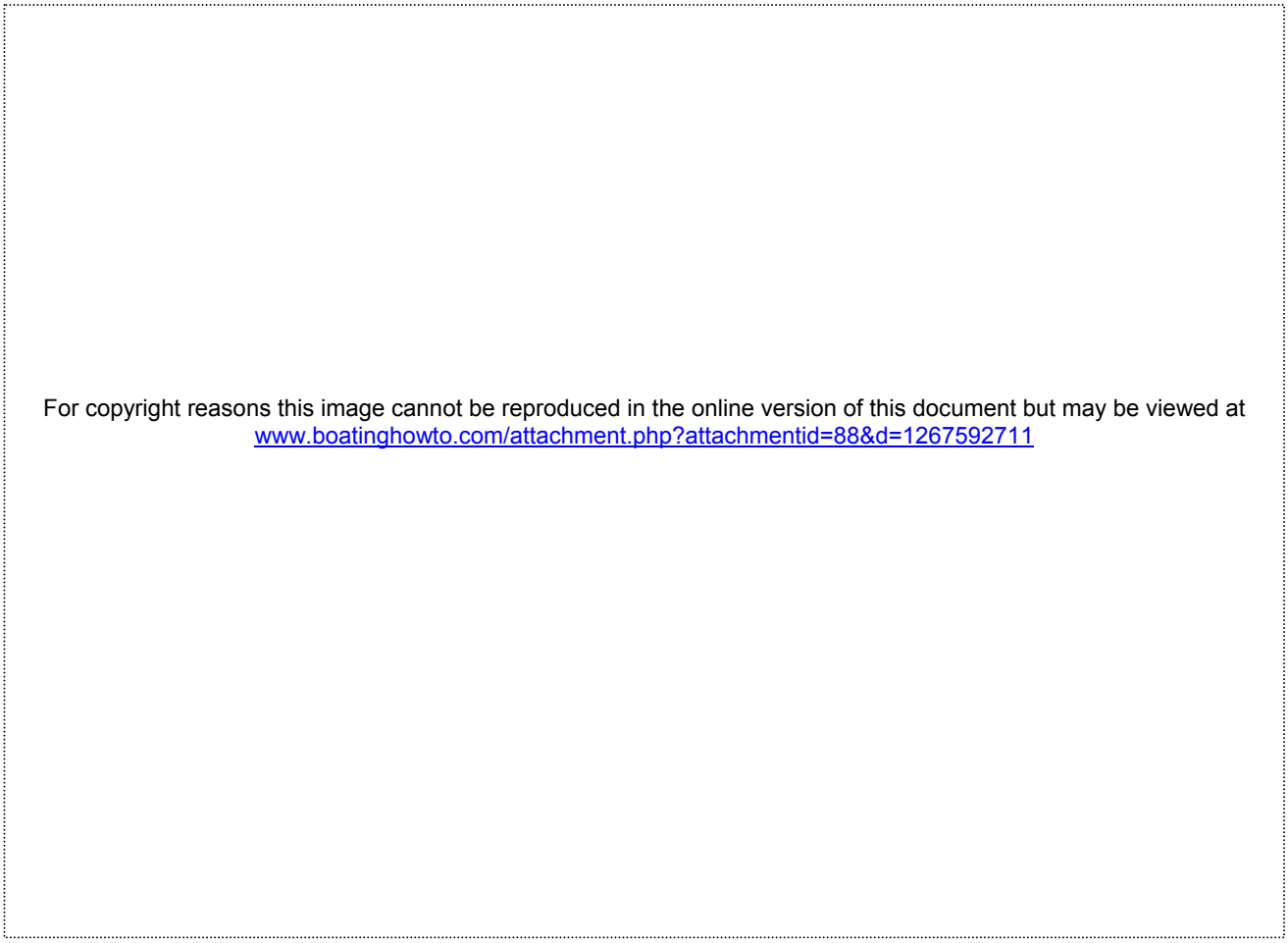
Explanation: _____

_____

See next page

Question 22 **(12 marks)**

Below is a diagram of the components of a marine engine's cooling system.



(a) Choose any three of the components in the diagram above and explain the role they have in maintaining correct engine temperature.

Component name	Role in maintaining correct engine temperature
_____	_____ _____
_____	_____ _____
_____	_____ _____

(3 marks)

(b) (i) The cooling system in the diagram on the previous page uses water from the boat's surroundings. Describe **two (2)** advantages and **two (2)** disadvantages of doing this. (4 marks)

Advantage One: _____

Advantage Two: _____

Disadvantage One: _____

Disadvantage Two: _____

(ii) Explain two routine maintenance procedures that can be performed to overcome the disadvantages you described in b (i). (2 marks)

One: _____

_____

Two: _____

_____

(c) Define each of the following terms as it applies to engine design and performance. (2 marks)

Compression: _____

_____

Horsepower: _____

_____

(d) What is 'antifouling'? (1 mark)

_____

_____

Question 23 **(8 marks)**

The survival of organisms living in marine and estuarine environments is affected greatly by the quality of the water in which they live. A number of factors in these environments affect living organisms. Complete the table below, identifying how each water quality factor is measured and the effect of that factor on the environment. Note that one has been completed as an example of what is required.

Water quality factor	What is measured	Effect on the marine/estuarine environment
Nitrates	Total nitrogen	Toxic in the form of ammonia, causes algal blooms.
pH		
Dissolved oxygen		
Temperature		
Salinity		

See next page

Question 24 **(13 marks)**

The safe working load for a rope can be measured using the following formula:

Safe Working Load (SWL) (kg) = $D^2 \times F$

Where D = the diameter of the rope measured in mm
F = the design factor, a number that represents the rope's strength

The breaking strain of rope can be calculated as 6 times the SWL,
i.e. breaking strain (kg) = SWL × 6

The table below shows the values for F for different types of rope.

Design factor for different rope materials	
manila	1
polythene/polyethylene/polypropylene	1.45
polyester/terylene	2
nylon	2.25
spectra/kevlar	6
steel	8
stainless steel	10

(a) Use the information provided to calculate the safe working load for a piece of manila rope of diameter 10 mm. (3 marks)

(b) Calculate the breaking strain for the manila rope. (2 marks)

See next page

(c) Draw a labelled diagram to explain the principle of a winch system. (4 marks)

(d) Explain **two (2)** ways in which the strongest rope could be used to secure a boat in a port. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

Question 25 **(10 marks)**

Western Australia is considered to have a very diverse (or varied) marine environment.

(a) Western Australia has a coastline approximately 25 000 km in total length. Give **two (2)** reasons why the length of the coastline contributes to the variety of ecosystems found in Western Australia's waters. (2 marks)

Reason One: _____

_____

Reason Two: _____

_____

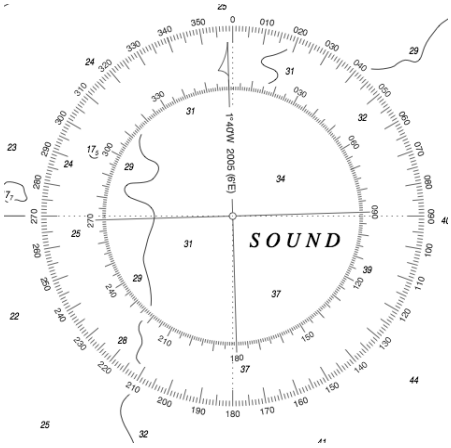
(b) Complete the following table to describe **two (2)** major ecosystems found along Western Australia's coastline. (8 marks)

Name of ecosystem and location	Main physical factors in the ecosystem	Dominant organism/s in the ecosystem	Other organisms in the ecosystem

Question 26 **(7 marks)**

Use **Appendix 1: King George Sound** to answer this question.

(a) Give the name and purpose of the symbol on the chart that looks like this:



Name of symbol: _____ (1 mark)

What purpose does this symbol have? (1 mark)

_____

(b) What do the symbols  that appear around Seal Island indicate to a skipper, and what action should the skipper take? (2 marks)

Indication: _____

_____

Action: _____

_____

(c) The map shows that HMAS *Perth* is located at E117°58.060. What is the name of this position on a map? (1 mark)

_____

(d) The chart contains a series of lines with numbers on them. One of these is near Seal Island and is written as $^{14}{}_{4}$. What does this mean? (2 marks)

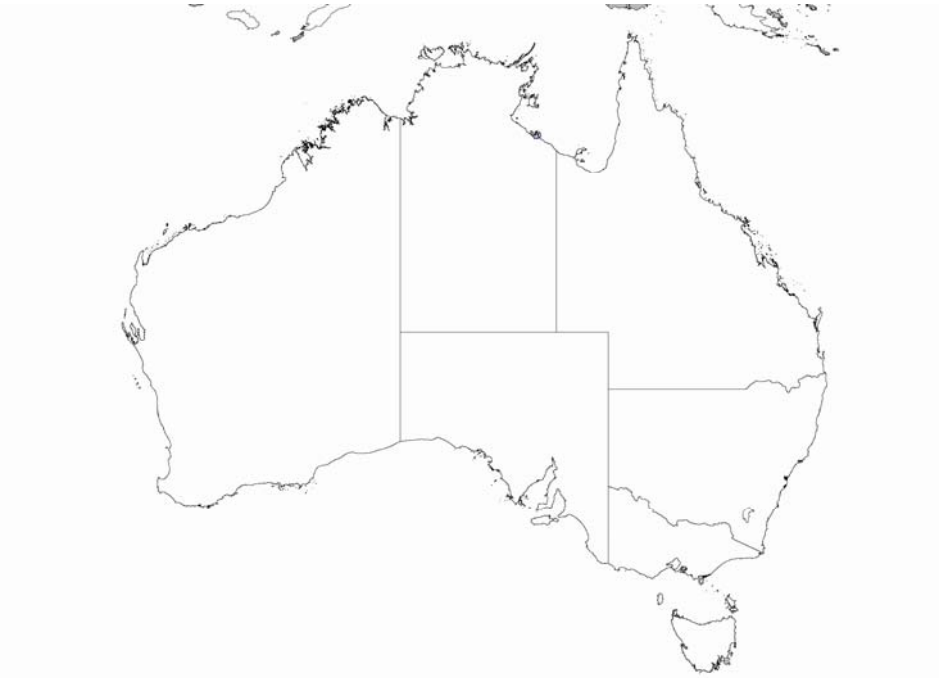
_____

_____

See next page

Question 27 **(10 marks)**

(a) (i) On the map provided below, show the complete pathway of an ocean current that significantly impacts on the Western Australian marine environment. (1 mark)



(ii) Name this current. (1 mark)

_____

(b) Name and explain **three (3)** factors that contribute to this current's flow. (6 marks)

Name: _____

Contributing factor: _____

_____

Name: _____

Contributing factor: _____

_____

Name: _____

Contributing factor: _____

_____

(c) Give an example of the impact this current has on each of the following: (2 marks)

(i) Marine life

Impact: _____

_____

(ii) The non-living environment

Impact: _____

_____

See next page

Question 28 **(10 marks)**

The data table below is the result of marine research into changes in water quality characteristics off the coast of south-western Australia over a period of 6 months. The measurements were taken at a depth of 0.5 m at the same location each time.

Month	Light intensity at 0.5 m depth (lux)	% Concentration of O_2	Temperature (°C)	Amount of chlorophyll-α (algae) present (µg/L)
September	4500	83	16	7.6
October	4300	81	16.5	8.2
November	3900	76	17.6	8.9
December	1750	82	19	57.2
January	980	65	21	68.1
February	600	21	22	27.2

(a) What technology could the researchers have used to ensure that they sampled water in the same location each time? (1 mark)

(b) Summarise and explain the changes in light intensity over the 6 months. (2 marks)

(c) If chlorophyll-α is a measure of how much microscopic algae (phytoplankton) is in the water, describe the changes in the amount of chlorophyll over the time period. (2 marks)

See next page

(d) Provide **three (3)** reasons as to why these changes have occurred, using other evidence from the data table to support your answer. (3 marks)

Reason One: _____

_____

Reason Two: _____

_____

Reason Three: _____

_____

(e) Summarise the relationship between temperature, the presence of chlorophyll and light intensity at this location over 6 months. (2 marks)

_____

_____

_____

_____

End of Section Two

Section Three: Extended answer **40% (80 Marks)**

This section contains **four (4)** questions. You must answer **two (2)** questions. Write your answers on the lined pages provided following question 32.

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.

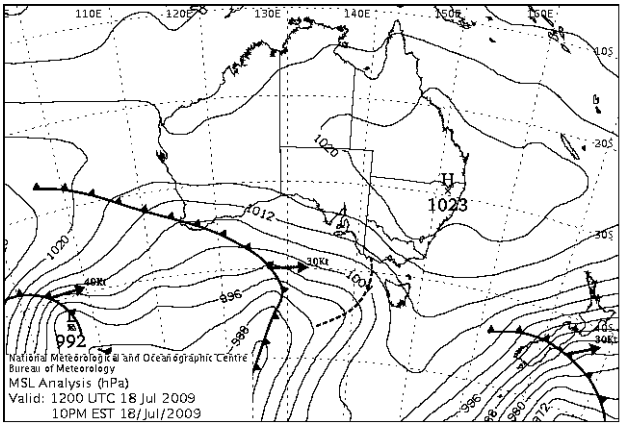
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s)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

Suggested working time: 80 minutes.

Question 29 **(40 marks)**

Marine navigation is vital for boats of all sizes and in many different conditions.

The following weather system was visible as a 4 m aluminium dinghy set off across a 1 km stretch of protected waters in south-western Australia. On seeing this, the skipper consulted a weather chart, as shown in the figure below.



(a) Describe what is shown in the image and how this relates to what is shown on the weather chart. Explain how this weather system will cause changes to sea and wave conditions. (6 marks)

(b) One important piece of marine equipment is a marine radio. Compare and contrast 27 MHz and VHF radios, and explain the role of Volunteer Sea Rescue, including its use of marine radios. (10 marks)

(c) Name **four (4)** other pieces of safety equipment required to be carried on board the 4 m boat described above that might be useful in such conditions. For each piece of equipment, give **two (2)** uses and explain how it would be used in an emergency situation. (12 marks)

(d) An outboard engine fell overboard during the weather event shown above and must be recovered. Explain the search patterns that could be used to locate the engine. Name and explain the equipment (including reels, lines, knots and lift bags) that could be used to recover the engine. (12 marks)

See next page

Question 30 **(40 marks)**

(a) Identify and discuss **two (2)** techniques that can be used to analyse human remains found at a shipwreck site. Include in your discussion what information can be obtained using these techniques and how this information can be used. (10 marks)

With reference to any shipwreck you have studied:

(b) Explain **three (3)** methods or techniques used to **locate** a shipwreck. (15 marks)

(c) Outline the method used to **survey** a shipwreck site. (5 marks)

(d) What precautions must be taken when excavating artefacts, and why? (10 marks)

Question 31 **(40 marks)**

Western Australia's fish and marine invertebrate resources are managed under the Fish Resource Management Act (1994) by the Department of Fisheries.

(a) Using a Western Australian fishery that you have studied, describe in detail **two (2)** major issues that have affected that fishery. Include in your answer a description of the suspected cause of each issue and what research was carried out to assess the state of the fishery. (20 marks)

(b) Describe, with examples, **five (5)** strategies used to manage these issues sustainably. (20 marks)

Question 32 **(40 marks)**

Boat engines are complex machines that require a variety of systems to interact together in order to operate at optimum condition. Modern engines include diagnostic equipment to monitor engine functioning.

(a) Explain why the operating temperature of the marine engine is important for its performance. (8 marks)

(b) Name **two (2)** items of diagnostic equipment that monitor an engine to ensure its optimum operation. For each item, explain how it assists in monitoring the vessel's condition and how it maintains engine quality. (12 marks)

A boat must be loaded correctly so that it travels correctly and safely.

(c) Describe how the loading of cargo can affect a boat's safety. (10 marks)

(d) Explain how ballast tanks can be used to alter the stability of a vessel. (10 marks)

End of questions

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Spare working space

Spare working space

ACKNOWLEDGEMENTS

Section One

Question 3 Foresman, P., S. (2007). Block and tackle [image]. Retrieved August, 2010, from: http://en.wikipedia.org/wiki/File:Block_and_tackle_(PSF).png.

Question 4 Eurion. (2008). *Jim is generally not an isolated danger buoy !*. Retrieved August, 2010, from http://beyond-the-break.blogspot.com/2008/03/dydd-gyl-dewi-st-davids-day-and-pirates.html.

Question 11 Photograph adapted from: Ottes, K. (2002). *Bugansight von catch up*. Retrieved August, 2010, from www.flickr.com/photos/klaus-ottes/692697078/in/photostream/.

Question 12 Wormald. (n.d.). *Fire etinguishers*. Retrieved August, 2010, from www.wormald.com.au/fire-products/fire-extinguishers.

Section Two

Question 21 Holidays Allover. (n.d.). *About boat anchors ad anchoring a bare boat*. Retrieved August, 2010, from www.holidaysallover.com/travel_about_aus/articles/bareboat_anchors.html.

Question 22 Boating How to.com. (n.d.). *Attachment* [image of boat engine parts]. Retrieved August, 2010, from www.boatinghowto.com/attachment.php?attachmentid=88&d=1267592711.

Question 24 MacDonald, J. A., Rossnagel, W. E., & Higgins, L. R. (2008). *Handbook of rigging: lifting, hoisting, and scaffolding for construction and industrial operations*. McGraw-Hill.

Question 26 Compass & symbols adapted from: Department for Planning and Infrastructure. (2005). *Chart showing King George Sound excerpted from Albany* [Chart no. 1083]. Perth: Department for Planning and Infrastructure.

Question 27 Map adapted from: Mapsof.net. (n.d.). *Australian location map*. Retrieved August, 2010, from http://mapsof.net/uploads/static-maps/australia_location_map.png.

Section Three

Question 29 Photograph adapted from: Maistora. (2007). *A (not so) distant storm*. Retrieved August, 2010, from www.flickr.com/photos/maistora/3979845717

Chart from: Bureau of Meteorology. (2009). *MSL Analysis (Manual) Australian Region*. Retrieved August 2010, from www.bom.gov.au/cgi-bin/charts/charts.view.pl?idcode=IDX0102&file=IDX0102.200907181200.gif

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