



MARINE AND MARITIME STUDIES

ATAR course examination 2023

Marking key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

Section One: Multiple-choice

20% (20 Marks)

Question	Answer
1	c
2	a
3	a
4	c
5	d
6	a
7	d
8	b
9	b
10	b
11	b
12	c
13	a
14	b
15	d
16	d
17	c
18	d
19	a
20	c

Section Two: Short answer

50% (107 Marks)

Question 21

(22 marks)

- (a) Describe how to fit a weight belt correctly around the waist. (3 marks)

Description	Marks
Any three of	
<ul style="list-style-type: none"> ensure correctly weighted (to achieve neutral buoyancy) ensure weights are evenly distributed appropriately tightened/comfortable fit right hand release (fit with buckle in left hand, other end in the right hand when securing) strap should be accessible in case of an emergency. 	1–3
Total	3

- (b) State
- two**
- purposes of a dive slate. (2 marks)

Description	Marks
to record data while in the water	1
to communicate underwater	1
Total	2
Accept other relevant answers.	

- (c) Explain how this sequence of steps is effective in removing water from the mask. (3 marks)

Description	Marks
Any three of	
<ul style="list-style-type: none"> air exhaled through the nostrils ascends (due to being less dense than water) this displaces the water trapped in the mask air is trapped due to the seal on the top trapped hair/ineffective seal creates a pathway for water to enter the mask tilting head back/looking up increases the efficiency of water escaping. 	1–3
Total	3

- (d) Propose a mistake the diver could likely make in performing these steps. (2 marks)

Description	Marks
the diver may not make an effective seal with forehead	1
therefore, no air would be caught in the mask/would still be full of water	1
Total	2
Accept other relevant answers.	

Question 21 (continued)

- (e) Describe **one** method by which a snorkeller or scuba diver can relieve cramp in their calf muscles while diving. (3 marks)

Description	Marks
For either on self or with buddy assistance	
On self: <ul style="list-style-type: none"> lengthen leg bend forwards and reach for tip of fin pull the tip of fin towards them to stretch out the calf muscle. 	1–3
Buddy assisted: <ul style="list-style-type: none"> lengthen leg buddy to assist by pushing tip of fin towards the person who has cramp. 	
Total	3

- (f) A scuba diver has a volume of 60 L and a mass of 65 kg, which has been determined by weighing the person on scales in air. Calculate the upthrust of the scuba diver in salt water and determine whether the scuba diver will float or sink. Show all workings. Assume a density of 1.03 kgL^{-1} for the salt water. (4 marks)

Description	Marks
Upthrust	
volume of scuba diver = 60 L mass of H_2O displaced = $60 \text{ L} \times 1.03 \text{ kg/L}$	1
= 61.8 kg upthrust	1
Buoyancy	
mass in air = 65 kg upthrust = 61.8 kg buoyancy = $65 - 61.8 = 3.2 \text{ kg}$ heavier by mass	1
scuba diver will sink/be negatively buoyant	1
Total	4

- (g) (i) Calculate the upthrust to determine the type of buoyancy they would be experiencing. Show all workings. (3 marks)

Description	Marks
volume of object = 70 L mass of H_2O displaced = $70 \text{ L} \times 1.03 \text{ kg/L}$ = 72.1 kg upthrust	1
mass in air (66 kg) < upthrust (72.1 kg)	1
positive buoyancy	1
Total	2

- (ii) Calculate the apparent mass and determine the weight the scuba diver requires to achieve neutral buoyancy. Show all workings. (2 marks)

Description	Marks
apparent mass = mass in air 66 kg – upthrust = $72.1 = -6.1 \text{ kg}$	1
the snorkeller will need to add 6.1 kg of weight to a weight belt to get to neutral buoyancy	1
Total	2

Question 22

(18 marks)

- (a) Explain how the Batavia and its artefacts were retrieved from the wreck site when its resting place was first discovered in 1963. (4 marks)

Description		Marks
Any four of		
<ul style="list-style-type: none"> • divers filled oil cylinders with exhaust fumes • attached to the artefacts • these were intended to be used like a modern-day lift bag/used to lift • attempted to lift with cranes/winches • removal of artefacts by hand. 	1–4	
Total		4

- (b) State **two** limitations of each of the following methods of locating shipwrecks. (6 marks)

Description		
Method	Limitations	Marks
Aerial survey	Any two of: <ul style="list-style-type: none"> • can only detect shallow sites • will not necessarily be identifiable in poor conditions • time consuming • costly process • unable to determine material of vessel/hull. 	1–2
Magnetometer	Any two of: <ul style="list-style-type: none"> • only detect ferrous (iron) and ferromagnetic materials • time consuming • costly process • may detect natural deposits • strength of magnetic field will dissipate with distance/depth. 	1–2
Sonar	Any two of: <ul style="list-style-type: none"> • costly process • equipment required is less available • requires specialised training • quality of image lost with depth/type of material/interference • time consuming • loses velocity with depth. 	1–2
Total		6

Question 22 (continued)

- (c) Propose why a combination of magnetometer, multibeam sonar and depth sounder should be used as a search techniques for shipwrecks. (3 marks)

Description	Marks
relying on one piece of equipment alone may not detect the wreck/decrease accuracy in detection	1
Any two of	
<ul style="list-style-type: none"> magnetometer can detect an iron/steel wreck at a distance three times its length away from its centre multibeam sonar gives topographic information (including geological makeup) of a wider area of the seafloor (however multibeam alone may not locate shipwreck) depth sounder is a more widely used piece of equipment (than multibeam sonar) and can detect an anomaly on the seafloor which might suggest a shipwreck. 	1-2
Total	3
Accept other relevant answers.	

- (d) Summarise the restoration process maritime archaeologists would perform on the wooden plank after it had been retrieved from the wreck site. (5 marks)

Description	Marks
preliminary cleaning to remove surface dirt/growth	1
place in a ventilated vat that has polyethylene glycol (PEG) and solvent (water or alcohol)	1
vat temperature is gradually increased (until reaching 60 °C)	1
with increasing temperature, the solvent will evaporate (more PEG is added)	1
PEG will permeate wood and replace water providing structure to wood	1
Total	5

Question 23

(19 marks)

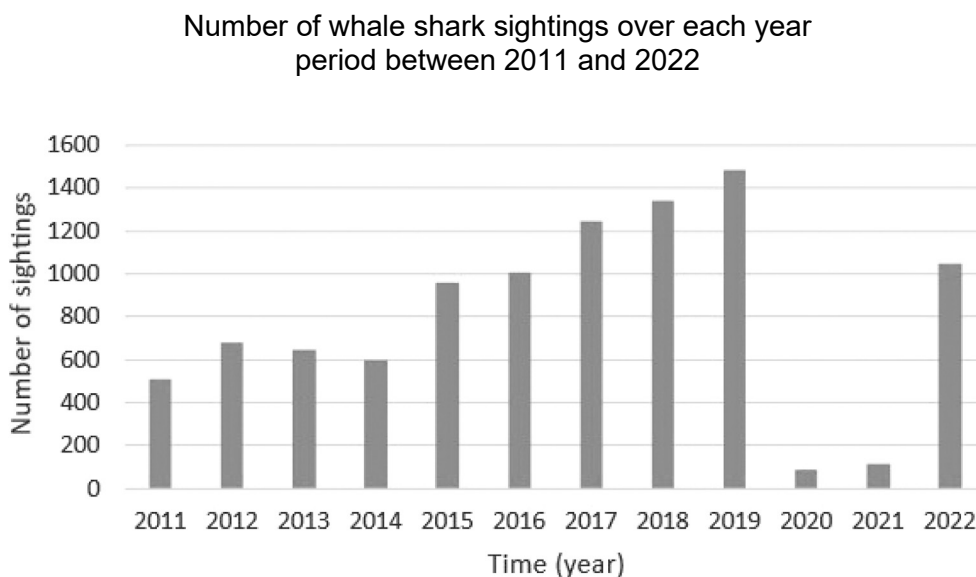
- (a) Outline what is meant by the term 'longitudinal study'. (2 marks)

Description	Marks
long-term research	1
repeated observations over time	1
Total	2

- (b) Using the grid below, construct a column graph to represent the information in the table on page 12. (6 marks)

Description	Marks
Title (includes independent and dependent variables – year and sightings)	1
Correct graph type (column graph/spaces between columns)	1
Axes titles (no units required)	1
Correct axis placement (X axis: independent variable/Y axis: dependent variable)	1
Scale	1
Correct plotting	1
Total	6

Answers could include:



Question 23 (continued)

- (c) Identify the trend shown in the graph and suggest reasons for any differences that are present. (4 marks)

Description	Marks
overall sightings increased between 2011–2019 period	1
sightings decreased between 2020–2021 period	1
Subtotal	2
Reasons for differences – any two of	
<ul style="list-style-type: none"> • due to fewer tourists because of the pandemic • tourism ceased and sightings are largely registered by citizen scientists on holiday • increasing popularity of ecotourism/increased entry into the photo-identification database. 	1–2
Subtotal	2
Total	4
Accept other relevant answers.	

- (d) Complete the table by defining primary and secondary data and identifying a marine example of each. (4 marks)

Description	Marks
Primary data	
Definition: data collected directly by a person or group	1
Example: any valid marine response	1
Subtotal	2
Secondary data	
Definition: data that is used by someone other than the person or group who collected the data	1
Example: any valid marine response	1
Subtotal	2
Total	4
Answers could include:	
<ul style="list-style-type: none"> • primary data example: taking identification photographs of whale sharks and uploading them to the ECOCEAN database • secondary data example: reviewing identification photographs of whale sharks from the ECOCEAN database to study population demographics. 	
Accept other relevant answers.	

- (e) State **three** benefits of using the photo-identification method of data collection, instead of tagging animals. (3 marks)

Description	Marks
Any three of	
<ul style="list-style-type: none"> • non-invasive • more skills required to tag animals • citizens can assist, which increases effort/sample size • more cost-effective • provides an education opportunity. 	1–3
Total	3
Accept other relevant answers.	

Question 24

(15 marks)

- (a) State **four** reasons why it was considered suitable for current whale shark tour operators to be granted permits during the trial period. (4 marks)

Description	Marks
whale sharks are a similar size to humpback whales and so interactions may be similar	1
whale shark operators have already established adherence to guidelines and safety measures for interacting with a species	1
experience of operators in offering in-water encounters with a large animal for the safety of citizens	1
capability of assisting with real-time monitoring and data collection via electronic monitoring system (EMS) which is already installed on their vessels to monitor whale sharks	1
Total	4
Accept other relevant answers.	

- (b) Suggest **three** criteria that would have been considered to allow the industry to move from the trial to a licensed operation. (3 marks)

Description	Marks
Any three of	
<ul style="list-style-type: none"> • impact of the industry on humpback whales (especially mothers and calves) • benefit of industry to local economy • risk to people partaking in the in-water interactions • assist with the establishment of an industry that is viable and sustainable long-term • use research and monitoring programs to ensure informed decision-making. 	1–3
Total	3
Accept other relevant answers.	

Question 24 (continued)

- (c) State **two** rules for each of the following areas of vessel interaction with whales. (4 marks)

Description	Marks
No approach zone – any two of	
<ul style="list-style-type: none"> no approach 100 m to the side no approach 300 m in front and to the rear 60 degree no approach zone at front and rear no waiting in front of direction of travel no following from behind a zone of total vessel exclusion. 	1–2
Subtotal	2
Caution zone – any two of	
<ul style="list-style-type: none"> caution zone from 100 m to 300 m speed must be six knots or under maximum of three vessels do not enter zone if animals are injured, stranded, entangled or stressed do not enter zone, if a calf is present do not enter, if operating a prohibited vessel. 	1–2
Subtotal	2
Total	4
Accept other relevant answers.	

- (d) (i) State **two** examples of prohibited whales. (2 marks)

Description	Marks
Any two of	
<ul style="list-style-type: none"> small calves (less than half the size of accompanying whales) special interest whales injured, sick, deceased or incapacitated whales whales demonstrating agonistic (combative) or disturbance behaviours. 	1–2
Total	2
Accept other relevant answers.	

- (ii) State **two** examples of interaction limits. (2 marks)

Description	Marks
Any two of	
<ul style="list-style-type: none"> the time spent with any whale or pod must not exceed 60 minutes the permitted number of unsuccessful interaction attempts may be restricted multiple operators may interact with the same whale or pod if the total cumulative time and number of unsuccessful interactions do not exceed these limits. 	1–2
Total	2
Accept other relevant answers.	

Question 25

(18 marks)

- (a) Name the Western Australian organisation that an incident would need to be reported to if a vessel leaks petroleum oil into the environment. (1 mark)

Name	Marks
Department of Transport (Maritime Environmental Emergency Response)	1
Total	1

- (b) State the type of source that petroleum oil coming from a recreational vessel would be. (1 mark)

Description	Marks
point source	1
Total	1

- (c) Using an example, describe each of the following petroleum oil clean-up methods. (6 marks)

Description	Marks
Biological	
Example: bacteria	1
Description: living organisms break down the oil	1
Subtotal	2
Chemical	
Example: soaps or detergents or burn off	1
Description: chemicals act as dispersants and break up/dissolve oil	1
Subtotal	2
Mechanical	
Example: a boom which blocks surface movement or a vacuum or skimmer	1
Description: use of an object/piece of equipment to clean up or stop oil movement	1
Subtotal	2
Total	6
Accept other relevant answers.	

- (d) Identify **two** pieces of information relating to the site of a spill that would be beneficial in managing the clean-up process, and advise why for each. (4 marks)

Description	Marks
Any two of (2 x 2 marks)	
<ul style="list-style-type: none"> weather modelling: to predict what future impacts there may be to the environment and/or human use areas water current modelling: to predict future movement of oil to assist managers to block the pathway of the oil wind modelling: wind may influence water currents which carry oil away from accident site. 	1–4
Total	4
Accept other relevant answers.	

Question 25 (continued)

- (e) List **four** potential impacts of oil spills on marine animals. (4 marks)

Description	Marks
Any four of	
<ul style="list-style-type: none"> • inhalation of toxic chemicals • ingestion of toxic chemicals • loss of food resources • skin irritations • clogging of baleen in whales • loss of insulating feathers on birds • disruption of nests of marine birds and turtles • covers blowholes and interrupts respiration. 	1–4
Total	4
Accept other relevant answers.	

- (f) If petroleum oil remains in the environment, state, and account for, the issue that would affect filter feeders over time. (2 marks)

Description	Marks
bioaccumulation/build up within organisms and the concentration of oil (or chemicals within the oil) will increase over time	1
due to the intake of oil and it not breaking down in the organism	1
Total	2

Question 26

(15 marks)

- (a) (i) Identify
- two**
- roles of a port. (2 marks)

Description	Marks
goods are carried to/from ports to distribute to the mainland/cities/towns	1
ports allow loading/unloading of large cargo vessels	1
Total	2
Accept other relevant answers.	

- (ii) Identify
- one**
- physical feature a port needs and outline why this is important. (2 marks)

Description	Marks
Identifies a physical feature a port needs	1
Outlines why the physical feature is important	1
Total	2
Answers could include:	
<ul style="list-style-type: none"> • deep channels: allows vessels with a large draft to move through/access area • training walls: directs the water out to sea maintaining an open passageway • breakwater: reduces wave motion to protect the vessels. 	
Accept other relevant answers.	

- (b) Identify the primary engineering process that leads to an increase in water turbidity in ports. Explain how this process decreases the quality of water and affects marine organisms. (5 marks)

Description	Marks
dredging	1
Subtotal	1
Any four of	
<ul style="list-style-type: none"> • removes sand/silt from channels • suspended sand/silt will decrease water clarity/increase turbidity • leading to poor light penetration • causing issues for organisms that require light such as seagrass/coral/phytoplankton • these organisms are unable to undertake photosynthesis • can impact higher trophic levels due to loss of primary producers. 	1–4
Subtotal	4
Total	5
Accept other relevant answers.	

Question 26 (continued)

(c) Name and outline **one** technique used to measure water turbidity. (2 marks)

Description	Marks
Names a technique used to measure water turbidity	1
Outlines the technique used to measure water turbidity	1
Total	2
Answers could include: <ul style="list-style-type: none"> • Secchi disc: lower Secchi disc into water column and record depth when it is no longer visible • turbidity tube: sample of water poured into a tube to indicate relative water transparency. Accept other relevant answers.	

(d) Draw an annotated diagram to demonstrate how an artificial reef is used to reduce erosion at a beach. (4 marks)

Explanation	Marks
Diagram includes	
Artificial reef placed parallel to shore	1
Artificial reef reduces impact of destructive wave energy reaching shoreline	1
Encourages waves to break at the artificial reef instead of the shore	1
Backwash has less energy so carries less sand away	1
Total	4
Answers could include: <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> </div>	

Section Three: Extended answer

30% (40 Marks)

Question 27

(20 marks)

- (a) Explain how thermohaline circulation helps to drive the Leeuwin Current and discuss how the Leeuwin Current influences marine ecosystems. (10 marks)

Description	Marks
Explanation	
thermohaline circulation is the movement of water due to different densities caused by temperature and salinity	1
warmer water is less dense than cooler water so will sit higher in the water column	1
salty water is more dense than fresh water so will sit lower in the water column	1
the Leeuwin Current is a warm, surface current that travels down the Western Australian coastline	1
Subtotal	4
Discussion – any six of	
<ul style="list-style-type: none"> • carries eggs, larvae and juveniles of coral, invertebrates, and tropical fish species • strengthens during coral spawning in autumn on the Ningaloo Coast allowing coral species to settle in southern reefs, such as the Abrolhos Islands and Rottnest Island • coral reefs exist more southerly than the normal range and more southerly than coral reefs in other locations in the southern hemisphere • the Leeuwin Current is nutrient-poor and does not support a high biomass of finfish • assists the movement of western rock lobster larvae through eddies moving them offshore then back towards the coast before growing into pueruli that travel down the West Australian coast in the Leeuwin Current • assists the southern migration of humpback whales travelling to feeding grounds in Antarctica • assists blue fin tuna travelling from the spawning ground between Java and Western Australia to southern waters in South Australia • assists herring and salmon eggs and larvae to travel from the South West of Western Australia to nursery areas in Western Australia, South Australia, and Victoria. 	1–6
Subtotal	6
Total	10
Accept other relevant answers.	

Question 27 (continued)

- (b) Explain the impact of the enhanced greenhouse effect on thermohaline circulation. (3 marks)

Description	Marks
Any one of	
The enhanced greenhouse effect leads to: <ul style="list-style-type: none"> • decreased ice formation • which lowers surface water salinity • that in turn creates lower density water which does not sink to drive global water circulation. 	1–3
The enhanced greenhouse effect leads to: <ul style="list-style-type: none"> • reduction in temperature differences of water bodies • resulting in less vertical mixing (and therefore reduced horizontal movement) • which slows major thermohaline ocean currents. 	
Total	3
Accept other relevant answers.	

- (c) Describe the potential impacts of the enhanced greenhouse effect and changes to thermohaline circulation on marine habitats. (7 marks)

Description	Marks
Any seven of	
<ul style="list-style-type: none"> • less water movement will result in lower oxygen levels at depth • reduction in vertical migration of plankton • reduction in plankton availability may alter whale feeding behaviour/migration routes • increased storm systems due to the EGE may bring pollutants, such as heavy metals to coastal waters and decrease water quality • increased storm systems due to the EGE may damage reef systems and cause coral bleaching • increased storm systems due to EGE may damage seagrass habitats and deplete food resources • increased storm systems and flooding may inundate coastal waters with organic material/silt/sand which will increase water turbidity (reduce clarity) and benthic producers may die • higher nest temperatures may result in the sex-bias of eggs in marine reptiles. 	1–7
Total	
Accept other relevant answers.	

Question 28

(20 marks)

- (a) Explain, with reference to the sand budget, how the coastal profile of a location can vary significantly with changes in the seasons. (8 marks)

Description	Marks
Any eight of	
<ul style="list-style-type: none"> • sand budget refers to the net movement of sand in and out of a coastal system • seasonally, wave energy changes • this results in movement of sand in different ways throughout the year • in winter, destructive/storm waves have higher energy backwash which removes sand from the beach • this results in a steeper coastal profile • due to deposition of sediment offshore • in summer, constructive waves have lower energy backwash • which deposits sand from the sandbank onto the beach • this results in a gentler, sloping coastal profile/deposition of sediment on the beach. 	1–8
Total	8

- (b) Identify **two** soft and **two** hard engineering strategies that could be implemented to minimise the impacts of coastal erosion. For each strategy, describe **one** advantage and **one** disadvantage. (12 marks)

Description	Marks
Soft strategies	
sand replenishment/beach nourishment	1
Advantage – any one of: <ul style="list-style-type: none"> • does not further erode the current beach as it is sourced from an external location • can widen the recreational beach area • new sand will protect any structures that sit behind the main beach area, such as amenities, surf lifesaving clubs or resorts • creates high amenity • will not have adverse impacts on adjacent coastline. 	1
Disadvantage – any one of: <ul style="list-style-type: none"> • nourished sand will often erode faster than natural sand • expensive and must be repeated often • during nourishment, the beach will be a construction zone and decrease amenity and use • sand may be different from the natural sand and reduce amenity. 	1
Subtotal	3
sandbags	1
Advantage: <ul style="list-style-type: none"> • cheap • non-permanent • integrates into the environment 	1
Disadvantage – any one of: <ul style="list-style-type: none"> • decreases amenity • unable to keep sediment on top of sandbags as this will erode easily and leave the sandbags exposed. 	1
Subtotal	3

Question 28 (continued)

Hard strategies	
sea wall	1
Advantage – any one of: <ul style="list-style-type: none"> protects human use areas and buildings from wave energy and tides considered a long-term solution, especially in a high-energy wave environment. 	1
Disadvantage – any one of: <ul style="list-style-type: none"> can deflect waves back out to sea which combine with incoming waves and increase turbulence and sand suspension the sediment in front of a sea wall will erode easily can disrupt natural sediment movement and longshore drift can alter adjacent coastline due to disruption of natural sediment movement expensive to construct. 	1
Subtotal	3
breakwater	1
Advantage – any one of: <ul style="list-style-type: none"> protects human use areas and buildings from wave energy and tides provides a safe harbour for vessels considered a long-term solution, especially in a high-energy wave environment protects the coastline from common wind and swell patterns and can be extended further in these directions. 	1
Disadvantage – any one of: <ul style="list-style-type: none"> large environmental impact and footprint destruction of marine and terrestrial habitats can disrupt natural sediment movement and longshore drift can alter adjacent coastline due to disruption of natural sediment movement expensive to construct. 	1
Subtotal	3
Total	12
Answers could include: Hard strategy: groyne Advantages: <ul style="list-style-type: none"> smaller environmental impact footprint than a breakwater or sea wall can reduce beach erosion caused by longshore drift. Disadvantages: <ul style="list-style-type: none"> can alter adjacent coastline due to disruption of natural sediment movement need to keep adding additional groynes to reduce impact along the adjacent coastline will lose sand on one side of the groyne as constructive waves are not able to deposit sediment on that side. 	
Accept other relevant answers.	

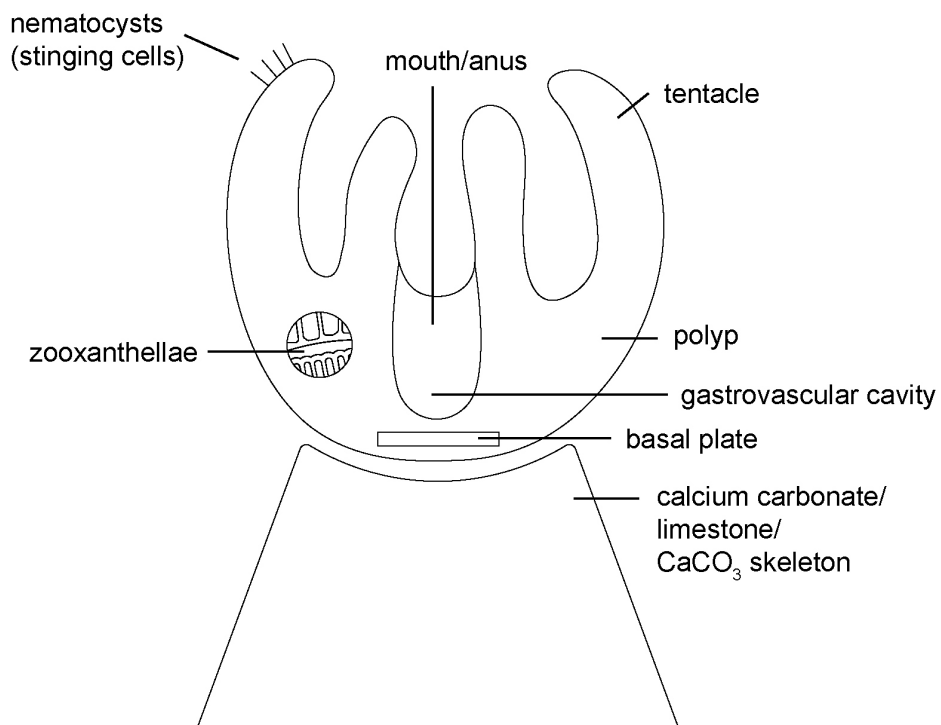
Question 29

(20 marks)

- (a) Using a labelled diagram, describe the structure of a typical coral polyp, including the surrounding hard structure. (8 marks)

Description	Marks
Draws a labelled diagram of a typical coral polyp	1-2
Descriptions	
mouth/anus: one opening for taking in nutrients and excreting wastes	1
tentacles: used for competition with other coral species for space and/or catching prey	1
nematocysts: stinging cells	1
calcium carbonate: secretion that forms the hard coral structure	1
coelenteron or gastrovascular cavity (accept either): primary organ of digestion and circulation	1
zooxanthellae: photosynthetic algae that provides coral with nutrition	1
Total	8

Answers could include:



Coenosteum: calcium carbonate skeletal material between walls of adjacent corallite
 Accept other relevant answers.

Question 29 (continued)

- (b) Identify **three** abiotic conditions required for coral reefs to occupy an area and state why each condition is necessary. (6 marks)

Description	Marks
Identifies clear/shallow water in the photic zone	1
States light penetration required for photosynthesis	1
Subtotal	2
Identifies low nutrient water	1
States – any one of <ul style="list-style-type: none"> • minimise overgrowth of invasive algal species • maximum light penetration through clear water for zooxanthellae 	1
Subtotal	2
Identifies warm water (23–29 °C)	1
States typically tropical species, small tolerance for temperature beyond this range for extended period	1
Subtotal	2
Total	6
Accept other relevant answers.	

- (c) Discuss the role and importance of a coral reef in the marine environment. (6 marks)

Description	Marks
architecture species/habitat (provide structure on which other organisms rely)	1
without this structure small organisms would be without nursery grounds	1
protection from predators	1
allows for the establishment of a food web/food source for other organisms	1
minimise incoming wave energy which reaches coastal ecosystems (seagrass meadows/mangroves)	1
increases protection for these ecosystems from storms	1
Total	6

Question 30

(20 marks)

- (a) Explain, with reference to Boyle's Law, what would happen to a diver in situations where a CESA is used, and where a CESA is not used during an emergency ascent. Include in your answer the behaviour of gases and their effects on the body. (12 marks)

Definition	Marks
Boyle's Law	
relationship between pressure and volume identified correctly as inversely proportional	1
the relationship is true for a constant temperature and fixed mass of gas	1
Subtotal	2
With CESA	
<ul style="list-style-type: none"> • air is slowly and gently released by the diver as they ascend • lung volume starts and finishes with air even though air is released • lung volume should stay at a similar size as any gas that expands will also be released • no barotrauma. 	1–4
Subtotal	4
Without CESA	
<ul style="list-style-type: none"> • air will expand within the lung cavity and has nowhere to go as diver does not exhale • lung volume starts and finishes with air as it is trapped in lung cavity • lung overexpansion due to increased volume of gas within the lungs • air has nowhere to go except to rupture soft tissue and move into body cavity • barotrauma likely such as: • pulmonary barotrauma (arterial gas embolism). 	1–6
Subtotal	6
Total	12
Accept other relevant answers.	

- (b) Suggest the most likely cause of this pain and describe what is occurring in the ear space when the snorkeller descends to a depth of 10 m. (4 marks)

Description	Marks
barotrauma	1
Subtotal	1
Description	
trapped air in middle ear contracts creating low pressure	1
thus higher pressure on ear drum (tympanic membrane) from outer ear causes pain	1
trapped air contracts to 50% of original volume at depth of 10 m	1
Subtotal	3
Total	4

Question 30 (continued)

- (c) Identify and state how to perform **two** methods of equalisation for this situation. (4 marks)

Description	Marks
Any two of	
Valsalva: exhalation against closed airway/pinching nose and closing mouth while exhaling	1–4
Frenzel: use the tongue as a piston (close the back of the throat) and push air towards the back of your throat (make the sound of the letter 'k')	
Toynbee: pinching nose and swallowing to open the eustachian tubes	
Total	4
Answers could include:	
Lowry and Edmonds methods.	
Accept other relevant answers.	

ACKNOWLEDGEMENTS

- Question 24(a–b)** Dot points 5–9 adapted from: Department of Biodiversity, Conservation and Attractions (DBCA). (2020). *Humpback Whale Interactions Along the Ningaloo Coast*. Retrieved April, 2023, from https://www.dpaw.wa.gov.au/images/documents/conservation-management/marine/wildlife/Managing%20interactions%20with%20humpback%20whales%20along%20the%20Ningaloo%20Coast_fact%20sheet.pdf
- Question 24(d)** Dot points 1–7 adapted from: Department of Biodiversity, Conservation and Attractions (DBCA). (2020). *Management Program for Humpback Whale Interactions Along the Ningaloo Coast*. Retrieved August, 2023, from <https://library.dbca.wa.gov.au/static/FullTextFiles/202927.pdf>

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