



MARINE AND MARITIME STUDIES

ATAR course examination 2020

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

Section Two: Short answer

50% (97 Marks)

Question 21

(20 marks)

- (a) Give a title for this graph. (2 marks)

Description	Marks
Title must include the following	
Independent variable (e.g. water depth)	1
Dependant variable (e.g. number of fish)	1
Total	2
For example: The effect of water depth on the number of fish present.	

- (b) Name each of the following variables that would have been used to arrive at this graph. (2 marks)

Description	Marks
(i) Independent variable	
Depth of water	1
(ii) Dependent variable	
Number of fish	1
Total	2

- (c) List
- three**
- variables the experimenter would have had to control. (3 marks)

Description	Marks
Any three of following	
<ul style="list-style-type: none"> • location • temperature (if possible) • light level • time of day/year • other organisms/predators present • same day 	1–3
Total	3
Accept any other relevant answers.	

- (d) Write an hypothesis that, when tested, may have caused the results shown in the graph. (3 marks)

Description	Marks
Must be one sentence	
Statement gives relationship between independent variable and dependent variable and direction of change	3
Statement only links dependent and independent variables.	2
States variable with no connection	1
Total	3
Answer include but is not limited to: As the depth of water increases the number of fish will decrease.	
Accept any other relevant answers.	

Question 21 (continued)

- (e) (i) Rewrite this statement so that it reflects the graph results more accurately. (3 marks)

Description	Marks
Statement includes the increase in fish numbers up to a point then they decline	
<ul style="list-style-type: none"> Independent variable (e.g. water depth) increases the dependent variable (e.g. number of fish) increases up to a certain depth then the numbers decline 	3
<ul style="list-style-type: none"> Independent variable (e.g. water depth) increases the dependent variable (e.g. number of fish) increases 	2
<ul style="list-style-type: none"> The fish numbers increase 	1
Total	3
Accept any other relevant answers.	

- (ii) Support your answer to question (e)(i), using the results shown in the graph. (3 marks)

Description	Marks
Statement should include the increase in numbers of fish and then the decline with the depth stated when there is the change in fish numbers	
The graph shows that as the depth increases the number of fish increases up to a point (13 m) then they decrease. Independent and dependant variables are wrong.	3
There is an increase then a decrease in fish numbers.	2
The numbers change over depth.	1
Total	3
Accept any other relevant answers.	

- (f) Explain how this size limit would lead to a sustainable fishery for this species. (4 marks)

Description	Marks
Males can breed at any age	1
Female reach sexual maturity/breeding size and so	1
Have a chance to mate/reproduce (before capture) therefore	1
Stock is replenished/not reduced (each breeding season)	1
Total	4
Accept any other relevant answers.	

Question 22

(19 marks)

- (a) State what is happening in the above diagram at points (3 marks)

Description	Marks
A: (Electromagnetic) radiation (light and UV) entering atmosphere	1
B: Shorter wave radiation (infrared) absorbed by greenhouse gas (molecules)	1
C: Rays/(Heat/IR radiation) reflecting off greenhouse gas (molecules)/clouds	1
Total	3

- (b) What
- two**
- things are occurring at point D in the above diagram? (2 marks)

Description	Marks
Any two of the following	
<ul style="list-style-type: none"> • Short wave radiation (light and UV) being absorbed by Earth's surface • Short wave radiation (light and UV) being converted into longer wave length radiation (infrared) • Longer wavelength radiation (infrared) is re-radiated 	1-2
Total	2
Accept any other relevant answers.	

- (c) (i) What is the difference between the types of energy at points A and of D in the above diagram? (1 mark)

Description	Marks
Statement must distinguish between which is longer/shorter wavelength	
Wave length of A is shorter than that of D/Light and UV at A is converted to infrared or heat radiation at D	1
Total	1
Accept any other relevant answers.	

- (ii) Explain how this difference in energy results in the heating of the atmosphere. Refer to the greenhouse effect diagram in your answer. (4 marks)

Description	Marks
Much of short wave radiation passes through atmosphere and is absorbed by Earth's surface/the Earth's atmosphere is transparent to most short wave radiation	1
Re-radiation/emitted from Earth's surface is long wave radiation	1
Absorbed/reflected by Greenhouse gases causing	1
Heat retention (in atmosphere)/atmosphere to heat up	1
Total	4
Accept any other relevant answers.	

Question 22 (continued)

- (d) Other than carbon dioxide (CO₂), list **three** greenhouse gases. (3 marks)

Description	Marks
Any three of the following	
<ul style="list-style-type: none"> • methane/CH₄ • water/H₂O • Chlorofluorocarbons (CFCs) • nitrogen oxides (nitric oxide) 	1–3
Total	3
Accept any other relevant answers.	

- (e) List **two** ways in which the enhanced greenhouse effect is having an impact on marine habitats and describe how each of these impacts is brought about. (6 marks)

Description	Marks
Any two of	
Increase in ocean temperature	1
as atmospheric temperature increases heat is absorbed by the oceans which leads to an increase in ocean/water temperature	1–2
Subtotal	3
Coral bleaching	1
due to temperature stress on coral which leads to expulsion of zooxanthellae	1–2
Subtotal	3
Water levels will rise	1
increase temperature leads to greater thermal expansion	1–2
Subtotal	3
Sea ice will melt	1
(no increase in water levels but) loss of habitat/refuge for marine mammals	1–2
Subtotal	3
Increase in storm frequency and severity	1
erosion tearing up the bottom which can lead to habitat destruction	1–2
Subtotal	3
Example of explanation and marks awarded: Increase in ocean temperature: (1 mark) As atmospheric temperature increases heat is absorbed by the oceans (1 mark) which leads to an increase in ocean/water temperature (1 mark).	
Total	6
Accept any other relevant answers.	

Question 23

(22 marks)

- (a) Describe the procedure involved in a snorkeller or diver establishing neutral buoyancy at the surface. (5 marks)

Description	Marks
All equipment on	1
Float vertical/upright in water	1
Breath out and hold breath	1
Add/remove weight until	1
Float to water at eye level (breath out should just sink/breath in should just rise up)	1
Total	5
For example: With all equipment on, float vertically in the water and breath out, add or remove weight until float with nose just out of the water.	

- (b) Explain why a mask may become cloudy or foggy during a dive. (3 marks)

Description	Marks
Any three of the following: <ul style="list-style-type: none"> • (mask) glass cold • water vapour inside mask (is warm) • water condenses on glass (as tiny droplets which look foggy) • mask is dirty provides nuclei for formation of droplets. 	1–3
Total	3
Accept any other relevant answers.	

- (c) In air, sound waves travel at 345 metres per second, while in seawater, sound waves travel at 1531 metres per second. Explain how this difference affects a diver trying to locate the source of a sound while underwater. (3 marks)

Description	Marks
Humans evolved for speed of sound in air/ear distance apart suited for discerning direction of sound in air	1
Sound underwater arrives at each ear almost at the same time	1
Diver can't discern sound direction/distance	1
Total	3
Accept any other relevant answers.	

Question 23 (continued)

- (d) Outline **two** practices or processes that divers should follow to cope with the effects of the higher speed of sound in water. (4 marks)

Description	Marks
Any two of the following	
While ascending (slowly) diver should look around 360 degrees if they hear a vessel. As they don't know where it is coming from	1-2
Dive flags show that vessels should stand off 50 m and proceed slowly in the vicinity	1-2
Diver tows a float with a dive flag so that vessels stand off 50 m and proceed slowly	1-2
Total	4
Accept any other relevant answers.	

- (e) Describe **one** method of releasing a lower leg cramp while in the water. (3 marks)

Description	Marks
Any three of the following: <ul style="list-style-type: none"> • stop swimming • grasp end/tip of fin and hold it • straighten the leg • hold until cramp goes • massage affected muscle (to help restore adequate blood supply) 	1-3
Total	3
For example: Stop swimming, hold tip of fin and straighten leg. Hold until cramp goes.	
Accept any other relevant answers.	

- (f) If a snorkeller was to ascend quickly to the surface, would you expect them to suffer from a barotrauma? Explain why you think this. (4 marks)

Description	Marks
No	1
<ul style="list-style-type: none"> • air volume in body cavities returns to what was at the start of the dive/surface volume prior to descent • pressure back to same as start of dive • no pressure change so no barotrauma 	1-3
Total	4

Question 24

(14 marks)

- (a) Explain how this increase in ocean acidity has occurred. (4 marks)

Description	Marks
Increase in atmospheric CO ₂ (due to burning fossil fuels)	1
CO ₂ dissolves in water to	1
Form Bicarbonate/hydrogen carbonate and carbonate and hydrogen ions	1
Hydrogen ions make water more acid/lowers pH	1
Total	4
If include chemical equation of dissolving process award 2 marks CO ₂ + H ₂ O → CO ₃ ²⁻ + HCO ₃ ⁻ + H ⁺	

- (b) Explain why this decline in plankton skeleton integrity could affect a population of large fish such as snapper or dhufish and the effect you would expect in the longer term. (4 marks)

Description	Marks
Weaker exoskeleton leads to less viability/decrease in breeding	1
Less plankton (phytoplankton and zooplankton)	1
Plankton start of many (marine) food chains/base of biomass pyramids	1
(Less food at start of food chain) unable to support organisms higher up food chain(s)/pyramid(s) or Longer term result is to reduce larger fish population/collapse of food web	1
Total	4
Accept any other relevant answers.	

- (c) State
- two**
- effects this acidification could have on a marine habitat, other than the loss of exoskeletons and food chain problems. Explain the process(es) involved in each effect. (6 mark)

Description	Marks
Include any two of the following effects	
Coral Bleaching	1
Loss of calcium carbonate from limestone/coral reef	1
Increased photosynthesis	1
Subtotal	2
Explains the two effects chosen	
Stresses coral Which eject zooxanthellae Lose colour and food supplier	1–2
Leads to loss/weakening of reef structure, e.g. damage increased during storms/rough seas Loss of habitat/protection	1–2
Some sea grass and algae may benefit – higher CO ₂ levels leads to increased photosynthesis	1–2
Subtotal	4
Total	6
Accept other relevant answers.	

Question 25

(13 marks)

- (a) Describe the process involved in adding the photograph of individual whale sharks to the international database. (5 marks)

Description	Marks
Any five of the following: <ul style="list-style-type: none"> • (photograph of whale shark) • picture/photograph close to gills/behind pectoral fin • on left side ideally • process photograph using appropriate computer program • enter location data • locate spots in pectoral region and mark (on screen) • computer logs data in reference/data base (international data base) 	1–5
Total	5
Accept any other relevant answers.	

- (b) Explain how the photographic identification of individual whale sharks can help in determining their migration patterns. (3 marks)

Description	Marks
Each siting logged (for each animal)/photograph processed	1
Time of year important for migration patterns/Can see where found (at different times of year)	1
Hence deduce migration patterns/estimate/guess path(s) taken between location points	1
Total	3
Accept any other relevant answers.	

- (c) Explain why it is important to know whale shark migration patterns. (3 marks)

Description	Marks
Know when to expect them at different locations	1
Know how to aid protection of animals (along migration routes/pathways)	1
Know how to enable better tourist visitation timing	1
Total	3
Accept any other relevant answers.	

- (d) What special characteristic(s) would another animal need to possess for a photographic identification technique to be used to identify individuals? (2 marks)

Description	Marks
Unique feature/marking for each animal	1
which is easy to identify/see	1
Total	2
Accept any other relevant answers.	

Question 26

(9 marks)

- (a) Name **two** pollutants that may affect the nutrient levels in this estuarine river system. (2 marks)

Description	Marks
Any two or the following	
<ul style="list-style-type: none"> • nitrates • nitrites • phosphate • potassium • human waste/rubbish/sewage • discharge water • animal excrement 	1–2
Total	2
Accept any other relevant answers.	

- (b) State how each of the **two** pollutants you named in part (a), could enter into the estuarine river system. (2 marks)

Description	Marks
Any two of the following as in part (a)	
<ul style="list-style-type: none"> • Fertilisers – excess fertiliser run-off • Human waste – dumping of sewage in water/catchment region • Discharged water – running into water way • Animal excrement – run-off from farms into water way 	1–2
Total	2
Accept any other relevant answers.	

- (c) Explain how an increase in nutrient levels in the estuarine river system could have led to fish deaths through the process of eutrophication. (5 marks)

Description	Marks
Explanation should include the following	
(The increase in nutrients) stimulates plant growth	1
On death of plants, micro-organisms in water feed on dead plant matter	1
These organisms have a population explosion	1
Which leads to them using up available dissolved oxygen	1
And so fish die due to lack of oxygen	1
Total	5
For example: Water is enriched with dissolved nutrients which stimulate plant growth, which die and decay and ultimately leads to fish deaths through lack of oxygen.	
Accept any other relevant answers.	

Section Three: Extended answer

30% (40 Marks)

Question 27

(20 marks)

- (a) With the aid of labelled diagram(s), explain the cause of a longshore drift and how both it and wind lead to sand movements. (10 marks)

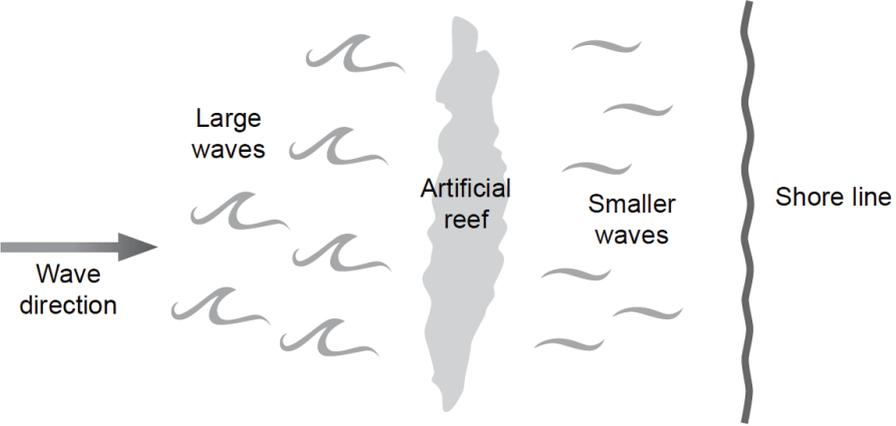
Description	Marks	
Diagram includes arrows showing wind direction, wave movement and sand movements- must be labelled to get full marks	1-2	
Explanation to include the following		
<ul style="list-style-type: none"> • Wind causes water to form waves and these waves pushed in the direction of the wind. • Waves/water collide with shore and pushed along it. • Forms a current/water movement parallel to shore line (called longshore drift). 	1-3	
Explanation to include the following		
<ul style="list-style-type: none"> • Waves hitting beach/shoreline erode sand • Water carries sand seaward in backwash • Current/longshore drift moves this eroded sand along beach parallel to shore in zig zag pattern 	1-3	
Explanation to include the following		
<ul style="list-style-type: none"> • Wind picks up sand (on the beach) • Carries it away in direction of wind movement 	1-2	
Total		10
Accept other relevant answers.		

(b) Explain, with the aid of labelled diagram(s), an efficient system that could operate at these locations to reduce the effect of sand movement. (5 marks)

Description	Marks
Diagram includes river mouth opening, groyne, longshore current, accretion zone, pump location	1-2
Subtotal	2
Explanation could include	
<ul style="list-style-type: none"> • groyne on windward side of river mouth • sand accretes at this groyne • move accreted sand across river/river mouth opening • dump sand on other/leeward side of river mouth • refers to longshore drift 	1-3
Subtotal	3
Total	5
Accept other relevant answers.	

Question 27 (continued)

- (c) Discuss, with the aid of labelled diagram(s), how an artificial reef could be used to reduce erosion at a beach. (5 marks)

Description	Marks
Diagram includes location of reef parallel to shoreline, indicate wave direction and sizes.	1–2
Subtotal	2
Explanation could include	
<ul style="list-style-type: none"> • larger waves on seaward side of artificial reef • waves hit reef and reduce in size/energy/power • smaller waves on lee side of reef/less energy when hit beach • less sand movement in swash zone • less erosion at beach • wave refraction resulting in the creation of a point opposite reef 	1–3
Subtotal	3
Total	5
	
Accept other relevant answers.	

Question 28

(20 marks)

- (a) Explain, using examples, **four** management strategies that the Western Australian Government (through the Department of Fisheries) could use to improve the sustainability of a fish stock. For each strategy, give **one** example of a fishery where it has been employed and state how it could aid the sustainability of that fishery.

(16 marks)

Description	Marks
Explanation to include any four of the following strategies Example can be any relevant one for each strategy.	
Size	1
Over/under certain size must release 'Letterbox' limits both min and max size Able to breed at least once Change sex at certain size	1-2
Example: Snapper or barramundi between certain sizes can retain/must release if outside size limits	1
Subtotal	4
Sex	1
Release females 'Letterbox' limits both min and max size So can maintain breeding stock Change sex at certain age/size	1-2
Example: Barramundi change sex over about 55 cm to female	1
Subtotal	4
Possession limits	1
Release/not keep once over bag/catch number Maintains viable population for breeding Release weights to reduce barotrauma deaths	1-2
Example: Rock lobster, crabs, abalone, most fish species	1
Subtotal	4
Marine Parks/Sanctuary Zone	1
Stops predation by fishers Maintain fish stock for breeding	1-2
Example: Cottesloe beach/groyne, Coral Bay	1
Subtotal	4
Closed Seasons	1
Stops predation by fishers Maintain fish stock for breeding/protects breeding aggregations	1-2
Example: Marron, snapper in Cockburn sound area	1
Subtotal	4
Education	1
People are more likely to know/observe rules Report infringements	1-2
Example: Provision of Recfishwest app/accept the ethos of fish for the future	1
Subtotal	4
Total	16
Accept other relevant answers.	

Question 28 (continued)

- (b) What evidence would be needed to support the continued use of these management strategies to ensure sustainability of the fish stock? How could this evidence be obtained? (4 marks)

Description	Marks
Evidence could include	
Any two of the following: <ul style="list-style-type: none"> • data collected before and after implementation (for comparison) • collection of data on e.g. population numbers, distribution, age and sex distribution of stock • catch rates/decreases indicate declining stock • catch effort/increases indicate declining stock 	1–2
Collection methods could include	
Any two of the following: <ul style="list-style-type: none"> • tag and release • video/film • log books • fish frame collection 	1–2
Total	4
Accept any other relevant answers.	

Question 29

(20 marks)

- (a) Describe the steps you should take to identify the ships that may have been wrecked and to identify their possible location(s). (3 marks)

Description	Marks
Journals of crew and passengers	1
Log Books/company records of ships in area or movements of ships	1
Local history	1
Total	3
Accept any other relevant answers.	

- (b) Explain **four** techniques you could use to locate the possible wreck(s) and state why each method is either suitable or unsuitable for each vessel type. (12 marks)

Description	Marks
Visual search/aerial survey of possible locations	1
Look for any evidence of past/early visitation/wreckage	1
Suitability Direct evidence of ship wreck or May have been removed earlier and so lost	1
Subtotal	3
Magnetometer	1
Look for anomalies in magnetic field of possible wreck area(s) If find investigate further	1
Suitability If one vessel is iron will readily detect this vessel/show up better than small amounts of iron in wooden hulled vessel or Ship may have had little iron materials on board (so not detect wreck) or Picks up any iron present e.g. cannon/rigging	1
Subtotal	3
Sonar/side-scan sonar	1
Search sea area for bottom differences/shapes/evidence of wreckage	1
Suitability May not be on the reef/out from shore (but on reef) Shows up seafloor clearly and so shapes of possible objects	1
Subtotal	3
Photography/photogrammetry	1
Photographs could identify wreckage or evidence of it/shapes of material	1
Suitability Wreck evidence may be concreted into reef/covered in sand/weed or otherwise hidden	1
Subtotal	3
Total	12
Accept any other relevant answers.	

Question 29 (continued)

- (c) Describe **one** method used for the conservation of iron artefacts that are found under the ocean and **one** method for those found on the nearby land. (5 marks)

Description	Marks
Oceanic iron could include any three of the following	
<ul style="list-style-type: none"> • remove concretions • protect from drying out • remove and replace salts and water/electrolysis/discusses electrolytic exchange process • coat with protective layer 	1–3
Subtotal	3
Land iron to include any two of the following	
<ul style="list-style-type: none"> • remove concretions if present • coat with protective layer • convert the rust 	1–2
Subtotal	2
Total	5
Accept any other relevant answers.	

Question 30

(20 marks)

- (a) Define the term 'biosecurity' and give **two** examples of methods employed to maintain biosecurity. (5 marks)

Description	Marks
Definition	
Biosecurity – measures to protect living things (1) in an area (1) against harmful biological and biochemical contaminants (1)	1–3
Subtotal	3
Any two examples	
<ul style="list-style-type: none"> • travel restrictions • ballast discharge • import restrictions • biofouling on International vessels 	1–2
Subtotal	2
Total	5
Accept any other relevant answers.	

- (b) Describe **three** ways in which introduced species can affect the Australian marine environment. (6 marks)

Description	Marks
Two marks for each description for any three of the following	
Description identifies the problem caused by the introduced species and its outcome on the marine environment	2
Provides a relevant statement about introduction of species	1
Total	6
<p>Answers may include but are not limited to:</p> <p>Introduced species may cause disruption to local food webs which results in a depletion in the population of local species (2)</p> <p>Introduced species may cause disruption to local food webs (1)</p> <p>Introduced species compete/outcompete for resources with local species leading to reduction in populations of local species. (2)</p> <p>Introduced species compete/outcompete for resources (1)</p> <p>Introduced species have no natural predators to check their population growth so may displace local species (2)</p> <p>Introduced species have no natural predators (1)</p> <p>Introduced species cause seafloor changes due to habitat destruction which can displace local species (2)</p> <p>Introduced species cause seafloor changes (1)</p>	
Accept any other relevant answers.	

Question 30 (continued)

- (c) Identify **three** ways Australia can minimise risks to its maritime biosecurity. For each way state how it minimises risk. Support your answer with an example for each risk minimisation you have identified. (9 marks)

Description	Marks
Any three of the following ways Australia can minimise risks to maritime biosecurity	
Having a national/state plan for dealing with incursions	1–3
Vigilance – border control inspections	
Quarantine	
Regulations	
Intelligence gathering	
Import restrictions	
Education	
Inspect and clean/sanitise	
Subtotal	3
Any three matching statements and examples	
1 mark for statement; 1 mark for relevant example of the procedure. Example:	
1 National plan covering the identification of the species – develop ways to deal with incursion to reduce numbers (1), e.g. Asian paddle crab in W.A. waters with pictures for ease of identification (1)	1–2
2 Vigilance/ Border control inspections – can stop/reduce risk of entry of undesirable species form entering the Australia (1) e.g. inspection of ships hulls (will identify if it is carrying undesirable species such as Asian bag mussel (1)	1–2
3 Quarantine – place imported fish species into isolation to see if carrying illness or parasites (1) e.g. aquarium fish imported from overseas/foreign countries (1)	1–2
4 Regulations – set of rules on what can and cannot be imported into Australia (1) e.g. Ban importation of live prawns from Queensland to other states (1)	1–2
5 Intelligence gathering – monitor imported species, the paper work involved and the companies that import them to ensure no other species are imported or smuggled in. (1) or monitor ports and other entry places for illegal imports (1) e.g. visits to dealers/shops and distributors of live aquatic species for information they may have on illegal activities. (1)	1–2
6 Import Restrictions – border security check all cargo arriving for importation to ensure only what is on manifest is coming in (1) e.g. Importation of live salmon and eggs is restricted to reduce the risk of disease in local stocks such as fish farms (1)	1–2
7 Education Recfishwest – recreational fishing is responsible for public education (1) e.g. to stop ‘white spot’ disease (in prawns) coming to W.A. (1)	1–2
Subtotal	6
Total	9
Accept any other relevant answers.	

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