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

MARINE AND MARITIME STUDIES

ATAR course examination 2019

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.

2020/2756
Web version of 2019/63001

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

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

Section Two: Short answer **50% (98 Marks)**

Question 21 **(12 marks)**

(a) Give **two** ethical behaviours humans can demonstrate within areas occupied by cetaceans. (2 marks)

Description	Marks
Answer includes:	
Keep habitat unviolated/swimming and boat exclusion zones	1
Allow for animals to exhibit normal behaviours	1
Total	**2**
Accept other relevant answers.	

(b) Identify **three** rules relating to vessels' 'no approach zones' for dolphins and for each rule state how it is considered ethical. (6 marks)

Description	Marks
Answer includes:	
50 metres to the side of the dolphin – allows the dolphin turning aside from its normal route	1–2
150 metres in front of the dolphin – reduces the dolphin altering its route	1–2
150 metres behind the dolphin – allows the dolphin altering its route	1–2
Total	**6**

(c) Describe **two** ways in which the guidelines maintain the sustainability of the dolphin tourism industry. (4 marks)

Description	Marks
Answer includes any two of the following:	
• minimises impacts on dolphins – allowing the activity to continue • allows normal behaviours – for example feeding, playing, hunting, resting • allows animals to continue breeding normally – allowing long term sustainability of the animals • allows animals to access breeding and feeding grounds – without disruption • not feeding – no dependence/ maintain health • reducing noise – not disturb so remain in area (tourism)	1–2
Total	**4**

Question 22 **(12 marks)**

Complete the following table by naming **four** items of snorkelling equipment. For each item listed, state why it is required for snorkelling and how it is used when snorkelling.

Description			**Marks**
Answer includes one mark for each box correct. Four of the following items:			
Item	**Why is it required for snorkelling?**	**How is it used for snorkelling?**	
Mask	places air in front of the snorkeler's eyes to allow refraction/seeing clearly	placed on the face with good fit /defogged	
Snorkel	allows breathing while face in the water	placed comfortably in the mouth and breathed through normally/continually keep head in water	
Fins	allows more effective movement in water	placed on the feet without being tight/kicking technique	
Exposure protection/ wetsuit	reduces heat loss to the water/sun protection in warmer areas	worn on the body without being too tight or loose	
Weight belt/weights	neutral buoyancy	wear around waist	
		Total	**12**

Question 23 **(13 marks)**

(a) Give a title for the graph above. (2 marks)

Description	Marks
Title includes:	
Independent variable included (e.g. sunscreen)	1
Dependent variable included (e.g. % bleaching)	1
Total	**2**
For example, The effect of three chemicals in sunscreen on coral bleaching.	

(b) Propose an hypothesis for the experiment on which this graph is based. (2 marks)

Description	Marks
Statement gives relationship between independent and dependent variables	2
Statement only links independent and dependent variables	1
Total	**2**
Answer may include but is not limited to: Zinc oxide causes greater coral bleaching than titanium dioxide	
Accept any other relevant answers.	

(c) List **three** variables the scientists should have controlled while obtaining their data. (3 marks)

Description	Marks
Any three of the following for one mark each:	
• temperature • salinity • gas levels (oxygen/carbon dioxide) • chemical levels • light levels • other organisms • nutrients	1–3
Total	**3**
Accept any other relevant answers.	

(d) Explain how the control coral increases reliability of the experiment. (3 marks)

Description	Marks
Explanation includes the following points:	
Allows comparison between the control and other corals	1
Repetition shows the control to not change	1
Changes in control show other factors affect results.	1
Total	**3**
Accept any other relevant answers.	

Question 23 (continued)

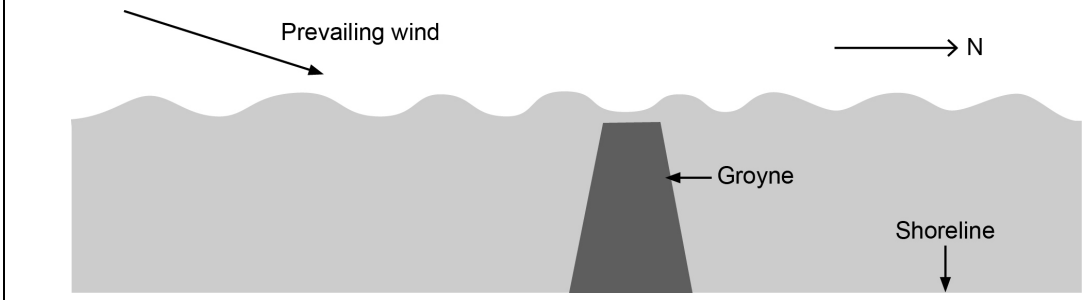
(e) Explain the process that occurs when a coral recovers from bleaching. (3 marks)

Description	Marks
Explanation includes:	
• stress causing bleaching is no longer present • zooxanthellae may now return • causing colour to return/allowing coral to survive	1–3
Total	**3**
Accept any other relevant answers.	

Question 24 **(10 marks)**

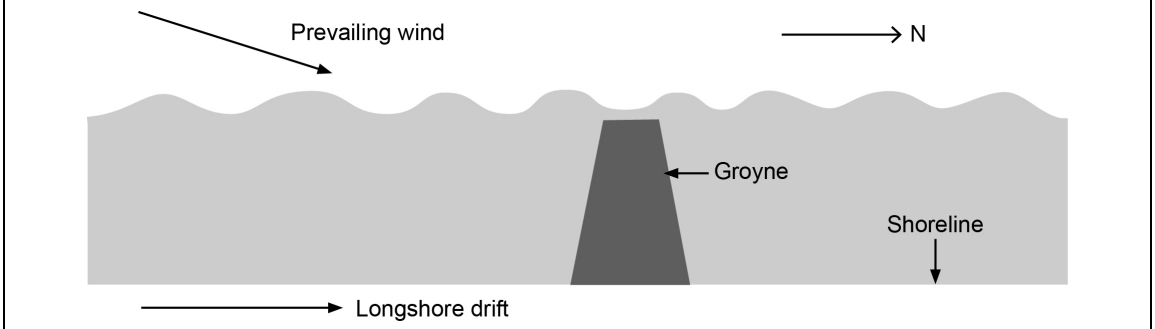
(a) On the diagram, show with a labelled arrow the direction of prevailing south westerly wind. (1 mark)

Description	Marks
Diagram includes an arrow and label of prevailing wind	1
Total	**1**



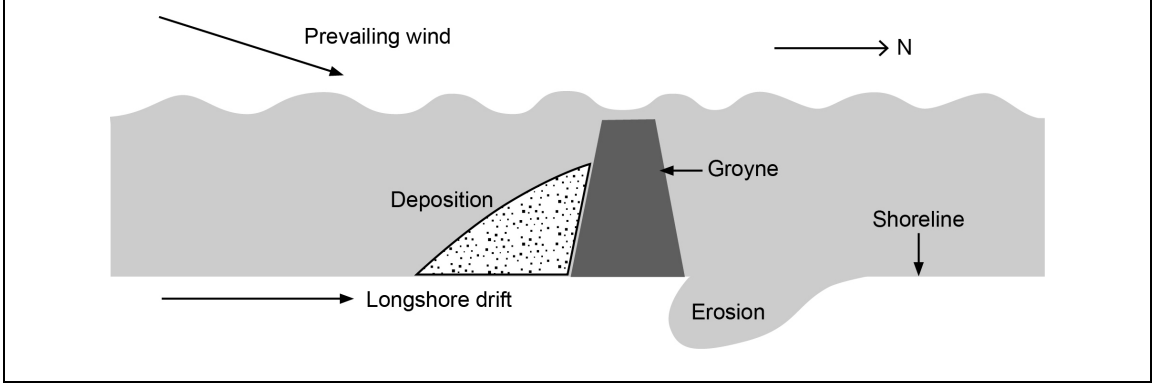
(b) On the diagram, show with a labelled arrow the direction of the longshore drift resulting from the prevailing wind. (1 mark)

Description	Marks
Arrow labelled of longshore drift that would result from prevailing wind	1
Total	**1**



(c) On the diagram, draw and label areas of erosion and deposition. (4 marks)

Description	Marks
One mark for drawing and one mark for label	
Erosion area shown and labelled as a result of longshore drift	1–2
Deposition area shown and labelled as a result of longshore drift	1–2
Total	**4**



Question 24 (continued)

(d) Describe how the length of the groyne could affect the erosion and accretion of sand.
(4 marks)

Description	Marks
Two marks for erosion and two marks for accretion	
Erosion: Larger area eroded As the length of groyne increases **or** Erosion further out from shore line So reduce lee shore erosion	1–2
Accretion: Larger volume of sand accreted As groyne length increases	1–2
Total	**4**

Question 25 **(12 marks)**

(a) State marine parks. (3 marks)

Description	Marks
Protected area under State laws	1
Only go out 3 nautical miles	1
Subtotal	**2**
Any one of the following:	
• protect fish within park through rules and regulations • ensuring long-term survival of fishery by keeping fish numbers • protect nurseries	1
Subtotal	**1**
Total	**3**

(b) Commonwealth-protected areas. (3 marks)

Description	Marks
Protected area under Commonwealth laws	1
For waters 3–200 nautical miles off the coast	1
Subtotal	**2**
Any one of the following:	
• protect fish/flora and fauna habitat within/through rules and regulations • ensures survival of fishery by protecting fish stocks.	1
Subtotal	**1**
Total	**3**

(c) Fish habitat-protected areas. (3 marks)

Description	Marks
Protected area under State laws	1
Particular value area to protect habitat/fish/special protection area	1
Subtotal	**2**
Any one of the following:	
• the conservation and protection of fish/fish breeding areas/fish fossils or the aquatic eco-system • the culture and propagation of fish and experimental purposes related to that culture and propagation • the management of fish and activities relating to the appreciation or observation of fish.	1
Subtotal	**1**
Total	**3**

(d) Explain the role of scientific research in assisting governments to decide on strategies for maintaining sustainable fisheries. (3 marks)

Description	Marks
Explanation may include the following:	
Research provides data/life cycles/growth rate/ knowledge of maturity/fecundity	1
Allows governments to make policies	1
Protect the future of the fisheries.	1
Total	**3**
Accept any other relevant answers.	

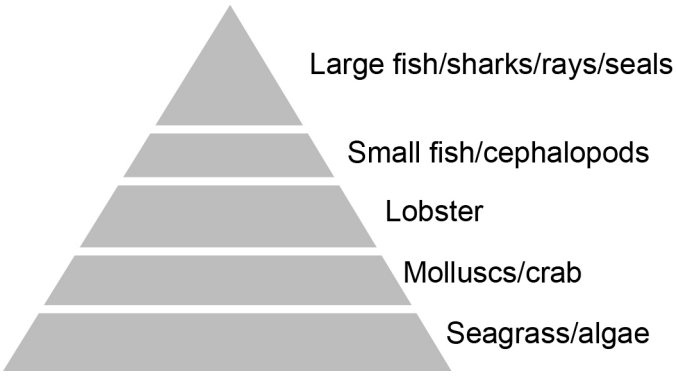
Question 26 **(16 marks)**

(a) What do the arrows in the food web indicate? (2 marks)

Description	Marks
Energy transfer	1
between (trophic) levels	1
Total	**2**

(b) Draw a biomass pyramid for the shallow water section of the food web. (4 marks)

Description	Marks
Image contains the following components:	
Pyramid with larger base	1
Decreasing segments vertically	1
Five segments – matching diagram (must have all)	1
Labelled appropriately (and correct sequence) – matching diagram	1
Total	**4**



(c) What type of plankton spend only part of their lifecycle as plankton? (1 mark)

Description	Marks
Meroplankton	1
Total	**1**

(d) Describe how planktonic Western Australian rock lobster populations are measured by scientists and then used to determine their likely abundance in future years. (3 marks)

Description	Marks
Answer includes the following	
Caught in Puerulus traps	1
Measure Puerulus numbers caught	1
Compare to previous years/gives good indication of future population numbers	1
Total	**3**

(e) Explain the seasonal patterns that are seen among Western Australian rock lobster, describing how the lobster are dispersed in the environment. (6 marks)

Description	Marks
Explanation includes six of the following:	
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Total	**6**

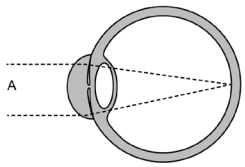
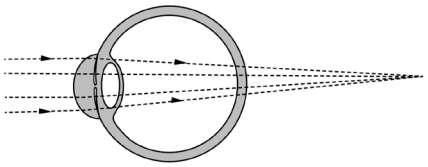
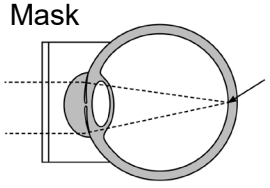
Question 27 **(23 marks)**

(a) Explain the term 'refraction'. (3 marks)

Description	Marks
Explanation includes the following:	
Bending of light/change in direction of light	1
As it passes from one medium to another	1
Of different (optical) density.	1
Total	**3**

(b) Complete the table below by drawing the refraction of light as it:

(i) enters the eye in air
(ii) enters the eye underwater without a mask
(iii) enters the eye underwater with a mask.
(iv) Explain the role of the mask in allowing clear water vision. (12 marks)

Description	Marks
Refraction in air	
 (i)	
Diagram correctly shows lines in straight lines	1
Bending at lens/cornea	1
Focussing on retina	1
Subtotal	**3**
Refraction underwater without a mask	
 (ii)	
Diagram shows lines in straight lines	1
Bending less at lens/cornea	1
Focussing beyond retina	1
Subtotal	**3**
Refraction with mask	
 (iii)	
Diagram shows mask	1
Lines travelling in straight line	1
Focussing on retina	1
Subtotal	**3**

(iv) Explanation includes the following points:	
Mask provides a layer of air in front of the eyes	1
Which alters refraction of light/compared to eye water interface	1
Allowing focus on the retina	1
Subtotal	**3**
Total	**12**
Accept other relevant answers.	

(c) Describe why a mask full of water prevents the diver from seeing clearly. (2 marks)

Description	Marks
Describes that with just air more refraction occurs compared to water, so not able to focus/accommodate light on retina **or** Describes that with water less refraction occurs compared to air, so not able to focus/accommodate light on retina	2
States that with just air more refraction but no comparison or mention of eye/focus	1
Total	**2**
Example: The light is refracted less in water than with air only in the mask. With water in the mask, or with no mask, light refracts less. Eyes used to accommodating refraction in air/can focus light on retina.	

(d) Identify the steps to be followed to clear a partially-flooded mask and state why each step is conducted. (6 marks)

Description	Marks
Identifies step, states why	
One mark for step and one mark for reason	
Place fingers on top of mask to prevent air escaping	1–2
Exhale through nose to fill mask with air/displace water	1–2
Look up as you exhale to assist water exiting the mask	1–2
Total	**6**

Section Three: Extended answer **30% (40 Marks)**

Question 28 **(20 marks)**

(a) Describe **four** steps that could have been followed to locate the site of this wreck. (8 marks)

Description	Marks
Journals to account for ship movements	1–2
Local history to describe ship sightings or changes	1–2
Log books of companies involved in ship movement to understand ships journey	1–2
Visual search of the area to determine if it can be found	1–2
Total	**8**
Answers might also include: magnetometer/sonar/aerial photography (all counted as visual searches).	

(b) Describe **three** steps that scientists would be able to follow to explore the site before excavating and salvaging items. (6 marks)

Description	Marks
Photogrammetry/sonar/magnetometer – using photos/graphics to make measurements of the wreck site	1–2
Photomosaic of site – using photos to determine layout of wreck site for reconstruction	1–2
Physical measurements/Plot/Map – using tape measures to measure the site and place objects/artefacts where they were found	1–2
Total	**6**

(c) Identify the steps scientists would follow to recover an anchor and the method they would use prepare it for transport to a laboratory. (6 marks)

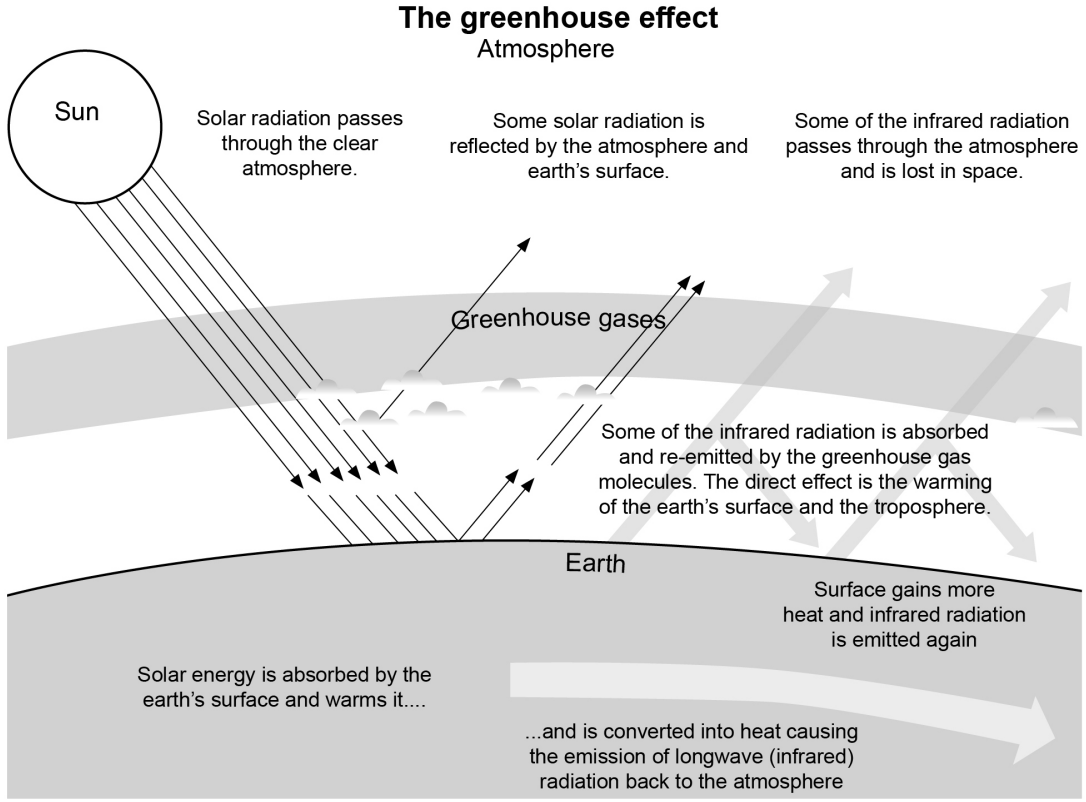
Description	Marks
Clear around anchor	1
Tied to anchor (and lift bag filled with gas to raise)	1
Lift bags or crane to bring to surface	1
Need to be kept in sea water to reduce corrosion rate/exposure to air (oxygen)	1
Cover to reduce evaporation and prevent light further deteriorating the anchor	1
Secure in place for transport to ensure it isn't damaged by movement	1
Total	**6**

Question 29 **(20 marks)**

(a) Using diagrams, explain the enhanced greenhouse effect. Include how anthropogenic changes have resulted in this phenomenon. (8 marks)

Description	Marks
Answers include:	
Appropriate labels on diagram	1–2
Subtotal	**2**
Explanation includes six of the following:	
• build-up of anthropogenic gases with at least one example of CO_2/methane/water vapour • incoming IR radiation is shorter wavelength • absorbed IR radiation by Earth's surface • absorbed IR radiation re-radiated into atmosphere (as longer wavelength) • greenhouse gases absorb and re-emit the re-radiated IR • reduced outgoing IR radiation • the increased IR is transferred as heat/heat absorbed by atmosphere and associated temperature rises • shows some heat this is lost from atmosphere but most stays due to greenhouse gases	1–6
Subtotal	**6**
Total	**8**

Answers might include:



Accept any other relevant answers.

Question 29 (continued)

(b) Explain the thermohaline current and how enhanced greenhouse effect is impacting on this current. (5 marks)

Description	Marks
Answers include three of the following components of the thermohaline current:	
• large scale ocean circulation • caused by differences in global water density • density changes due to differences in salinity • surface heat changes density of water/decreases density of the water.	1–3
Subtotal	**3**
Answers include two of the following impacts of enhanced greenhouse effect:	
• ice melting increases freshwater flows • temperature differences reduce the density gradient/expanding water • decreasing density gradient reduces flow of current	1–2
Subtotal	**2**
Total	**5**
Accept any other relevant answers.	

(c) Explain the impact that the enhanced greenhouse effect is having on marine habitats and coastal communities. (7 marks)

Description	Marks
Answers include seven of the following impacts on marine habitats and coastal communities, must have at least one of each:	
• increased coral bleaching due to temperature rises • decreased biodiversity due to habitat loss • decreased protection due to habitat destruction • increased CO_2 dissolve to make water more acidic/decrease pH • increased atmosphere temp increase water temp and change currents • increased storm numbers and intensity. • increased flooding due to increased ocean levels • increased storm risk and damage due to increased ocean temperatures • dissolve carbonaceous materials like reef and shell • too hot for animals/change currents and these effect habitat in many ways • increase costal erosion	1–7
Total	**7**
Accept any other relevant answers.	

Question 30 **(20 marks)**

(a) Describe **five** types of information about the organisms that may be found in the National System and why they are useful in its management. (10 marks)

Description	Marks
Any five of the following described:	
• features of the organism – assist in identifying it • habitats descriptions – assist in determining where it may be found • how they survive – allows the requirements of the organism to assist in preventing its spread • reproduction and growth – allows authorities to stop it increasing numbers • feeding, competitors and predators – allows authorities to stop it increasing numbers • pictures – easy for public to identify for control • entry pathways – allows the prevention of it arriving in areas • impacts – management of the organism and urgency can be determined • known locations – can prevent boats from certain areas or be careful with those arrivals by quarantining • control options – allows rapid response to preventing infestation • DNA profile – allows identification	1–2
Total	**10**
Accept any other relevant answers.	

(b) Describe what would happen at each phase and how it would minimise the spread and impact of a pest. (10 marks)

Description	Marks
Investigation and alert phase described including the following parts:	
Organism searched for and/or identified	1
To determine if a risk exists	1
Extent/spread of the pest is determined	1
Response plan is organised	1
Subtotal	**4**
Operational phase described including the following parts:	
Aims to contain or eradicate the pest	1
Specific actions determined to work for that pest	1
Management plan to reduce further risks if it cannot be eradicated	1
Subtotal	**3**
The stand down phase described including the following parts:	
Commences when either success or failure is determined	1
Develop ongoing solutions and plans	1
Monitor for re-emergence of pest	1
Subtotal	**3**
Total	**10**
Accept any other relevant answers.	

Question 31 **(20 marks)**

(a) Old train carriages may contain traces of petroleum oil and heavy metals. Describe **two** impacts each of these pollutants have on marine organisms. (4 marks)

Description	Marks
Answer includes:	
Petroleum oil – less dense so floats to surface and covers organisms/reduces insulation of animals/can be toxic/physiological changes over time	1–2
Heavy metals – physiological effects/bioaccumulation/toxic	1–2
Total	**4**
Accept any other relevant answers.	

(b) Describe **two** detrimental impacts, other than the presence of petroleum and heavy metals, that a train carriage artificial reef might have on local reefs. (4 marks)

Description	Marks
Any two of the following:	
• may contain additional toxins (e.g. PCB's) that are added to the local environment • encourage overfishing in areas nearby that cannot sustain the pressure • promotes poor waste management/damage local area if not stable • attract species from other areas and increase competition	1–2
Total	**4**
Accept any other relevant answers.	

(c) Describe **six** positive impacts that the artificial reef in general might have on local reef communities. (12 marks)

Description	Marks
Answer includes:	
Improve diversity of marine life by providing habitat	1–2
Increase numbers of local fish with new habitat	1–2
New fishing locations which reduces fishing pressure on local reef communities	1–2
Increase tourism/recreation by providing alternative venue thus reducing pressure on local reef	1–2
Increase fishing for commercial fishermen and increase economics of areas	1–2
Decrease erosion/effects of weather on existing local reef	1–2
Total	**12**
Accept any other relevant answers.	

ACKNOWLEDGEMENTS

Question 21(b)(c) Information under answer includes adapted from: © Commonwealth of Australia, Department of the Environment and Energy. (2017). *Australian national guidelines for whale and dolphin watching*. Retrieved October, 2019, from www.environment.gov.au/system/files/resources/7f15bfc1-ed3d-40b6-a177-c81349028ef6/files/aust-national-guidelines-whale-dolphin-watching-2017.pdf
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Question 24(a)(b)(c) Direction of prevailing south westerly wind diagram provided by courtesy of a member of the examining panel

Direction of the longshore drift due to prevailing wind diagram provided by courtesy of a member of the examining panel

Erosion and deposition areas formed by longshore drift diagram provided by courtesy of a member of examining panel

Question 25(c) *Fish Resources Management Act*. *(1994)*. (WA) s.115 (2). Retrieved October, 2019, from www.legislation.wa.gov.au/legislation/statutes.nsf/law_a283.html

Question 26(b) Biomass pyramid of the food web diagram provided by courtesy of a member of the examining panel.

Question 26(e) Information from: © Government of Western Australia, Department of Fisheries. (2011). Western rock lobster: *Life cycle* [Fact sheets]. Retrieved October, 2019, from www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_western_rock_lobster.pdf

Question 29(a) UNEP/Grid-Arendal. (2005). Greenhouse effect graphic. Retrieved November, 2019 from http://www.grida.no/resources/6888

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