Marine Science marking guide and solution

Sample external assessment 2020

Science (90 marks)

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. describe and explain the reef and beyond, changes on the reef, oceans of the future and managing fisheries
2. apply understanding of the reef and beyond, changes on the reef, oceans of the future and managing fisheries
3. analyse evidence about the reef and beyond, changes on the reef, oceans of the future and managing fisheries to identify trends, patterns, relationships, limitations or uncertainty
4. interpret evidence about the reef and beyond, changes on the reef, oceans of the future and managing fisheries to draw conclusions based on analysis.

Note: Objectives 5, 6 and 7 are not assessed in this instrument.

Queensland Government | Queensland Curriculum & Assessment Authority

For all Queensland schools

Introduction

The Queensland Curriculum and Assessment Authority (QCAA) has developed mock external assessments for each General senior syllabus subject to support the introduction of external assessment in Queensland.

An external assessment marking guide (EAMG) has been created specifically for each mock external assessment.

The mock external assessments and their marking guides were:

- developed in close consultation with subject matter experts drawn from schools, subject associations and universities
- aligned to the external assessment conditions and specifications in General senior syllabuses
- developed under secure conditions.

Purpose

This document consists of an EAMG and an annotated response.

The EAMG:

- provides a tool for calibrating external assessment markers to ensure reliability of results
- indicates the correlation, for each question, between mark allocation and qualities at each level of the mark range
- informs schools and students about how marks are matched to qualities in student responses.

Mark allocation

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

Where no response to a question has been made, a mark of 'N' will be recorded.

External assessment marking guide

Paper 1: Multiple choice

Question	Response
1	D
2	D
3	A
4	B
5	A
6	B
7	D
8	C
9	B
10	B
11	D
12	C
13	C
14	C
15	A
16	D
17	A
18	C
19	A
20	D
21	D
22	A
23	A
24	B
25	D

Paper 1: Short response

Question		Sample response	The response
26		A factor that affects the reliability of fishery population data is the sampling technique used. This can limit the sampler's ability to collect valid and reliable data, e.g. an unspecified catch changes sample size and effort is not clearly defined in CPUE situations.	• identifies a relevant factor [1 mark] • provides a limitation of the factor [1 mark]
27		The direction and strength of trade winds is one factor driving this weather pattern. Warmer than normal water temperature off northern Australia is also driving increased rainfall.	• identifies wind factor [1 mark] • identifies temperature factor [1 mark]
28	a	N = 178 $\Sigma n\,(n-1) = 6360$ $SDI = 1 - \left(\frac{6360}{178 \times 177}\right)$ SDI = 0.798	• shows substitution correctly performed [1 mark] • calculates SDI [1 mark]
	b	The sample represents a high diversity of coral species as the SDI value is closer to 1 than it is to 0.	• provides a valid conclusion [1 mark]
29		The species richness is 7 because this is the relative abundance of the highest ranked species. There is low species evenness for species ranked 5 to 15 due to steep gradient of the curve.	• identifies a relationship about species richness [1 mark] • identifies a relationship about species evenness [1 mark]

Question	Sample response	The response
30	Coral species diversity will increase with distance from shore. Suspended sediments increase turbidity, which decreases the growth of juveniles due to the restriction of light.	• identifies relationship between species diversity and distance from shore [1 mark] • describes effect of the specific pressure [1 mark]
31	1. Using early warning indicators. 2. Setting targets.	• identifies two features [2 marks] OR • identifies one feature [1 mark]
32	1. The small sample sizes reduce the reliability of the predicted population. 2. There may be inconsistencies in reporting from a non-scientific survey. 3. The very localised collection, i.e. Black marlin only of data doesn't represent the true size of a migratory population.	• identifies three features [3 marks] OR • identifies two features [2 marks] OR • identifies one feature [1 mark]

Question	Sample response	The response
33	Increases in pCO_2 leads to rising mean global temperatures, which causes increased surface ocean stratification. This reduces the nutrient input from deeper layers and alters the photosynthetic rate of marine biota, leading to either blooms or decreases in densities.	• describes relationship between pCO_2, global temperatures and surface ocean stratification [1 mark] • describes effect on nutrient input or light availability [1 mark] • describes effect on photosynthetic rate of marine biota [1 mark]
34	Species A would be most affected by a reduction in ocean pH. For Species A, the net calcification decreases by a greater amount as pH decreases. Species A will be less likely to develop and maintain its shell structure because of the low net calcification at pH 7.3.	• identifies Species A as most affected [1 mark] • provides evidence [1 mark] • identifies effect on structural development [1 mark]
35	Both coral cores A and B have annual density banding. However, coral core B has multiple dark patches, indicating a more porous structure as a result of carbonate dissolution. Therefore, the wastewater from the seep site must have a negative effect on coral growth.	• identifies similarity between coral cores [1 mark] • identifies difference between coral cores [1 mark] • identifies significance of difference [1 mark]

Paper 2: Short response

Question	Sample response	The response:
1	approximately 500 000 million years ago.	• provides 500 000 [1 mark]
2	corallite: VI coelenteron: IV	• provides corallite as VI [1 mark] • provides coelenteron as IV [1 mark]
3	1. Rock lobster, prawns, salmonids, oysters and squids all increased in value. This is because of changes in taste within the Australian and export markets. 2. Abalone, tuna and scallop decreased in value due to an increase in export demand for 'clean green' product.	• identifies two trends [2 marks] OR • identifies one trend [1 mark] • provides a valid reason for each of two identified trends [2 marks] OR • provides a valid reason for one of the identified trends [1 mark]

Question	Sample response	The response:
4	Higher stocking densities result in lower settlement success because there is only a limited amount of substrate surface area available. There is also, only a limited amount of substrate available in the presence of an appropriate settlement cue to induce settlement and metamorphosis. Higher stocking densities also result in lower settlement success because of a prolonged larval pre-settlement stage, which increases the mortality of larvae.	• identifies three influences [3 marks] OR • identifies two influences [2 marks] OR • identifies one influence [1 mark]
5	An El Niño event would cause an increase in the intensity of the East Australian Current (EAC) which, in turn, will result in increased water temperature in upwellings and decreased levels of nutrients. This decreases the effects of upwellings because decreased nutrient levels limit the abundance of phytoplankton. Decreases in phytoplankton are associated with reduced primary productivity of surface waters, which limit fish populations relying on plankton as a food source.	• explains how an El Niño affects the EAC and decreases nutrient levels [1 mark] • explains decrease in phytoplankton [1 mark] • explains decrease in primary productivity and fish populations [1 mark]
6	Mangrove habitat area C would be most crucially linked. Mangrove habitat area A is connected to each reef but only provides a small proportion (16–19%) of the total nursery habitat to each reef. Mangrove habitat area B is only connected to one reef habitat. Mangrove habitat area C contributes a high proportion of nursery habitat to several reefs.	• identifies C as most crucial [1 mark] • provides a valid reason why A is not most crucial [1 mark] • provides a valid reason why B is not most crucial [1 mark] • provides a valid reason why C is most crucial [1 mark]

Question		Sample response	The response:
7		A bleaching event is likely to produce an overall decline of the total fish population because of the loss of structure on the reef associated with bleaching.	• identifies an implication [1 mark] • provides a valid reason for the identified implication [1 mark]
8	a	Burning of fossil fuels releases carbon dioxide into the atmosphere.	• describes a source [1 mark]
	b	Decrease in pH.	• describes a valid effect [1 mark]
9	a	It is possible to study a greater variety of variables in the field compared to aquaria.	• identifies a valid difference [1 mark]

Question		Sample response	The response:
	b	Aquaria studies can investigate the effect of changing pH levels on a single species in isolation.	• identifies a valid purpose [1 mark]
10		1. Herbivory reduces macro-algae assisting in the maintenance of light and space (helps coral diversity). 2. Herbivorous fish maintain settling sites for coral. 3. Herbivorous fish add essential nitrogen and phosphorus, which are required for coral growth, into the nutrient cycle of coral reefs.	• identifies three ways in which coral reefs benefit [3 marks] OR • identifies two ways in which coral reefs benefit [2 marks] OR • identifies one way in which coral reefs benefit [1 mark]
11		Strengths: 1. A greater area under conservation management, i.e. an increase from 5 to 25%, in conjunction with the sanctuary zone, could have positive flow-on effects for keystone ecosystems. 2. This would also mean increased protection from interaction with humans.	• identifies two strengths [2 marks] OR • identifies one strength [1 mark]

Question	Sample response	The response:
	Limitations: 1. The small size of the sanctuary zone limits its ability to adequately protect a representative range of keystone species. 2. Removal of multi-use zones, i.e. reduction from 20% to 0%, may increase illegal activity due to stakeholder conflict.	• identifies two limitations [2 marks] OR • identifies one limitation [1 mark]
12	Connectivity is the interconnectedness between reefs within a larger reef ecosystem. In this study, the connectivity is limited by the isolation of the reefs. Therefore, reproductive material, larvae or juveniles would not be carried between isolated reefs by currents and the breeding population is limited to the isolated population.	• explains connectivity between reef ecosystems [1 mark] • explains that isolation limits the connectivity [1 mark] • explains how limited connectivity influences the replenishment of species and/or genetic diversity [1 mark]
13	1. The harvesting of wild-caught fish to feed carnivorous aqua-cultured fish has no potential for increase. 2. Reaching maximum stocking densities prohibits further growth.	• identifies two valid features [2 marks] OR • identifies one valid feature [1 mark]

Question	Sample response	The response:
14	1. The greater the rugosity of the reef, the higher the probability that the reef will recover. 2. The greater the depth of the reef, the higher the probability that the reef will recover.	• describes two valid factors [2 marks] OR • describes one valid factor [1 mark]
15	Status of the fishery is not overfished as the SB_{MEY} is under/below the target reference point. The adoption of MEY in 2004 may have led to the increase of SSB from 2004–2010. Adoption of MSY did not greatly increase SSB from 2000–2004, therefore the use of MEY in this situation over MSY appears to be more successful at this stage.	• identifies that the fishery is not overfished [1 mark] • identifies the effect of adopting the MEY [1 mark] • identifies that MEY has been more successful than MSY [1 mark]