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## **Marine Science**

### Paper 1

#### Time allowed

- Perusal time 10 minutes
- Working time 90 minutes

#### **General instructions**

- Answer all questions in this question and response book.
- · QCAA-approved calculator permitted.
- · Planning paper will not be marked.

#### Section 1 (20 marks)

• 20 multiple choice questions

#### Section 2 (26 marks)

• 7 short response questions

# DO NOT WRITE ON THIS PAGE THIS PAGE WILL NOT BE MARKED

#### **Section 1**

#### **Instructions**

- · This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1-20.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	В	С	D
Example:		0	0	0

	A	В	С	D
1.	0	0	0	0
2.	0	$\bigcirc$		$\bigcirc$
3.	0	$\bigcirc$		$\bigcirc$
4. 5.	0	$\bigcirc$		$\bigcirc$
	0	$\circ$	0	$\circ$
6.	0	$\bigcirc$		$\bigcirc$
7.	0	$\circ$	0	$\bigcirc$
8.	0	$\circ$		$\bigcirc$
9.	0	$\circ$	0	$\circ$
10.	0	$\circ$	0	$\circ$
11.	0	$\bigcirc$		$\bigcirc$
12.	0	$\circ$	$\circ$	$\bigcirc$
13.	0	$\circ$		$\circ$
14.	0	$\circ$	0	$\circ$
15.	0	0	0	$\circ$
16.	00000 00000 00000 00000	00000 00000 00000 00000	0000000000000000000	000000000000000000000000000000000000000
17.	0	$\circ$	0	$\bigcirc$
18.	0	$\circ$	0	$\bigcirc$
19.	0	$\circ$	0	$\circ$
20.	0	$\circ$	0	$\circ$

Ensure you have filled an answer bubble for each question.

#### **Section 2**

#### **Instructions**

- · Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page ...
  - If you do not do this, your original response will be marked.
- This section has seven questions and is worth 26 marks.

QUESTION 21 (3 marks)							
Explain the need for agreements to manage migratory species in international waters.							

a)	Identify an argument for mangrove conservation. Give two reasons to support your argument.	[3 marks
b)	Identify a management strategy that could support the health of mangrove habitats.	
	Explain your reasoning.	[2 marks

#### QUESTION 23 (5 marks)

The table shows the marine organisms sighted during a survey of three reefs in the Great Barrier Reef Marine Park.

Organism	Reef A	Reef B	Reef C
Sea cucumber	6	4	1
Giant clam	4	0	3
Anemonefish	0	0	0
Butterflyfish	1	1	3
Grazing herbivores	2	20	5
Grouper	1	0	0
Coral trout	2	0	2
Maori wrasse	0	0	1
Turtle	2	0	0
Shark	0	0	1
SDI	0.84	0.35	

a)	Use Simpson's diversity index (SDI) to calculate the biodiversity of reef C
	Show your working.

[2 marks]

SDI = 
$$1 - \left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

0)	Compare the diversity of the three reefs.	[3 mark
Sin	nilarity:	
Dif	ference:	
Sig	nificance:	
nde	ESTION 24 (3 marks)  The La Niña conditions, there is a greater temperature contrast between the eastern and west concean than under normal conditions.	tern tropica
nde icifi	r La Niña conditions, there is a greater temperature contrast between the eastern and wes	
nde icifi	r La Niña conditions, there is a greater temperature contrast between the eastern and wes c Ocean than under normal conditions.	[1 mar
nde acifi a)	La Niña conditions, there is a greater temperature contrast between the eastern and west cocean than under normal conditions.  Identify one effect this scenario has for weather conditions on Australia's east coast.  Describe an impact on a local marine environment associated with the effect	[1 mar
nde acifi a)	La Niña conditions, there is a greater temperature contrast between the eastern and west cocean than under normal conditions.  Identify one effect this scenario has for weather conditions on Australia's east coast.  Describe an impact on a local marine environment associated with the effect	tern tropica

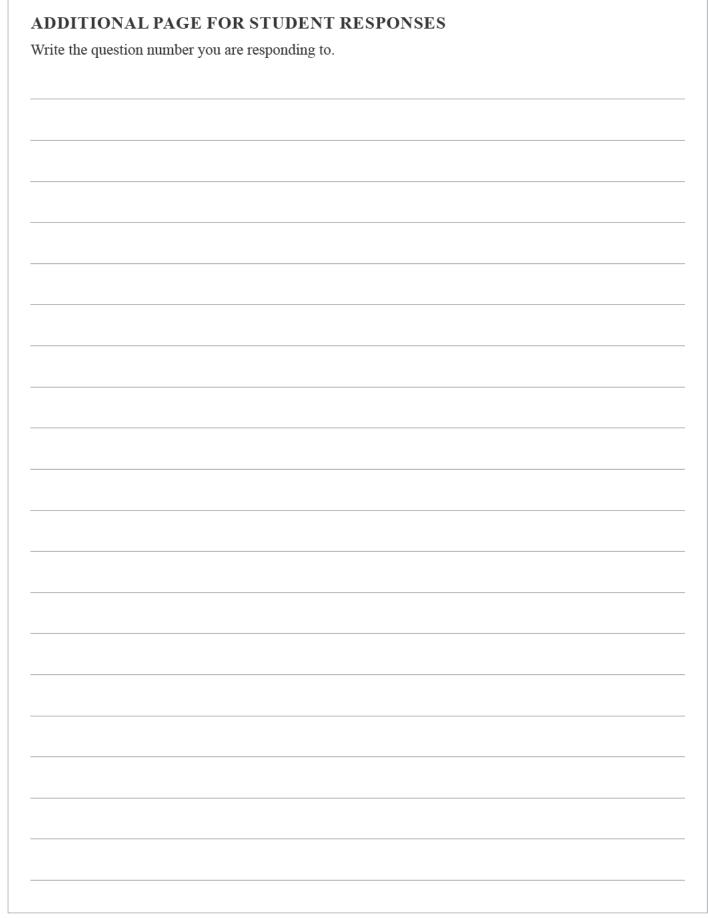
# QUESTION 25 (5 marks) Representative concentration pathways (RCPs) are greenhouse gas concentration trajectories that describe different climate futures depending on the volume of greenhouse gases emitted in future years. The graphs show long-term changes in ocean pH and hydrogen ion concentration [H<sup>+</sup>] using historical observations and modelled predictions using RCP scenarios between 1770 and 2100. This content has been redacted until copyright has been assessed and cleared.

a)	Which RCP scenario predicts that ocean pH will stabilise?	[1 mark
b)	Explain the relationship between $[H^+]$ and ocean pH using evidence from the graphs.	[2 marks
c)	Describe two consequences for coral reef ecosystems under the RCP 8.5 scenario.	[2 marks

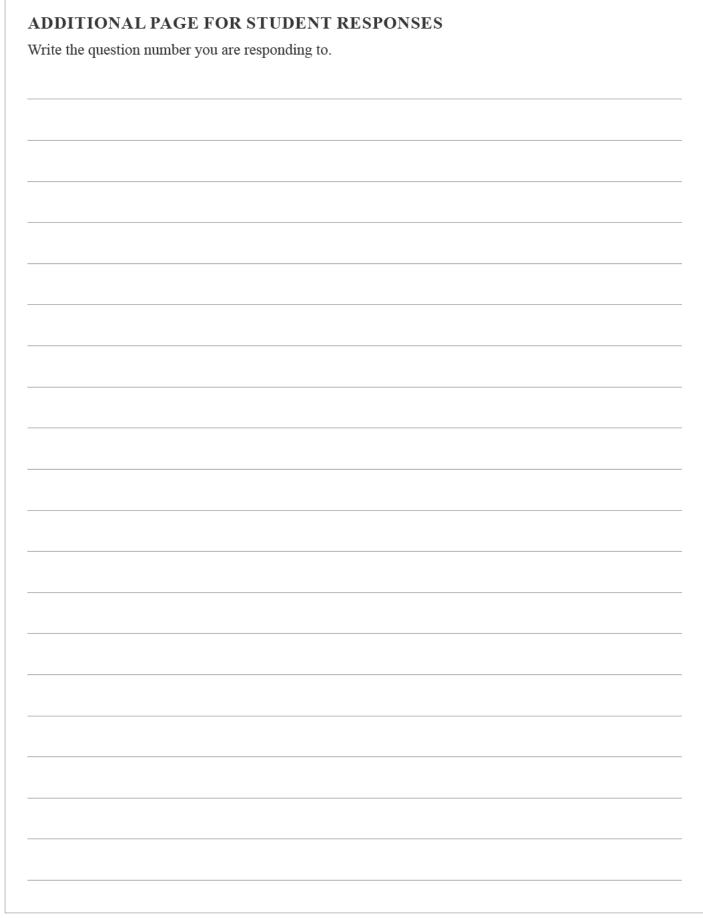
a c	tock of a wild migratory Australian fish species needs sustainable management before ommercial resource. However, there is little scientific data about the species' behavioution.	out the species' behaviours and		
a)	Explain how the precautionary principle applies to this situation.	[1 mark		
b)	Explain one management technique that should be implemented to prevent overexploitation of this resource.	[2 marks		

am low feed conversion ra	atio and why it is a desirable attribute for an aquaculture species.
	END OF PAPER









#### References

#### Question 25

Adapted from Jiang, L-Q, Carter, B, Feely, R, Lauvset, S & Olsen, A 2019, Figure 5: Long-term change of global surface ocean pH and ocean acidity in 'Surface ocean pH and buffer capacity: past, present and future', Scientific Reports, vol. 9, issue 18624, CC BY 4.0, https://doi.org/10.1038/s41598-019-55039-4

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