basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

MARINE SCIENCES P2

MAY/JUNE 2026

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 20 pages.

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PRINCIPLES RELATED TO MARKING MARINE SCIENCES

1. **If more information is given than marks allocated**
   Stop marking when the maximum number of marks is reached, and draw a wavy line and write 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three reasons irrespective of whether these first three are correct or not.

3. **If a whole process is given when only a part of the process is required**
   Read the whole process given and credit the relevant part.

4. **If comparisons are asked for, but descriptions are given**
   Accept the description if the differences or similarities are clearly stated.

5. **If diagrams are given with annotations when descriptions are required**
   Mark the description.

6. **If flow charts are given instead of descriptions**
   Mark the description only.

7. **If a described sequence is muddled and links do not make sense**
   Where sequence and links are correct, marks are given. Should a logical sequence resume, marks are given.

8. **Non-recognised abbreviations**
   Accept the abbreviation if it is first defined in the answer. If the definition is not defined, do not give credit for the unrecognised abbreviation, but credit the rest of the answer if correct.

9. **Wrong numbering**
   If the answer fits into the correct sequence of questions, but the wrong number is given, credit the answer if the answer is in the correct order.

10. **If the language that is used changes the intended meaning**
    Do not accept the answer.

11. **Spelling errors**
    If a word is recognisable (if read out loud), accept the answer, provided it does not mean something else in Marine Sciences terminology or if it is out of context.

12. **In QUESTION 1.1 of SECTION A, only accept and credit the correct letter.**

13. **Be sensitive to the sense of an answer, which may be stated in a different way.**

14. **Title**
    All illustrations (e.g. diagrams, graphs and tables) must have a title written above or below.

15. **Code-switching of official languages (terms and concepts)**
A term or concept written in any official language other than the learner's assessment language used in their answers should be credited, if it is correct. A marker that is proficient in Marine Sciences content and the official language used should be consulted. This is applicable to all official languages.

16. **Changes to the marking guidelines**
No changes must be made to the marking guidelines. The provincial internal moderator must be consulted, who in turn will consult with the national internal moderator (and the Umalusi moderators who will be consulted, where necessary).

17. **Official marking guidelines**
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

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SECTION A

QUESTION 1

1.1	1.1.1	C ✓✓		
	1.1.2	D ✓✓		
	1.1.3	C ✓✓		
	1.1.4	D ✓✓		
	1.1.5	B ✓✓		
	1.1.6	A ✓✓		
	1.1.7	C ✓✓		
	1.1.8	D ✓✓		
	1.1.9	B ✓✓		
	1.1.10	B ✓✓		
			(10 x 2)	(20)

1.2	1.2.1	Infratidal (zone) ✓		
	1.2.2	(Behavioural) adaptations ✓		
	1.2.3	Ambulacral (grooves) ✓		
	1.2.4	Phagocytes ✓/ Phagocytic/Coelomocytes		
	1.2.5	Elasmobranchii ✓		
	1.2.6	Pinnae ✓		
	1.2.7	Nature-based tourism ✓		
	1.2.8	Representative (sample) ✓		
	1.2.9	Biogeographic (region) ✓		
	1.2.10	Ecological integrity ✓ / Ecosystem stability		
			(10 x 1)	(10)

1.3	1.3.1	Both A and B ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	B only ✓✓		
	1.3.4	A only ✓✓		
	1.3.5	None ✓✓		
			(5 x 2)	(10)

TOTAL SECTION A: 40

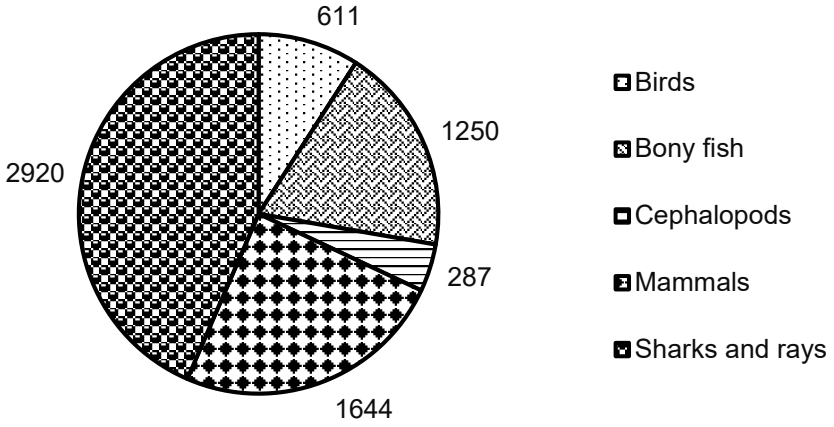
SECTION B

QUESTION 2

2.1 2.1.1

Prey	Plotting	Degrees	Rounded
Birds	$\frac{611}{6712} \times 360°$	32,77	33
Bony fish	$\frac{1250}{6712} \times 360°$	67,04	67
Cephalopods	$\frac{287}{6712} \times 360°$	15,39	15
Mammals	$\frac{1644}{6712} \times 360$	88,18	88
Sharks and rays	$\frac{2920}{6712} \times 360°$	156,62	157

Pie chart of the (relative) abundance of different prey species in the diet of large Tiger Sharks



MARKING GUIDELINES	
CRITERIA	**MARK ALLOCATION**
Descriptive heading (**H**)	½
Heading includes all variables (Prey categories and (relative) abundance) (**V**)	½
Type of graph, Pie chart **(T)**	½
For each correct calculation for (relative) abundance of different prey **(C)**	½ x 5 = 2½
Drew and labelled correct segments **(S)**	½ x 5 = 2½
Key/Label (**K**)	½

(7)

2.1.2 $\frac{644}{8\,043} \times 100$ ✓ $= 8{,}01$ %✓ (answer and %) (2)

2.1.3
- Study was done over many years (31 years) ✓
- 37 beaches were used ✓
- Large sample size of 628 sharks ✓

(Mark any 2, mark first 2) (2)

2.1.4
- The decaying stomach contents will be difficult to identify. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking) (1)

2.1.5
- Generally, fish are smaller than mammals. ✓
- Small sharks catch fish more easily. ✓
- Large sharks catch mammals more easily. ✓
- Smaller prey has less energy ✓
- Larger sharks will prey on mammals because a bigger prey will result in more energy for the shark ✓

(Any 4)
(Any logical relevant substantiating answer, marker discretion for insightful thinking) (4)
(16)

2.2 2.2.1
- Organisms might grow around ✓/block the siphons
- Restricting water flow in or out of the tunicates ✓
- Possibly reducing the amount of oxygen ✓/nutrients
- Possibly increasing the amount of carbon dioxide ✓/waste within the tunicate

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Any 3) (3)

2.2.2 (a)
- Marine biologist ✓
- to understand the physiology of the species ✓

- Marine ecologist ✓
- to understand the impact of the paints on the ecosystem ✓ /to understand the impact on the species

- Chemists ✓/Biochemists
- to understand the properties of the chemicals produced by tunicates ✓/describe the molecular structure of the chemicals

- Biotechnologist ✓/Chemical engineer
- to develop the manufacturing process ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any 2 pairs, mark first 2 pairs) (4)

(b)
- Environmentally friendly/life-friendly chemicals ✓
- reducing pollution and harm to marine organisms. ✓

- It can be designed for circular economy ✓
- The chemicals that are released can be reformed into new or the original chemicals. ✓

- Avoid extremes of temperatures ✓
- Incorporate renewable or low-energy production methods for creating the antifouling paints. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark first pair, mark any pair) (2)

2.2.3
- High cost ✓
- It will cost money to experiment and design the antifouling paints, compared to the already existing paints ✓

- Durability ✓
- The coatings may wear off faster in harsh marine environments, therefore requiring more frequent reapplication ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any pair) (2)

2.2.4 **IF YES**

- Tunicates have evolved anti-fouling strategies over millions of years, so copying them provides a tested, effective solution. ✓
- Using paints inspired by the chemicals of the tunicates reduces the need for toxic paints, which benefits marine ecosystems. ✓
- It encourages humans to look at natural adaptations of the tunicates for creative engineering solutions. ✓
- Paints, in particular, include substances that are damaging to ecosystems/animals. ✓

IF NO

- Producing paints inspired by the chemicals of the tunicates might be expensive and difficult to scale for large ships or structures. ✓
- Natural mechanisms of the tunicates might not withstand harsh maritime conditions as effectively as engineered coatings. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(1 mark if Opinion and motivation correlates 1 mark for motivation) (2)
(13)

2.3 2.3.1 (a)
- Sea cucumbers have(**feeding) <u>tentacles*</u>** with a broad, sticky surface area ✓/ adapted podia around their mouths.
- These are waved around in the water column to <u>filter out organic material</u> ✓/food particles from the water
- that is/are then pushed into their mouths ✓
- and then transferred to the through-gut ✓

(1 Structure* and any 1) (2)

(b)
- Humpback Whales take large volumes of water containing plankton/a large amount of sardines into their mouths, ✓
- then filter the food out by raising their large tongues, ✓
- forcing the water through the **<u>baleen plates*</u>** ✓
- and leaving the food behind. ✓

(1 Structure* and any 1) (2)

2.3.2
- Humpback Whales have a pair of blow holes on the top of their heads. ✓
- When they are on the surface, air is drawn via the blow holes into the lungs. ✓
- **The air passages are entirely separate from the mouth ✓* ensuring that they are able to open their mouths while feeding and still hold their breath.**

(1 Compulsory mark* and mark any 1) (2)

2.3.3
- Both small animals and large animals play important roles in their food webs ✓/global ocean food web by controlling the amount of planktonic organisms
- The loss of either one might result in an imbalanced food web/ a collapse of the food web ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking) (2)

(8)
[37]

QUESTION 3

3.1 3.1.1 Branchiostegal membrane ✓ (1)

3.1.2
- To prevent water from flowing out of the mouth ✓
- thereby maximising the amount of (oxygen-rich) water that flows over the gills ✓

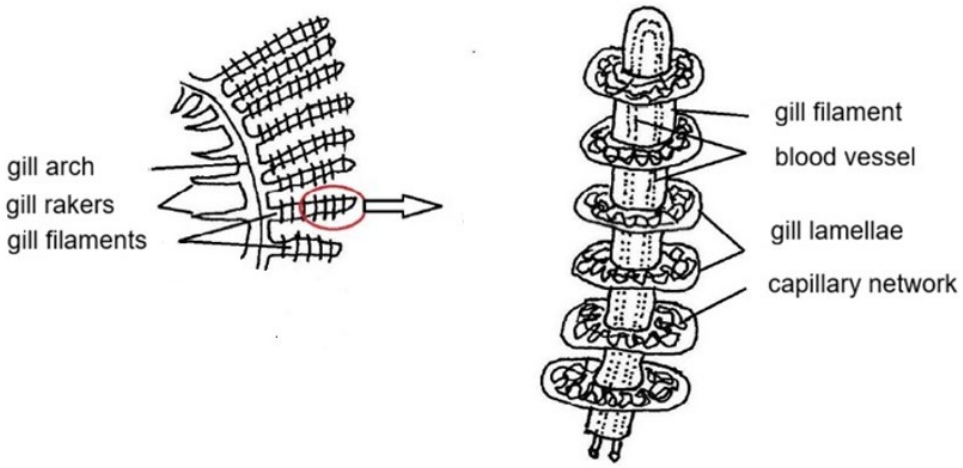
OR

- To create an area of high water pressure in the mouth compared to the surrounding water ✓
- causing the (oxygen-rich) water to flow over the gills ✓

(Mark any pair) (2)

3.1.3
- There would be a reduced pressure difference between the front area of the mouth and the area of the gills ✓
- therefore, ventilation will be less efficient ✓ (2)

3.1.4 **An illustration showing the structure of a gill and a magnified gill filament**



MARKING GUIDELINES OF ILLUSTRATION		
CRITERIA	**ELABORATION**	**MARK**
Correct drawing (**D**)	Gill structure indicating the gill filaments or the magnified gill filament (did not have to draw both)	½
Suitable heading (**H**)	Descriptive heading (Illustration showing a gill filament)	½
Drawing technique	- Drawing in pencil (**TP**) - Drawing solid lines (not more than 45–50% shading – marker's discretion) (**TS**)	½ ½
Labels (**L**)	Mark any 2 x 1	2

(4)
(9)

3.2 3.2.1
- Through electromagnetic stimuli (overstimulating the ampullae of Lorenzini)✓
- sharks will be deterred from being in this area/sharks will avoid this area ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking) (2)

3.2.2
- Prevents shark attacks ✓
- Provide a haven/protection for juveniles/vulnerable species ✓
- Reduces the effects of swells ✓
- Allows for attachment of sessile animals ✓
- Provides safe breeding grounds for fish ✓

(Mark first 1, mark any 1) (1)

3.2.3
- The influx of tourists could have resulted in increased activities at the beaches ✓
- The increased movement in the water would have created more vibrations ✓ /chemical stimuli
- The sharks perceived the vibrations as prey in the water ✓
- which attracted the sharks closer to the shore ✓ increasing the chances of shark attacks

(Mark any 2) (2)

3.2.4 (a)
- Shark cage diving ✓/snorkelling with sharks
- Boat trips to view sharks ✓/glass bottom boats

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark first 1, mark any 1) (1)

(b)
- Increase the sensitivity/understanding of the visitors to the behaviour of sharks ✓
- thus, changing perspectives of the public resulting in more support for conservation initiatives ✓

- Minimise impacts upon the environment that sharks are found in ✓/minimise impacts upon the sharks
- Ensuring the shark populations can thrive ✓ (breeding grounds, feed)

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any pair, mark first pair) (2)

(c) It **IS** a sustainable approach

- The barrier is artificial so it would potentially last longer than a natural barrier ✓/more durable
- The barrier provides a surface for other sessile animals to grow which could result in a thriving ecosystem in the long term ✓

It **IS NOT** a sustainable approach

- Sharks are unpredictable and might find a way through the SharkSafe Barriers ✓
- Material used might become harmful to the marine organisms ✓
- More research is required to establish the impact of shark nets and other shark control measures on the shark populations and their ecosystems ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark opinion and correlating answer) (2)
(10)

3.3 3.3.1
- Mangrove forests help to calm water turbulence/break the impact of waves ✓
- thereby promoting sedimentation and the expansion of the estuaries ✓

- Mangrove forests serve as a nursery/protection for fish/sharks ✓
- thereby survival rate of species/increasing biodiversity ✓

- The leaves of the mangroves trees that fall into the river, ✓
- contributes to the organic load/food for other organisms ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any pair, mark first pair) (2)

3.3.2
- (The increased solid waste from the sewage)
- causes eutrophication ✓
- resulting in an oxygen deficit in the water. ✓
- The sewage changes the chemistry of the sea water ✓
- by introducing high concentrations of ions.
- Organisms would not be able to adapt to a change in salinity ✓/pH
- **This could result in loss of life ✓*/a loss of biodiversity within the Nahoon Estuary**

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(1 Ecological role* and any 2) (3)
(5)

3.4 3.4.1 (a) Granular Limpet ✓/ *S. granularis* (1)

(b)
- *S. granularis*/Granular Limpet is larger <u>and therefore has more flesh</u> ✓
- providing the community with more food (for less effort) ✓

OR

- *S. granularis*/Granular Limpet is found in the balanoid zone compared to the *S. cochlear*/Pear-shaped Limpet therefore <u>more easily accessible</u>
- less time is spent harvesting✓/ able to harvest for longer period compared to the Pear-shaped Limpet that might be submerged during low tide

(Mark any pair) (2)

3.4.2 Managed resource (protected area) ✓ (1)

3.4.3
- Introduce quotas for the harvesting of limpets ✓
- Educate the community on sustainable harvesting practices ✓ such as staggering the localities of harvesting, i.e. not making the whole harvested area bare
- to prevent overharvesting and ensure that the limpet population numbers remain stable ✓
- Employ the local community members to be part of the conservation efforts ✓
- and upskill the community to give economic alternatives, ✓
- thereby providing a source of income to buy alternate food sources ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any 4) (4)

3.4.4 (Zone) B ✓ (1)

3.4.5
- There would be more space available ✓
- for other molluscs/barnacles/other species to settle. ✓
- The algae that the limpet feeds on would grow and spread unchecked throughout the upper balanoid zone ✓
- the balance of the ecosystem/food chain in the zone would be changed ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
(Mark any 3) (3)

3.4.6 If learner says **YES**

- Individuals from both species are found in the no-take zone and the harvesting zone. Species are protected in the no-take zone. ✓
- The species occur in different zones. Therefore, harvesting of the larger Granular Limpet is not influencing the density of the Pear-shaped Limpet. Both species were found in the harvesting zone. ✓

If learner says **NO**

- Low numbers of Granular Limpets were found even in the no-take zone ✓ This might indicate that the species is not well conserved/that this area is on the edge of this species' distribution range.
- The effects of overharvesting of Granular Limpets in the harvesting zone might result in disruptions/imbalance in the ecosystem, that might have indirect effects on the Pear-shaped Limpets.

(Any logical relevant substantiating answer, marker discretion for insightful thinking)

(Mark only allocated for Yes or No if answer is motivated) (2)

(14)

[38]

TOTAL SECTION B: 75

SECTION C

When marking essays:
- *Markers should indicate with the designated letter.*
- *Compulsory marks per section are indicated with ✓*.*
- *The breakdown of the synthesis marks is indicated on the rubric for the essays.*
- *Credit valid responses which may be provided by the candidate from other sources.*
- *Markers need to allocate a minimum of four marks per bullet point.*
- *A maximum of two marks for the opinion.*
- *Excluding the opinion, the other seven marks may be awarded for any of the bullet points being discussed.*

Important notice: more potential responses are given in these marking guidelines than marks allocated per question.
'/' means either the first or the following phrase provided in these marking guidelines is allocated marks.

ASSESSING THE PRESENTATION OF THE ESSAY

MARK ALLOCATION	2	1	0
INTRODUCTION 2 marks (INTR)	The introduction shows a contextual link that the candidate understands what the question is, by: Correctly stating in their own words what the question is about AND describing the intention/purpose of the essay.	Some attempt to write an introduction/ stated intention of essay but to a large extent using the wording from the question. Unclear that candidate fully understands the topic. Stated the intention of the essay in their own words.	There is no introduction. Starts with the asked content straight away. Provides randomly arranged facts. Restating the question
USE OF PARAGRAPHS 2 marks (PAR)	The internal structure of a paragraph clearly planned. One main aspect/idea discussed in a paragraph. If more than one aspect is discussed in a paragraph, the connection is clearly visible.	Some paragraph division but is unclear (not linked) why content is grouped in these paragraphs.	All content sections written as one paragraph.

RELEVANCE 2 marks (REL)	Sufficient information with many good points made, 50% or more of the content is relevant to the question asked.	An attempt to write on the topic, but only 26% to 49% of the content discussed in the essay is relevant to the question asked.	25% or less of the content that the learner addressed is relevant to the topic asked.
LOGICAL SEQUENCE 2 marks (LSEQ)	Paragraphs show logical sequence and are demonstrably linked to each other.	Generally clear sequence but some facts not in place – content provided is correct but is meant to be in a different (relevant) paragraph. Essay poorly planned.	Very difficult to read the essay as no logical sequence. Many facts with no clear layout. Clearly unplanned.
CONCLUSION 2 marks (CONC)	Clearly bringing the aspects discussed in the essay together in a final paragraph in own words.	An attempt to write a conclusion, but closely quotes the words of the question asked. Still shows linkage of the topic to their response.	No conclusion. Learner clearly stopped after the content paragraphs – no attempt to pull the ideas together.

(10)

QUESTION 4

INTRODUCTORY PARAGRAPH

- The introduction must include amphibians/Western Leopard Toad and reptiles/ Yellow-bellied Sea Snake evolution to a drier climate/destruction of rainforest habitats and the development of amniotes
- Must NOT include the direct wording of the question.

Impact of habitat reduction on amphibian populations (H)
- **Eggs would have become dehydrated/the effects of desiccations were higher ✓***
- **resulted in a decrease in the egg survival rate ✓*/ fewer moist areas would have resulted in fewer areas for eggs to be laid**
- Amphibians lay eggs that are filled with fluid ✓/yolk and other contents/nutrients
- which provides the <u>embryo with nutrition</u> for development. ✓
- These eggs are soft and <u>require water</u>. ✓
- The rainforest maintains constant moisture due to increased rainfall ✓
- Thus, the drier climate resulted in fewer moist areas being available for amphibians to lay eggs ✓

(Mark 2 compulsory and min 2)
Min 4

Drier climate influence on eggs (D)
- Reptiles have a waterproof (outer) shell ✓
- That is leathery ✓/calcareous.
- The waterproof shell <u>keeps the fluid</u> (along with the yolk and other egg contents) inside✓/ keeps the inner environment of the egg moist
- which means that a drier climate will not have an impact on the development of eggs. ✓
- However, the Yellow-bellied Sea Snake is ovoviviparous, ✓
- giving birth to live young (in the ocean) ✓ and
- thus eliminating the need to go onto dry land to lay eggs. ✓

(Mark min 2 other reptiles and min 2 sea snake)
Min 4

Osmoregulation in the ocean (R)
- Sea snake lives in sea water and it has a diet of seafood. ✓
- Sea water has a higher salinity than the fluids in the body of the snake ✓
- The sea snake therefore loses water ✓ to the environment (through osmosis)
- and could become dehydrated. ✓
- The sea snake, therefore, takes in/drinks sea water ✓
- The Yellow-bellied Sea Snake has salt glands ✓
- in their mouths, ✓
- to excrete the salts out of their body. ✓

(Mark min 2 need to osmoregulate and min 2 how adapted)
Min 4

Gaseous exchange (G)
Western Leopard Toad/Amphibian
- The Western Leopard Toad has soft/thin/glandular skin ✓
- which is not waterproof ✓/permeable.
- Many amphibians secrete moisture onto their skin✓
- to use it as a gaseous exchange surface. ✓
- Toads have rudimentary/simple lungs✓

Min 2

Yellow-bellied Sea Snake
- The Yellow-bellied Sea Snake has large lungs ✓ that consist of
- air sacs ✓ inside the lung where
- the (inner surfaces of the small) air sacs in the lungs are thin ✓/moist/well supplied with blood vessels.
- Breathing is brought about by the (muscular) rib cage ✓
- which can expand and contract the size of the body cavity ✓
- pulling in air through their nostrils. ✓

Min 2
Max (23)

If the candidate wrote: Western Leopard Toad (J)
- The skin is the gaseous exchange surface which can extract oxygen directly from air in the atmosphere. ✓
- The moisture in the skin makes the diffusion of gases easier/requires less energy compared to breathing through lungs (like the sea snake). ✓

If the candidate wrote: Yellow-bellied Sea Snake
- Yellow-bellied Sea Snake has large lungs to take in more oxygen from the atmosphere. ✓
- Yellow-bellied Sea Snake lungs have alveoli that increase the surface area for effective gaseous exchange ✓
- Yellow-bellied Sea Snake has ribs and muscles that assist in breathing to facilitate the movement of air into the lungs from the atmosphere. ✓

(1 mark if Opinion and motivation correlates 1 mark for motivation)
(Any logical relevant substantiating answer, marker discretion for insightful thinking)
Max (2)

CONCLUDING PARAGRAPH
- Discusses how amphibians/Western Leopard Toad and reptiles/Yellow-bellied Sea Snakes have evolved to a drier climate and their adaptations (eggs/gaseous exchange surface) to overcome the changed climate and habitat
- Does not repeat/reproduce wording of the question/text

Content: (25)
Synthesis: (10)
[35]

QUESTION 5

INTRODUCTORY PARAGRAPH

- The introduction must include marine birds (terns) and Leatherback Turtles and refer to their reproduction/nesting and survival during periods where climate change conditions increase temperatures of their habitats.
- Must NOT include the direct wording of the question.

Reproduction of Marine Birds (R)
- Fertilisation occurs internally ✓
- where an optimum temperature is maintained for gametes to become fertilised ✓ despite changing external temperatures.

- Marine birds lay eggs that are calcareous ✓/waterproof shell
- which reduces the chances of desiccation ✓ during drought periods caused by climate change.

- Eggs contain amniotic fluid, ✓
- which provides a constant supply of moisture to the embryo ✓

- Both parents look after/take turns to incubate eggs. ✓
- which ensures that the eggs are safe during severe weather conditions. ✓

(Mark minimum 2 pairs)
Min 4

Nesting process in Leatherback Turtles (T)
- (The females return to the beaches on which they hatched, drag themselves up beyond the high tide mark and dig holes to lay a clutch of eggs)
- Only the female is involved with the nesting process ✓
- The females dig the holes for the nest <u>using their hind flippers</u>. ✓
- (After laying the eggs and closing the nest with sand) the females disguise/camouflage the nest from predators ✓/ the nest protects the eggs from the external environmental conditions
- The hole covered with sand acts as a natural <u>incubator for development</u> ✓
- This nesting process is repeated a number of times (over several weeks). ✓
- Eggs are not all laid in the same clutch. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
Min 2

Increased temperature of beach sand effect on turtle hatchlings (B)
- Higher beach sand temperatures will influence the nest site selection/location on the beach where the female will dig the hole for the nest ✓
- The sex of the turtle hatchlings is determined by the temperature of the eggs ✓ while they are developing.
- Thus, an environment with an average higher temperature can result in a disproportionately large number of a certain sex ✓/unbalanced sex ratio (females if temperatures develop to above 30 °C to 31 °C)
- and hinder future reproduction. ✓
- Higher incubation temperatures can exceed the optimal thermal tolerance limits of the embryos, ✓

- leading to increased death rates of embryos before hatching ✓
- **which could result in the long-term decline in the sea turtle populations. ✓***

(Any logical relevant substantiating answer, marker discretion for insightful thinking)

(1* Effect on turtle population and min 1 other)

Ensuring waterproofing of feathers in terns (W)

- Marine birds have preen glands ✓
- at the base of their tails. ✓
- The oil secreted ✓ by the preen glands
- is applied to their (down/quill/contour) feathers ✓
- using their beaks ✓
- when they preen/groom themselves. ✓
- The oil repels water ✓
- as the oil is hydrophobic ✓ (thereby waterproofing their feathers, that are more likely to get wet during a storm surge).

Min 4

Storm surge impact on nesting grounds (N)

- (During a storm surge event/high winds/heavy or prolonged rainfall) the nesting material/sand can be eroded/washed away. ✓
- This can result in the eggs being washed away or ✓
- exposing the eggs to environmental temperatures✓/unsuitable environmental conditions or
- exposing the eggs to predators. ✓
- The water remaining in the nests after heavy/prolonged rainfall makes the nests water saturated ✓
- The temperature of water is not ideal for eggs to develop resulting in increased egg mortality. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)

(1 mark min for impact on nesting ground and min 3 effect on eggs)

Min 4

Max (23)

Opinion (J)

If candidate wrote tern

- Chicks can grow very quickly, leading to a shorter nesting period compared to turtles, minimising the exposure to nest-based threats caused by climate change. ✓
- The terns lay a clutch of one or two eggs, a smaller number compared to turtles, both parents will be able to take better care/provide protection during severe weather conditions. ✓
- Extensive parental care allows for higher nutrient intake during early development and can lead to fast development of sensory systems and behaviours to deal with the changing environment caused by climate change. ✓

If candidate wrote Leatherback Turtle

- As turtle hatchlings are precocial they are independent from hatching and move on their own to the water. They are more agile than the tern chicks and able to find their way to suitable resources in the ocean, that is a changing environment due to climate change. ✓
- Many hatchlings emerge from nests/increased genetic diversity which means that at least some might be able to deal with the effects of climate change. ✓
- No parental care takes place, which reduces energy/time constraints on the parents in the long-term and potentially allow for more offspring during their lifespan.

(1 mark if Opinion and motivation correlates 1 mark for motivation)
(Any logical relevant substantiating answer, marker discretion for insightful thinking)

Max (2)

CONCLUDING PARAGRAPH

- Discuss how reproduction and nesting grounds in marine birds (tern) and Leatherback Turtles are affected by the effects of climate change
- Does not repeat/reproduce wording of the question/text

Content: (25)
Synthesis: (10)
[35]

TOTAL SECTION C: 35
GRAND TOTAL: 150

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