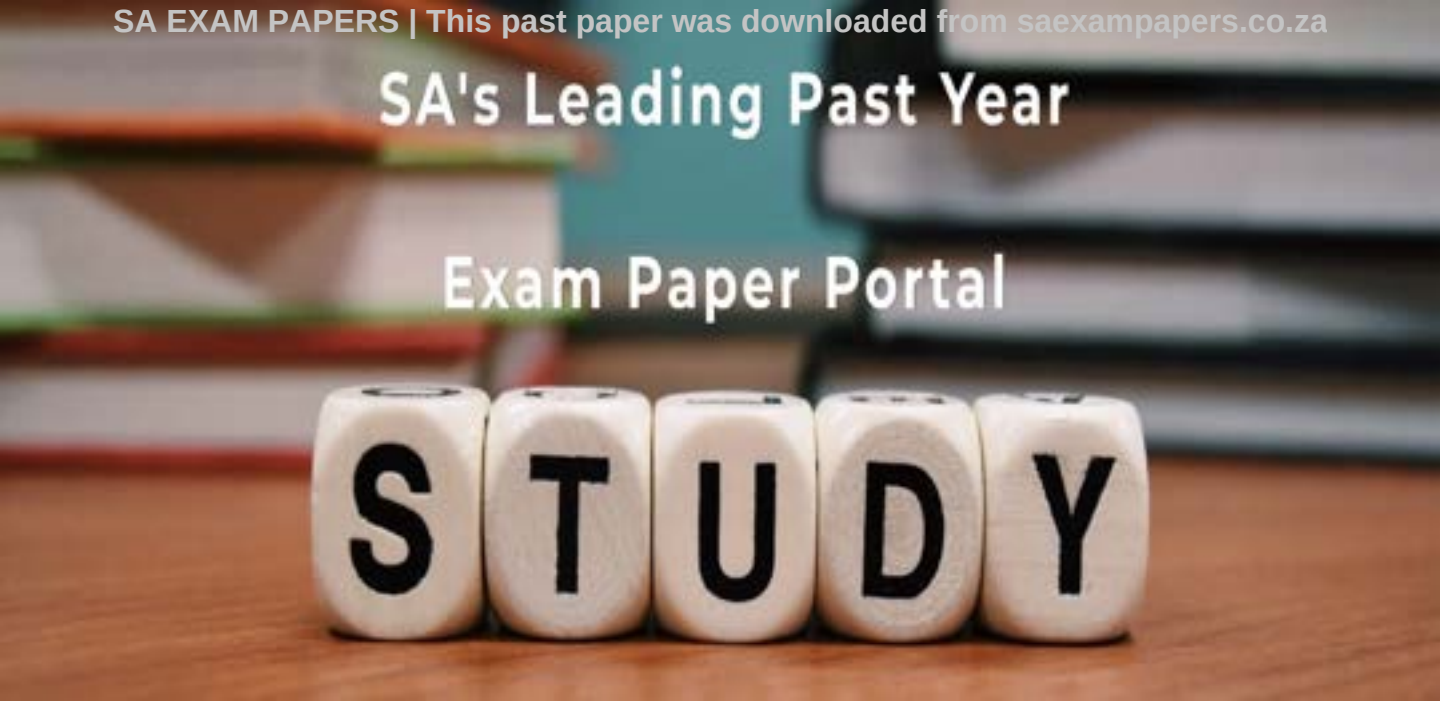

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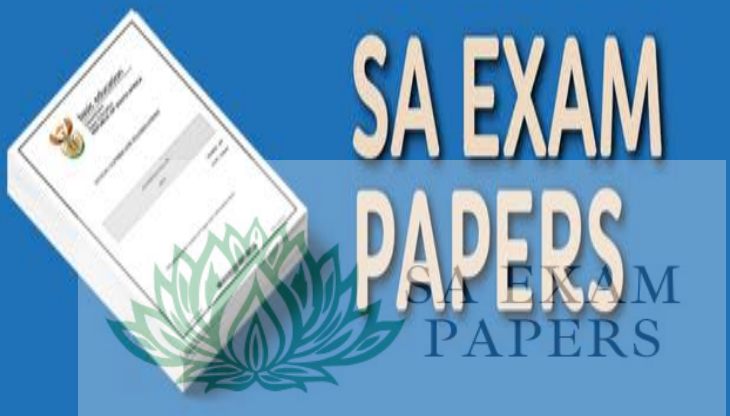


basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARINE SCIENCES (P2)

NOVEMBER 2022

MARKS: 150

TIME: 2½ hours

This question paper consists of 13 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of THREE sections. Answer the questions as follows:

SECTION A:	COMPULSORY
SECTION B:	Consists of QUESTIONS 2 and 3. Answer BOTH questions in this section.
SECTION C:	Consists of QUESTIONS 4 and 5. Answer any ONE of the two questions in this section.

2. Answer ALL the questions in the ANSWER BOOK.

3. Start EACH question on a NEW page in the ANSWER BOOK.

4. Number the answers correctly according to the numbering system used in this question paper.

5. Present your answers according to the instructions of each question.

6. Do ALL drawings in pencil and label them in blue or black ink.

7. Draw diagrams, tables or flow charts only when asked to do so.

8. The diagrams in this question paper are NOT necessarily drawn to scale.

9. Do NOT use graph paper.

10. You must use a non-programmable calculator, protractor and a compass, where necessary.

11. Round off your FINAL numerical answers to the SECOND decimal place, where applicable.

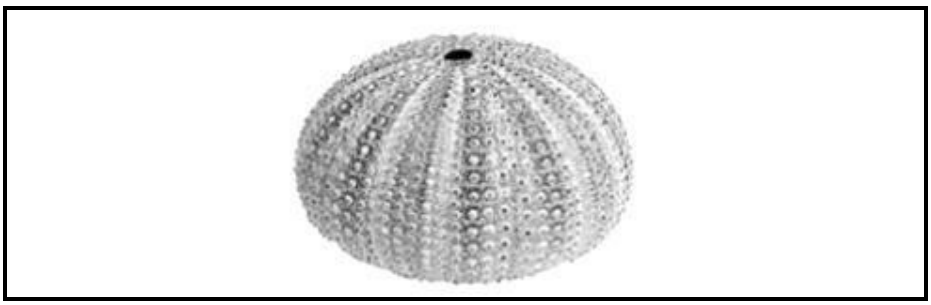
12. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 The structure represented below is referred to as a/an …



[Source: https://www.deepseanews.com]

A shell.
B endoskeleton.
C test.
D basket.

1.1.2 Sharks are …

A mostly carnivores.
B opportunistic omnivores.
C all apex predators.
D herbivores.

1.1.3 Amphibians first appeared about … years ago.

A 100 million
B 330 million
C 500 million
D 660 million

1.1.4 Brittle stars …

A have a central disc covered with rigid, brittle skin.
B mainly move around by actively swimming through the water.
C are mostly filter feeders.
D have a through gut with a mouth and an anus.

1.1.5 Which statement about the denticles found in Chondrichthyes is INCORRECT?

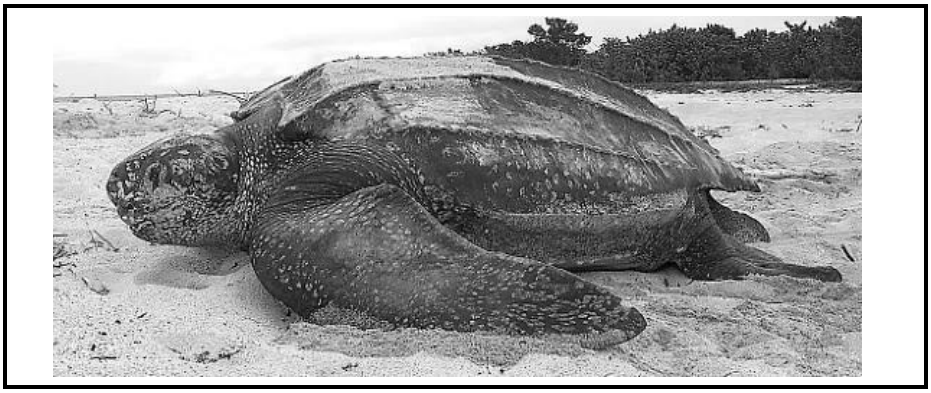
A Can be used to tell the age of the species
B Create a hydrodynamic surface
C Discourage the attachment of parasites and fouling organisms
D Provide some form of exoskeleton layer for protection

1.1.6 Select the CORRECT statement/s about sharks:

(i) Sharks have countershading to blend into the environment.
(ii) The oil in their livers assist with buoyancy.
(iii) They are positively buoyant.
(iv) They are torpedo-shaped.

A (ii), (iii) and (iv)
B (i), (ii) and (iv)
C (i), (ii) and (iii)
D (i), (ii), (iii) and (iv)

1.1.7 Which ONE of the options below gives the CORRECT common name and scientific name of the organism below?



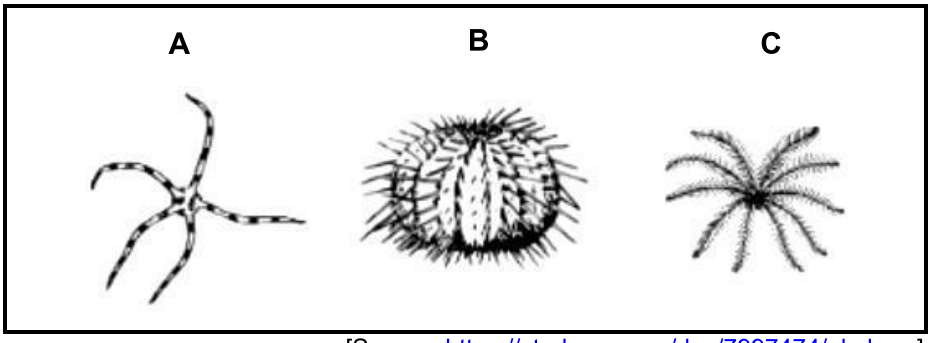
[Source: https://en.wikipedia.org/wiki/]

A Leatherback Turtle, *Dermochelys coriacea*
B Green Turtle, *Chelonia mydas*
C Leatherback Turtle, *Dermochelys caretta*
D Hawksbill Turtle, *Eretmochelys imbricate*

1.1.8 Which statement about sea snakes is INCORRECT?

A They have flattened bodies and tails which enable them to swim efficiently.
B They have salt glands in their mouths to deal with a very salty diet.
C They have large gills to provide for efficient gaseous exchange while swimming on the surface.
D Most are ovoviviparous.

1.1.9 The diagrams below represent individuals in three different classes of the same phylum.



[Source: https://studyres.com/doc/7997474/phylum-]

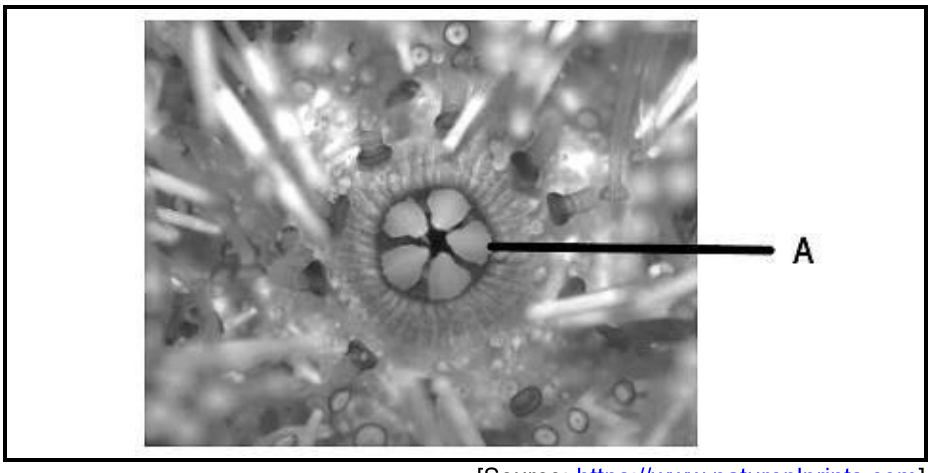
The names of the classes are provided below:

(i) Echinoidea
(ii) Crinoidea
(iii) Ophiuroidea

Select the correct order to match the class names to the diagrams (**A**–**C**):

A (iii), (ii),(i)
B (ii), (iii), (i)
C (iii), (i), (ii)
D (ii), (i), (iii)

1.1.10 Which ONE of the options below provides the correct name and function of the structure labelled **A** in the image below.



[Source: https://www.natureplprints.com]

A Aristotle's lantern, used for feeding
B Cupid's lamp, used for reproduction
C Medusa's basket, used for respiration
D Thor's tooth, used as a sensory organ (10 x 2) **(20)**

1.2 Give the correct **scientific term/phrase** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 The small, jointed legs with which feather stars hold onto a substrate

1.2.2 A hard, flexible protein found in skin, horns, claws and many other structures in animals

1.2.3 A pair of backward-facing, tapering appendages used by male sharks during reproduction

1.2.4 An embryo feeding strategy in some sharks where the pups that hatch feed on unfertilised eggs in the ovary

1.2.5 The millions of microscopic sacs which fill the lungs of mammals

1.2.6 A stage in embryonic development when the embryo is a hollow sphere

1.2.7 The hard, dorsal, shield-like covering in turtles, tortoises and other arthropods

1.2.8 The bony plates on the ventral surface of a turtle or tortoise

1.2.9 Structures associated with the gill chambers enabling water to flow outwards

1.2.10 The blood vessels taking blood to and from the respiratory organs

(10 x 1) **(10)**

1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Sea cucumbers	A: B:	belong to deuterostomes belong to the class Holothuroidea
1.3.2	Elasmobranchii	A: B:	have a prism-valve digestive system are able to constantly replace their teeth
1.3.3	Loggerhead Turtles	A: B:	nest on KwaZulu-Natal beaches have a disproportionately large body in comparison to their head
1.3.4	Lampreys	A: B:	are eel-like parasites and feed on blood of organisms they attach to are found along the South African coastline
1.3.5	Reptiles' circulatory system	A: B:	includes a four-chambered heart referred to as an open system

(5 x 2) **(10)**

TOTAL SECTION A: 40

SECTION B

QUESTION 2

2.1

SEABIRD BYCATCH

Many species of seabirds are facing the risk of extinction. Large numbers of birds have been caught as bycatch by long-line fisheries.

Long-line fisheries also influence the food availability of seabirds. Some fisheries may lead to a decrease in the numbers of seabirds by reducing the abundance of their prey species. Other fisheries may increase seabird numbers. This happens by increasing seabird prey abundance through the depletion of predatory fish stocks.

Provision of discard and offal can stimulate large increases in scavenging seabird numbers. Desirable reductions in discard rates may have an unfortunate side-effect of forcing some scavenging seabirds to turn to killing smaller seabirds, with drastic consequences for the community structure.

[Adapted from https://www.researchgate.net/publication/29816290 Impacts_of_fisheries_on_seabird_communities]

An investigation was conducted on similar-sized fishing vessels that only used the long-line method to catch fish. No vessel had measures to prevent/deter birds being caught as bycatch. Researchers determined the species of bird and the number of each species caught as bycatch from 1 April–31 July 2022.

Use the data in the table below to answer the questions that follow.

The total number of seabirds captured as bycatch and the species for each fishing vessel

NAME OF FISHING VESSEL	SEABIRD SPECIES	NUMBER OF BIRDS
Heart of the Sea	Albatross Petrels Terns Gannets	2 4 3 3
Marlin I	Albatross Petrels Terns Gannets	8 4 10 6
Aqua-Bell	Albatross Petrels Terns Gannets	12 7 14 11
Shy Shark II	Albatross Petrels Terns Gannets	18 13 8 17

2.1.1 State the aim of this investigation. (2)

2.1.2 Identify TWO controlled variables mentioned in the text for the investigation. (2)

2.1.3 Construct a pie chart to illustrate the proportions of birds caught by each fishing vessel. Use the total number of birds caught per vessel. Show ALL calculations. (10)

2.1.4 Why would data, such as that found in the table above, be considered as important for ecologists? (2)

2.1.5 Why can fisheries lead to the extinction of bird species? (2)

2.1.6 International regulations indicate seabird bycatch may not be more than 50 seabirds in total.

(a) Which vessel in the table does NOT comply with these international regulations? (1)

(b) Suggest a mitigation measure to reduce bycatch in order for this fishing vessel to comply with the international regulations. (1)
(20)

2.2

SARDINE FISH

The annual sardine run, containing millions of individual sardines, occurs every year between May and August when a coastal current of cold water heads north from the Agulhas Bank up to Mozambique. The sardines migrate in large schools.

[Adapted from https://www.researchgate.net/publication/241682964_Shelf_currents_lee-trapped_and_transient_eddies_on_the_inshore_boundary_of_the_Agulhas_Current_South_Africa_their_relevance_to_the_KwaZulu-Natal_sardine_run]

SOUTHERN RIGHT WHALE MIGRATION

During the summer, Southern Right Whales inhabit the southern and sub-Antarctic oceans. During the winter breeding season whales migrate to warmer temperate waters around the southern parts of the African, South American and Australian land masses.

[Adapted from https://australian.museum/learn/animals/mammals/southern-right-whale/]

2.2.1 Describe the mechanisms used by Southern Right Whales to retain body temperature during their migration. (2)

2.2.2 Sardines are able to regulate their body temperatures.

(a) Draw a diagram to indicate how sardines regulate their body temperatures. (2)

(b) Refer to this diagram to discuss how sardines regulate their body temperature. (4)

2.2.3 Name and describe each of the two groups of Cetaceans. (4)
(12)

2.3 Some marine mammals and marine fish species migrate over long distances to reproduce, each having their own reproductive strategy.

Use a table to compare the reproductive strategies of marine mammals and marine fish. **(8)**
[40]

QUESTION 3

3.1

TRACKING THE ORIGIN OF SHARKS

Sharks do not preserve very well. Usually only their dermal denticles and teeth readily fossilise. Because of this, their origins are fragmentary. However, researchers have a good idea of when they first appeared. Sharks are still very well represented in living specimens today. They have truly stood the test of time.

[Adapted from https://www.fossilguy.com/gallery/vert/fish-shark/shark_evolution/shark_evolution.htm]

LIVING FOSSILS: REPTILES

Reptiles arose from amphibians in the late Carboniferous Period. They evolved adaptations for life in dry environments, such as scaly skin and shelled eggs that can be laid on land. Most reptile groups that dominate today originated in the Mesozoic era. Living reptiles include snakes, lizards, crocodiles and turtles. Today most of these groups contain members that look very similar to what they looked like during the Mesozoic era.

[Adapted from https://www.digitalatlasofancientlife.org/ve/living-fossils/reptiles/]

3.1.1 Explain why shark fossils that have been discovered are limited to denticles and teeth. (2)

3.1.2 Turtles and snakes are examples of organisms that returned to the ocean as part of their evolutionary history.

(a) State possible reasons why these organisms returned to the ocean. (1)

(b) Discuss which limitations these organisms overcame as they returned to the marine environment. (6)

3.1.3 The above extract indicates an evolutionary development from amphibians to reptiles.

Differentiate between the *reproductive processes* in *amphibians* and *reptiles*. (6)
(15)

3.2 Consider the structure below and answer the questions that follow.

[Source: https://a-z-animals.com/blog/]

3.2.1 What does the structure above represent? (1)

3.2.2 Explain how this structure is adapted to maximise survival of the species. (3)

3.2.3 Name the reproductive strategy represented in the diagram above. (1)

3.2.4 Discuss the advantages that other reproductive strategies in sharks have over the strategy indicated in QUESTION 3.2.3. (3)
(8)

3.3 Consider the organisms below and answer the questions that follow.

A	B
	
[Source: https://www.science.org/content/article/]	[Source: https://www.earth.com/news/]

3.3.1 For organism **A,** provide the:

(a) Class (1)

(b) Common name (1)

3.3.2 Select an organism above that, in your opinion, is better adapted for survival in a marine environment and substantiate your answer. (4)

3.3.3 Draw and label the internal structure of organism **B.** (6)
(12)
[35]

TOTAL SECTION B: 75

SECTION C

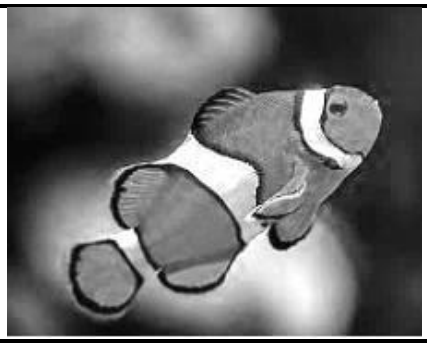
Answer any ONE question in this section.

Clearly indicate the QUESTION NUMBER of the chosen question.

NOTE: Your answer must be in the form of an essay. NO marks will be awarded for answers in the form of a table, flow charts or diagrams.

QUESTION 4

Starfish and clownfish are both referred to as fish, which indicates their relatedness and that their life functions have substantial similarities.

CLOWNFISH	STARFISH
	
[Source: https://www.aquariumofpacific.org/]	[Source: https://www.shutterstock.com/i]

In an essay, critique the statement above by including the following aspects:

- State your opinion with a motivation whether the above statement is valid.
- Discuss, in detail, symmetry and external structures of both organisms.
- Argue if and why it is necessary to classify organisms into different groups. **[35]**

QUESTION 5

A rocky shore is a dynamic zone. It is ever changing and the organisms living in this area have to be adapted to these environmental changes.

During a large storm, above average amounts of rain water flowed into a rocky shore area. After the storm, a friend that loves rocky shore exploration noticed a sudden decrease in the number of Echinoderms in this area but the amount of Osteichthyes seemed to remain the same.

Assist your friend in understanding the phenomenon above by including the following aspects:

- Compare the circulatory mechanism in marine Osteichthyes and Echinoderms.
- Discuss osmoregulation and excretion in both organisms.
- Critique why the Echinoderms numbers were reduced and the fishes were not. **[35]**

TOTAL SECTION C: 35
GRAND TOTAL: 150