

RADLEY

2025 Scholarship Examination Paper

BIOLOGY

26 February – 27 February 2025

Time allowed – 30 min

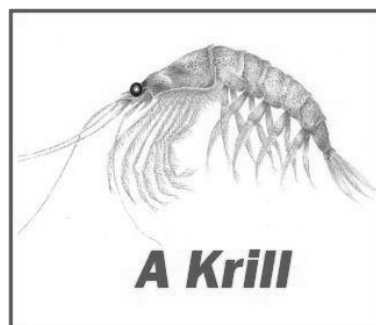
Read the passage on the next page and answer the
question that follow

[33 marks]

Life in the Ocean around Antarctica

The Southern Ocean has high levels of two key **nutrients**, phosphates and nitrates, often several times higher than in the other oceans. This and the continuous 24 hour daylight of the summer months provide the perfect conditions for **phytoplankton** blooms to flourish. In places, huge areas of the ocean turn green as the phytoplankton rush to **photosynthesise** before winter steals away the sun. But the **turbulence** that brings up the minerals also ensures that these green patches are widely separated and very unpredictable.

The next step up the food chain ladder is occupied by the animal plankton, or **zooplankton**. They come in an enormous variety of shapes and sizes but by far the most important are the shrimp-like **crustaceans** called krill. Just 5 centimetres long, krill can occur in swarms so dense and large that they turn the surface of the ocean red for kilometres. Like birds in a flock, the several thousands of individuals per square metre in a krill swarm show amazing **co-ordination**, swimming parallel to each other and altering course together. The total number of krill in the Southern Ocean is estimated to be a staggering 600 million million, making krill easily the most numerous creature on Earth. Based on this estimate, their total weight is 650 million tonnes, far greater than that of the world's human population.



The krill is the cornerstone of the Antarctic's ecology. Whales, seals, penguins and many other seabirds depend on it for their basic food. In the first half of this century it is thought that whales alone were taking 150 million tonnes of krill a year. In comparison, our annual world fish catch weighs 70 million tonnes. Since then, people have vastly reduced whale **populations**, which has left far more krill for other creatures. The massive increase in fur seal numbers and the steady climb in penguin populations in the last 20 years reflects the bounty now available. For the Wildlife of Antarctica, it is good news that our taste does not run to krill.

As winter approaches the krill disperse, most of them grazing beneath the increasing **pack ice**, and all the baleen whales except the minke head north. The six months they have spent feeding in Antarctic waters have built up their blubber and **fat reserves** for breeding. They will now draw on these in the winter months. Not surprisingly, when the summer comes and the whales return to the Antarctic, their blubber is thin and their condition poor.

From *Life in the Freezer* by Alastair Fothergill

Using information in the passage and your own knowledge, answer the following questions.

1. What is meant in the passage by the words indicated in bold as follows:
 - i. nutrients
 - ii. phytoplankton
 - iii. photosynthesise
 - iv. turbulence
 - v. zooplankton
 - vi. crustaceans
 - vii. co-ordination
 - viii. populations
 - ix. pack ice
 - x. fat reserves[10]
2. Name and describe two characteristics of krill which mean they are classified as crustaceans. [4]
3. Backboned animals are called vertebrates and there are five main groups of vertebrates. Which three of these groups are represented by animals in the passage above? [3]
4. Phytoplankton photosynthesise. Why, apart from nutrient availability, is the Southern Ocean such a good place for them to do this? [2]
5. Write out two food chains, starting with phytoplankton in each case. [3]
6. The krill is the cornerstone of the Antarctic's ecology. Explain the effect on other animals of:
 - i. Humans reducing whale populations by hunting. [1]
 - ii. Humans deciding to eat krill in the future. [1]
7. Many whales move north in the winter.
 - i. What word do we use for seasonal animal movements like this? [1]
 - ii. Name two British animal species that move in this way. [2]
8. Krill live underneath the pack ice in Winter. Explain:
 - i. Why whales can't hunt them there? [1]
 - ii. What effect global warming would have on the krill? [2]
 - iii. What can humans do to help reduce global warming? [3]

[33]