

Paper Reference(s) 4BI1/2B
Pearson Edexcel International GCSE (9–1)

Biology
UNIT: 4BI1
PAPER: 2B

Friday 9 June 2023 – Afternoon

Text Booklet

**DO NOT RETURN THIS TEXT BOOKLET WITH THE
QUESTION PAPER.**

Question 1

The black and white photograph shows a sandy coastline with exposed rock along the shoreline. Waves are lapping the shore against a starry night sky.



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When the Oceans Glow

5 In some areas of the world the oceans around the coast sometimes glow with a blue light. The photograph shows an area of coast that is glowing. This blue light is produced by the presence of thousands of microscopic, living organisms called dinoflagellates. These dinoflagellates are protoctists. The production of light by living organisms is called bioluminescence, a process that has evolved many times in different species of organism.

15 To generate light, dinoflagellates use special proteins and the ATP produced within their cells. Many species of dinoflagellate contain chlorophyll and are able to photosynthesize. The appearance of glowing dinoflagellates in the sea used to be a rare event but this now occurs much more frequently. Many of the events occur in the sea around river estuaries and scientists think that intensive farming and deforestation could be to blame.

20 Due to overpopulation of dinoflagellates in these areas, other species of animal are often harmed. After a series of glowing events, large numbers of dinoflagellates die causing oxygen levels in the water to decrease.

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**25 People have often wondered why dinoflagellates
glow. They only glow in areas where the water
moves around, such as when waves hit a beach.
Scientists now think that the production of light
is a type of warning to stop predators eating the
30 dinoflagellates. If an animal eats dinoflagellates,
the dinoflagellates in the area glow making the
animal obvious to its own predators. To test
this, scientists placed dinoflagellates into a tank
along with 15 copepods, which are predators of
35 dinoflagellates. When the dinoflagellates glowed,
the copepods ate 1200 dinoflagellates in two hours.
When the dinoflagellates did not glow, the
copepods ate 2100 dinoflagellates in two hours.**

**40 Some scientists think that we could make use of
the dinoflagellates to provide sustainable street
lighting. Tanks of dinoflagellates could be placed
on top of lamp posts. The dinoflagellates would
photosynthesise during the day when it is light.
A stirrer powered by a small battery would then
45 move them at night so that they would glow.
These sustainable lamps could be carbon neutral
and help to reduce pollution.**

Question 1
(Source: © AMIRREZA KAMKAR/SCIENCE
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