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Level 3 Biology 2021

91603 Demonstrate understanding of the responses of plants and animals to their external environment

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the responses of plants and animals to their external environment.	Demonstrate in-depth understanding of the responses of plants and animals to their external environment.	Demonstrate comprehensive understanding of the responses of plants and animals to their external environment.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (). This area may be cut off when the booklet is marked.

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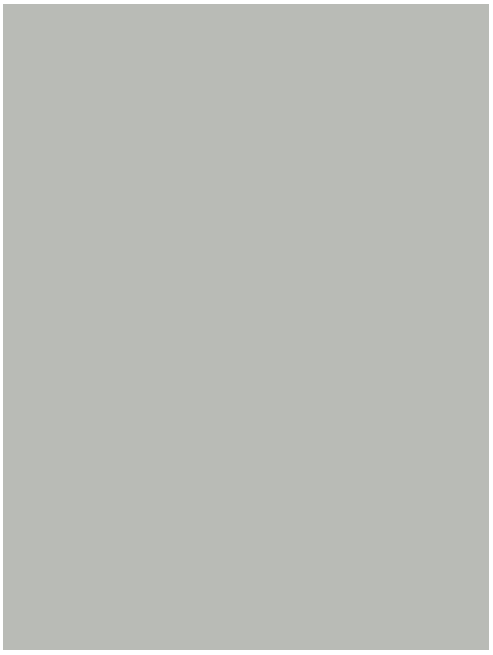
QUESTION ONE: NIGHT FLOWERS

Evening primrose, *Oenothera biennis*, is a plant that lives for two years. It has many small yellow **flowers that open at night** or, at times, also from late afternoon through to mid-morning. They have a **strong scent** and are useful in gardens, not only for their night colour and scent, but also because the presence of these plants in the soil **prevents weeds** growing near them.

Evaluate the adaptive behaviours of the evening primrose.

In your answer:

- name and define both of:
  - the likely response shown by the evening primrose opening its flowers at night, and
  - the relationship between the plant and the weeds
- explain the specific mechanism for how the nightly opening of the flowers occurs
- discuss how the behaviours in **bold** above may ensure both successful growth and reproduction when living in an area with many flower species.



Source: https://sweetfernandfireflies.blogspot.com/2017/08/evening-primrose-and-bumblebees-part-one.html

There is more space for your answer to this question on the following page.

QUESTION TWO: SKUA BEHAVIOUR

The hākoakoa or New Zealand subantarctic skua (*Catharacta antarctica lonnbergi*) is a dark-brown seabird resembling a large gull.

A skua display.

Source: www.nzbirdsonline.org.nz/species/subantarctic-skua

A skua showing aggressive behaviour to a penguin.

Source: https://news.cgtn.com/news/2019-12-02/Ice-and-fury-penguins-vs-skuas-M5EhWORo5O/index.html

A skua and a gull in flight.

Source: www.luontoportti.com/suomi/fi/linnut/merilokki

Usually quiet in flight and at sea, skuas have a loud territorial display, which includes the raising of wings and a descending long call. Skuas are opportunistic feeders that obtain food through scavenging, stealing from other birds while in the air, and predation. The maintenance of feeding territories by skuas shows that they feed on penguin eggs and chicks. Skua pairs that hold feeding territories in a penguin rookery defend these areas against intruders if they fly less than 3 m above them. Territory size changes year to year. The energy investment of male skuas in hunting and territorial defence is a lot greater than for the female.

Discuss how innate territorial behaviours have led to the success of skuas.

In your answer:

- define 'territory'
- explain how territorial behaviour leads to the success of the skua chicks
- discuss what factors bring a change in territory size from year to year, and how this enables more success for the skua species.

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QUESTION THREE: SAMOAN WATERS

The palolo worm is a marine worm (*Eunice viridis*) that lives in shallow coral reefs throughout the south central Pacific. They live in burrows dug into the coral on the outer reef flat. They have two distinct sections (see drawing). The front section is the worm body, with eyes, mouth, etc., followed by a string of segments called the 'epitoke' that contain reproductive gametes coloured blue-green (females) or tan (males). Each epitoke segment has a tiny eyespot that can sense light. Spawning takes place for two or three nights, beginning seven days after the full moon in October or November each year. Late in the evening, the palolo worms back out of their burrows and release the epitoke sections from their body, which then floats to the surface. Around daybreak, the segments dissolve and release the eggs and sperm that they contain. In Samoa, the floating epitoke segments are regarded as a delicacy (palolo), and are gathered at night using lanterns.

www.abc.net.au/news/2020-10-11/palolo-season-in-samoa-where-locals-hunt-for-an-ocean-delicacy/12740588

www.nps.gov/npsa/learn/nature/upload/2nded05c.pdf

Discuss biological rhythms and strategies that lead to success in the palolo worm.

In your answer:

- name and define two of the biological rhythms described above for the palolo worm
- explain a reason why locals would choose to gather palolo at night with lanterns
- explain a reproductive strategy used by the palolo worms, and also explain a disadvantage of that reproductive strategy
- discuss how the synchronised rhythms together lead to the success of the species.

There is more space for your answer to this question on the following page.

Extra space if required.
Write the question number(s) if applicable.

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