

AS 91603

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

**Plant Responses**

(2017, 1)



Manuka seeds



Manuka seeds germinating



Manuka seedlings

When the mānuka (*Leptospermum scoparium*) seed germinates below the soil surface, two different plant responses occur at the radical and plumule.

Mature mānuka trees release leptospermone, a chemical that acts as a natural herbicide.

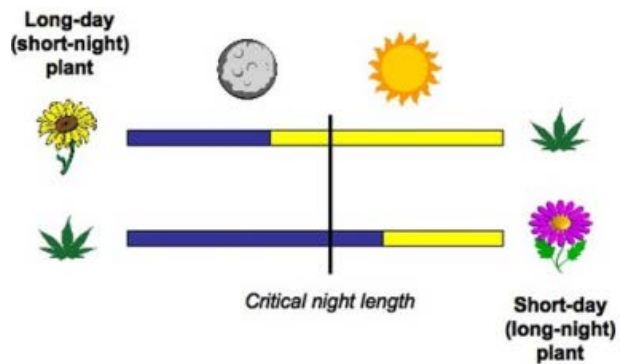
Discuss how the different responses that the mānuka plant displays in germination and early growth are beneficial to the survival of the plant.

In your answer:

- identify and describe the two different responses shown by the mānuka seedling as it germinates below the soil
- explain the type of interaction between the mature mānuka and other plants growing nearby, due to the release of leptospermone into the soil
- explain how these responses occur below the soil as the mānuka germinates
- discuss the adaptive advantage of these two responses below the soil, and compare them with the response once the plumule is exposed to light.

You may use annotated diagrams as a part of your answer.

(2017, 3)



Mānuka (*Leptospermum scoparium*) are long-day plants which flower in spring and into summer.

Flowering in the mānuka plant is controlled by the phytochrome system.

The flowers are used by beekeepers to produce mānuka honey. Honeybees (*Apis mellifera*) seek their food within a circumference of 3 to 4 km around their hive.

The bees navigate from the hive to the flowers using different cues during the day.

Relate the role of the phytochrome system to the survival of the mānuka plant population.

In your answer:

- identify and describe the relationship between the mānuka tree and the bees
- describe the process of photoperiodism AND explain how the phytochrome system could work in the mānuka tree
- discuss how photoperiodism in the mānuka tree provides an adaptive advantage to BOTH species.

You may use annotated diagrams to support your answer.

The following questions are from the now expired AS90716 but are still relevant.

(2011:2)

The sensitive plant *Mimosa pudica* has leaves composed of small leaflets. When a leaf is exposed to a sudden short shock, it rapidly collapses and its leaflets fold together. The response takes only a few seconds, and is quite different to the plant's growth response to a constant directional light source.



*Mimosa pudica* before (left) and after (right) being touched.

Discuss the response of *Mimosa pudica* to the sudden shock stimulus, and compare it to the plant's growth response under a constant directional light source.

In your answer:

- identify and describe **both** the rapid leaf response and the slower growth response
- explain how **both** the rapid leaf response and the slower growth response happen
- compare and contrast both responses in terms of their significance to the plant's survival.

(2008:2 c)

- (c) *Mimosa* (*Mimosa pudica*) is also called the 'sensitive plant' because its leaves fold inwards when touched. This is an example of a nastic movement.



Discuss the possible significance of this nastic movement in mimosa.

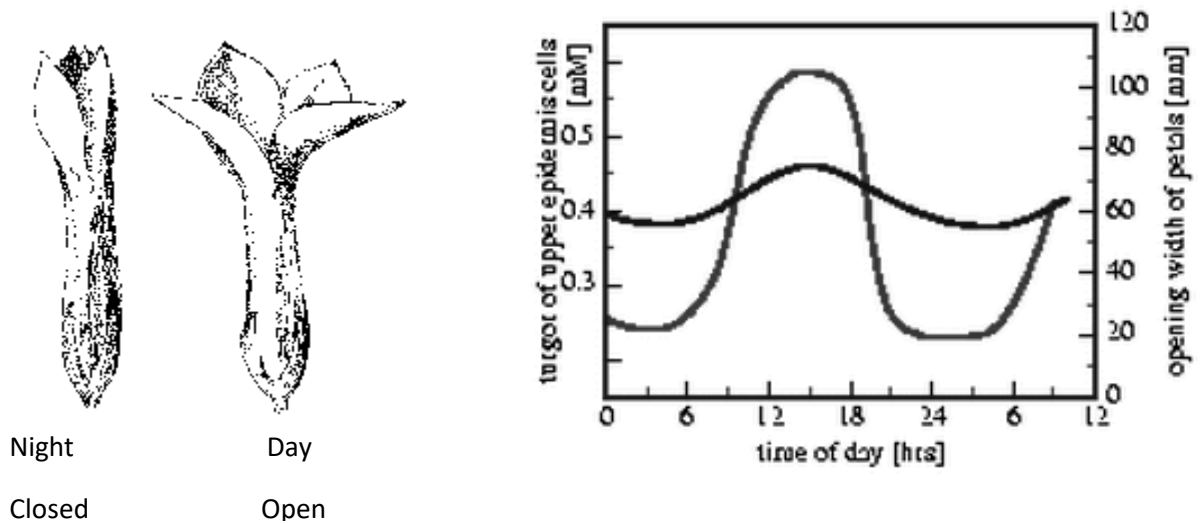
(2007: 2 c,d)

(c) Petal movement in *Kalanchoe* is a nastic response.

Explain the **difference** between a nastic response and a tropism, using responses in *Kalanchoe* as an example.



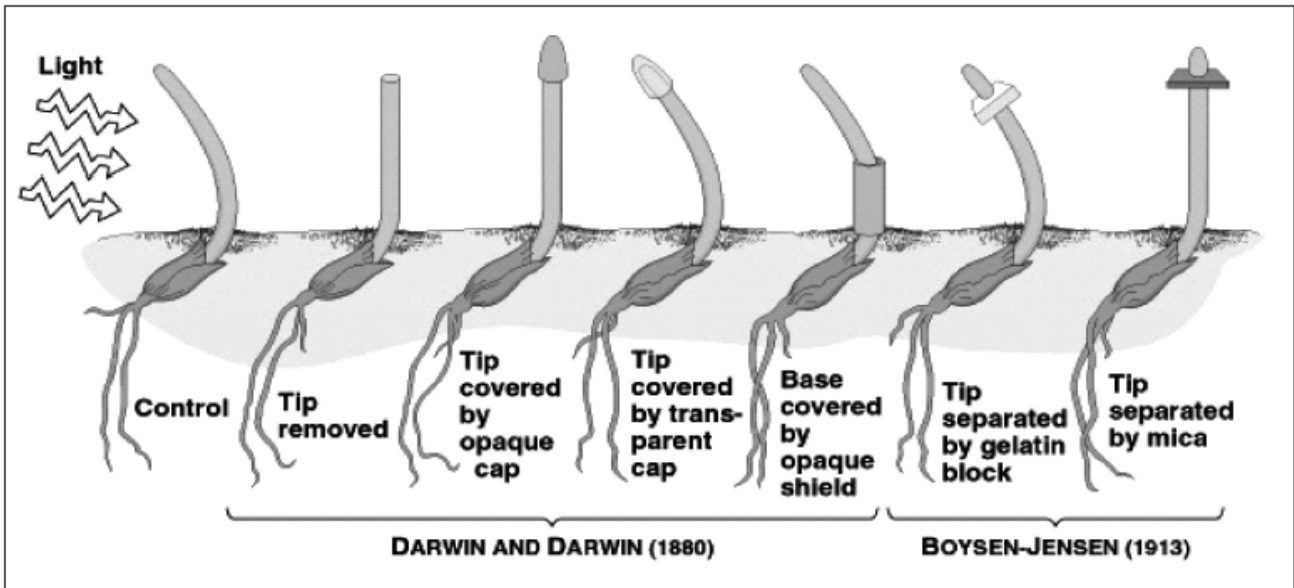
*Kalanchoe* has small flowers with petals that open and close in response to changes in turgor pressure within the petals (below).



(d) Discuss how this regular movement of the petals is produced by changes in turgor pressure, **and** how this movement enhances the plant's reproductive success.

(2006:1)

The diagram shows the response of recently germinated wheat shoots (coleoptiles) to a directional light source. The coleoptiles have been treated in several different ways.



*Growth of wheat coleoptiles in response to a directional light source.*

- (a) Name the **response** shown by the bent coleoptiles AND identify the **hormone** that regulates plants' growth responses to light.

Response:

Hormone:

- (b) Give a reason, based on evidence from the diagram, for concluding that this hormone is produced by cells at the tip of the coleoptile.
- (c) Explain how this hormone causes the control coleoptiles to bend toward the light. Your answer **must** include a diagram showing a few cells in a cross section of the bent part of the shoot.
- (d) Explain how this response to light would be useful to plants.

Plants exhibit a number of other growth responses to environmental stimuli. One of these, **thigmotropism**, occurs in response to touch and is common in climbing plants, eg beans, young rata seedlings.

- (e) Discuss the advantages of **thigmotropism** to a climbing plant.