

Exercise walk-through

18.2

Adaptive features

IGCSE Biology

Plants adapted to too much water, and to too little

hydrophytes

water plants – **air spaces** to help them float, and stomata on the **upper** leaf surface, where the air is

xerophytes

desert plants – a **thick waxy cuticle**, few small stomata, and the ability to **store water**

the xerophyte logic

every feature reduces **transpiration**, because water is the scarce **resource**

the hydrophyte logic

water is abundant, so the problems are **floating and gas exchange** instead

further xerophyte features

sunken stomata, rolled leaves, hairs – all trapping humid air next to the stomata

State the feature, then **what it does about water**. “Thick waxy cuticle” alone is a description; “so less water evaporates from the leaf” is the mark.

Selective breeding, step by step

1. select

choose the individuals with the **desired characteristic**

2. cross

breed them together to produce the next generation

3. select again

choose the offspring showing the characteristic most strongly

4. repeat

over **many generations**, until the characteristic is reliable

used for crops

a higher yield, disease **resistance** , or better taste

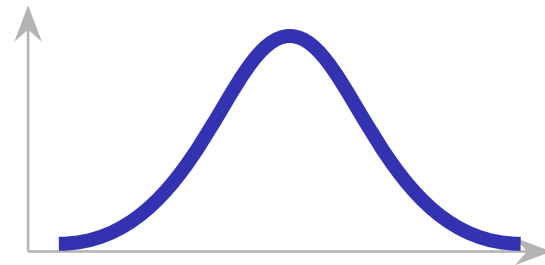
and for animals

cows that give more milk, sheep with more wool

The difference from natural selection is **who does the selecting**: a farmer choosing, against the environment choosing. The mechanism is otherwise identical.

Check yourself

- 1 Which variation gives a smooth range?
- 2 What is the original source of all variation?
- 3 Who survives in natural selection?
- 4 Who chooses the parents in selective breeding?



Answers 1. continuous variation 2. mutation 3. the best-adapted 4. humans

Exercises 2.1·2.2

2.1 Define an adaptive feature.

[1]

2.2 State one adaptive feature of a desert plant.

[1]

Exercises 2.1·2.2

2.1 Define an adaptive feature.

[1]

2.1

- an adaptive feature is an **inherited feature that helps an organism survive and reproduce** in its environment

2.2 State one adaptive feature of a desert plant.

[1]

2.2

- any **one** of: thick waxy cuticle / few or small stomata / water storage

Exercises 3.1·3.2

3.1 A thick waxy cuticle helps a desert plant by:

[1]

☐

A increasing water loss

B reducing water loss

C trapping more light

D attracting insects

3.2 Xerophytes live where water is scarce.

(a) Describe two adaptive features that reduce water loss, and how each helps.

[4]

Exercises 3.1-3.2

3.1 A thick waxy cuticle helps a desert plant by:

[1]

☐

- A increasing water loss
- B reducing water loss
- C trapping more light
- D attracting insects

3.1 B

- a thick waxy cuticle **reduces water loss**
- A is the opposite; C and D are other leaf jobs

3.2 Xerophytes live where water is scarce.

(a) Describe two adaptive features that reduce water loss, and how each helps.

[4]

3.2

(a)

- a **thick waxy cuticle** reduces evaporation from the leaf surface
- **few/small stomata** reduce water lost by transpiration

Exercise 3.3 (a)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(a) State what is meant by an *adaptive feature*.

[2]

Exercise 3.3 (a)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(a) State what is meant by an *adaptive feature*. [2]

(a)

- an inherited characteristic that makes the organism **better suited** to its environment
- so it is more likely to **survive and reproduce** there

Exercise 3.3 (b)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(b) Describe **three** adaptive features of a xerophyte such as marram grass, and explain how each reduces water loss. [6]

Exercise 3.3 (b)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(b) Describe **three** adaptive features of a xerophyte such as marram grass, and explain how each reduces water loss. [6]

(b)

- **thick waxy cuticle:** water cannot evaporate through wax
- **rolled leaves** with stomata inside: trap humid air, so less vapour diffuses out
- **hairs / sunken stomata:** trap still humid air and shelter pores from wind

Exercise 3.3 (c)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(c) Describe **two** adaptive features of a hydrophyte such as water lily, and explain each. [4]

Exercise 3.3 (c)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(c) Describe **two** adaptive features of a hydrophyte such as water lily, and explain each.[4]

(c)

- **large air spaces:** hold the leaf at the surface and store oxygen for roots
- **stomata on the upper surface only:** the lower surface is in water

Exercise 3.3 (d)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(d) Explain why a xerophyte would not survive if planted in a pond.

[2]

Exercise 3.3 (d)

3.3 Marram grass grows on dry sand dunes. Water lily grows with its roots in mud and its leaves floating on the surface.

(d) Explain why a xerophyte would not survive if planted in a pond. [2]

(d)

- its features save water, which is **not scarce** in a pond
- its roots are not adapted to airless mud, so they would **not get enough oxygen**