# 18. Variation and selection

## 18.2 Adaptive features

## Paper 3 and 4

Question Paper

# Paper 3

**Questions are applicable for both core and extended candidates**

**1 (b) (i)** Complete the definition of the term adaptive feature by inserting the missing words.

An adaptive feature is an ..... feature that helps an organism to

..... and ..... in its environment.

[3]

**(ii)** The part labelled **A** in Fig. 1.1 is an adaptive feature of the pseudoscorpion.

Suggest a function of the part labelled **A** in Fig. 1.1.

.....

.....

..... [1]

**2 (d)** State the term that is defined as an inherited feature that helps an organism to survive and reproduce in its environment.

..... [1]

3 **(a)** Complete the definition of the term *adaptive feature* by filling in the gaps with the correct words.

An adaptive feature is an ..... feature that helps an organism to

..... and reproduce in its ..... . [3]

**(b)** The flagellum is one of the adaptive features of a sperm.

A sample of sperm was taken and the length of each flagellum was recorded.

Fig. 2.1 shows a graph of the results.

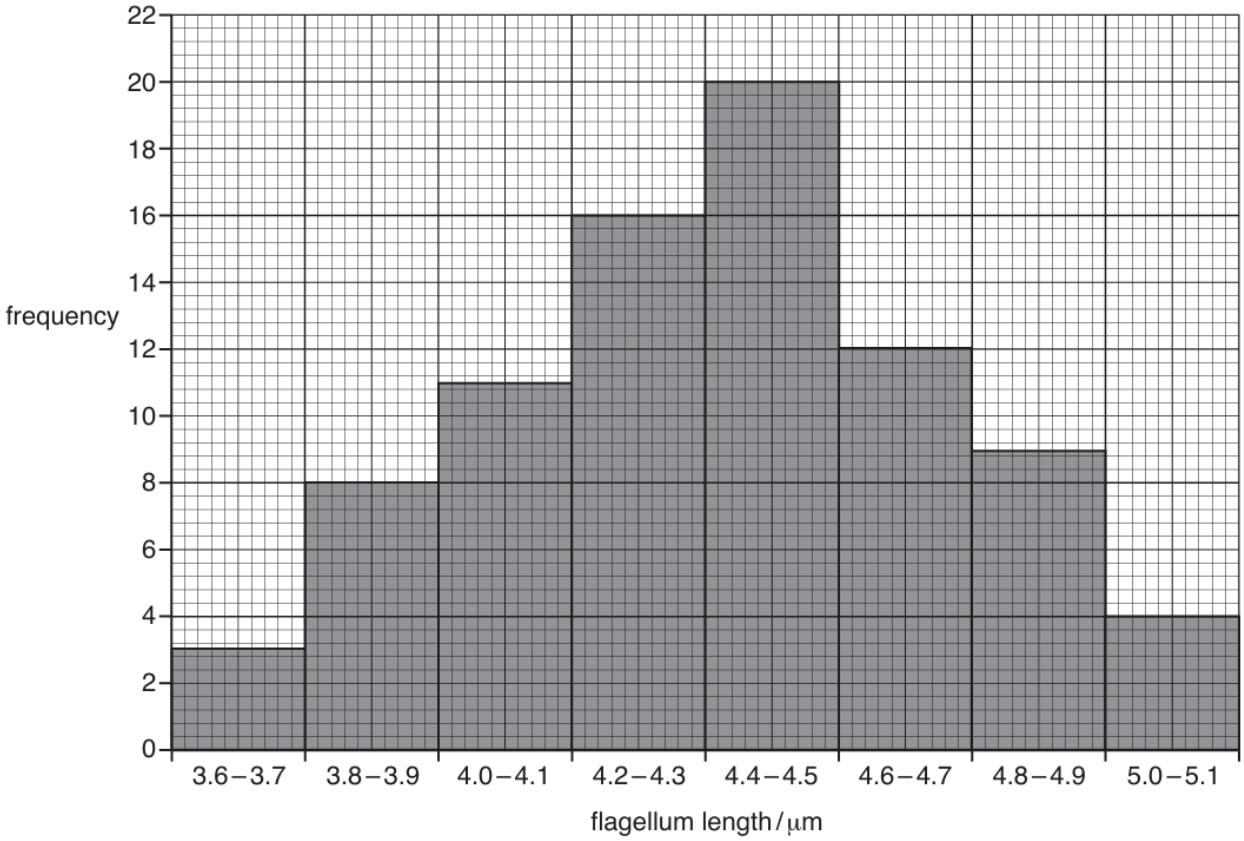


**Fig. 2.1**

**(i)** State the most frequent range for flagellum length.

..... μm [1]

**(ii)** State the frequency of sperm with flagellum length between 4.8 μm to 4.9 μm.

..... [1]

**(iii)** State the type of variation shown by flagellum length.

..... [1]

# Paper 4

**Questions are applicable for both core and extended candidates unless indicated in the question**

4 **(c)** State the type of environmental conditions that hydrophytes are adapted to live in. **(extended only)**

..... [1]

5 Fig. 2.1 is a photograph of some leaves of a water lily, which is a hydrophyte. The water lily has adaptive features that are found in many different hydrophytes.

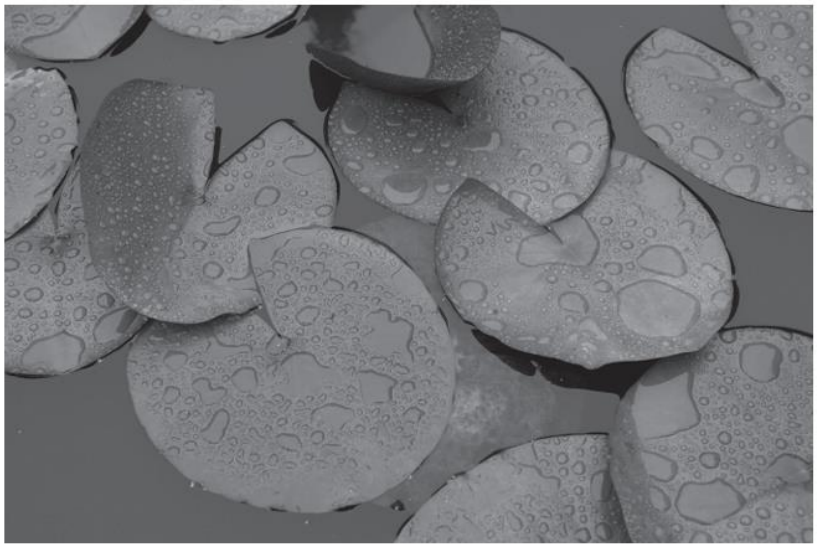

**Fig. 2.1**

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

.....

.....

.....

.....

..... [2]

**(b)** Fig. 2.2 is a photomicrograph of a cross-section of a part of a water lily leaf.

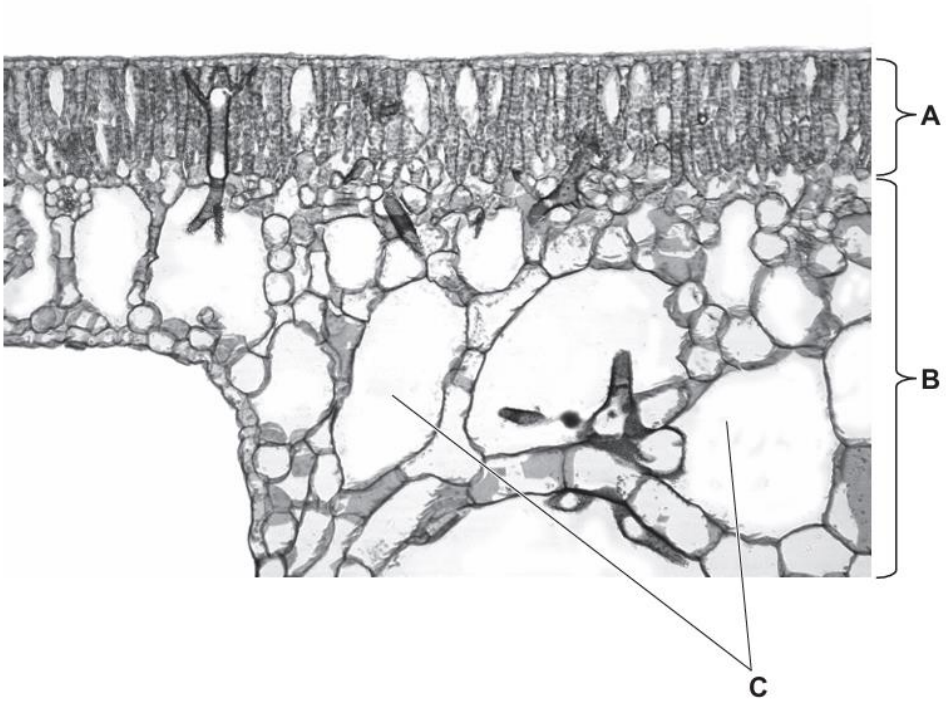


**Fig. 2.2**

**(i)** State the names of the parts labelled **A**, **B** and **C** in Fig. 2.2.

**A** .....

**B** .....

**C** .....

[3]

**(ii)** Explain how part **C** in Fig. 2.2 adapts the hydrophyte for its environment. **(extended only)**

.....

.....

.....

.....

.....

.....

..... [3]

**(c)** A scientist calculated the mean number of stomata per $mm^2$ in the upper and lower epidermis in tomato plants and water lily plants. Tomato plants are a type of terrestrial plant.

Table 2.1 shows the results.

**Table 2.1**

| | mean number of stomata per $mm^2$ | |
|---|---|---|
| plant | in upper epidermis | in lower epidermis |
| tomato | 10 | 129 |
| water lily | 475 | 0 |

**(i)** Compare **and** explain the differences in the mean number of stomata in a tomato plant and in a water lily plant. **(extended only)**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

**(ii)** State the name of the cells that control the opening and closing of stomata.

..... [1]

6 Cheetahs, *Acinonyx jubatus*, are carnivores found in the dry grasslands and woodlands of southern Africa. Cheetahs hunt for food during the day. They eat deer and antelope.

The cheetah is the fastest mammal on land but can only run at high speed (sprint) over a short distance. Its hunting strategy is to creep up on prey and then sprint to catch them.

Fig. 3.1 is a photograph of a cheetah in its natural habitat.

**Fig. 3.1**

**(a)** Suggest how these adaptive features enable cheetahs to survive in their natural environment.

fur colouring .....

.....

.....

streamlined body shape .....

.....

.....

[2]

7 **(a)** Adaptive features are defined as the inherited features of an organism that increase its fitness.

State what is meant by *fitness* in this context.

.....

.....

.....[1]

**(b)** Rodents are the most common mammals in many hot deserts.

Fig. 2.1 shows the lesser Egyptian jerboa, *Jaculus jaculus*, which lives in North Africa and the Middle East in areas that have high daytime temperatures and very little rainfall.

**Fig. 2.1**

Like many desert-living mammals, jerboas are active at night.

Suggest **two** features of *J. jaculus* that adapt it to each of the following challenges of living in desert ecosystems:

**(i)** very high daytime temperatures

1 .....

2 .....
[2]

**(ii)** very little or no light at night

1 .....

2 .....
[2]

8 Mangrove trees are hydrophytes because they grow in water.

Fig. 2.1 shows a young mangrove tree.

**Fig. 2.1**

**(a)** An adaptive feature is a feature that increases the fitness of an organism.

**(i)** Define the term *fitness*.

.....

.....

..... [1]

**(ii)** Mangrove trees have many aerial roots and floating seeds.

Suggest how these adaptive features allow mangrove trees to survive in water. **(extended only)**

many aerial roots .....

.....

.....

floating seeds .....

.....

.....

[2]