

1. Characteristics and classification of living organisms

1.2 Concept and uses of classification systems

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

- 1 (a) Describe the meaning of the term species.

.....
.....
..... [2]

- (b) Fig. 1.1 is a photograph of *Lithobius forficatus*, a species of myriapod.



Fig. 1.1

- (i) State the genus of the organism shown in Fig. 1.1.

..... [1]

- 2 (a) (i) Keys can be used to identify a species.

State the name of the type of key that uses paired choices of features.

..... [1]

- (ii) Fig. 1.1 shows drawings of six different birds and their names.

Ammodramus bairdii



Buceros rhinoceros



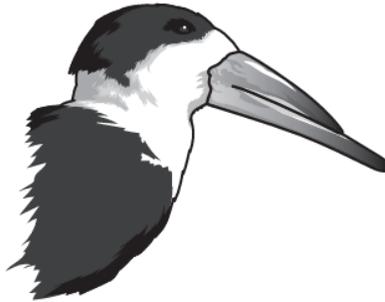
Pandion haliaetus



Haliaeetus leucocephalus



Rynchops niger



Recurvirostra avosetta



not to scale

Fig. 1.1

Use the key to identify the birds in Fig. 1.1.

Complete Table 1.1 by writing the letters of the birds **A** to **F** in the correct box.

| | | key | letter of the bird |
|---|-----|--|--------------------|
| 1 | (a) | beak is longer than the head | go to 2 |
| | (b) | beak is shorter than the head | go to 3 |
| 2 | (a) | beak curves upwards | C |
| | (b) | beak does not curve upwards | go to 4 |
| 3 | (a) | top part of the beak is hooked over the bottom part of the beak | go to 5 |
| | (b) | top part of the beak is not hooked over the bottom part of the beak | E |
| 4 | (a) | top part of the beak is shorter than bottom part of the beak | A |
| | (b) | has a large projection above the beak | B |
| 5 | (a) | head has a stripe | F |
| | (b) | head does not have a stripe | D |

Table 1.1

| name of the bird in Fig. 1.1 | letter of the bird in the key |
|---------------------------------|-------------------------------|
| <i>Ammodramus bairdii</i> | |
| <i>Buceros rhinoceros</i> | |
| <i>Pandion haliaetus</i> | |
| <i>Haliaeetus leucocephalus</i> | |
| <i>Rynchops niger</i> | |
| <i>Recurvirostra avosetta</i> | |

[5]

(iii) State **two** features of birds, other than the beak, that can be used to classify them as birds.

1

2

[2]

(b) The population size of the avocet bird (*Recurvirostra avosetta*) was reduced to zero in one country. After more than 100 years, conservation has helped the number of avocet birds in this country to increase again.

(i) State the genus of the avocet bird.

..... [1]

(ii) In one area of this country, avocet bird numbers have increased from 25 birds to 2000 birds in 30 years.

Calculate the percentage increase in avocet bird numbers.

Space for working.

.....%
[2]

(iii) Explain why organisms such as the avocet bird become endangered or extinct.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

[Total: 15]

3 (a) Fig. 1.1 is a branching key that can be used to identify different types of crustaceans.

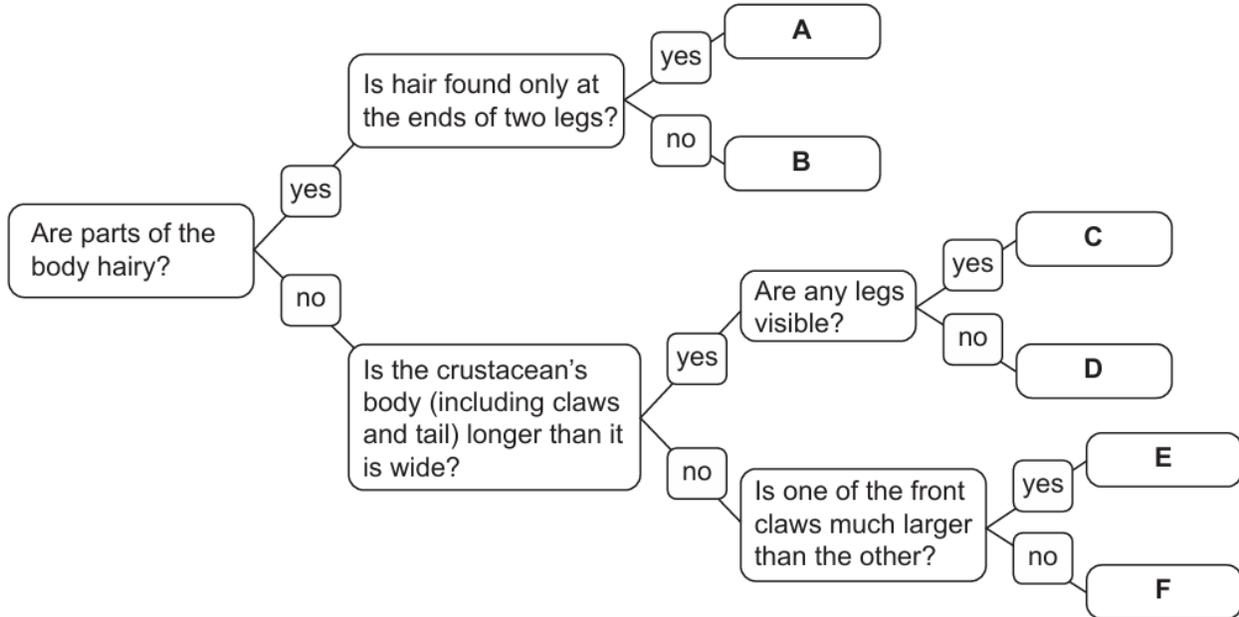
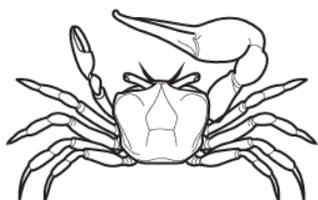


Fig. 1.1

Fig. 1.2 shows six crustaceans.

Use the key in Fig. 1.1 to identify the six different types of crustacean.

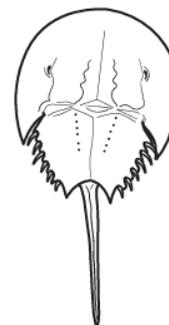
Write the letters on the lines in Fig. 1.2.



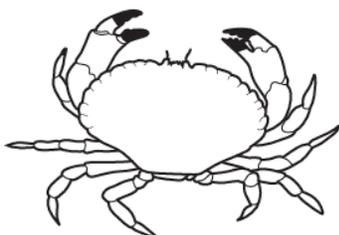
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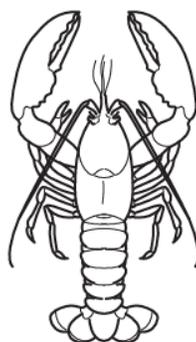
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.....



.....



.....



.....

Fig. 1.2

[5]

- 4 (d) Respiration is one of the characteristics of living things.

Tick (✓) **two** boxes to show two other characteristics of **all** living things.

| | |
|---------------------|--------------------------|
| breathing | <input type="checkbox"/> |
| excretion | <input type="checkbox"/> |
| growth | <input type="checkbox"/> |
| photosynthesis | <input type="checkbox"/> |
| sexual reproduction | <input type="checkbox"/> |

[2]

5 Fig. 1.1 is a dichotomous key. It can be used to identify different types of tree by using their leaves.

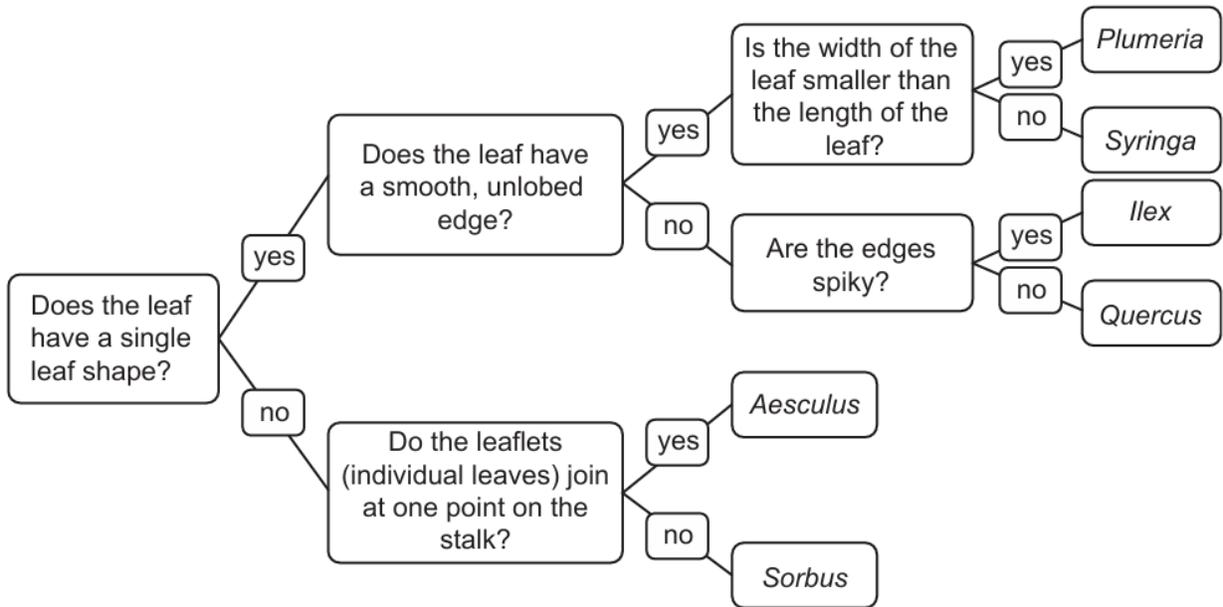


Fig. 1.1

Fig. 1.2 shows leaves from six different trees.

Use the key in Fig. 1.1 to identify the six different types of tree.

Write the name of each tree on the lines in Fig. 1.2.

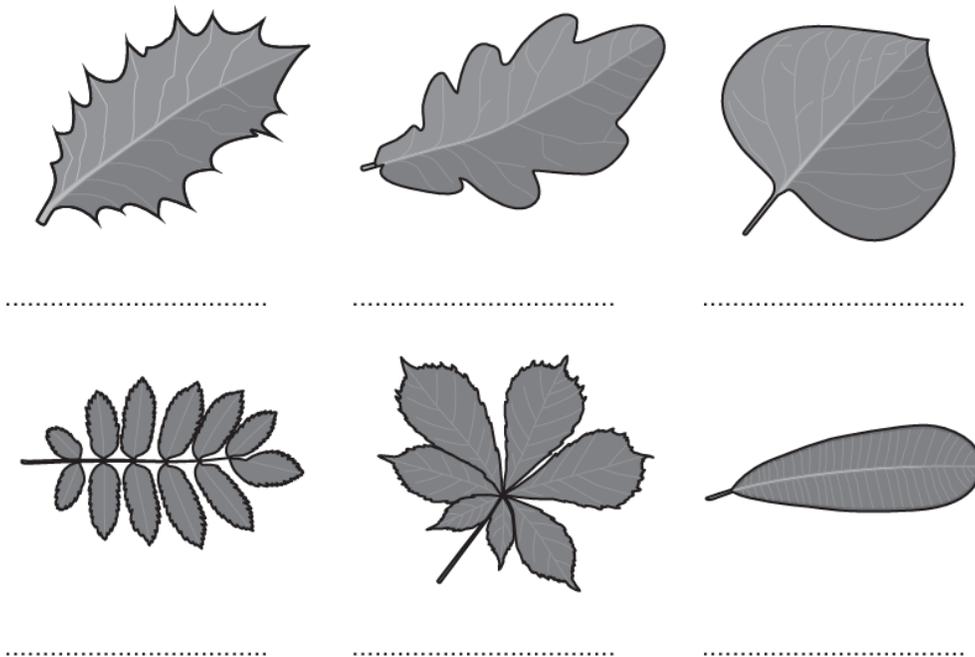


Fig. 1.2

Paper 4

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

6 (a) Fig. 1.1 is a photograph of a fish. Fig. 1.2 is a photograph of an amphibian.



Fig. 1.1



Fig. 1.2

State **two visible** features that distinguish the fish in Fig. 1.1 from the amphibian in Fig. 1.2.

1

2

[2]

(b) Fish, amphibians and mammals are all vertebrate groups.

State the name of **one other** vertebrate group.

..... [1]

- 7 (a) Organisms from the genus *Chlorella* are protocists.

State the additional information required to name *Chlorella* according to the binomial system.

..... [1]

- 8 (a) Fig. 4.1 shows a diagram of two flowers from different plants of the same species.

(i) Describe what is meant by the term species.

.....
.....
.....
.....
..... [2]

9 (b) Mammals can be classified according to the position and shape of their teeth.

Fig. 1.2 shows the skulls of seven mammals.

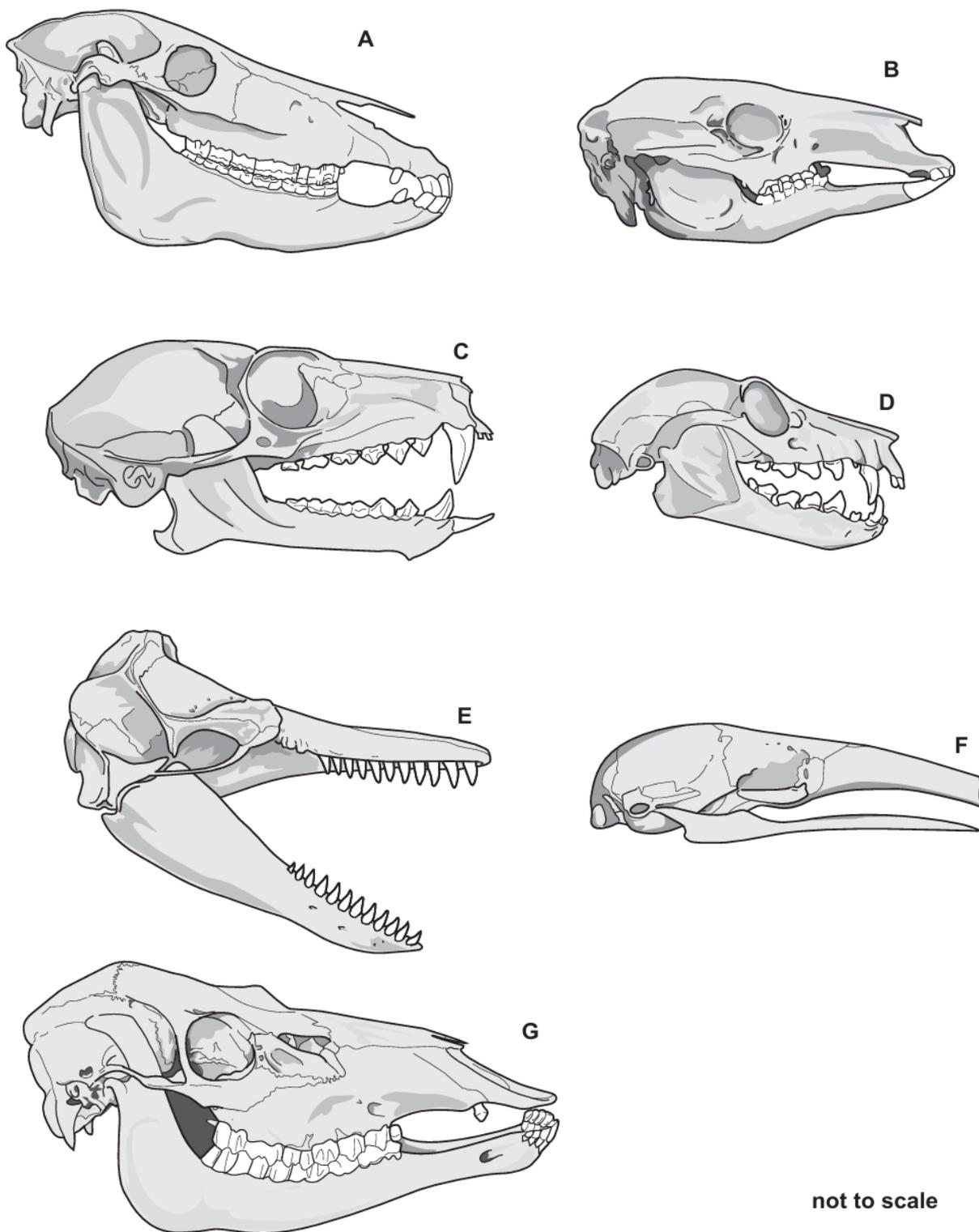


Fig. 1.2

(i) Use the key to identify each species shown in Fig. 1.2.

Write the letter of each species (**A** to **G**) in the correct box in the key.

Key

| | | | |
|-------|--|--------------------------------|--|
| 1 (a) | two or more different types of teeth | go to 2 | |
| | (b) fewer than two different types of teeth | go to 3 | |
| 2 (a) | have wide gap between front and back teeth in both jaws | go to 4 | |
| | (b) have no wide gap between front and back teeth in both jaws | go to 6 | |
| 3 (a) | all teeth of similar shape | <i>Orcinus orca</i> | |
| | (b) no teeth on either jaw | <i>Myrmecophaga tridactyla</i> | |
| 4 (a) | no incisors in upper jaw | <i>Cervus elephus</i> | |
| | (b) incisors in both upper and lower jaw | go to 5 | |
| 5 (a) | incisors on lower jaw longer than incisors on upper jaw | <i>Macropus rufus</i> | |
| | (b) incisors on upper and lower jaw are similar in size | <i>Equus ferus</i> | |
| 6 (a) | incisors on lower jaw project forwards | <i>Lemur catta</i> | |
| | (b) incisors on lower jaw do not project forwards | <i>Pteropus niger</i> | |

[4]

(ii) Killer whales, *Orcinus orca*, are mammals.

State **two internal** features you would expect to find in a killer whale that you would **not** find in a fish.

1

2

[2]

(iii) State the name of the group of animals that includes mammals and fish.

..... [1]

10 (c) The student made careful drawings of seven types of alga found in the samples of lake water.

The drawings are shown in Fig. 1.2.

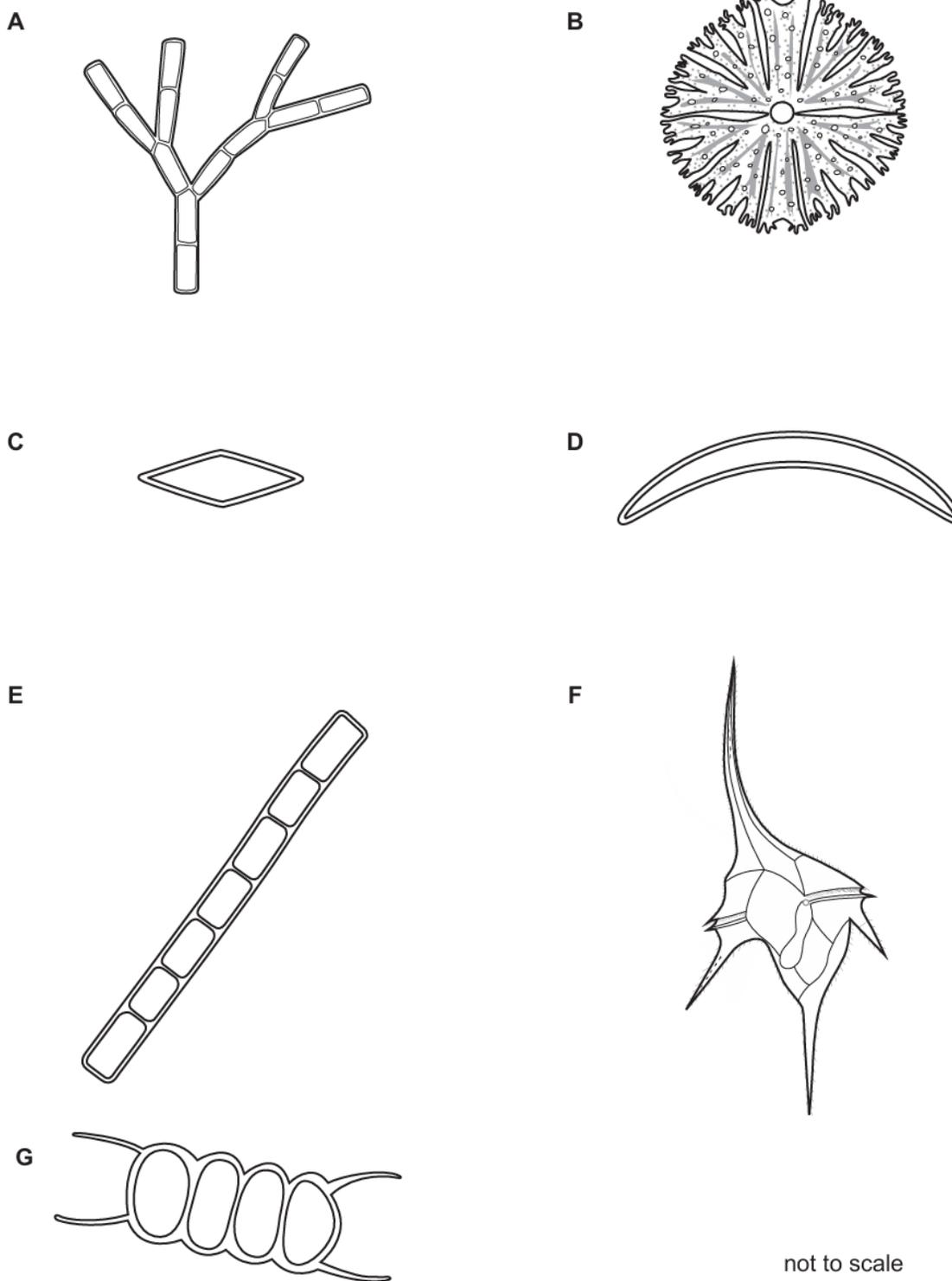


Fig. 1.2

Use the key to identify each of the species **A** to **G**. Write the letter of each species in the correct box beside the key.

| | | | |
|---|---|-------------------------------|--|
| 1 | alga has four spine-like extensions | go to 2 | |
| | alga does not have four spine-like extensions | go to 3 | |
| 2 | alga has spine-like extensions that are all the same length | <i>Scenedesmus communis</i> | |
| | alga has spine-like extensions that are different lengths | <i>Ceratium hirundinella</i> | |
| 3 | alga has a round shape | <i>Micrasterias radiosa</i> | |
| | alga does not have a round shape | go to 4 | |
| 4 | alga narrows towards the ends | go to 5 | |
| | alga does not narrow towards the ends | go to 6 | |
| 5 | algal cell is semi-circular in shape | <i>Closterium diana</i> | |
| | algal cell is not semi-circular in shape | <i>Navicula radiosa</i> | |
| 6 | alga is branched | <i>Chaetophora incrassata</i> | |
| | alga is not branched | <i>Zygnema</i> sp. | |

[5]

- 11 The Mulanje cedar, *Widdringtonia whytei*, is the national tree of Malawi. This species of tree grows naturally only on Mount Mulanje in Malawi. Many of the trees have been overharvested or destroyed by wildfires, resulting in deforestation, as shown in Fig. 5.1.



Fig. 5.1

- (a) State the genus name of the Mulanje cedar tree.

..... [1]

12 Johnson grass, *Sorghum halepense*, is wind-pollinated.

(a) Fig. 4.1 shows some Johnson grass flowers.



Fig. 4.1

(i) State the genus of Johnson grass.

..... [1]

13 (b) Fig. 5.1 shows five species of ciliate that are found in sewage treatment works.

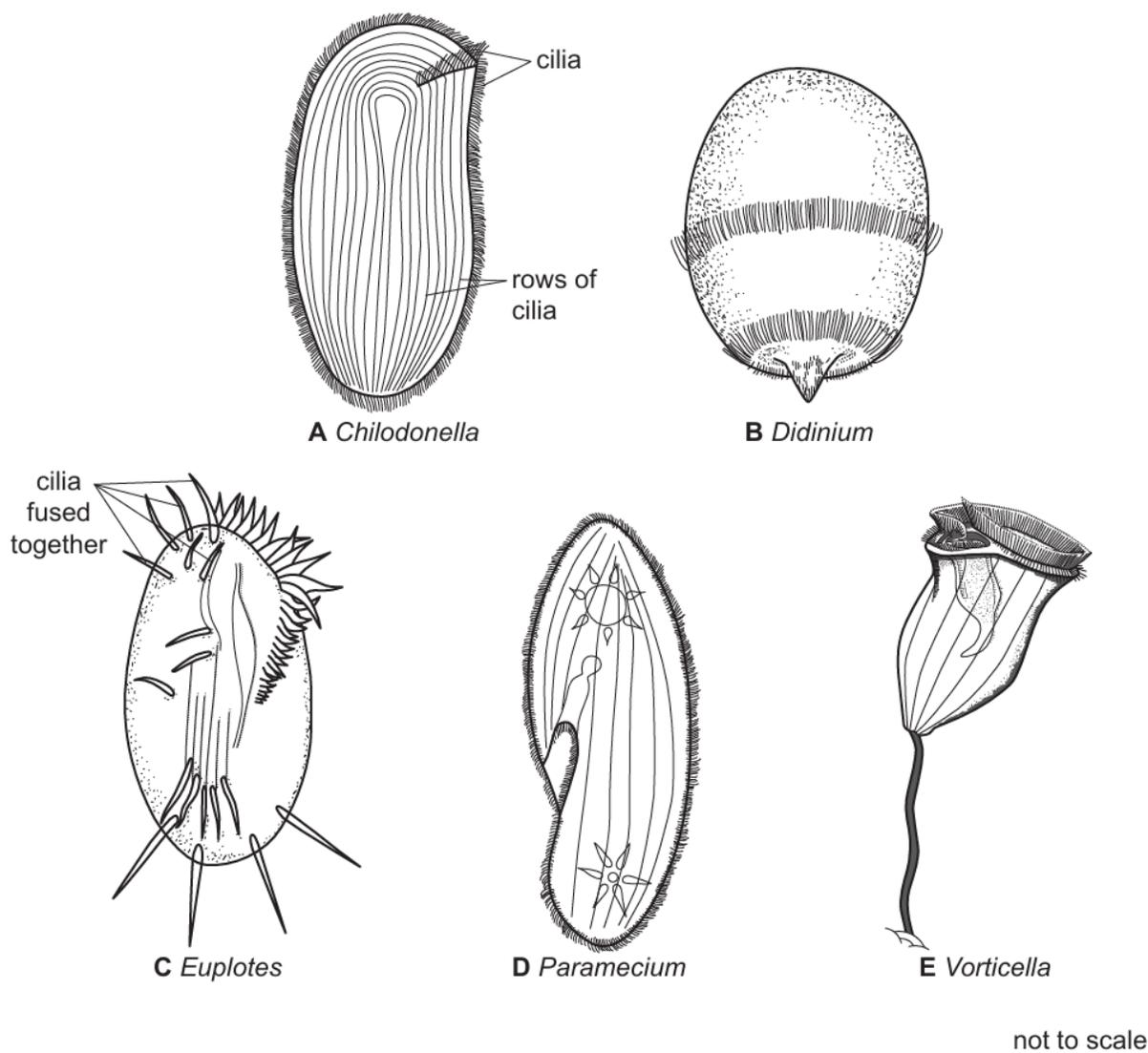


Fig. 5.1

Fig. 5.2 is a dichotomous key to identify the ciliates shown in Fig. 5.1.

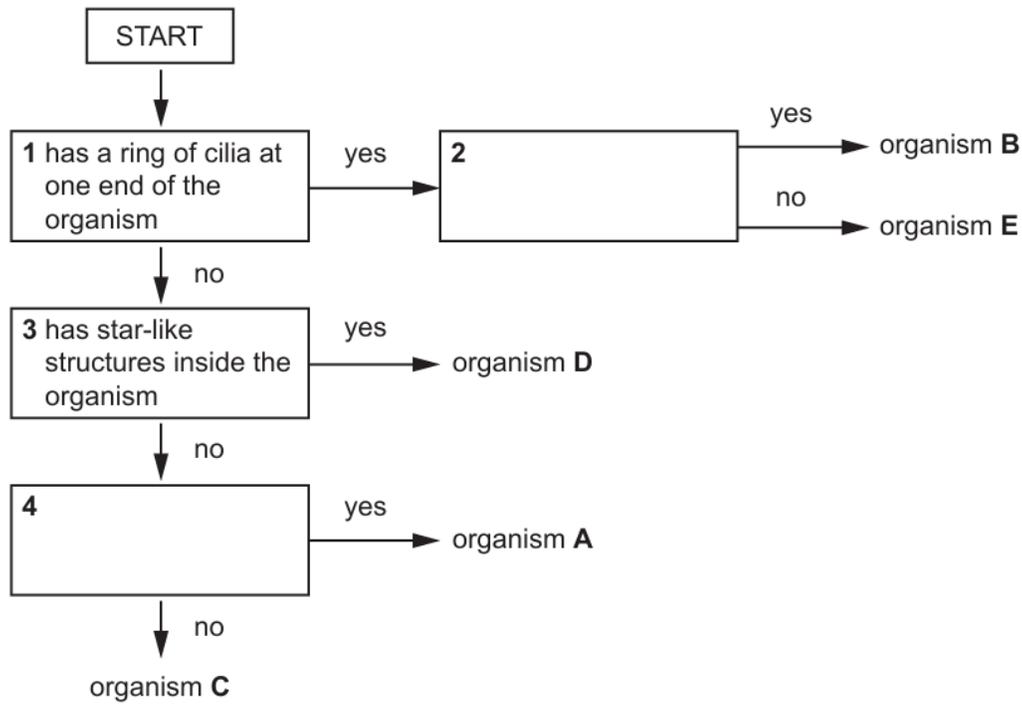


Fig. 5.2

Complete the key in Fig. 5.2 by writing suitable statements:

- for box 2 to distinguish species **B** and **E**
- for box 4 to distinguish species **A** and **C**.

text for box 2

.....

.....

text for box 4

.....

.....

14 The Galápagos Islands are a group of small islands in the Pacific Ocean.

In 1839 Charles Darwin published a book that described differences in a family of birds called finches.

Each species of Galápagos finch had:

- a different diet
- a different beak shape, as shown in Fig. 5.1.

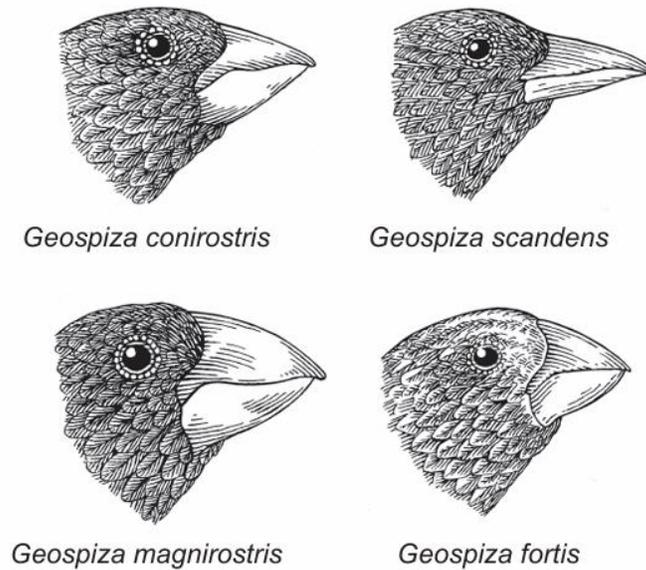


Fig. 5.1

(a) State the genus name for the Galápagos finches shown in Fig. 5.1.

..... [1]

15 All commercial breeds of sheep belong to the species *Ovis aries*.

(a) Define the term *species*.

.....

.....

.....

.....

..... [2]

16 (c) Myriapods can be classified into four classes, 1, 2, 3 and 4.

Fig. 1.2 is a dichotomous key that can be used to distinguish the four classes of myriapods.

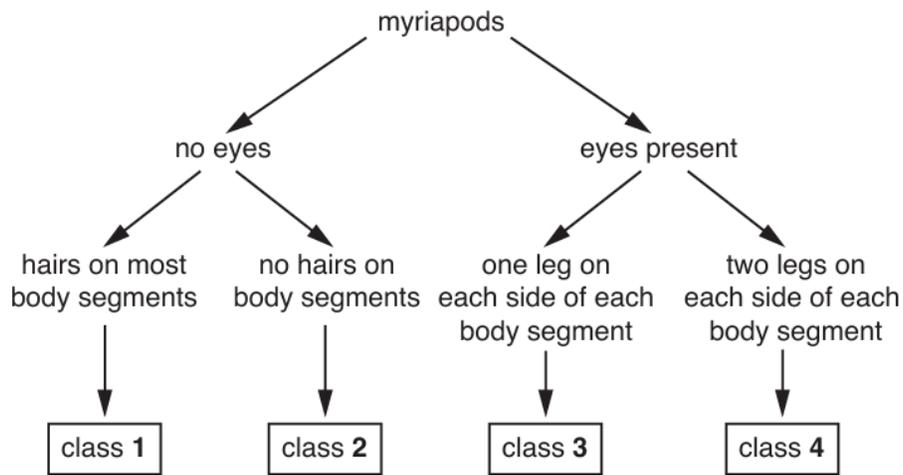
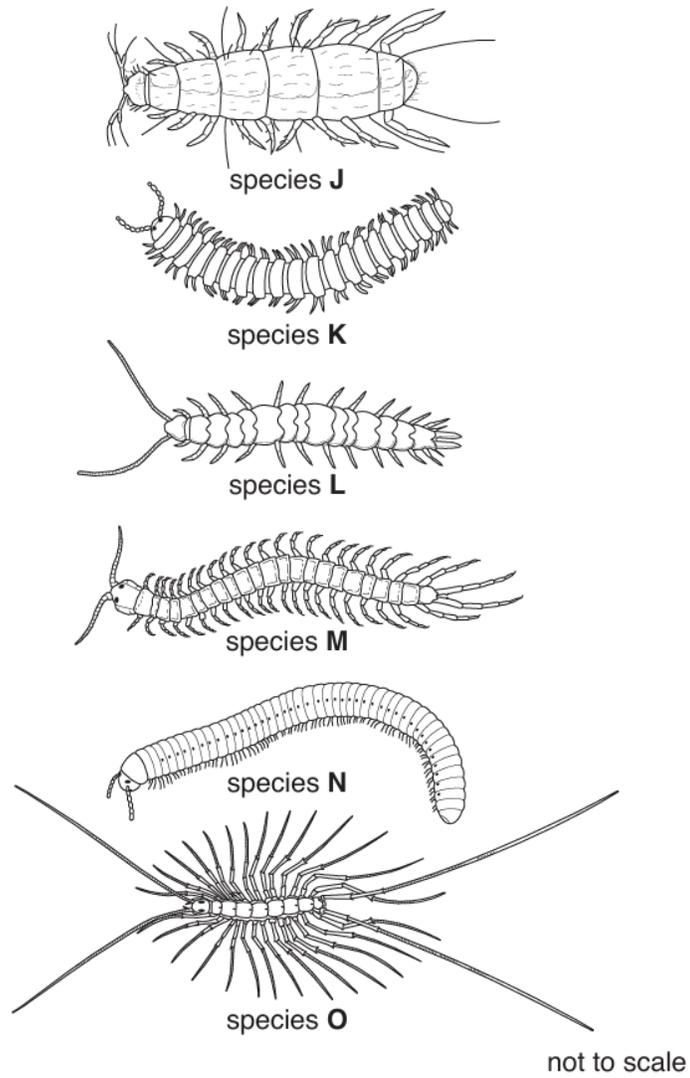


Fig. 1.2

**Fig. 1.3**

Complete Table 1.1 by using the key in Fig. 1.2 to classify the six myriapods in Fig. 1.3 into the four classes.

Table 1.1

| class | letter(s) of species from Fig. 1.3 in each class |
|----------|--|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

(d) Fig. 1.4 is a photograph of the myriapod, *Apheloria virginiensis*.



Fig. 1.4

(i) State the genus name and kingdom name for the myriapod shown in Fig. 1.4.

genus

kingdom

[2]

17 (c) DNA can be extracted from the webs of spiders. This DNA can be used to identify the species of spider that made the web, and the species of prey caught in the web. **(extended only)**

Explain how DNA extracted from spider webs can be used to identify different species.

.....

 [2]