Living together – food and ecosystems – 2022 GCSE 21st GCSE Biology B

1. May/2022/Paper_J257/03/No.9

Elephants live in a habitat where temperatures can get extremely high.

(a) Which statement explains why elephants find it difficult to regulate their body temperature?

Tick (✓) **one** box.

Elephants have a fast heart rate. ☐

Elephants have a large surface area to volume ratio. ☐

Elephants have a small surface area to volume ratio. ☐

Elephants move slowly. ☐

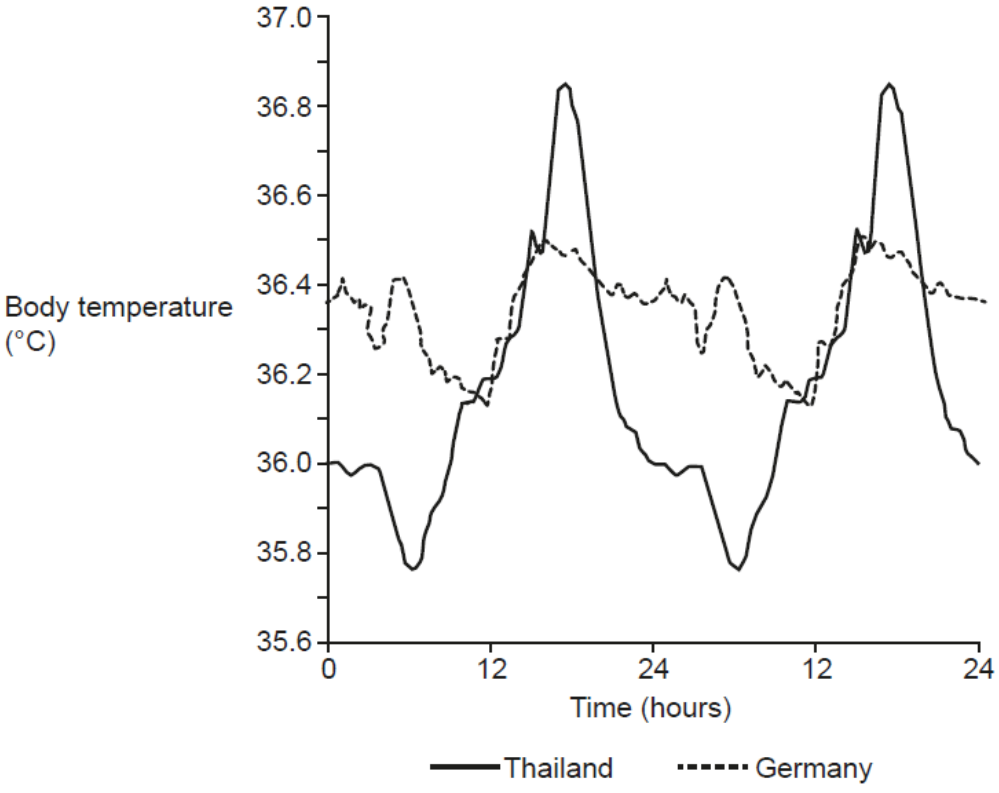
[1]

Elephants cope with these high temperatures using heterothermy.

This means the elephants do not regulate their body temperature during the daytime, so it increases in the sun.
The elephants regulate their body temperature back down to **below** normal overnight.

Scientists monitored the temperature of elephants in a zoo in Germany and in Thailand to see if they used heterothermy to regulate their body temperature.

The graph shows the scientists' data.



(b) The normal body temperature of an elephant is 35.9 °C.

Does the graph provide evidence for heterothermy in elephants? Explain your answer.

.....

.....

.....

.....

.....

..... **[3]**

(c) Elephants have large ears which are very thin and have a good blood supply.

(i) Describe **one** method that both elephants and humans use to **regulate** their temperature.

.....

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

(ii) Describe how the human body **monitors** its temperature.

.....

.....

.....

.....

.....

..... **[3]**

2. May/2022/Paper_J257/04/No.3

Gentoo penguins live on islands near South America.

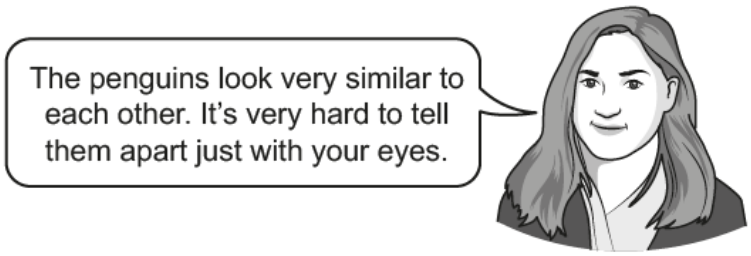
(a) The number of Gentoo penguins on the islands is decreasing.

Suggest **one** factor that could have caused the decrease in the number of Gentoo penguins.

.....

..... **[1]**

(b) Scientists used to think all the Gentoo penguins were the same species.



New evidence suggests that there are four different species of Gentoo penguins.

Describe evidence that scientists could have collected from the penguins' cells to show that there are four different species.

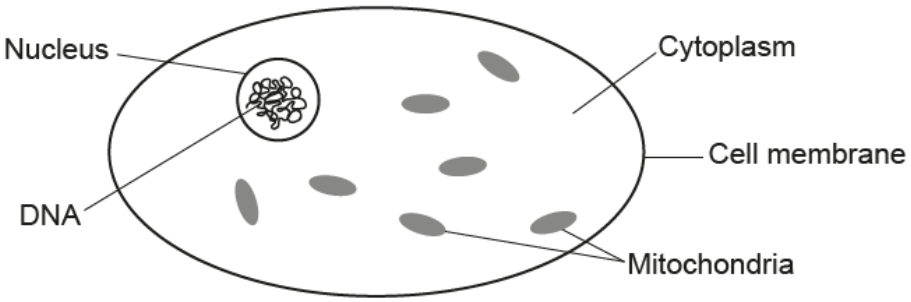
.....

.....

.....

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

(c) The diagram shows a cell from a Gentoo penguin.



The presence of mitochondria shows that this is a eukaryotic cell.

Which other structure shows that this is a eukaryotic cell?

Tick (✓) **one** box.

Cell membrane ☐

Cytoplasm ☐

DNA ☐

Nucleus ☐

[1]

(d) If a cell contains a vacuole, this suggests it could be a plant cell.

State **one other** structure that suggests a cell is a plant cell.

..... **[1]**

(e) The length of a cell is 0.00002 m.

How is the length of the cell written in standard form?

Put a (ring) around the correct answer.

2×10^{-5} m **2×10^{-4} m** **2×10^{4} m** **2×10^{5} m**

[1]

(f) The length of a mitochondrion is 3×10^{-6} m.

What is another way to write the length of the mitochondrion?

Put a (ring) around the correct answer.

0.0003 m **0.00003 m** **0.000003 m** **0.0000003 m**

[1]

3. May/2022/Paper_J257/04/No.5

Photosynthesis takes place in plants.

(a) Starch is a carbohydrate that is made when a plant photosynthesises.

Sam investigates the effects of different conditions on the presence of starch in three plant shoots. All three plants are given plenty of water throughout the experiment.

The method Sam uses for the experiment is shown in **Fig. 5.1**.

1. Keep three plant shoots in a dark place for two days.
2. **Test 1:** Cut a small piece of leaf tissue from each plant **A**, **B** and **C**. Test the pieces of leaf tissue for starch.
3. Wrap the leaf of plant **B** in metal foil.
4. Put the leaf of plant **C** inside an open conical flask containing potassium hydroxide solution to absorb carbon dioxide.
5. Keep the three plant shoots in bright light for one day.
6. **Test 2:** Cut a small piece of leaf tissue from each plant. Test the pieces of leaf tissue for starch.

Fig. 5.1

Fig. 5.2 shows the plants during step 5 of Sam's method.

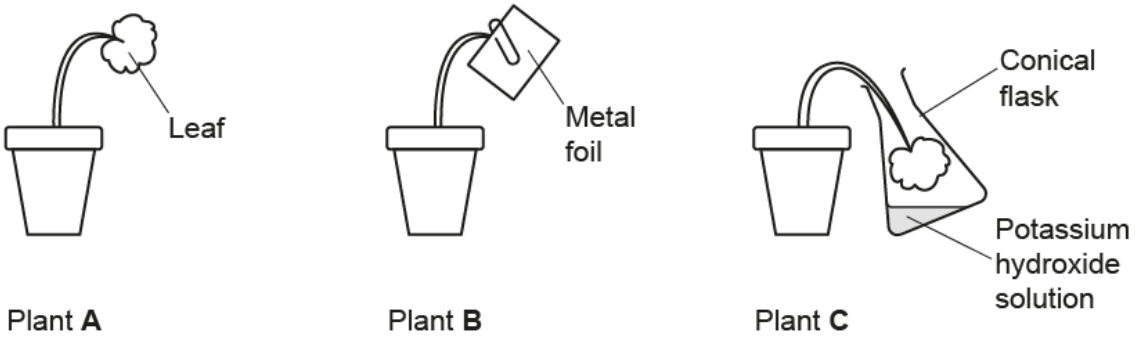


Fig. 5.2

Some of Sam's results are shown in **Table 5.1**.

Plant	Result of test 1	Result of test 2
A	Reagent appeared light brown	
B	Reagent appeared light brown	Reagent appeared light brown
C	Reagent appeared light brown	

Table 5.1

(i) State the name of the reagent used to test for starch.

.....

[1]

(ii) Describe a conclusion that can be made from the result of test **2** for plant **B**.

.....

.....

.....

.....

[2]

(iii) Predict the result of test **2** for plant **A**.

Explain your prediction.

Prediction .....

.....

Explanation .....

.....

[3]

(iv) Stores of starch can be broken down to make glucose.

Suggest how this helps to explain the result of test **1** for plant **A**.

.....

.....

.....

.....

[2]

(v) Suggest why it is helpful to keep the three plants in the dark for two days at the start of the experiment (step 1).

.....

.....

.....

.....

[2]

(vi) Sam predicts that test **2** for plant **C** would show **no** starch was present. However, the test shows that starch **is present**.

Describe **and** explain **one** improvement to their method that would produce the result Sam predicted for test **2** for plant **C**.

.....

.....

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

(b) A tank of water containing living pondweed is placed next to the window. Pondweed is a plant that lives in water.

Fig. 5.3 shows how the amounts of oxygen and carbon dioxide in the water changes over 24 hours.

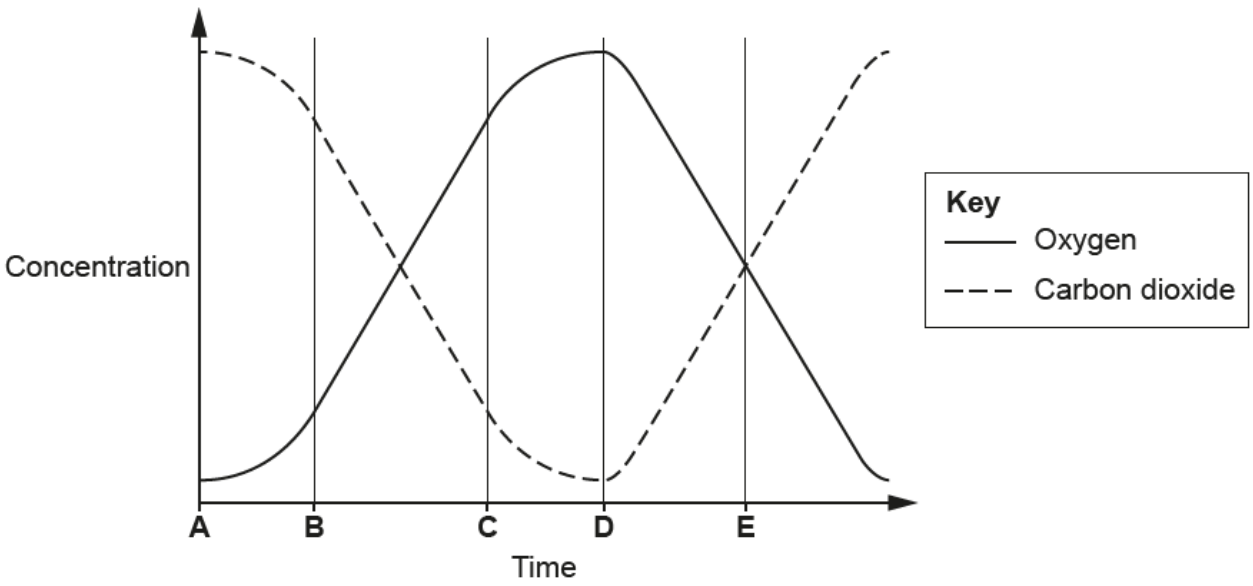


Fig. 5.3

Five time points in **Fig. 5.3** have been labelled **A**, **B**, **C**, **D** and **E**.

(i) At which time point were the concentrations of oxygen and carbon dioxide exactly the same?

Time point ..... **[1]**

(ii) Between which **two** time points is the line for oxygen represented by the equation $y = mx + c$?

Time points ..... and ..... **[1]**

(iii)* A student concludes that time point **D** is sunset.

Describe **and** explain how **Fig. 5.3** supports the student's conclusion.

.....

.....

.....

.....

.....

.....

.....

.....

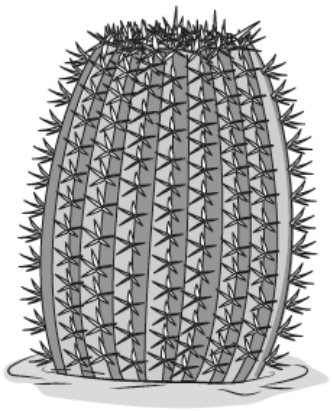
.....

.....

..... **[6]**

4. May/2022/Paper_J257/01/No.13

The diagram shows a cactus. It reproduces sexually by producing flowers.



(a) There are 22 chromosomes in all of the cells in this cactus apart from the gamete cells.

Complete the table to identify how many chromosomes are present during the events that take place in the life cycle of a cactus.

Tick (✓) **one** box in each row.

Event in the cactus life cycle	**Number of chromosomes**		
	11	**22**	**44**
At the end of interphase during meiosis			
At the end of interphase during mitosis			
In the cells produced by mitosis as the cactus grows			
In the pollen produced by meiosis			

[4]

A cactus must get water from the soil.

(b) Which process reacts water with carbon dioxide in plant cells?

Tick (✓) **one** box.

Active transport ☐

Cellular respiration ☐

Photosynthesis ☐

Transpiration ☐

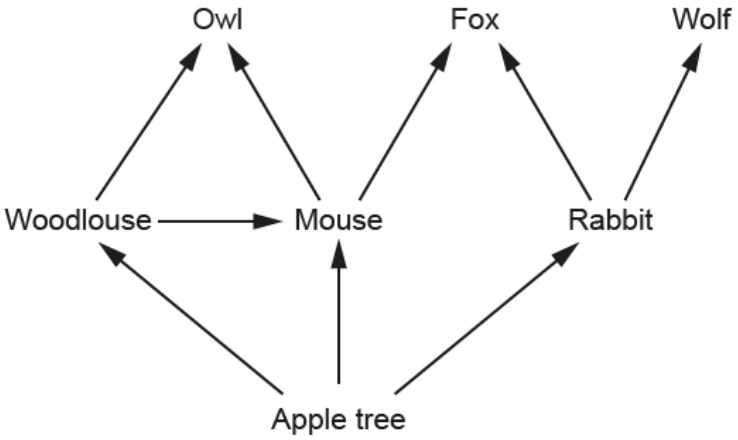
[1]

(c) Name the vessel in a plant that transports water up the stem.

..... **[1]**

5. May/2022/Paper_J257/02/No.2

The diagram shows a woodland food web.



(a) Complete the sentences to describe the organisms in the food web.
Use the phrases in the list.

a community	**a population**	**an ecosystem**	**an individual**

One rabbit is ..... .

All of the rabbits in the woodland are ..... .

All of the organisms in the woodland are ..... .

All of the organisms and their environment are ..... .

[4]

(b) State **one** example of an organism in the first trophic level of the woodland food web.

..... **[1]**

(c) State **one** example of a producer in the woodland food web.

..... **[1]**

(d) How many trophic levels does the longest food chain in the woodland food web have?

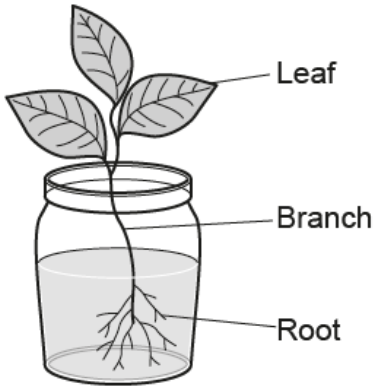
Number of trophic levels ..... **[1]**

(e) State **one** example of an organism that is in more than one trophic level in the woodland food web.

..... **[1]**

6. May/2022/Paper_J257/02/No.4

A cutting is taken from a leafy branch of a plant. When the cutting is placed in water, roots begin to grow from the branch.



(a) The cutting takes in substances from its surroundings to stay alive.

Complete the table to describe the substances taken into the cutting and what they are used for.

Substance	Part of the cutting that takes in the substance from the surroundings	What the substance is used for
Carbon dioxide	.....	Photosynthesis
Oxygen	Leaf stomata	.....
.....	Root hair cells	Photosynthesis
Mineral ions	.....	Making proteins and other biological molecules

[4]

(b) The cells that make up the cutting's leaves contain chloroplasts and mitochondria.

Explain how chloroplasts **and** mitochondria enable the cutting to grow.

Chloroplasts .....

.....

.....

Mitochondria .....

.....

.....

[4]

(c) Although the cutting had no roots at first, it could grow new roots because it has meristem cells.

Explain what the meristem cells did to make roots.

.....

.....

.....

.....

.....

.....

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