Questions are for separate science science students only

Q1.

An echidna is a mammal that lives in Australia.

Figure 1 shows an echidna.

Figure 1

Figure 2 shows how the body temperature of the echidna varies in warm weather and in cold weather.

Figure 2

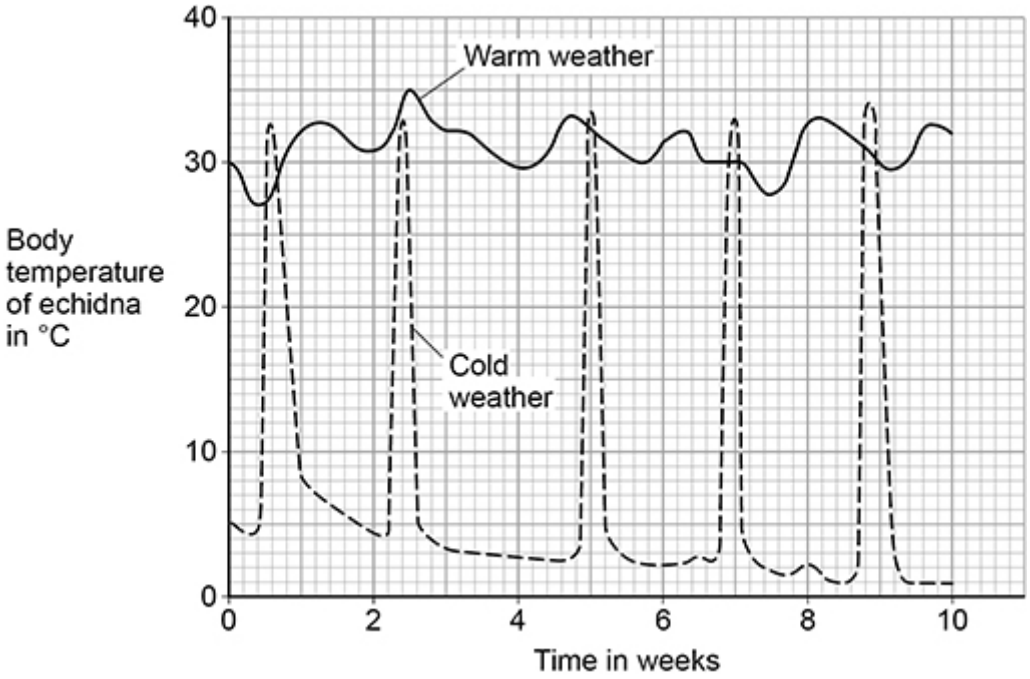
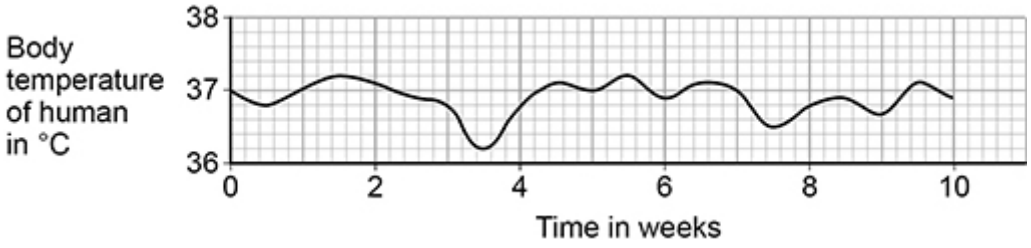


Figure 3 shows how human body temperature varies.

Figure 3



(a) Compare the variation in body temperature of the echidna in warm weather with the variation in body temperature of the human. **(biology only)**

Use data from **Figure 2** and **Figure 3**.

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(2)

In the cold winter months, the echidna hibernates.

During hibernation:

- the echidna's body temperature decreases to below 5 °C
- the echidna sleeps for up to 17 days at a time
- the echidna's rate of metabolism slows down.

(b) Explain why the decrease in body temperature is an advantage to the echidna during hibernation. **(biology only)**

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(2)

(c) During hibernation the echidna wakes up several times.

Each time the echidna wakes up it becomes active and its body temperature increases to over 30 °C.

Explain why the echidna has a higher body temperature when it is active. **(biology only)**

(2)

(d) An echidna can dilate and constrict blood vessels in its skin.

Explain how the **dilation** of blood vessels in the skin can help to decrease body temperature. **(biology only) (HT only)**

(3)

An athlete trained in a hot climate.

The athlete lost a large volume of water each day in sweat.

(e) The athlete's energy intake each day from food was 20 000 kJ.

Evaporation of 1 cm^3 of sweat requires 2.5 kJ of energy.

40% of the athlete's daily energy intake was used to evaporate sweat.

Calculate the volume of sweat the athlete lost each day. **(biology only)**

Give your answer in dm^3

1 dm^3 = 1 000 cm^3

Volume of sweat lost in one day = _____ dm^3

(3)

(f) Suggest why the athlete was advised to take salt tablets each day. **(biology only)**

(1)

(Total 13 marks)