Questions are for both separate science and combined science students unless indicated in the question

Q1.

Human body temperature is controlled within very narrow limits.

Scientists investigated the effect of drinking ice-cold water on:

- internal body temperature
- the rate of sweating.

This is the method used.

1. Sit a person inside a room kept at a constant temperature of 25 °C.
2. Measure the person's internal body temperature near the brain.
3. Measure the person's rate of sweating.
4. After 20 minutes, give the person 500 cm^3 of ice-cold water to drink.
5. Continue to measure the person's internal body temperature and sweating rate for a further 50 minutes.

(a) Give the reason why the person should **not** move during the investigation. **(separate only)**

_____

_____

(1)

Figure 1 and **Figure 2** show the scientists' results.

Figure 1

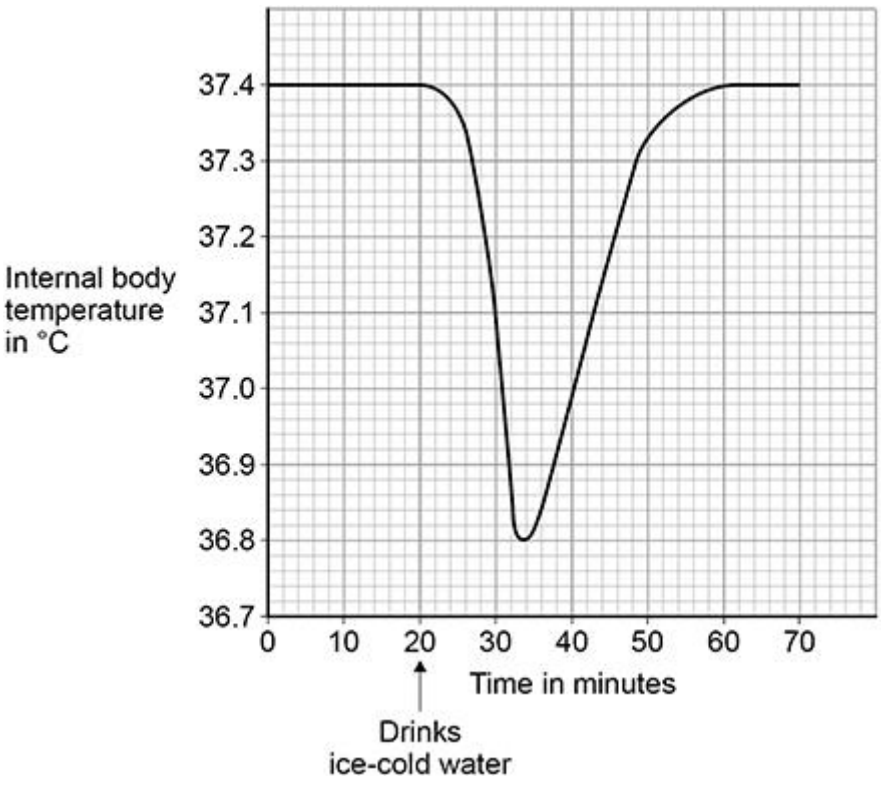
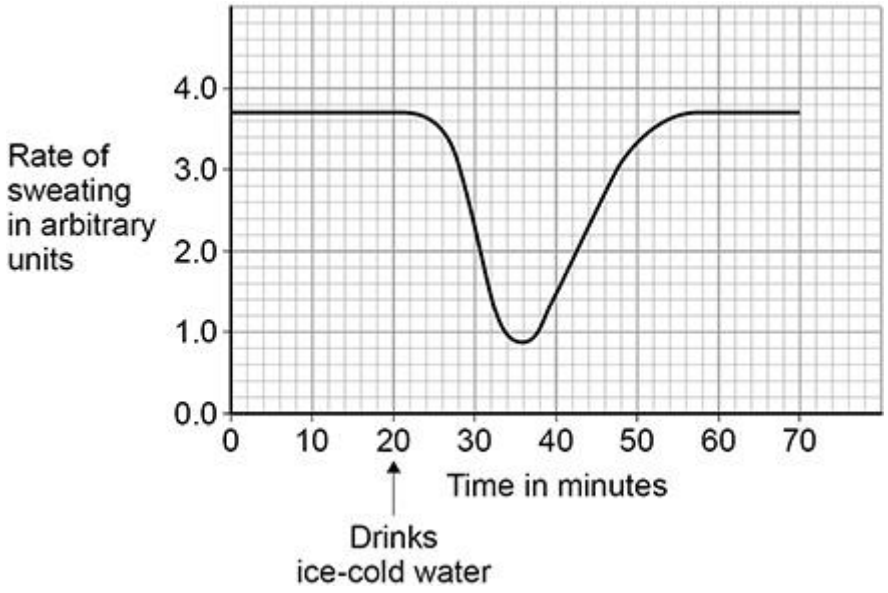


Figure 2



(b) What is this person's normal internal body temperature?

Tick (✓) **one** box. **(separate only)**

36.8 °C ☐ 37.0 °C ☐ 37.4 °C ☐

(1)

The results show that when the ice-cold water was drunk, the temperature near the brain decreased.

(c) Explain why the temperature near the brain decreased. **(separate only)**

_____

_____

_____

_____

(2)

(d) The thermoregulatory centre in the brain responds to the decrease in temperature.

How does the thermoregulatory centre send information to sweat glands in the skin? **(separate only)**

_____

_____

(1)

(e) The rate of sweating changes between 24 minutes and 36 minutes.

Explain how this change helps to maintain the person's normal body temperature. **(separate only)**

_____

_____

_____

_____

(2)

(f) During exercise, the skin appears red.

What causes the skin to appear red?

Tick (✓) **one** box. **(separate only)**

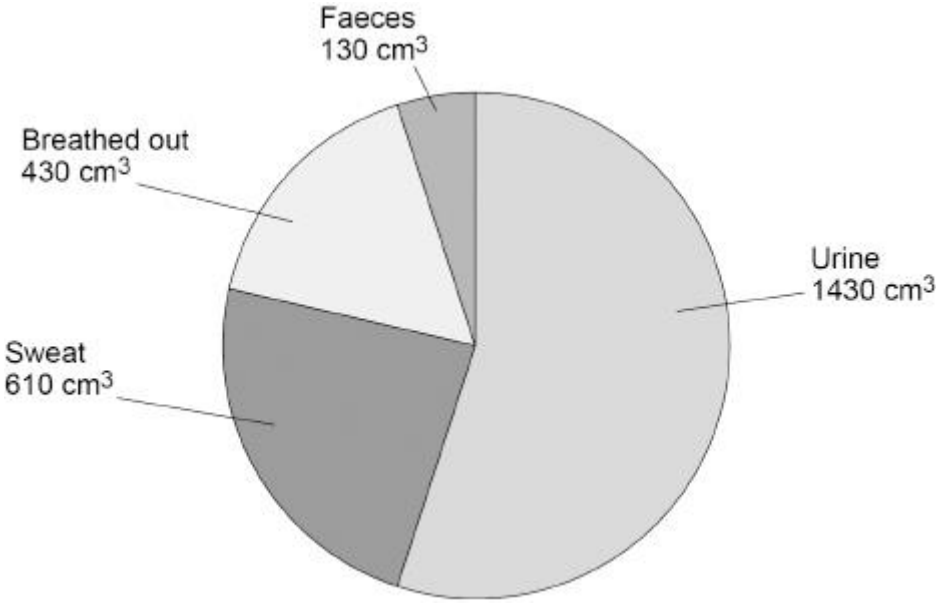
Blood vessels moving closer to the skin surface	☐
Constriction of blood vessels in the skin	☐
Decrease in heart rate	☐
Dilation of blood vessels in the skin	☐

(1)

(Total 8 marks)

Q2.

The pie chart below shows the water loss from a person on one day.



(a) The total water loss was 2600 cm^3.

Calculate the percentage of the total water loss that was lost as urine. **(separate only)**

_____

_____

_____

Percentage lost as urine = _____ %

(2)

A marathon race is 42 km long.

(b) What happens to the volume of water lost as sweat when a person runs a marathon? **(separate only)**

_____

_____

(1)

(c) What must marathon runners do to prevent themselves becoming dehydrated? **(separate only)**

_____

_____

(1)

(d) Complete the sentences.

Choose answers from the box. **(separate only)**

digestion	excretion	fertilisation	filtration	reabsorption

Blood entering the kidneys goes through the process of _____.

Glucose is **not** found in urine because of _____.

Urine is removed from the body in the process of _____.

(3)

(e) People with kidney failure can have dialysis or a kidney transplant.

Dialysis is often needed 3 times each week and can take over 4 hours each time.

Dialysis usually happens in a hospital.

Kidney transplants require a donor and major surgery.

Describe the advantages **and** disadvantages of having a kidney transplant instead of having dialysis. **(separate only)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

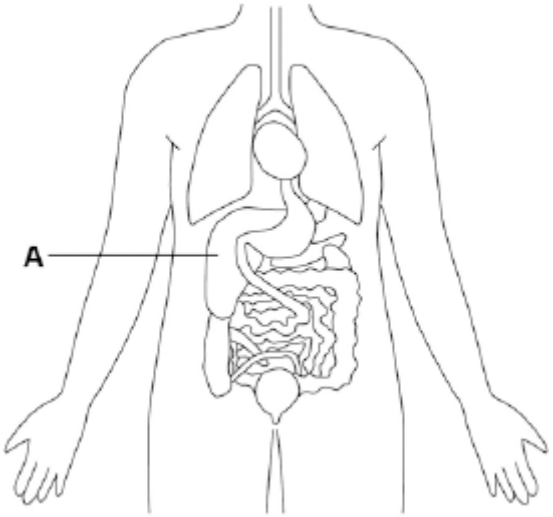
(4)

(Total 11 marks)

Q3.

Humans control their internal environment in many ways.

Look at the diagram below.



(a) Name organ **A**.

_____

(1)

(b) Organ **A** stores glucose.

People with Type 1 diabetes cannot effectively control the levels of glucose in their blood.

Name the **hormone** people with **Type 1 diabetes** have to inject to decrease their blood glucose level.

_____

(1)

(c) Which organ produces urine?

Tick **one** box. **(separate only)**

Brain ☐

Lungs ☐

Kidney ☐

Thyroid ☐

(1)

(d) Marathon runners often drink sports drinks during a race.

Explain why. **(separate only)**

_____

_____

_____

_____

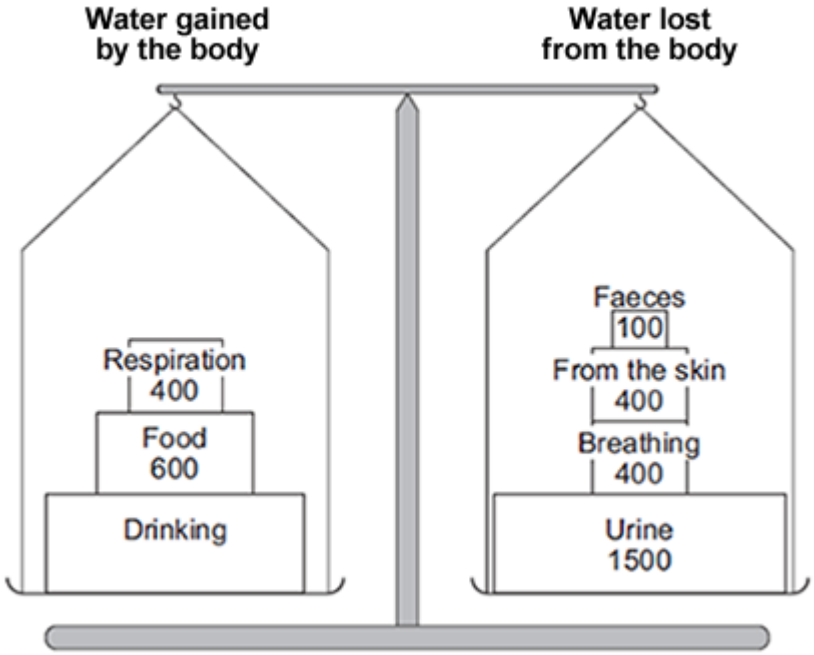
(2)

(Total 5 marks)

Q4.

The diagram below shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm^3, the person's body gained and lost.



(a) (i) How much water was lost from the body on the cold day?

Draw a ring around the correct answer. **(separate only)**

1800 cm^3 **2400 cm^3** **3300 cm^3**

(1)

(ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance? **(separate only)**

_____

_____

Volume of water = _____ cm^3

(2)

(b) (i) Name the process by which water is lost from the skin. **(separate only)**

_____

(1)

(ii) Why does the body need to lose water from the skin? **(separate only)**

_____

_____

(1)

(c) The next day was a hot day. The person gained the same volume of water and did the same activities.

(i) What effect did the increase in temperature have on the volume of water the person lost?

Tick (✓) **one** box. **(separate only)**

Less water was lost through the skin. ☐

More water was lost through the skin. ☐

More water was lost in faeces. ☐

(1)

(ii) What effect would the increase in temperature have on the volume of urine the person lost?

Draw a ring around the correct answer. **(separate only)**

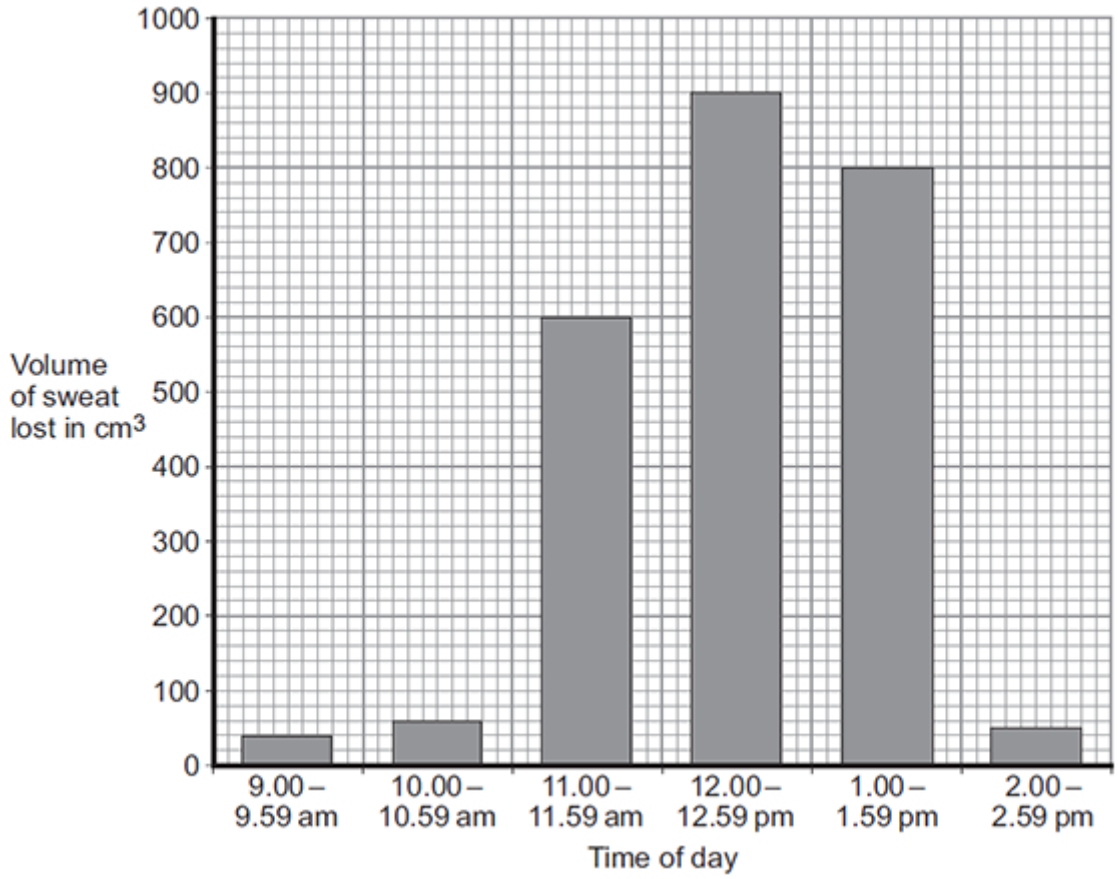
decrease **increase** **no change**

(1)

(Total 7 marks)

Q5.

A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.



(a) (i) Suggest what happened at 11.00 am.

Tick (✓) **one** box. **(separate only)**

The person moved into a cold room. ☐

The person removed their coat. ☐

The person started running a race. ☐

(1)

(ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm. **(separate only)**

_____

_____

Total volume of sweat lost = _____ cm^3

(1)

(iii) Suggest **one** way the person could replace the water that was lost as

sweat. **(separate only)**

_____

_____

(1)

(b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✓) **one** box. **(separate only)**

brain ☐

kidney ☐

pancreas ☐

(1)

(ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✓) **one** box. **(separate only)**

capillaries ☐

glands ☐

receptors ☐

(1)

(c) How does sweating help to control body temperature? **(separate only)**

_____

_____

(1)

(Total 6 marks)

Q6.

Humans keep their internal conditions almost constant.

Body temperature is kept within a narrow range.

When the core body temperature is too low, this is detected by the thermoregulatory centre in the brain.

Describe how the body responds when a decrease in core body temperature is detected. **(separate only)**

(Total 6 marks)