Homeostasis & Response

Total mark – 19

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.

_____

_____

(1)

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

Figure 1

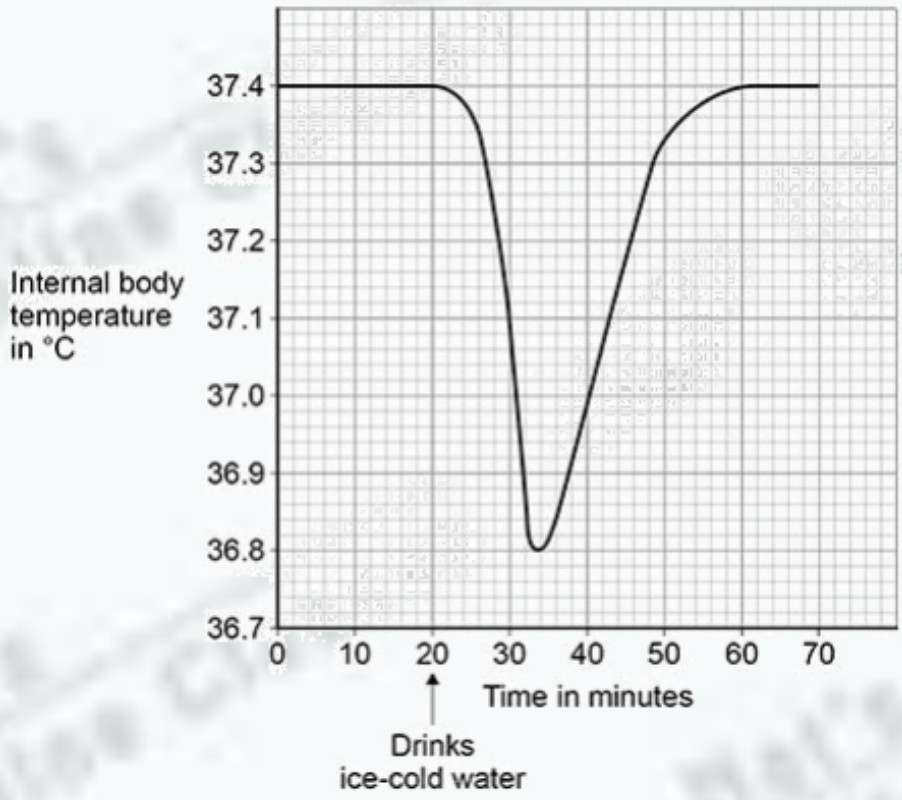
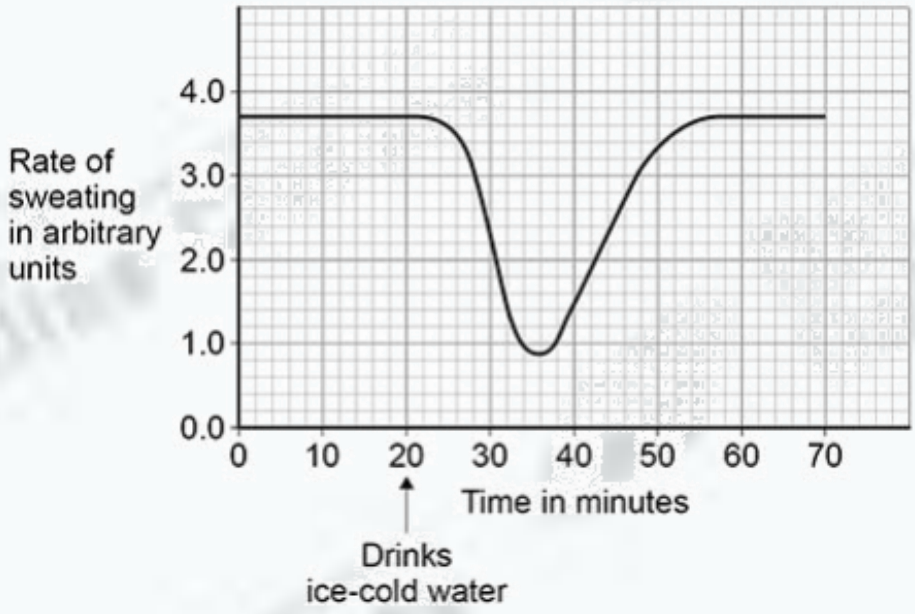


Figure 2



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

Tick (✓) **one** box.

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.

_____

_____

(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?

_____

_____

(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.

_____

_____

(2)

(f) During exercise, the skin appears red.

What causes the skin to appear red?

Tick (✓) **one** box.

- 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)

Mark Scheme

Q1.

(a) any **one** from:
- movement would release (extra) heat
- movement would increase body temperature
- movement would increase sweating

1

(b) 37.4 °C

1

(c) <u>blood</u> is cooled at stomach / mouth

1

(cooled) blood flows to the brain

1

(d) via nerve(s) / neurones
or
via (nerve) impulse(s)

ignore type of neurone
allow electrical signals
allow via the nervous system

1

(e) less sweating occurs

allow less sweat evaporates
*do **not** accept no sweating*

1

so less heat is lost **or** less cooling

allow less heat used for evaporation of sweat / water

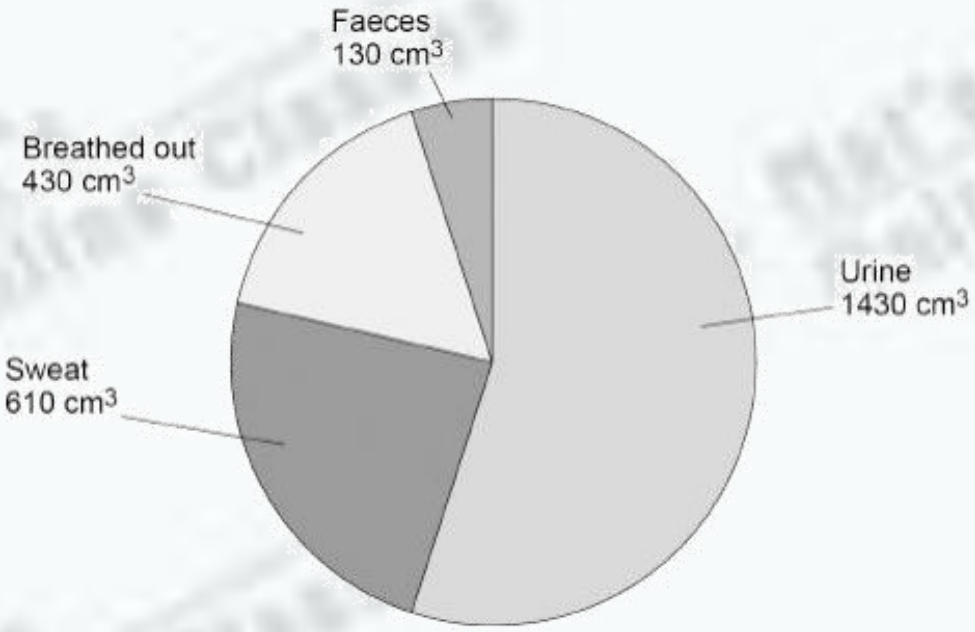
1

(f) dilation of blood vessels in the skin

1

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.

_____

_____

_____

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?

_____

_____

(1)

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

_____

_____

(1)

(d) Complete the sentences.

Choose answers from the box.

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.

(4)

Mark Scheme

Q2.

(a) $\frac{1430}{2600} \times 100$

1

55 (%)

1

(b) (volume) increases

allow (volume) goes up

1

(c) drink (a lot / more)

1

(d) filtration

1

reabsorption

1

excretion

this order only

1

(e) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

3–4

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–2

No relevant content

0

Indicative content

Advantages of kidney transplant

- no need for regular / long hospital visits **or** is a long-term solution
- flexible lifestyle, such as can go on holidays
- may not live near a hospital **or** reference to transport costs
- no risk of infection from frequent needles / treatment
- less / no need to control diet
- maintains correct concentration of substances in blood / body
- cheaper long term for NHS / hospital

Disadvantages of kidney transplant

- may be rejected
- have to keep taking anti-rejection drugs **or** immunosuppressants
- (suitable) donor may not be available **or** need for tissue matching
- risk from surgery (e.g. anaesthesia or infection)
- recovery from surgery will take a long time
- does not last forever (therefore further surgery needed)

For Level **2**, answers must refer to both advantages **and** disadvantages