

Controlling Body Temperature

Q:1 Humans maintain an almost constant body temperature.

(a) Describe the role of blood vessels in the control of body temperature.

(4 marks)

(b) An athlete can run a marathon in 2 hours 15 minutes on a dry day in outside temperatures up to 35 °C.

If the air is dry, his body will not overheat.

In humid conditions the same athlete can run the marathon in the same time. However, in humid conditions, if the outside temperature goes over 18 °C then his body will overheat.

Suggest an explanation for the athlete overheating in humid conditions.

(3 marks)

Q:2 Human body temperature must be kept within narrow limits. Figure 4 shows a cyclist in a race.

Figure 4



(a) Use the correct answer from the box to complete each sentence.

blood brain kidney sweat urine
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The cyclist's body temperature is monitored by a centre in the _____

This centre is sensitive to the temperature of the cyclist's _____

If the cyclist's body temperature increases, his body increases the production of _____

[3 marks]

(b) (i) Cyclists drink sports drinks after a race.

Table 1 shows the ratio of glucose to ions in three sports drinks, A, B and C.

	Sports drink		
	A	B	C
Ratio of glucose (g per dm ³) to ions (mg per dm ³)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, A, B or C, would replace water fastest in an athlete?

[1 mark]

(b) (ii) Why should sports drinks contain ions?

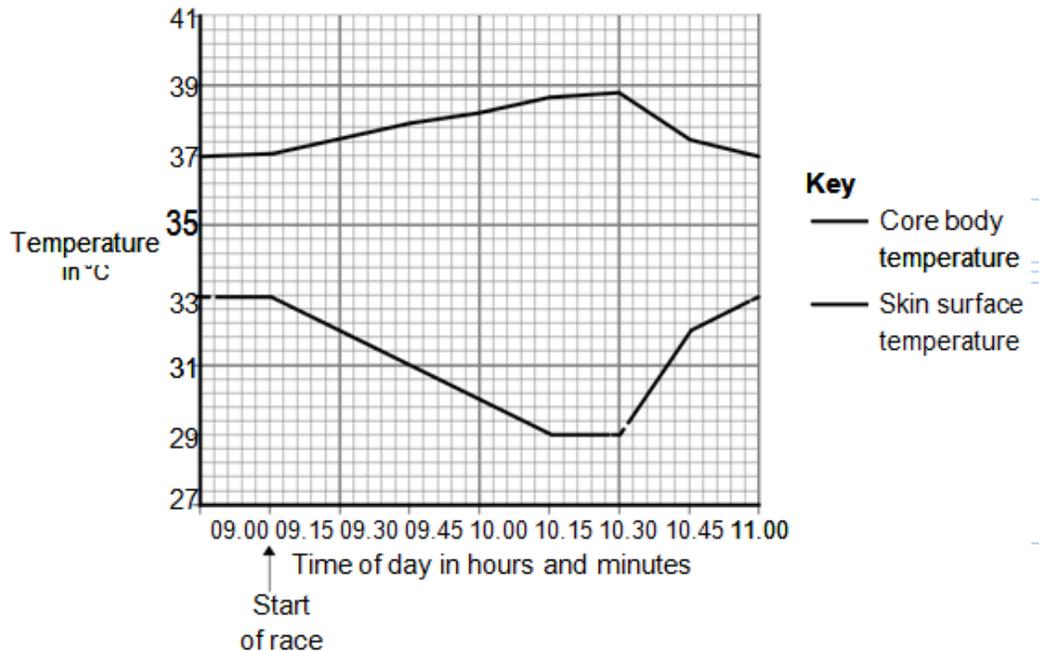
[1 mark]

(b) (iii) Why should a person with diabetes not drink too much sports drink?

[1 mark]

Q:3 Figure 6 shows the core body temperature and the skin surface temperature of a cyclist before, during and after a race.

Figure 6



[2 marks]

(b) During the race, the cyclist's blood glucose concentration began to decrease.

Describe how the body responds when the blood glucose concentration begins to decrease.

[3 marks]

Q:4 During exercise an athlete's core body temperature may rise.

(a) What causes this rise in core body temperature?

(1 mark)

(b) During a long race one athlete did not drink any liquid. Towards the end of the race the amount of sweat he produced began to fall.

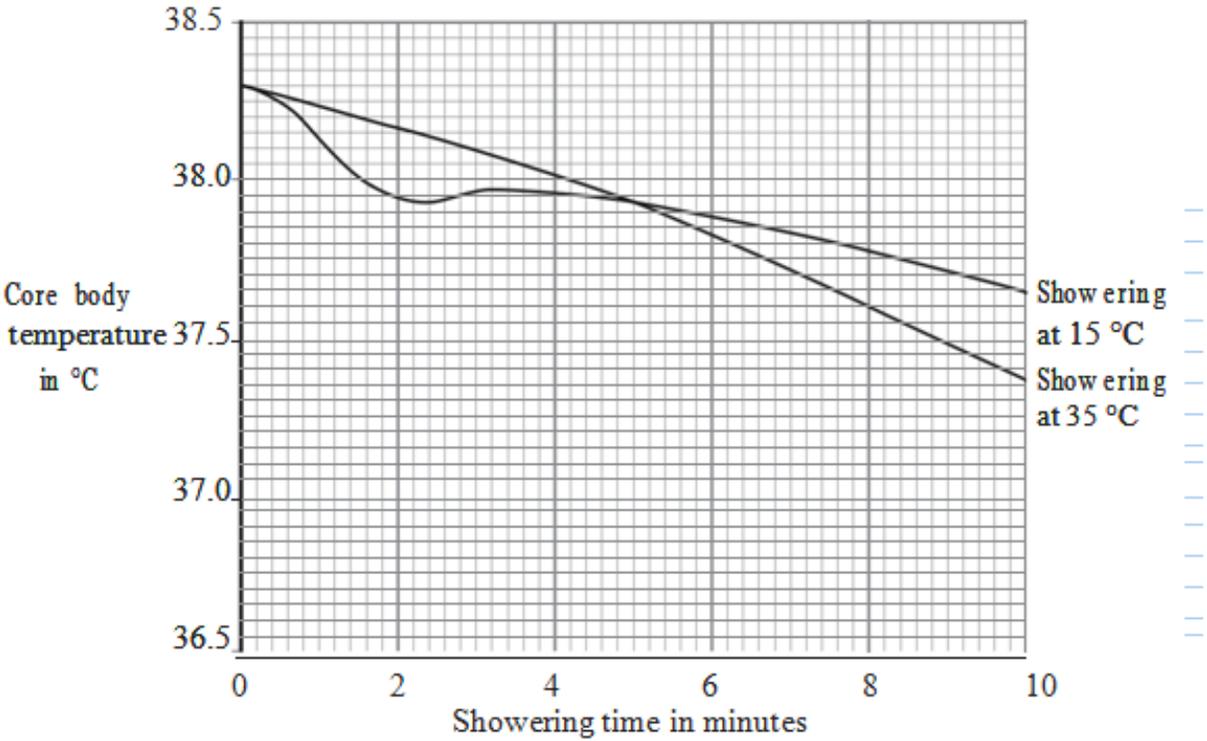
(b)(i) This athlete's core body temperature increased more than that of other similar athletes who had drunk enough liquid during the race. Explain why.

(2 marks)

(b)(ii) Describe one other way in which this athlete's body would respond in order to reduce core body temperature.

(2 marks)

(c) The graph shows the effects of showering for ten minutes at 15 °C and at 35 °C on core body temperature after a long race.



Suggest an explanation for the differences in core body temperature:

(c)(i) between 0 and 2 minutes

(1 mark)

(c)(ii) between 4 and 10 minutes.

(2 marks)

Q:5 The temperature in a sauna is much hotter than core body temperature.

A woman sits in a sauna.

The high temperature of the sauna causes the woman's core body temperature to rise.

(a) When the woman's core body temperature rises, the woman's rate of sweating increases.

Explain why.

(2 marks)

(b) The woman comes out of the sauna.

The woman's skin looks redder than when she went into the sauna.

Describe what happened to the blood circulation in her skin to cause this change in colour.

(2 marks)

(c) After coming out of the sauna the woman gets into a bath of icy water.

This makes the woman shiver.

(c) (i) What process brings about shivering?

(1 mark)

(c) (ii) Shivering increases body temperature.

Explain how.

(2 marks)

Q:6 The volume of water that the body loses must balance the volume of water that it gains. Tables 1 and 2 show losses and gains of water by the body in one day.

Table 1
Losses of water by the body

Method	Volume in cm ³
breathing	300
sweating	600
faeces	100
urine	
Total	2400

Table 2
Gains of water by the body

Method	Volume in cm ³
drinking	1300
food	800
chemical reactions	300
Total	2400

(a)(i) Calculate the volume of urine lost by the body.

Show clearly how you work out your answer.

Volume of urine lost by the body = _____ cm³

(2 marks)

(a)(ii) What proportion of water gained by the body comes from food?

Put a tick (☑) in the box next to your choice.

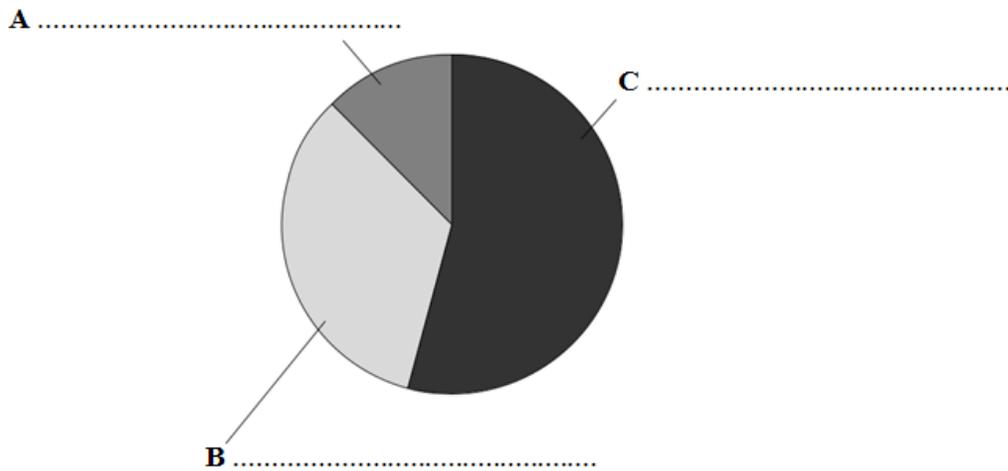
$\frac{1}{4}$

$\frac{1}{3}$

$\frac{1}{2}$

(1 mark)

(b) One pupil decided to show the figures from Table 2 as a pie chart. Label sections A, B and C of the pie chart.



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(1 mark)

(c) How does sweating help the body?

(1 mark)

(d) On a hotter day, the volumes of water lost and gained will be different. What differences will there be?

Tick (☑) two answers from the list.

- More sweat produced
- More faeces produced
- More food eaten
- Less urine produced
- Less liquid drunk

(2 marks)

TOTAL MARKS=48