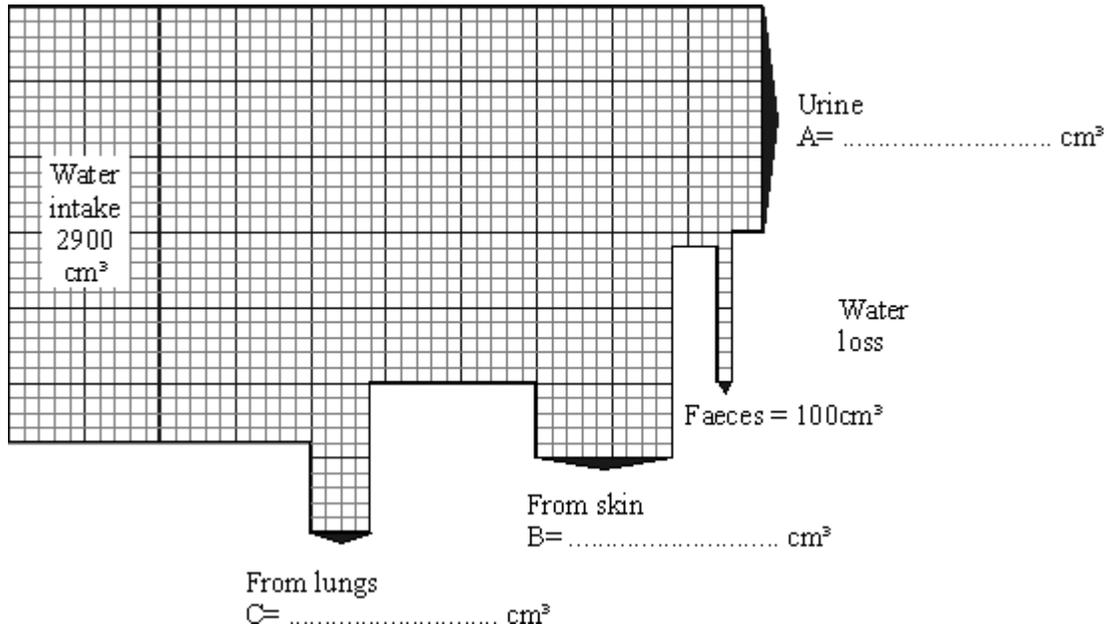


- 1 The diagram shows the amount of water lost by an adult in one day.
The width of the arrows shows how much water is lost in each way.



- (a) Work out from the diagram the water loss for urine, skin and lungs and write the correct figures in the spaces on the diagram. (4)
- (b) When it is hot, much more water is lost from the skin. Which other method of water loss would also change significantly?

Explain your answer.

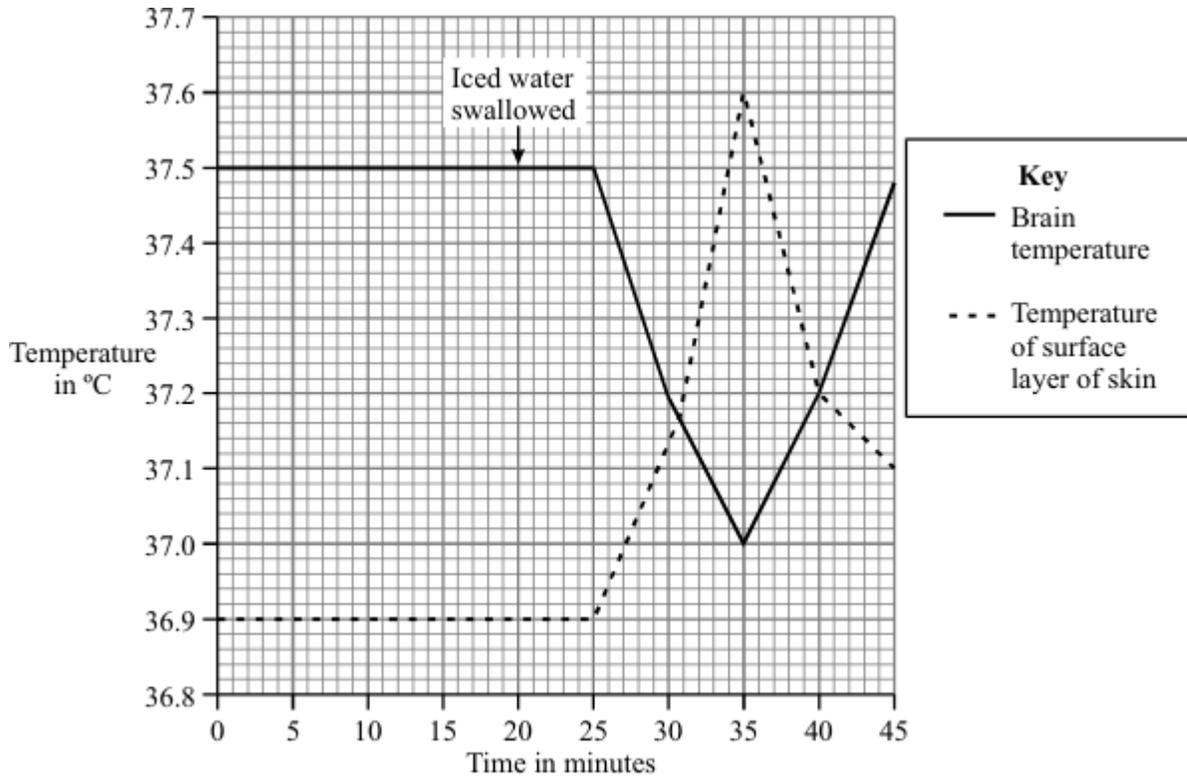
(3)
(Total 7 marks)

2

(a) Explain how sweating helps to keep our body temperature relatively constant.

(2)

(b) In an experiment, a student swallowed some iced water. The graph shows how this affected the student's skin temperature and brain temperature.



(i) Explain why the temperature of the brain changed after the student swallowed the iced water.

(2)

- (ii) This change in brain temperature led to a change in the temperature of the surface layer of the skin.

Explain how this happened.

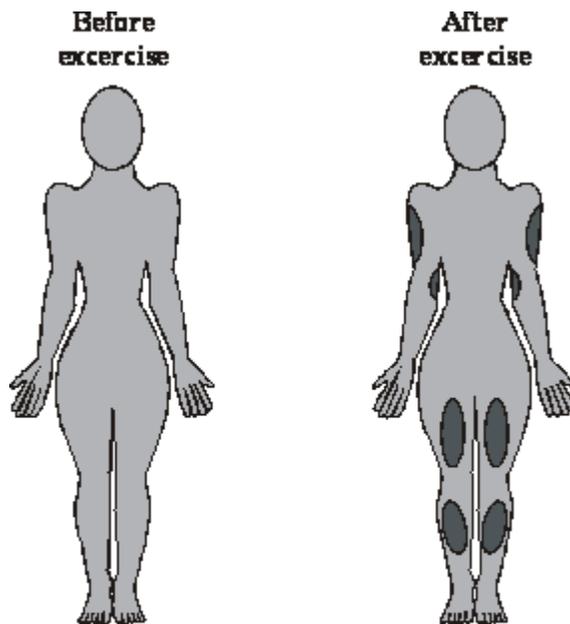
(3)
(Total 7 marks)

3

The temperature at the surface of the skin can be measured by using a technique called thermography.

In this technique, areas with higher temperature appear as a different colour on the thermographs.

The drawings below show the results of an investigation in which thermographs were taken from a person before and after exercise.



Key

-  Higher temperature areas
-  Normal temperature areas

Describe and explain, as fully as you can, the effects of exercise on skin temperature.

(Total 3 marks)

4

The kidneys remove waste materials from the liquid part of the blood.

The table shows the concentration of certain substances

- in the liquid part of the blood
- in the liquid that has just been filtered from the blood in the kidneys
- in the solution in the bladder.

SUBSTANCE	CONCENTRATION (%)		
	IN LIQUID PART OF BLOOD	IN LIQUID THAT HAS BEEN FILTERED IN THE KIDNEYS	IN LIQUID IN THE BLADDER
Protein	7.0	0	0
Salt	0.35	0.35	0.5
Glucose	0.1	0.1	0
Urea	0.03	0.03	2.0

(a) (i) Which **one** of these substances does **not** pass into the liquid that is filtered in the kidneys?

(1)

(ii) Suggest **one** reason why this substance does **not** pass out of the blood.

(1)

(b) Explain why the concentration of urea in the liquid in the bladder is much greater than the concentration of urea in the liquid that is filtered in the kidneys.

(1)

(c) (i) Describe how a kidney dialysis machine works.

(3)

(ii) Use the data in the table to suggest the concentration that the salt in the dialysis fluid should be. Explain your answer.

Concentration _____

Explanation _____

(2)

(Total 8 marks)

5

The table compares the percentages of various substances in a person's blood and their urine.

Substance	Blood	Urine
Water	92.00%	95.00%
Glucose	0.10%	0
Salt	0.37%	0.60%
Urea	0.03%	2.10%

(a) How does the level of urea in urine compare with the level of urea in the blood?

(2)

- (b) The kidney produces urine by filtering the liquid part of blood and then re-absorbing some of the filtered substances.

Use this information to explain the difference in the level of urea in urine compared to the level of urea in blood.

(2)

(Total 4 marks)

6

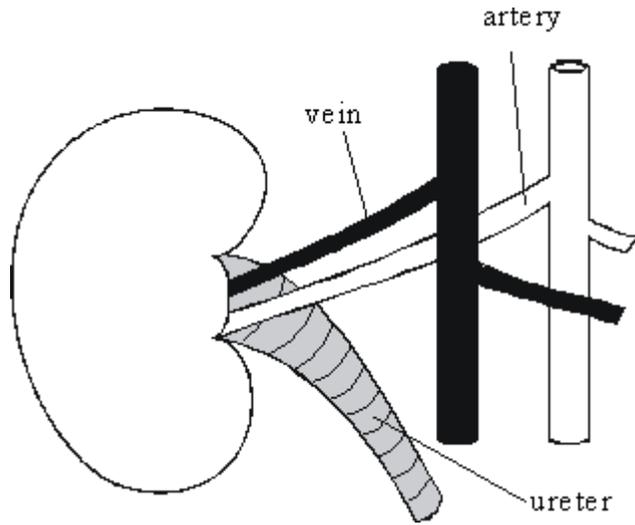
- (a) Explain, as fully as you can, why respiration has to take place more rapidly during exercise.

(2)

- (b) During exercise the process of respiration produces excess heat. Explain how the body prevents this heat from causing a rise in the core (deep) body temperature.

(4)

(Total 6 marks)



(a) The drawing shows a kidney, its blood supply and the ureter (a tube which carries urine from the kidney to the bladder). The amount and composition of the urine flowing down the ureter changes if the blood in the artery contains too much water. Describe these changes and explain how they take place.

(4)

(b) (i) Describe, as fully as you can, **two** methods of treating patients who suffer from kidney failure.

1. _____

2. _____

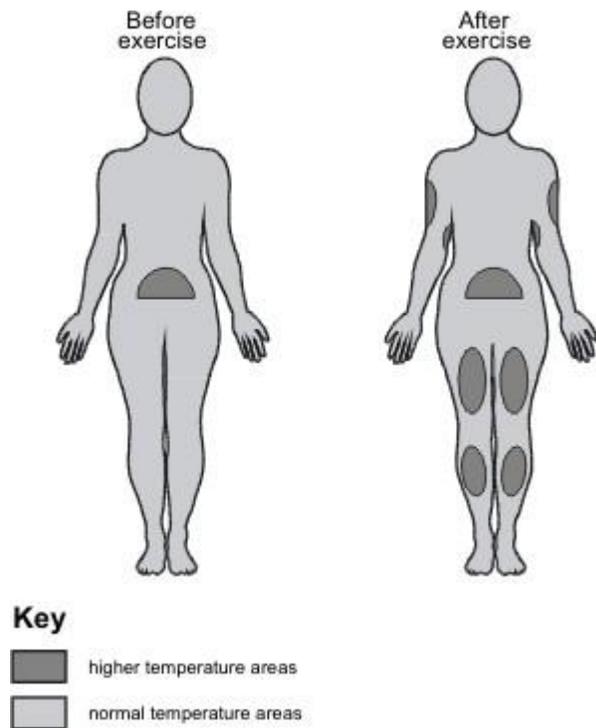
(4)

(ii) Describe how the amount of water in the body is controlled by the kidneys.

(3)
(Total 5 marks)

9

The temperature at the surface of the skin can be measured by using a technique called thermography. Areas with higher temperature appear as a light shade on the thermographs. The drawings below show the results of an investigation in which thermographs were taken before and after exercise.



Explain, as fully as you can, the body mechanisms which affected the skin temperature to give the results shown in the drawings.

(Total 8 marks)

Mark schemes

1

- (a) $A > B > C$;
 $A + B + C = 2800$;
one number correct
two numbers correct

each for 1 mark

4

- (b) urine;
less produced;
kidneys absorb more water
or
to maintain (water) balance

each for 1 mark

3

[7]

2

- (a) evaporation of sweat
*do not credit sweating cools body if no
reference to evaporation*

1

cools body

*allow cools body if attempt at
description of evaporation (e.g. sweat
dries) for 1 mark*

1

- (b) (i) idea blood (passing through gut)
cooled (by ice)

1

(this) cooled blood cools brain
do not credit ice cools brain

1

- (ii) **impulses** from brain /
thermoregulatory centre to skin
do not accept messages / signals
accept hypothalamus
accept electrical signals

1

vessels supplying skin surface
capillaries constrict / sweat glands less
active or hairs become erect
*do not credit capillaries constrict / move
down*
*accept reduced supply of blood to skin
surface*
shivering (unqualified) is neutral

therefore less heat lost by skin

2

[7]

3 any **three** from:

heat produced by muscles

during exercise

accept when working

by respiration

(skin) temperature over muscles rises / more blood to skin over muscles

*allow vasodilation **or** arterioles dilate over muscles*

reject capillaries dilate

sweating neutral

[3]

4 (a) (i) protein

for 1 mark

1

(ii) e.g. molecules too large

for 1 mark

1

(b) e.g. most of water reabsorbed, but little urea

for 1 mark

1

(c) (i) restores concentration of dissolved substances, to normal level,
wastes pass into dialysis fluid

for 1 mark each

3

- (ii) the same (0.35) or slightly below (<0.35),
so that concentration of salts in blood remains constant

for 1 mark each

2

[8]

5

- (a) increases

gains 1 mark

but

70 × more (concentrated)

gains 2 marks

2

- (b) *idea that*
water is reabsorbed;
urea is not reabsorbed (as much)

each for 1 mark

(credit (much) more water reabsorbed
than urea)

gains 2 marks

2

[4]

6

- (a) more energy needed,
for increased muscular activity

for 1 mark each

2

- (b) increased sweat production,
evaporation of sweat cools body,
vasodilation OWTTE,
more heat loss (by radiation)

for 1 mark each

4

[6]

7

- (a) water filtered from blood
smaller proportion reabsorbed therefore larger volume of dilute urine produced

each for 1 mark

4

- (b) (i) use of dialysis machine which restores concentrations of
substances in blood to normal levels
transplant of healthy kidney **or** compatible kidney

each for 1 mark

4

- (ii) 5 of e.g.:
dialysis needs much time attached to machine
consequent effect on lifestyle (qualified) need for special diet
transplant gives 'normal' life (qualified)
transplant cheaper in long term
risk attached to transplant operation
shortage of donors etc.
each for 1 mark

5

[13]

8

- (i) 2500 – 1000
= 1500

for 1 mark each

2

- (ii) 3 of
filter blood
reabsorb water
in sufficient quantities to keep body water content constant
produce dilute urine if water content of body high/reverse argument
any 3 for 1 mark each

3

[5]

9

- 8 of e.g.:
muscles release energy as heat
blood flowing through muscles heated increased blood temperature sensed by
centre in brain
impulses to skin blood vessels
particularly overlying muscles used in exercise to dilate
increased surface flow in these regions
gives pattern shown on thermographs
each for 1 mark

[8]