THE HUMAN NERVOUS SYSTEM PART II

Q1.

(a) Use words from the box to complete the sentences about controlling conditions in our bodies.

kidneys	liver	lungs	skin

(i) When we breathe out, water leaves the _____

(1)

(ii) When we sweat, water leaves the body through the _____

(1)

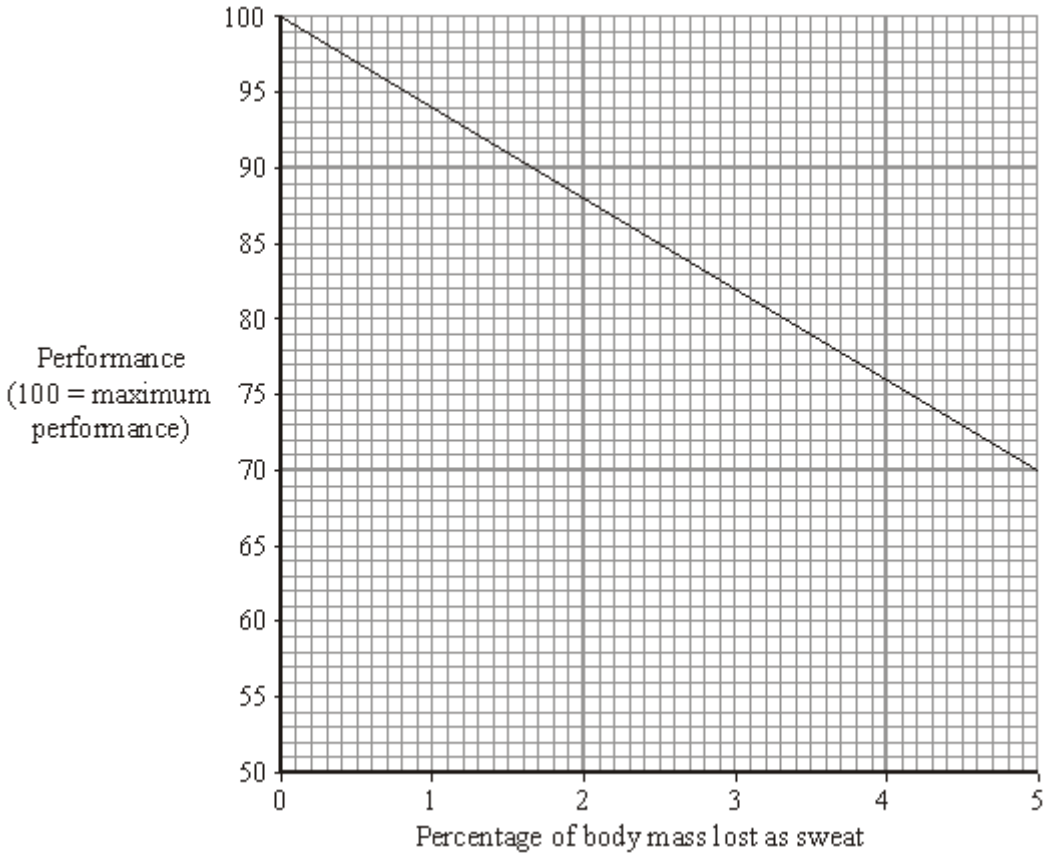
(iii) Excess water leaves the body in a liquid called urine.

Urine is produced by the _____

(1)

(b) We lose a lot of sweat during exercise. When this happens, we cannot perform as well as we could at the start of the exercise.

The graph shows the effect of losing sweat on the performance of an athlete.



(i) Describe the effect of losing sweat on performance.

_____

_____

(1)

(ii) How can athletes reduce this effect on performance?

_____

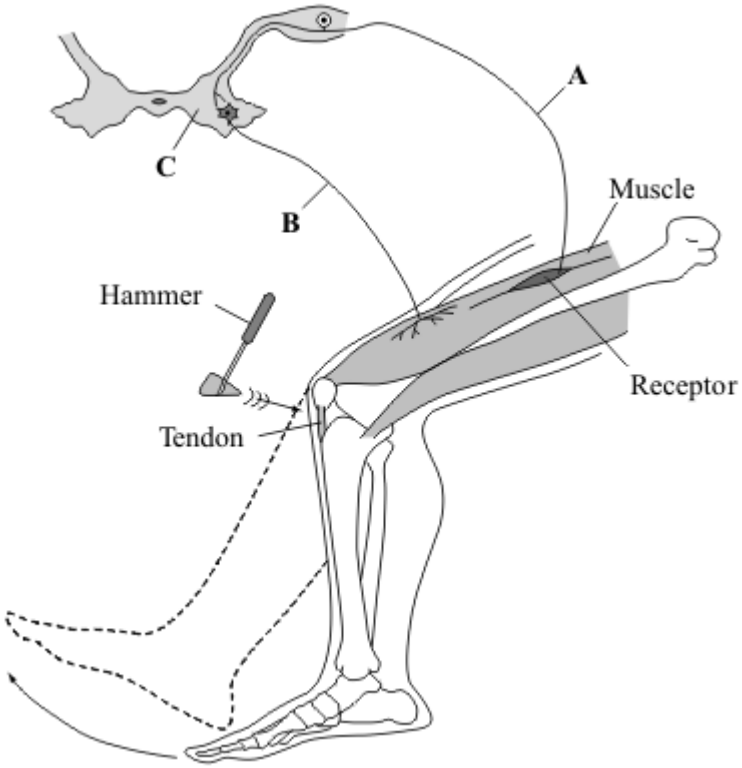
_____

(1)

(Total 5 marks)

Q2.

The diagram shows the structures involved in the knee-jerk reflex. When the tendon is struck with the hammer, the receptor is stimulated and the lower leg moves forward.



(a) Name the structures labelled **A**, **B** and **C**.

A _____

B _____

C _____

(3)

(b) How is information passed from structure **A** to structure **B**?

_____

_____

(1)

(c) What is the effector in this response?

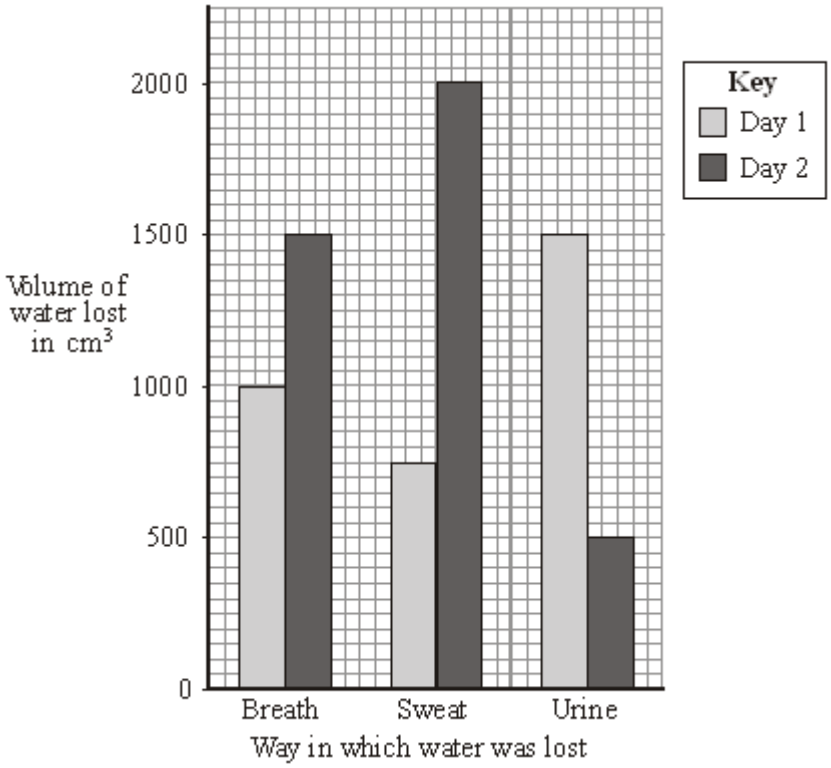
_____

(1)
(Total 5 marks)

Q3.

The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.



(a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2? Show all your working.

_____

_____ cm^3

(2)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day _____

Give **two** reasons for your answer.

1. _____

_____

2. _____

_____

(2)

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

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

Breathing	☐
Osmosis	☐
Respiration	☐
Sweating	☐

(1)

(ii) How does sweating help the body?

_____

_____

(1)

(iii) If the body loses more water than it gains, it becomes dehydrated.
The concentration of the solution surrounding the body cells increases.
This causes the cells to lose water.

By which process do cells lose water?

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

Breathing	☐
Osmosis	☐
Respiration	☐
Sweating	☐

(1)

(Total 7 marks)

Q4.

The brain and the skin are involved in monitoring and controlling body temperature.

(a) Describe the parts played by the brain and the skin in monitoring body temperature.

(i) The brain

_____

_____

_____

_____

(2)

(ii) The skin

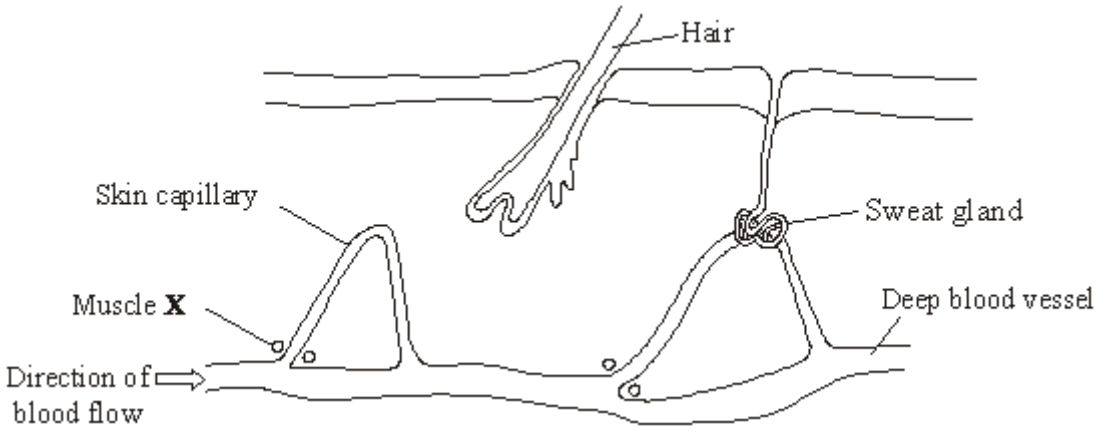
_____

_____

(1)

(b) The diagram shows a section through part of the skin.

The muscle labelled **X** controls the flow of blood into the skin capillary. When muscle **X** contracts, the flow of blood into the skin capillary is reduced.



Explain the role of muscle **X** in the control of body temperature.

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q5.

The drawing shows a group of people in a café.

(a) Use words from the box to answer the questions.

brain	eye	nose	skin	tongue

Which organ contains receptors that allow a person to:

(i) read the newspaper _____

(1)

(ii) smell the coffee _____

(1)

(iii) feel how hot the cup is _____

(1)

(iv) taste the coffee? _____

(1)

(b) A cigarette manufacturer increased the amount of nicotine in cigarettes by 11% between 1997 and 2006. The manufacturer did not tell the public about this change.

(i) Suggest **one** reason why the manufacturer increased the amount of nicotine in the cigarettes.

_____

_____

(1)

(ii) Suggest **one** reason why the manufacturer did not tell the public about the change.

_____

_____

(1)

(Total 6 marks)

Q6.

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	
urine	100
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 = _____ cm^3

(2)

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

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

$\frac{1}{4}$ ☐

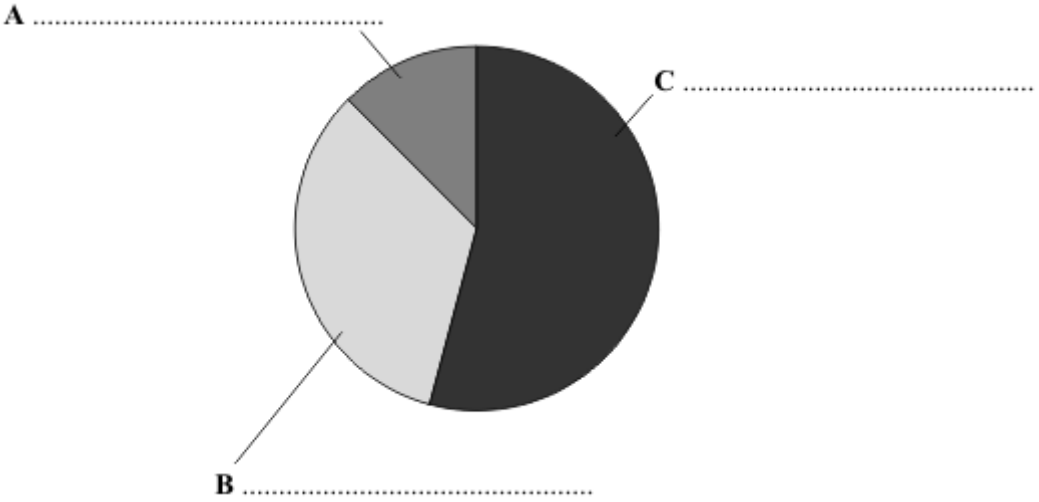
$\frac{1}{3}$ ☐

$\frac{1}{2}$ ☐

(1)

(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.



(1)

(c) How does sweating help the body?

_____

_____

(1)

(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	☐

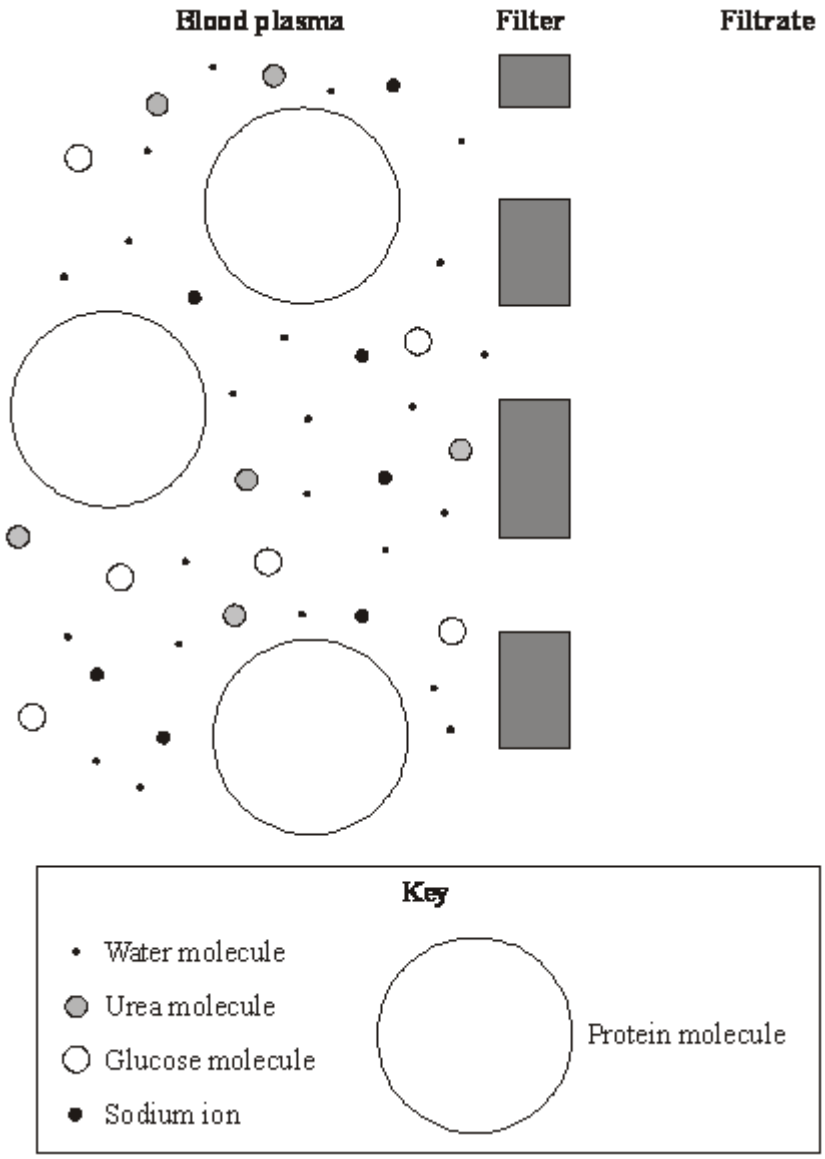
(2)

(Total 7 marks)

Q7.

The kidneys filter the blood.

The diagram shows the site of filtration in the kidney.



(a) Use information from the diagram to answer this question.

Put a tick (✓) in the box next to every substance that will pass through the filter from the blood plasma into the filtrate.

One has been done for you.

glucose	✓
urea	
water	
sodium ions	
protein	

(2)

(b) Proteins and glucose are not present in the urine of a healthy person.

(i) Use information from the diagram to explain why protein is not found in the urine of a healthy person.

_____

_____

(1)

(ii) Complete the sentence by drawing a ring around the correct answer.

After filtration, all the glucose is

reabsorbed
released
respired

(1)

(c) An athlete trained on a hot day and on a cold day. On each day, he did the same amount of exercise and drank the same volume of water.

Complete the sentences by drawing a ring around the correct answer.

(i) On the hot day, the athlete would produce

less
more
the same amount of

urine.

(1)

(ii) This is because he would produce

less
more
the same amount of

sweat.

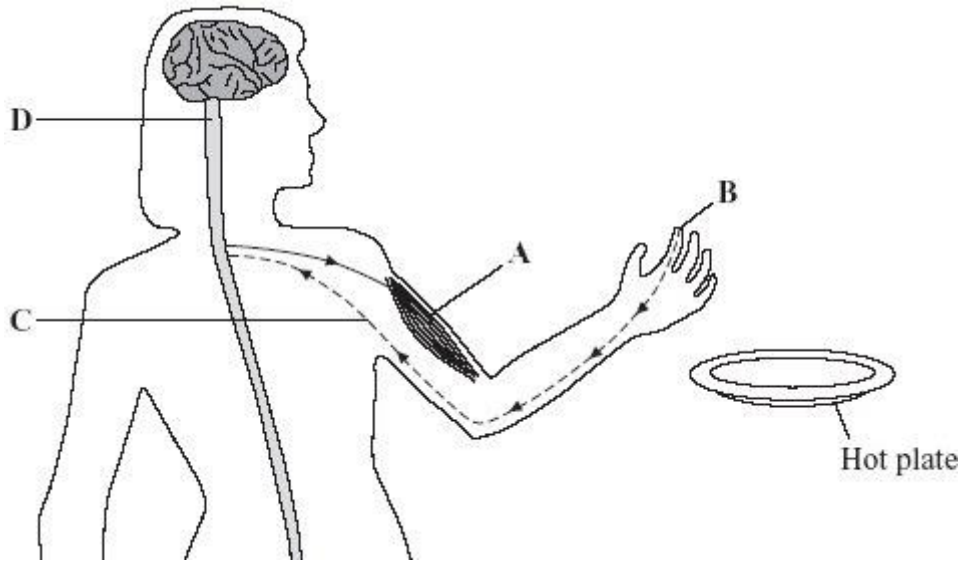
(1)

(Total 6 marks)

Q8.

A girl picks up a hot plate. A reflex action causes her to drop it.

The diagram shows some of the structures involved in this reflex action.



Use words from the box to name the structures labelled **A**, **B**, **C** and **D**.

brain	gland	muscle	neurone	receptor	spinal cord

A _____

B _____

C _____

D _____

(Total 4 marks)

Q9.

A runner might drink a special 'sports drink' at intervals during a marathon race. The table shows the substances present in a sports drink.

Substance	Percentage
Water	
Sugar	5.0
Ions	0.2

(a) Complete the table to show the percentage of water in the sports drink.

(1)

(b) The runner sweats and also breathes heavily during the race.

(i) Why does the runner need to sweat?

_____

(1)

(ii) Which **two** substances in the table are lost from the body in sweat?

_____

(1)

(iii) Which substance in the table is lost from the body during breathing?

_____

(1)

(c) How does the sugar in the sports drink help the athlete during the marathon?

_____

_____

(2)

(Total 6 marks)

Q10.

Each week, an athlete trains on 5 days (training days) but does not train on the other 2 days (rest days).

The table shows how water losses from the athlete's body are different on a rest day from those on a training day.

	Volume of water lost in cm^3	
Method	**Rest day**	**Training day**
Urine	1500	900
Sweating	625	2400
Breathing	450	1500
Faeces	125	120
Total	2700	

(a) Complete the table to show the total volume of water lost by the athlete on a training day.

(1)

(b) Explain why the athlete sweats more on a training day.

_____

_____

_____

_____

(2)

(c) On a training day, the athlete needs to take in more water.

Explain why the athlete needs to take in more water on a training day.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q11.

(a) Each day, a boy ate food containing 12 000 kilojoules of energy. The boy's body used 80 per cent of this energy to maintain his core temperature.

(i) Name the process which releases energy from food.

_____

(1)

(ii) Calculate the amount of energy that the boy would use each day to maintain his core body temperature. Show clearly how you work out your final answer.

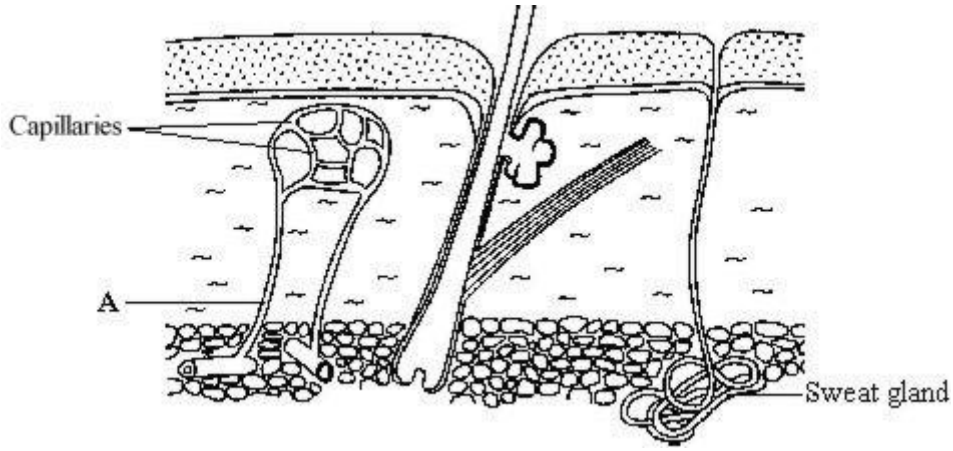
_____

_____

Amount of energy used each day = _____ kJ

(2)

(b) The diagram shows a section through human skin.



Explain how structure **A** helps to cool the body on a hot day.

_____

_____

_____

_____

_____

(3)

(c) Body temperature is monitored and controlled by the thermoregulatory centre. Where in the body is the thermoregulatory centre?

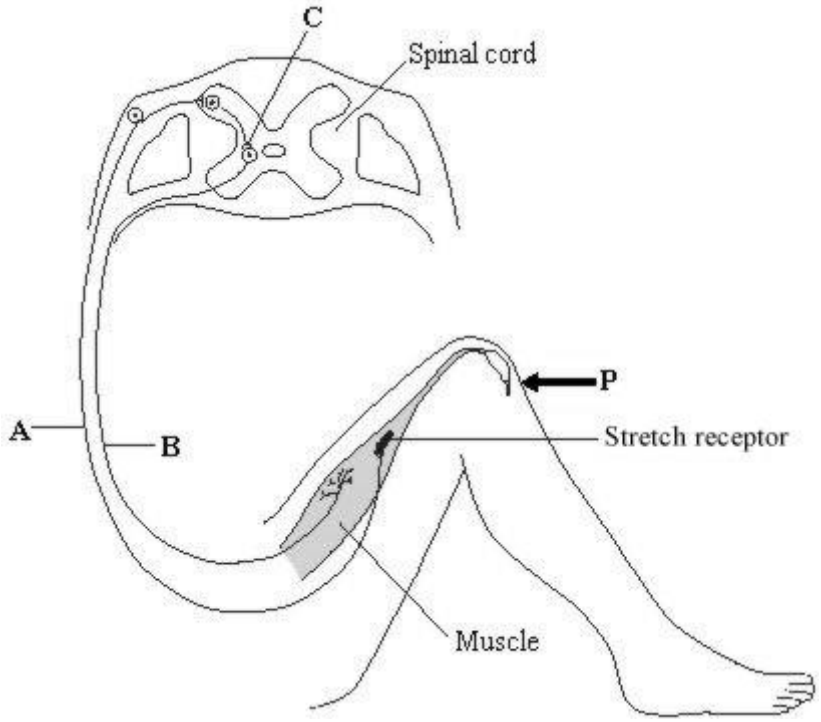
_____

(1)

(Total 7 marks)

Q12.

The diagram shows the nervous pathway which is used to coordinate the knee-jerk reflex. When the person is hit at point **P**, the lower leg is suddenly raised.



(a) (i) Name the type of neurone labelled **A**. _____

(1)

(ii) **On the diagram**, draw arrows next to the neurones labelled **A** and **B** to show the direction in which an impulse moves in each neurone.

(1)

(b) How is information passed across the synapse at **C**?

_____

(1)

(c) **On the diagram**, label the effector with the letter **X**.

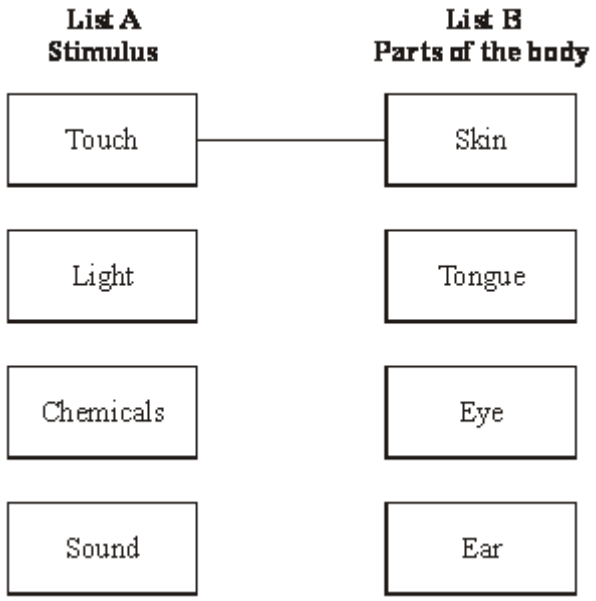
(1)

(Total 4 marks)

Q13.

(a) List **A** gives the names of four stimuli. List **B** gives four parts of the human body.

Draw a straight line from each stimulus in List **A** to the part of the body in List **B** which has receptors for that stimulus.
(One has been done for you.)



(3)

(b) Complete the following sentence by choosing the correct words from the box.

brain	**glands**	**motor**	**sensory**

To make us aware of a stimulus, impulses are sent along a _____ neurone

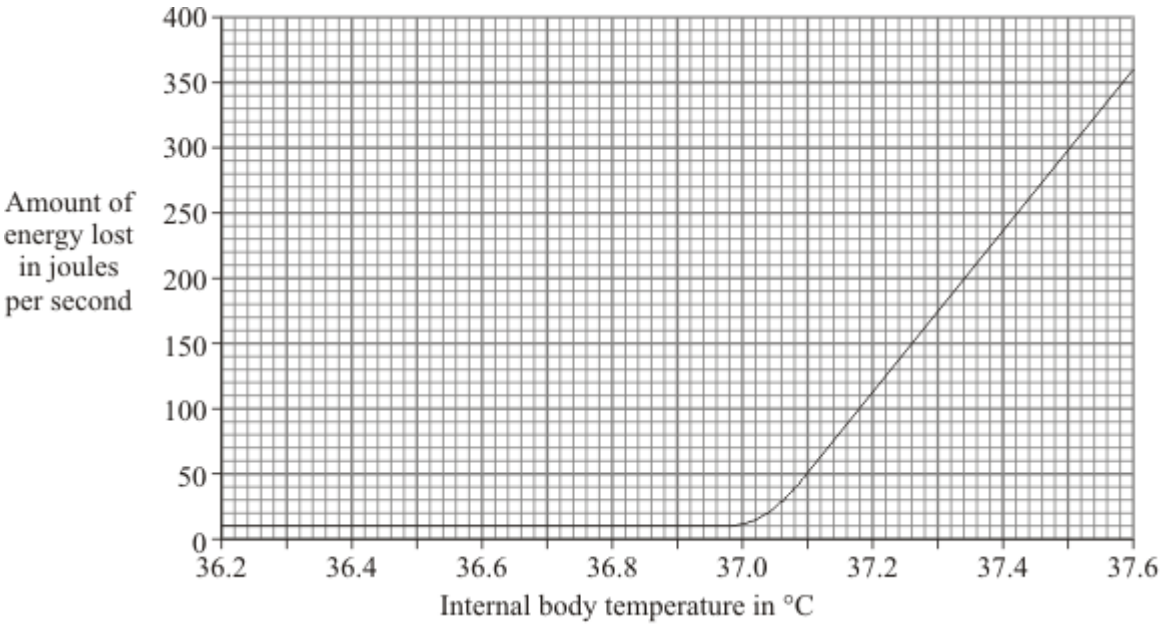
to the _____

(2)

(Total 5 marks)

Q14.

The internal body temperature determines how much a person sweats. The graph shows the effect of different internal body temperatures on a person's rate of energy loss by sweating.



(a) How much more energy was lost from the body each second by sweating when the body temperature was 37.6 °C than when it was 36.6 °C? Show clearly how you work out your final answer.

Amount of energy = _____ joules per second

(2)

(b) Explain why a person would feel more thirsty when the body temperature was 37.6 °C than when it was 36.6 °C.

(2)

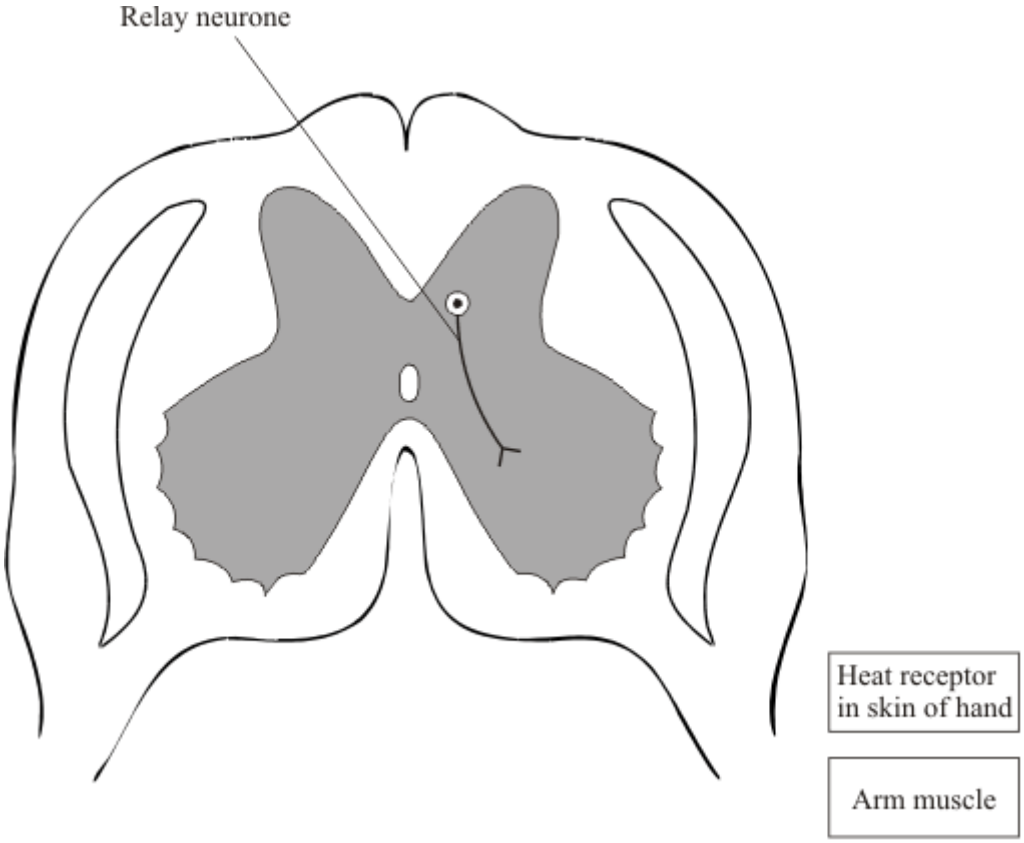
(c) Explain how sweating helps to control body temperature.

(3)

(Total 7 marks)

Q15.

The diagram shows a section through the spinal cord.



(a) Coordination of a reflex movement of the arm, in response to the hand touching a hot object, involves three neurones. One of these, the relay neurone, is shown in the diagram. Complete the nerve pathway between the receptor and the muscle on the diagram by drawing and labelling:

(i) the sensory neurone;

(ii) the motor neurone.

(2)

(b) The nerve pathway linking the heat receptor in the hand with the arm muscle is about
1.5 metres in length. It would take the nervous impulse 0.02 seconds to travel this distance along a neurone. However, it takes about 0.5 seconds for the arm to start moving during the reflex response to the heat stimulus.

Explain the difference.

_____

_____

_____

_____

(2)

(Total 4 marks)

Q16.

The pictures show three mammals and their average body temperature in °C.

Hamster	Horse	Sheep
		
36.8 °C	38.0 °C	39.2 °C

NOT TO SCALE

Describe **three** different ways by which most mammals are able to maintain a constant body temperature when the temperature of the environment falls.

_____

_____

_____

_____

_____

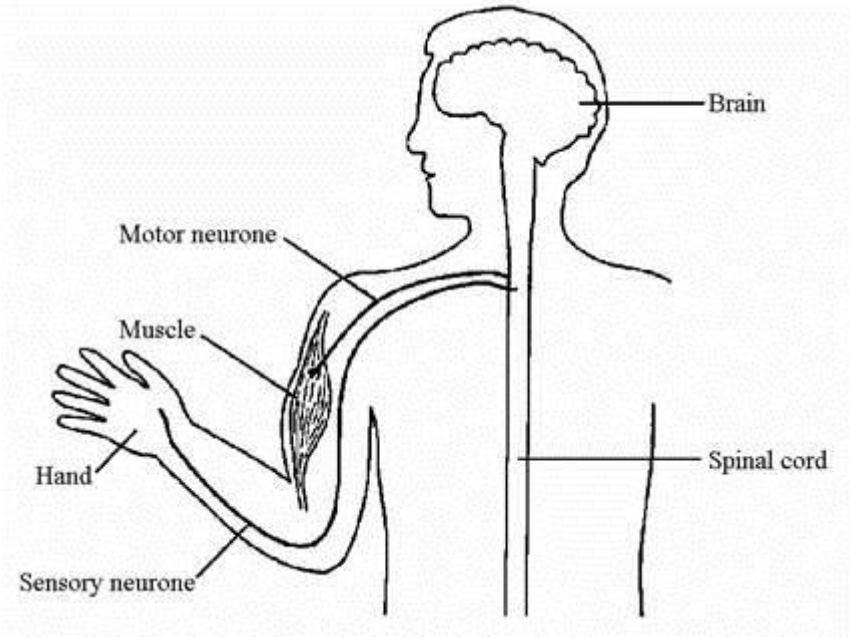
_____

_____

(Total 6 marks)

Q17.

The diagram shows a reflex pathway in a human.



(a) Label the *receptor* on the diagram.

(1)

(b) Label the *effector* on the diagram.

(1)

(c) (i) Suggest a stimulus to the hand that could start a reflex response.

_____

(1)

(ii) Describe the response that this stimulus would cause. _____

_____

_____

(1)

(d) Put arrows on the diagram to show the direction of the path taken by the nerve impulses.

(1)

(Total 5 marks)

Q18.

Humans use receptors to help them to respond to stimuli in the environment. Match up each receptor with the correct sense. One has been done for you.

Receptor	Sense
ear	hearing
skin	taste
tongue	balance
skin	touch
eye	smell
ear	sight
nose	temperature

(Total 5 marks)

Q19.

(a) During respiration, sugar is oxidised to release energy. Complete the equation for respiration.

Sugar + _____ = _____ + _____ + energy

(3)

(b) The photograph below shows an athlete using an exercise machine. The machine can be adjusted to vary the rate at which the athlete is required to work.

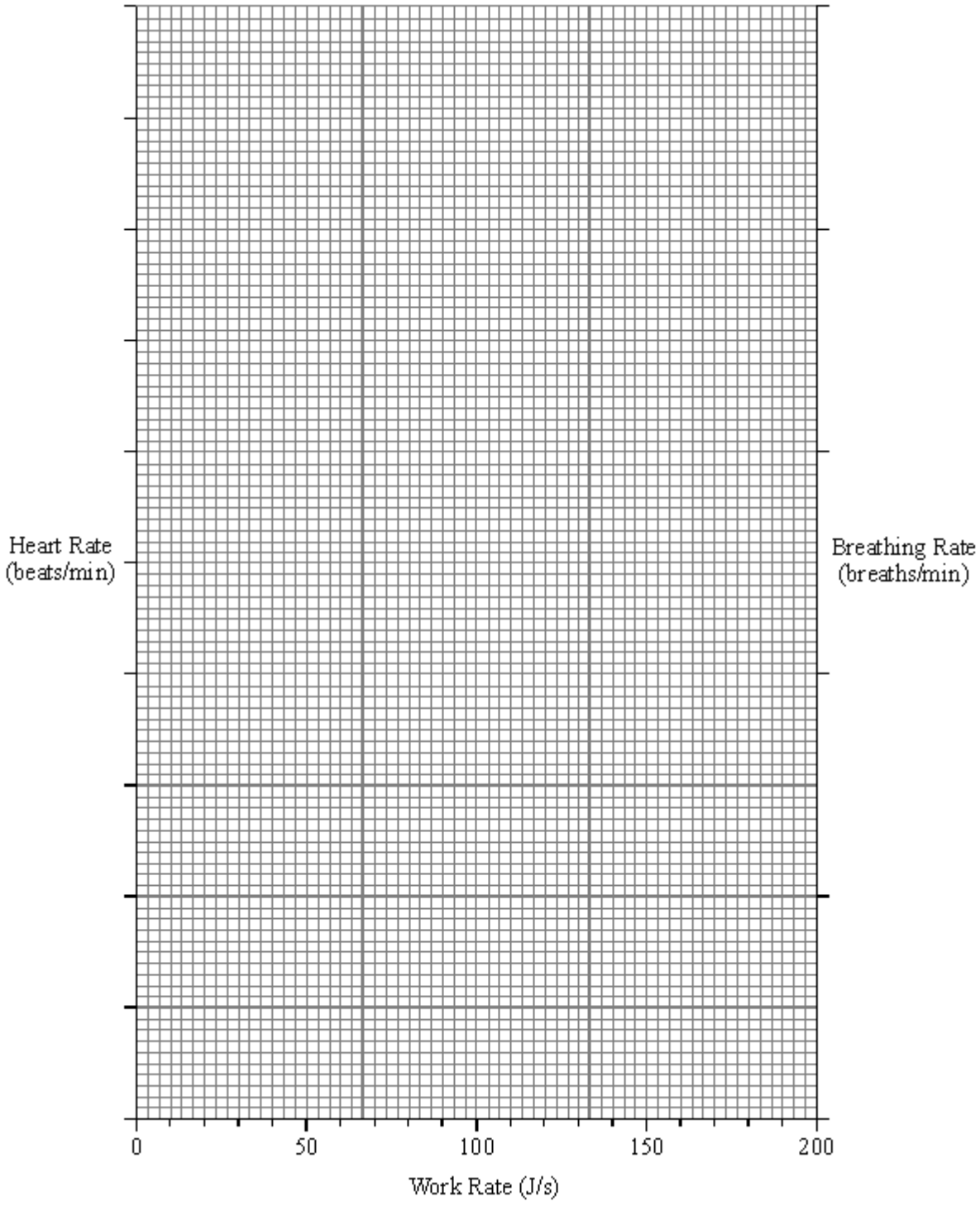
The athlete's heart rate and breathing rate were measured at different work rates.

The table below shows the results which were obtained.

WORK RATE (J/s)	HEART RATE (beats/min.)	BREATHING RATE (breaths/min.)
0	86	9.6

60	106	10.0
80	112	10.4
100	122	10.4
120	135	11.4
140	143	14.5
160	156	15.8
200	174	30.5

Plot the data on the graph paper below.



(3)

(c) Explain, as fully as you can, the advantages to the body in the change in breathing and heart rates.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(d) This increase in the rate of heart-beat is a response to a stimulus. For this response suggest:

(i) the stimulus; _____

(ii) the co-ordinator; _____

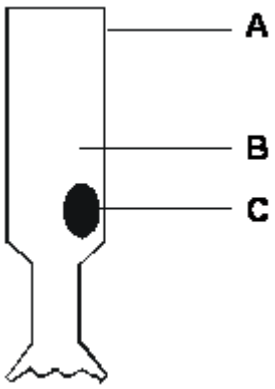
(iii) the effector. _____

(3)

(Total 15 marks)

Q20.

The drawing below shows a light-sensitive (receptor) cell from the eye. The structures labelled A, B and C, can be found in most animal cells.



(a) Name the structures labelled A, B and C.

A _____

B _____

C _____

(3)

(b) Describe, as fully as you can, what happens in the nervous system when this receptor cell is stimulated by light.

_____

_____

_____

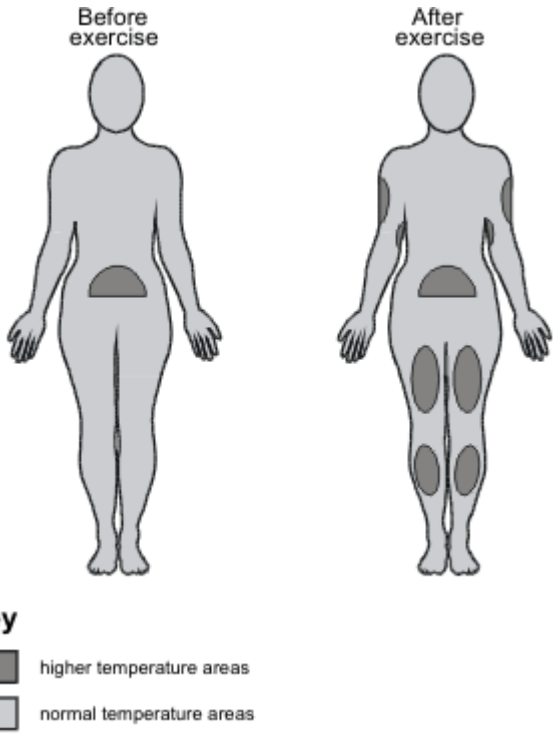
_____

(3)

(Total 6 marks)

Q21.

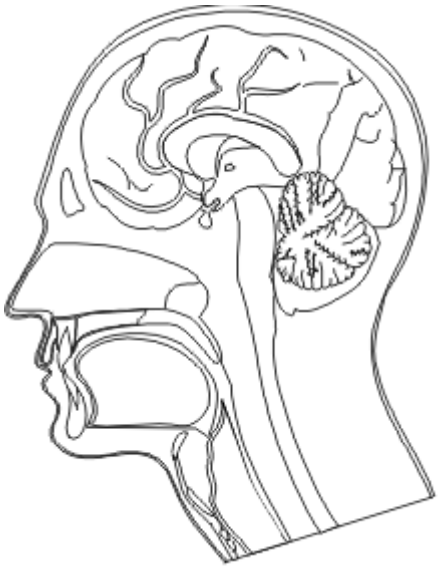
The temperature at the surface of the skin can be measured by using a technique called thermography. Areas with higher temperature appear as a light shade on the thermographs. The drawings below show the results of an investigation in which thermographs were taken before and after exercise.



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)

Q22.



(a) **On the diagram**, use guidelines to label:

1 the brain;

2 the spinal cord.

(2)

(b) Some students are investigating the behaviour of a mouse. They use a large empty box. The box has squares marked on the floor, as shown in the diagram.

(C = corner square, S = side square, I = inside square)

C_1	S_1	S_2	S_3	C_2
S_{10}	I_1	I_2	I_3	S_4
S_9	I_6	I_5	I_4	S_5
C_4	S_8	S_7	S_6	C_3

They put a mouse in the empty box. They record which square the mouse is in every minute for 15 minutes. They get these results.

Time (minutes)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Position of mouse	C_1	C_1	S_2	C_3	C_3	S_9	I_3	C_1	C_1	C_1	S_8	C_4	C_4	C_1	S_2

(i) Fill in the table below to show how much time the mouse spends in the corner squares (C), the side squares (S) and the inside squares (I).

POSITION	TIME (minutes)
Corner (C)	
Side (S)	
Inside (I)	

(3)

(ii) What pattern is shown by the results?

_____

_____

(1)

(iii) Suggest how the behaviour of the mouse might help its survival.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q23.

(a) Give **three** receptors which a mouse might use to detect food under natural conditions.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) Whilst observing mouse behaviour, a student drops a pen near the mouse's cage. The mouse jumps at the noise.

Describe, as fully as you can, the processes by which the mouse responds to the stimulus of the dropped pen.

_____

_____

(6)

(Total 9 marks)

Q24.

The doctor is testing the child's nervous system by tapping the tendon just below the knee.

This pulls cells which are sensitive to stretching.

(a) What are cells which are sensitive to stimuli called?

(1)

(b) These cells send information to the spinal cord.

In what form is this information sent?

(2)

(c) The healthy response to the stimulus is the straightening of the leg.

What is the effector in this response?

_____

(1)

(d) This response is one example of a reflex action.

Describe **one other** example of a reflex action in terms of:

stimulus → receptor → coordinator → effector → response

_____

_____

_____

_____

_____

_____

(5)

(Total 9 marks)

Q25.

A dog runs across the road in front of a car. The driver slams her foot on the brakes.

(i) Explain how the nervous system brings about this response.

_____

_____

_____

_____

_____

_____

_____

(4)

(ii) Explain why alcohol consumption would affect the driver's response.

_____

_____

(1)

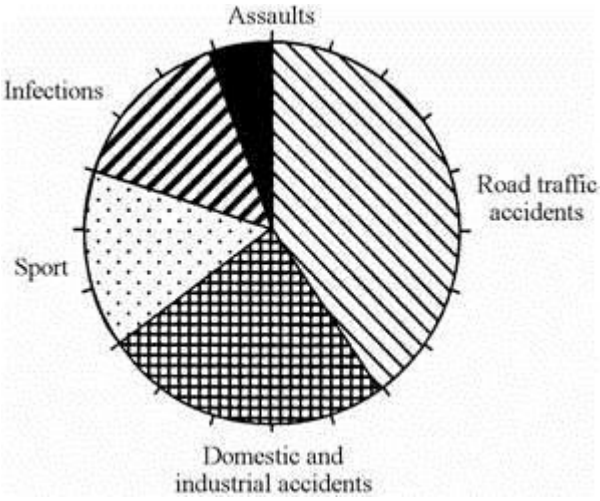
(Total 5 marks)

Q26.

Every year at least 700 people in Britain break their back or their neck. This damages the

spinal cord and may result in permanent paralysis.

(a) The pie chart shows the causes of damage to the spinal cord.



(i) Which is the commonest cause of damage to the spinal cord?

_____

(1)

(ii) Calculate the proportion of injuries to the spinal cord caused by sport.

Proportion _____

(1)

(b) Explain why a man with a damaged spinal cord cannot feel a pin stuck in his toe.

_____

_____

_____

_____

_____

_____

_____

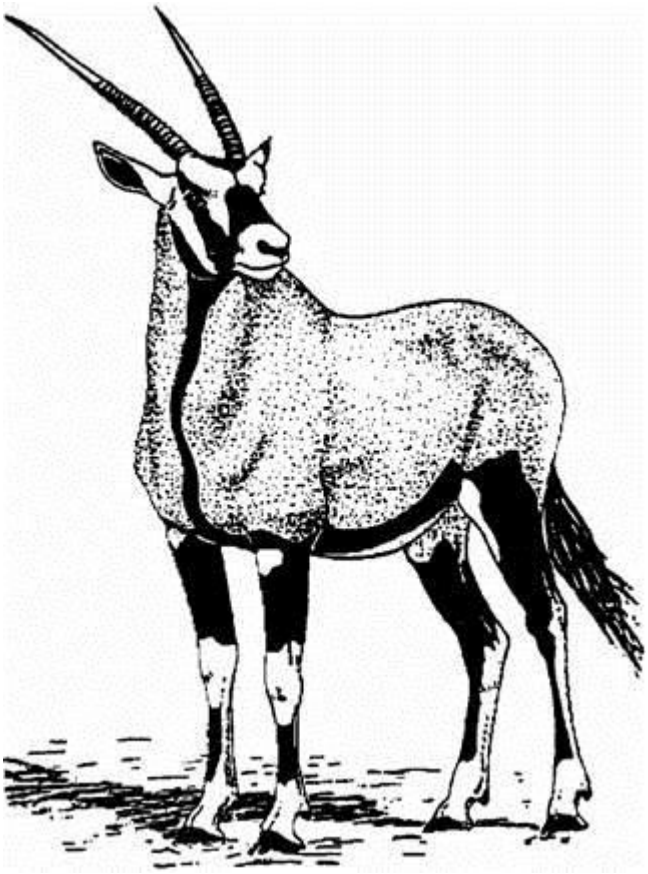
_____

(3)

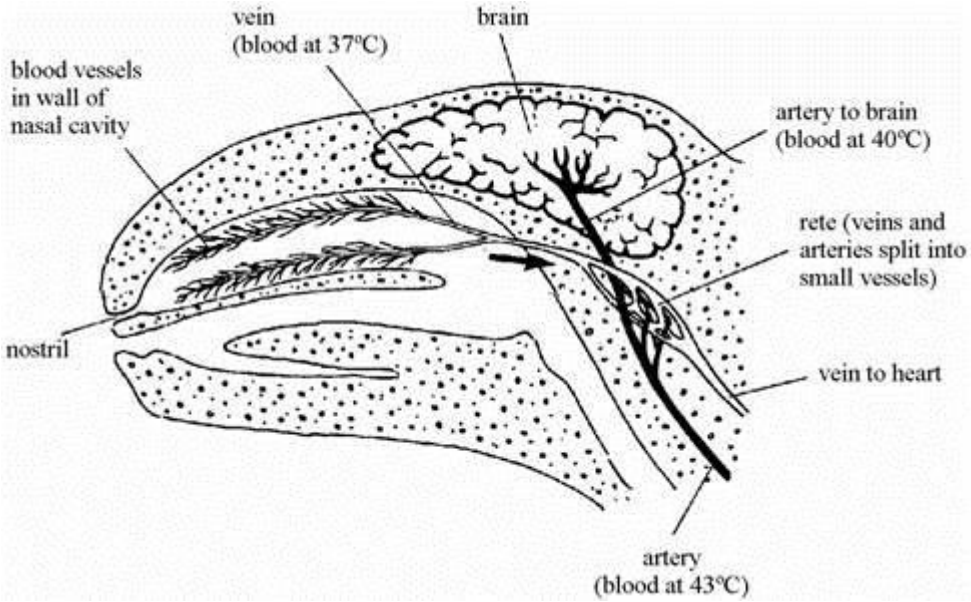
(Total 5 marks)

Q27.

The gemsbok is a large herbivore that lives in herds in desert areas of South Africa. Gemsboks feed on plants that are adapted to living in dry conditions. There are not many rivers, lakes or ponds that can provide drinking water for the animals. The desert areas are hot during the day but cool at night. As the air cools at night it becomes moist, and the plants absorb the moisture.



Although the gemsbok lives in hot conditions, it does not sweat. During the day its body temperature can rise, but it is important that blood reaching the brain does not rise above 40°C. The drawing shows how the blood system is adapted to cool the blood which flows to the brain.



(i) Suggest an advantage to the gemsbok of **not** sweating.

_____

_____

(1)

(ii) Explain how the blood is cooled in the cavities of the nose.

_____

_____

_____

_____

(2)

(iii) How does the structure of the rete help in keeping the brain cool?

_____

_____

_____

_____

(2)

(Total 5 marks)

Q28.

The table shows four ways in which water leaves the body, and the amounts lost on a cool day.

	WATER LOSS (cm^3)	
	COLD DAY	HOT DAY
Breath	400	the same
Skin	500	
Urine	1500	
Faeces	150	

(a) (i) Fill in the table to show whether on a hot day the amount of water lost would be

less **more** **the same**

The first answer has been done for you.

(3)

(ii) Name the process by which we lose water from the skin.

_____

(1)

(b) On a cool day the body gained 2550 cm^3 of water.
1500 cm^3 came directly from drinking.
Give **two** other ways in which the body may gain water.

1. _____

2. _____

(2)

(Total 6 marks)

Q29.

(a) Fill in the table about receptors. The first answer has been done for you.

RECEPTORS IN THE	SENSITIVE TO
Eyes	Light
Skin	
	Sound
Tongue	

(3)

(b) Describe, in as much detail as you can, how information is transmitted from light receptors in the retina to the brain.

_____

_____

_____

_____

(3)

(Total 6 marks)

Q30.

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

_____

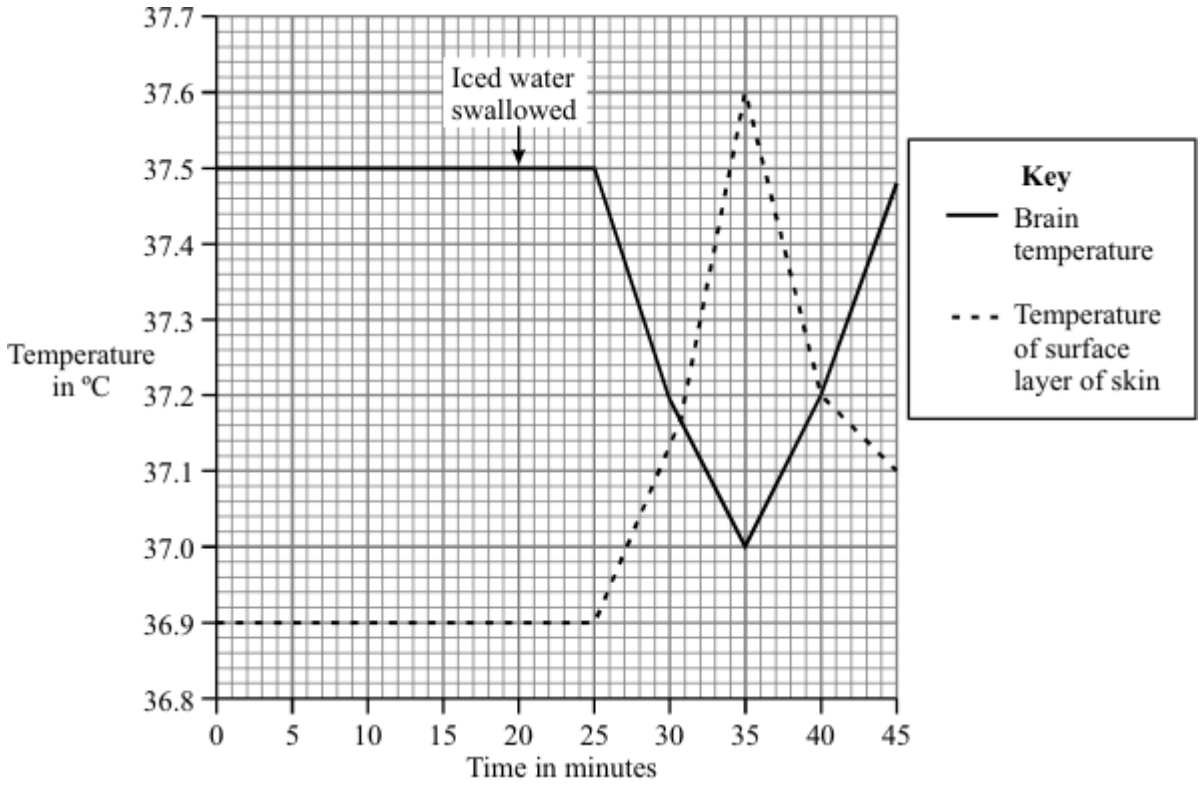
_____

_____

_____

(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)

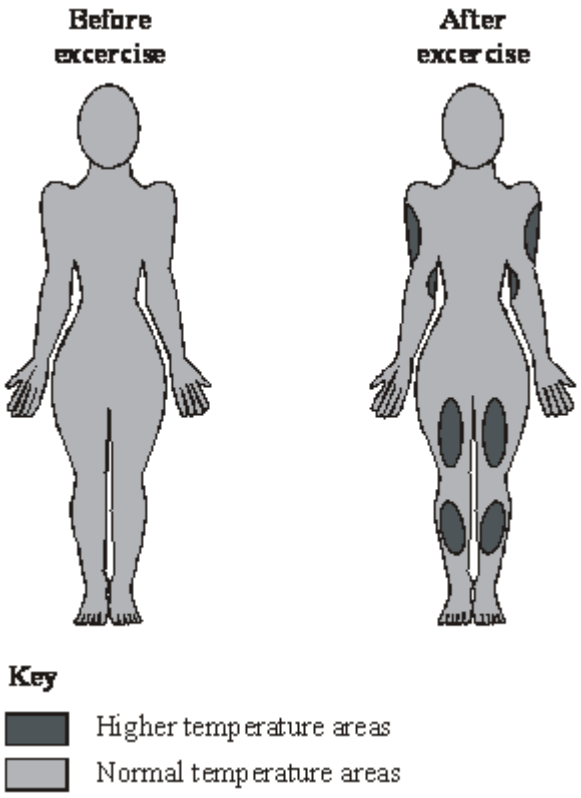
(Total 7 marks)

Q31.

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.



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

_____

_____

_____

_____

_____

_____

_____

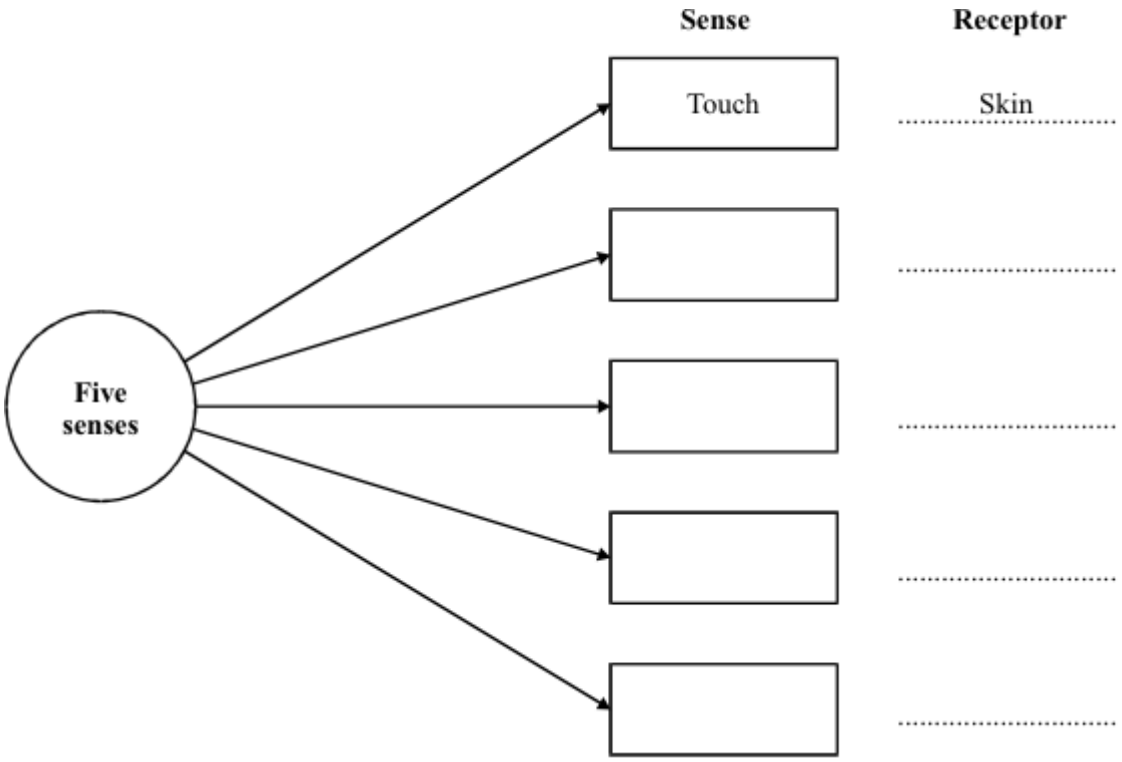
_____

(Total 3 marks)

Q32.

(a) Humans have a number of senses, for example touch. Senses are detected by receptors, for example skin detects touch.

In the boxes write the names of **four** other senses. By each box write the name of the receptor.



(8)

(b) When your hand is touched, the information is passed to your brain. Describe how the information gets from your skin to your brain.

_____

_____

_____

_____

(2)

(Total 10 marks)

Q33.

Describe how the brain is informed of the image detected by the retina.

_____

_____

_____

_____

_____

(Total 3 marks)

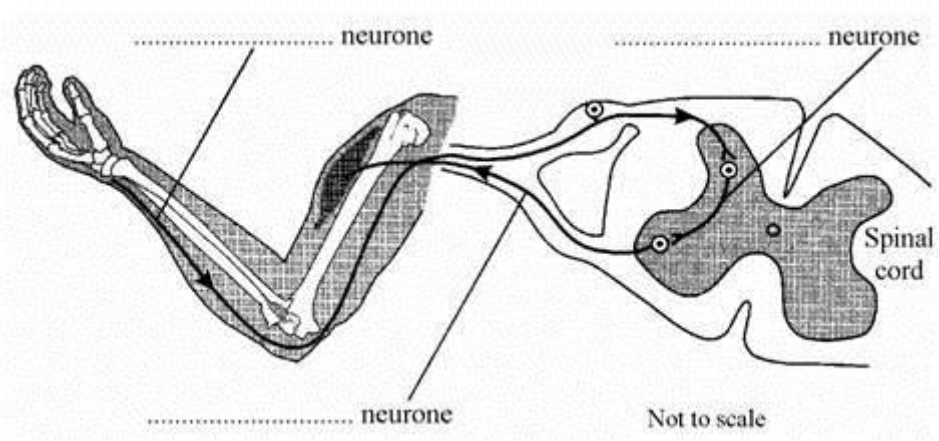
Q34.

(a) What is the name of the organ which controls the nervous system?

_____

(1)

(b) The diagram shows a reflex arc. Label the **three** neurones.



(3)

(c) Snatching your hand from a hot object is an example of a reflex action. Give **one** other example of a reflex action.

_____

(1)

(d) Describe the stages that happen in a reflex action.

_____

_____

_____

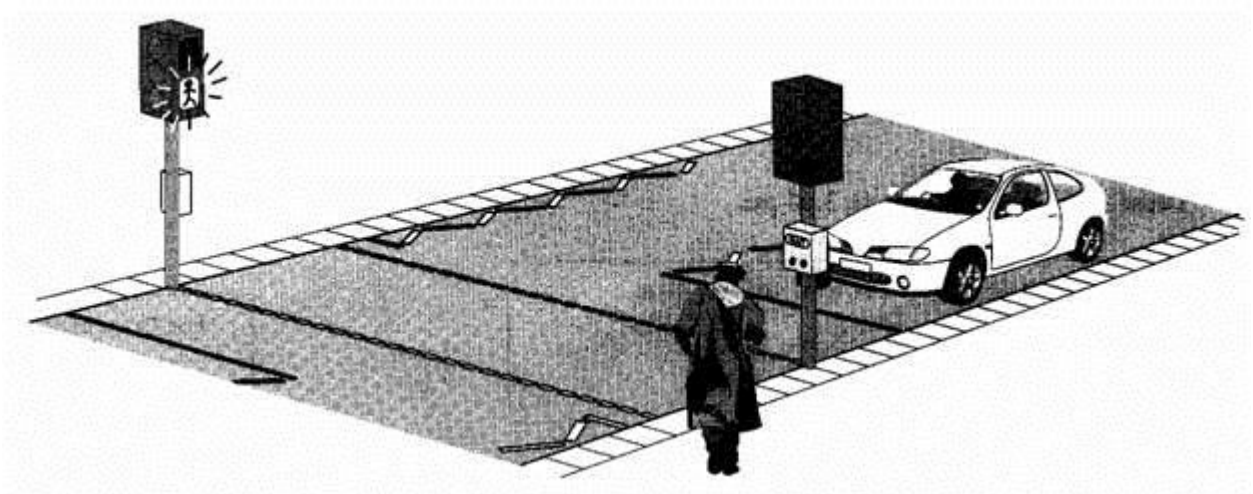
_____

(3)

(Total 8 marks)

Q35.

A man is walking along a street. He plans to cross the road at the pelican crossing. Pelican crossings show a flashing green person and bleep when it is safe to cross.



(a) State **two** different ways the man uses:

(i) his eyes, to help him cross the road safely;

1. _____

2. _____

(2)

(ii) his ears, to help him cross the road safely.

1. _____

2. _____

(2)

(b) (i) Eyes, ears and skin contain sense receptors.

State the names of **two** other parts of the body which contain sense receptors.

_____ and _____

(2)

(ii) What type of sense receptor is in the skin of his feet?

_____

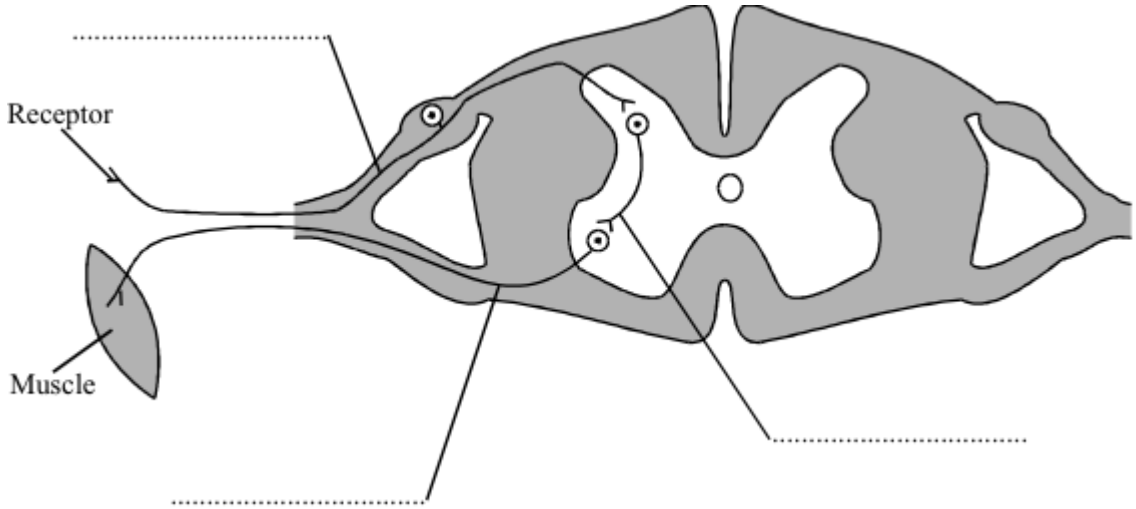
(1)

(Total 7 marks)

Q36.

Information is also passed by impulses in the nervous system. Neurones carry impulses very rapidly. The diagram shows a reflex arc.

Label the diagram by adding the names of the neurones.

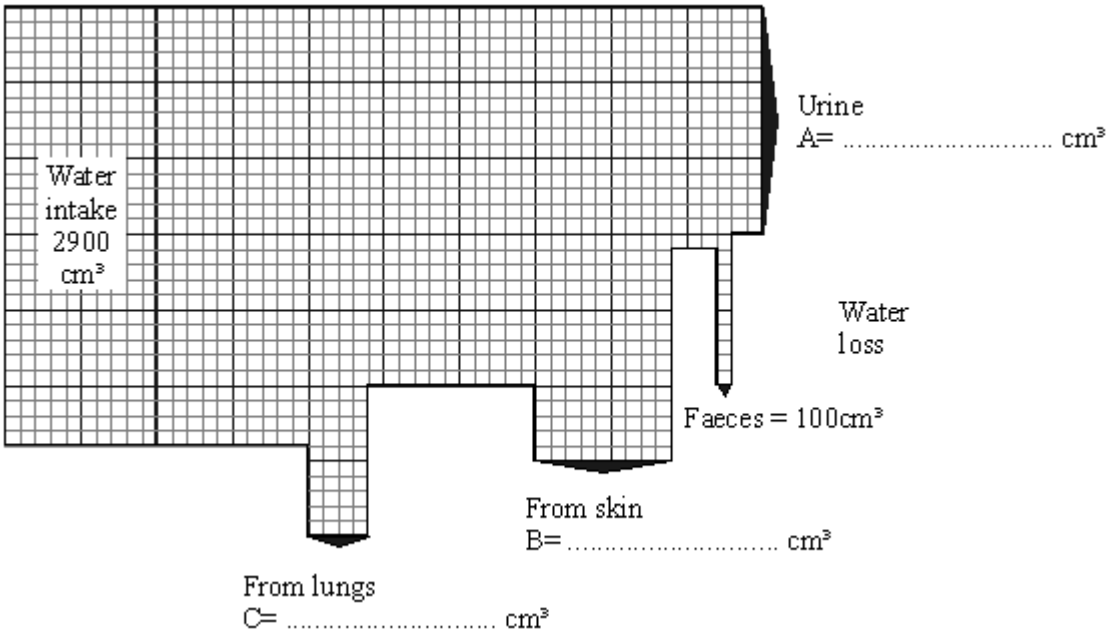


(Total 3 marks)

Q37.

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.

_____

_____

_____

_____

_____

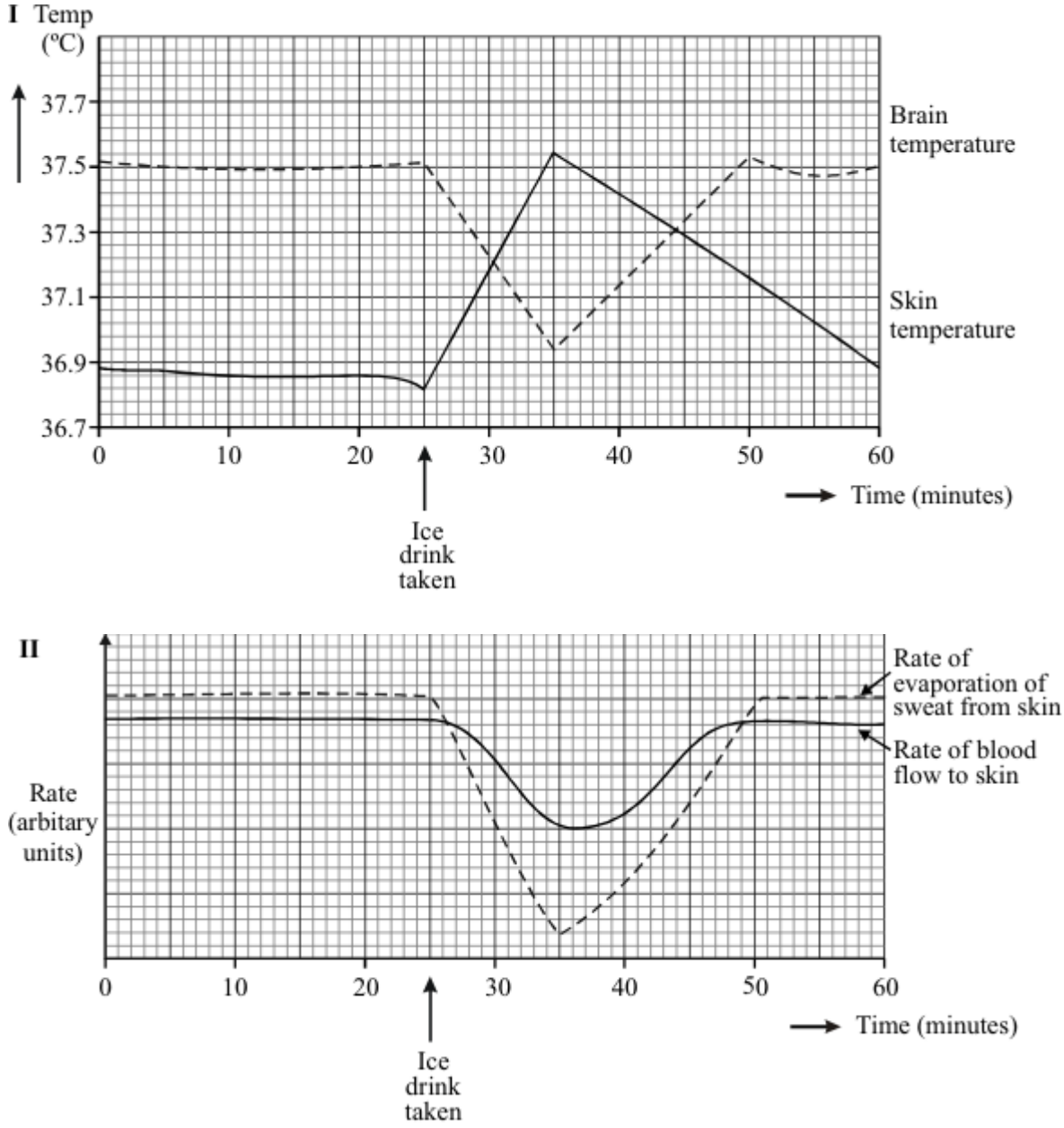
(3)

(Total 7 marks)

Q38.

On a hot day, a student has an iced drink.

Graphs I and II show some of the changes to the student's body produced by the iced drink.



Use the information from the graphs to explain, as fully as you can, why the temperature of the student's skin rises after she has taken the iced drink.

_____

_____

_____

_____

_____

_____

(Total 4 marks)

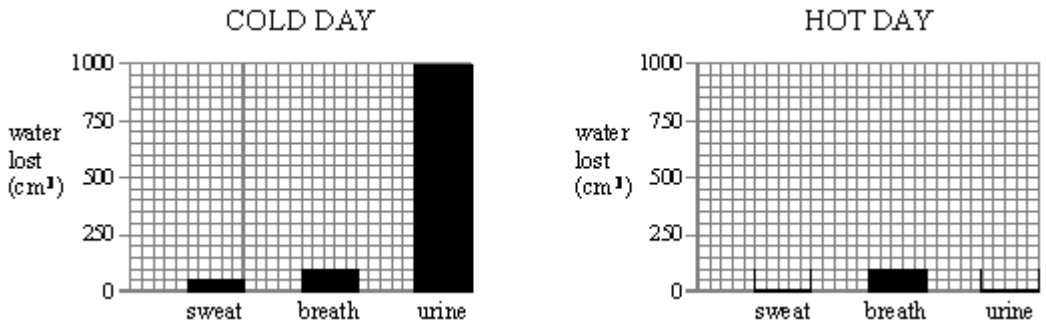
Q39.

The table shows how much water is lost from a boy's body on a cold day and on a hot

day.

WATER LOST (cm^3)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100
in urine	1000	750

(a) Use the figures in the table to complete the bar-chart for a hot day.



(2)

(b) How do the figures for the hot day compare with those for the cold day? Answer in as much detail as you can.

_____

_____

_____

_____

(4)

(c) The boy does the same things for the same amount of time on both days. Explain why the amounts of water lost in sweat and urine change.

Sweat _____

_____

Urine _____

_____

(2)

(Total 8 marks)

Q40.

The table shows how much water is lost from a boy's body on a cold day and on a hot day.

WATER LOST (cm^3)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100

in urine	1000	750

(a) How do the figures for the hot day compare with those for the cold day? Answer in as much detail as you can.

_____

_____

_____

_____

_____

(2)

(b) The boy does the same things for the same amount of time on both days.

Explain why the amounts of water lost in sweat and urine change.

Sweat _____

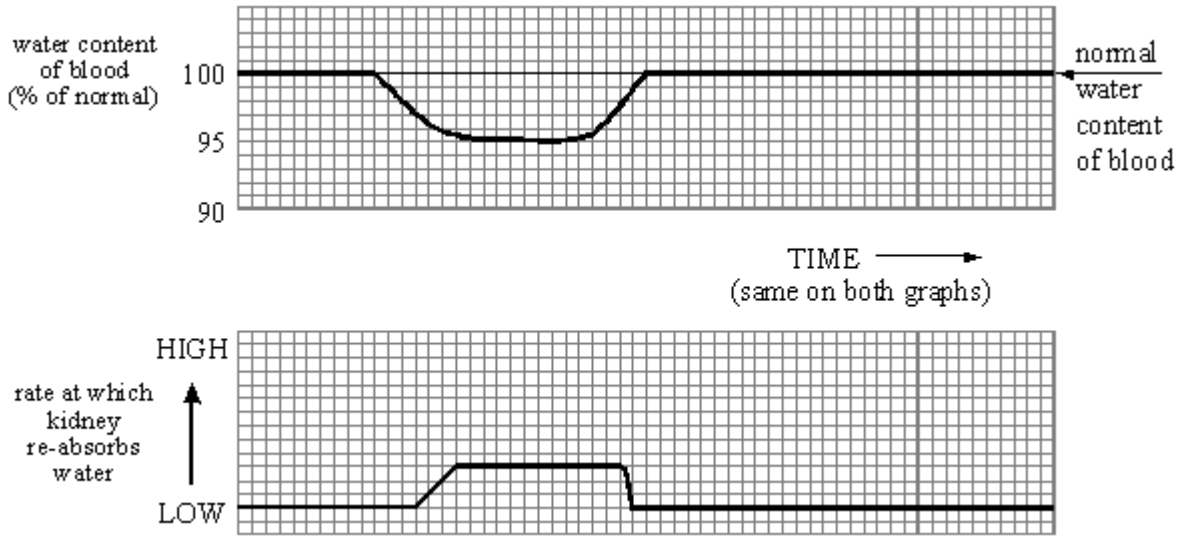
_____

Urine _____

_____

(2)

(c) The rate at which the kidney re-absorbs water depends on the percentage of water in the blood.



Describe, as fully as you can, what the graphs tell you.

_____

_____

_____

_____

(4)

(d) How does your body control the rate at which your kidney re-absorbs water?

_____

_____

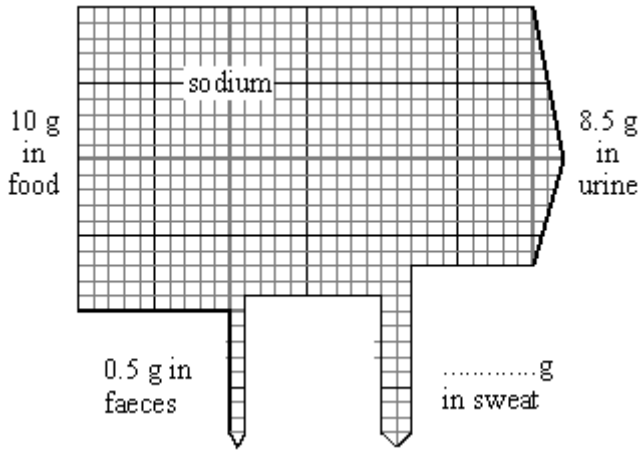
(2)

(Total 10 marks)

Q41.

To stay healthy, the amount of sodium in your body must not change very much.

On average, a girl takes in 10 grams of sodium a day in the food she eats.
The diagram shows what happens to this sodium.



(a) Add the missing figure to the diagram.

(1)

(b) Choose words from this list to complete the sentences below.

bladder **kidneys** **lungs** **skin**

Sweat is produced by the girl's _____

Urine is produced by the girl's _____

(2)

(c) The girl goes on holiday to a very hot place.
Her diet stays the same but she now loses 12 g of sodium each day in sweat.

(i) How will this affect the amount of sodium she loses each day in her urine?

_____

(1)

(ii) What should the girl do to make sure that her body still contains enough sodium?

_____

(1)

(Total 5 marks)