

HORMONAL COORDINATION IN HUMANS PART I

Q1.

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

kidneys	liver	lungs	skin
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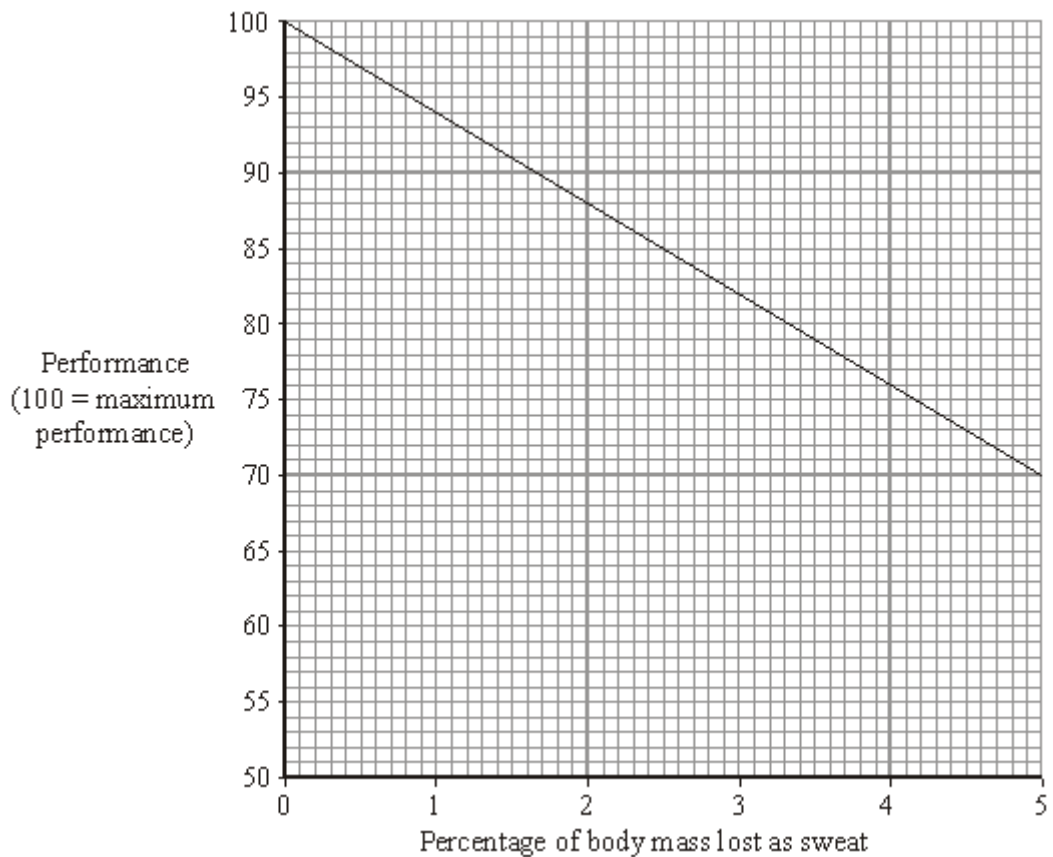
(i) When we breathe out, water leaves the _____ (1)

(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)

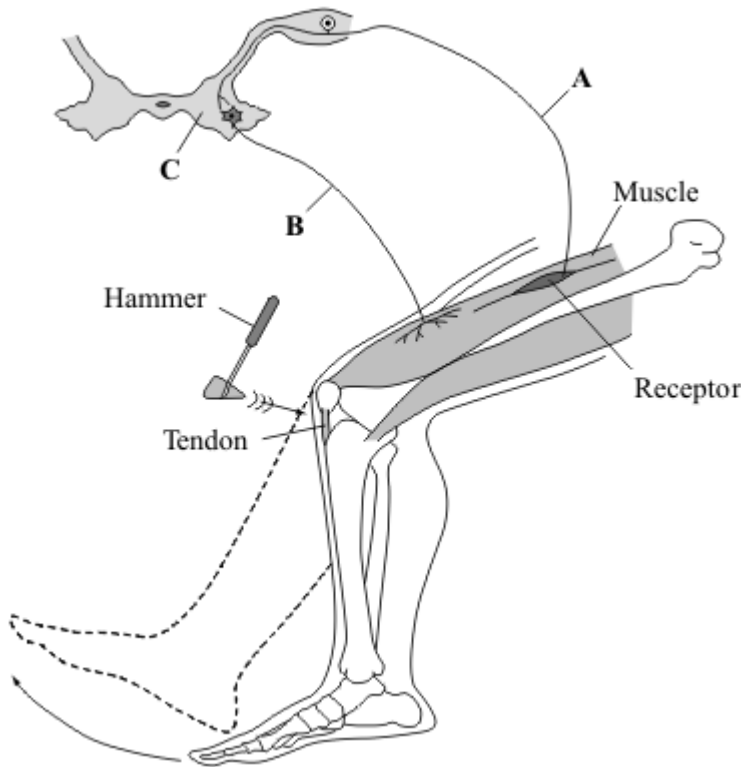
(ii) How can athletes reduce this effect on performance?

(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**?

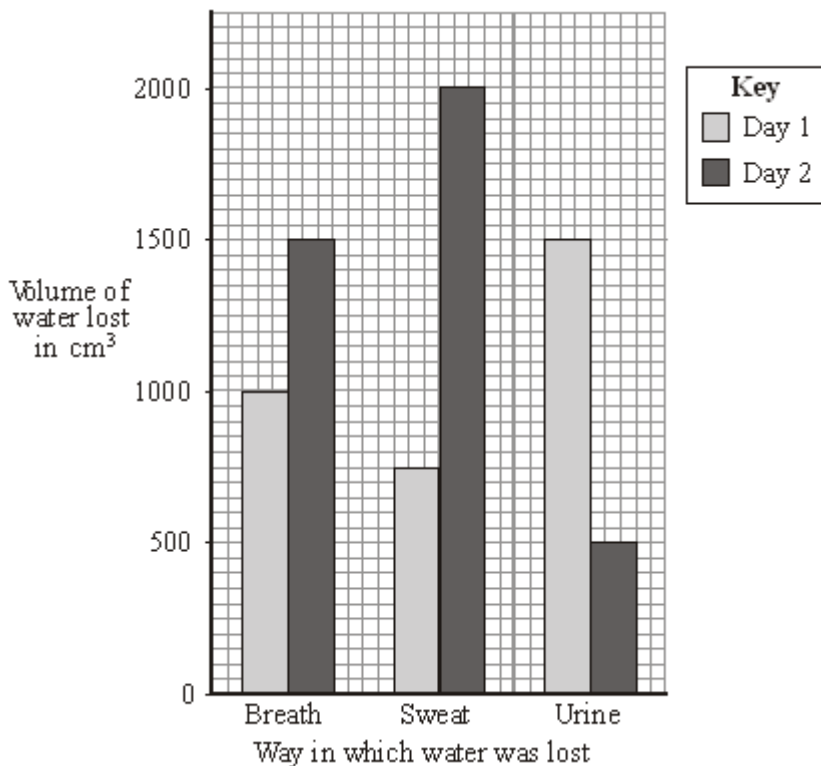
(1)

(c) What is the effector in this response?

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 cm³.

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

_____ cm³

(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

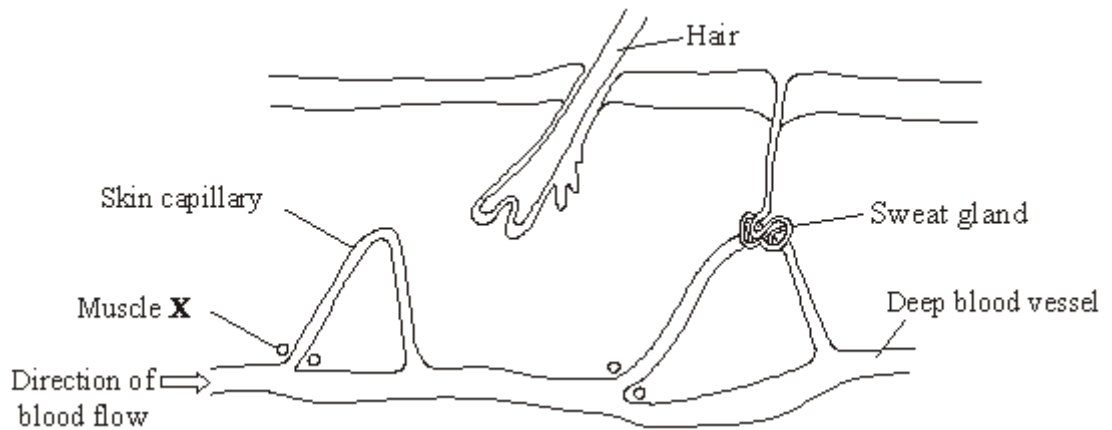
(2)

(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
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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)
- (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 = _____ cm³

(2)

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

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

$\frac{1}{4}$

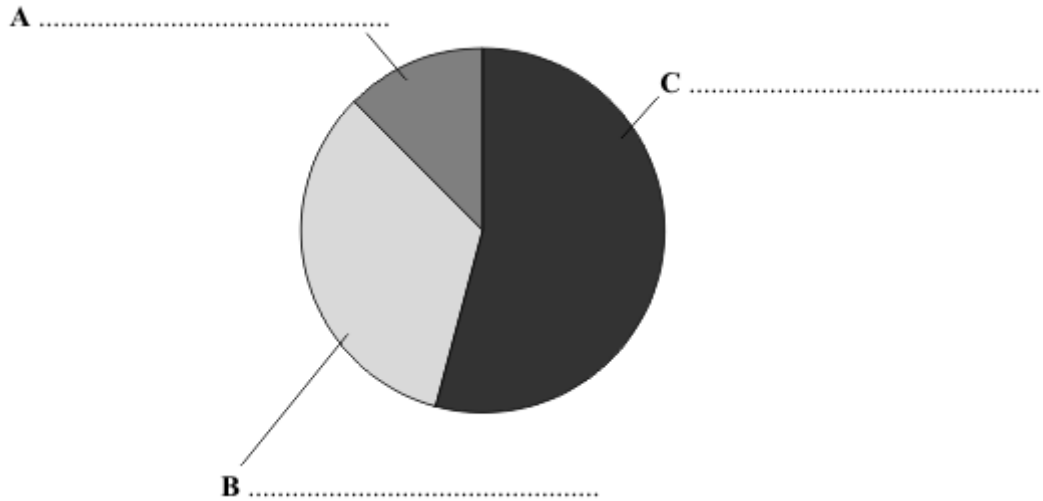
$\frac{1}{3}$

$\frac{1}{2}$

(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	<input type="checkbox"/>
More faeces produced	<input type="checkbox"/>
More food eaten	<input type="checkbox"/>
Less urine produced	<input type="checkbox"/>
Less liquid drunk	<input type="checkbox"/>

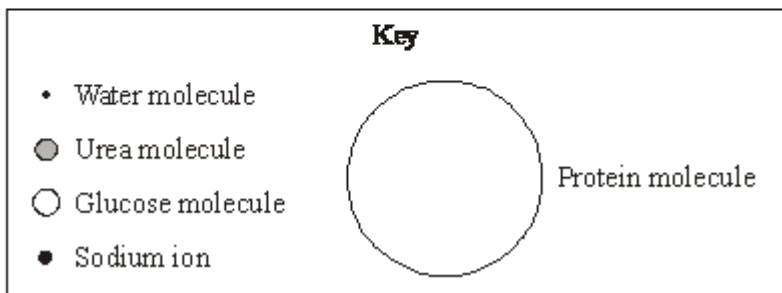
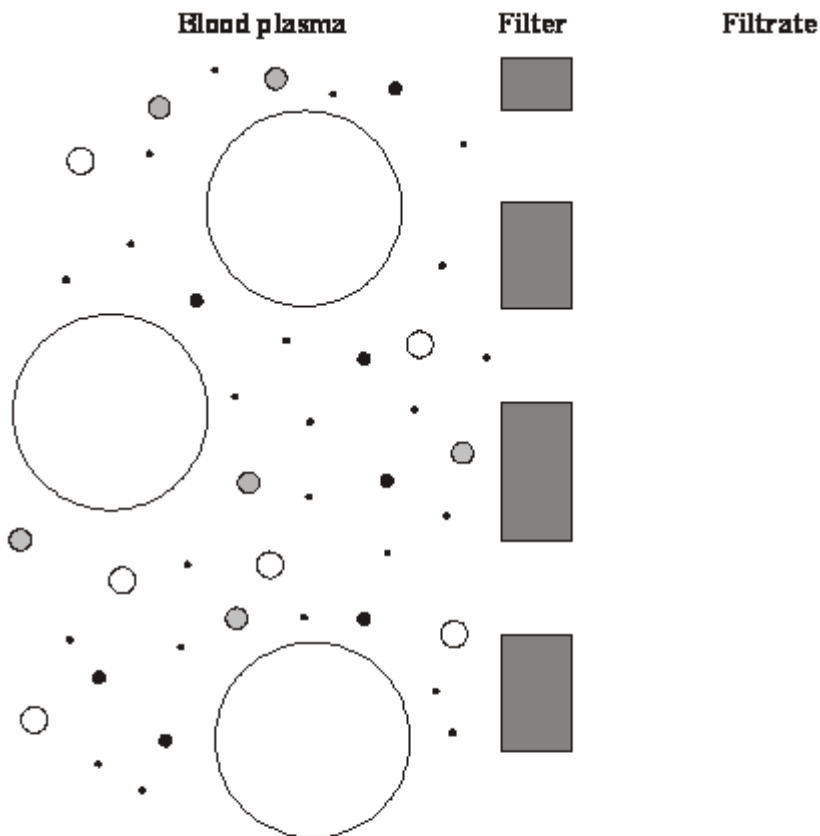
(2)

(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

(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.

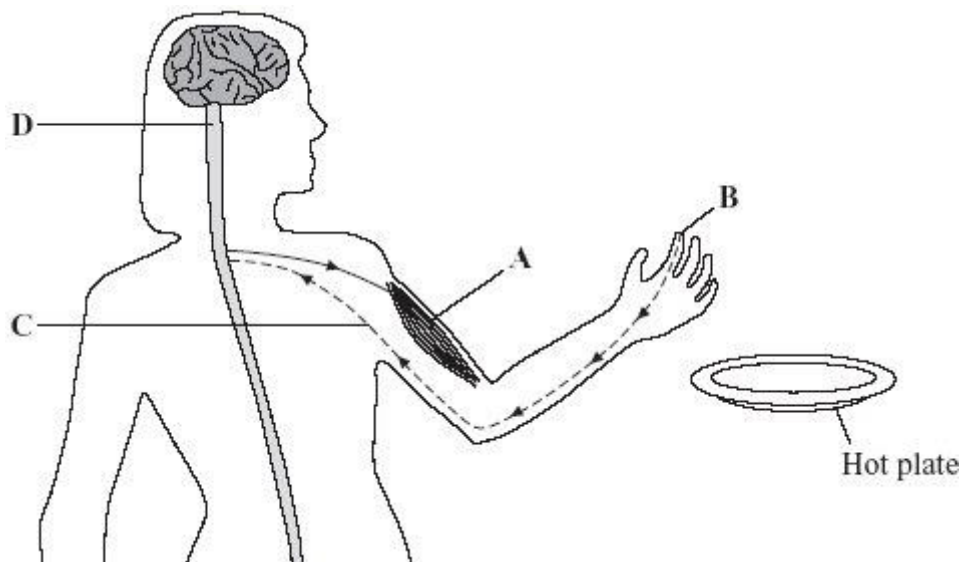
(1)

(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
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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.

Method	Volume of water lost in cm ³	
	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.

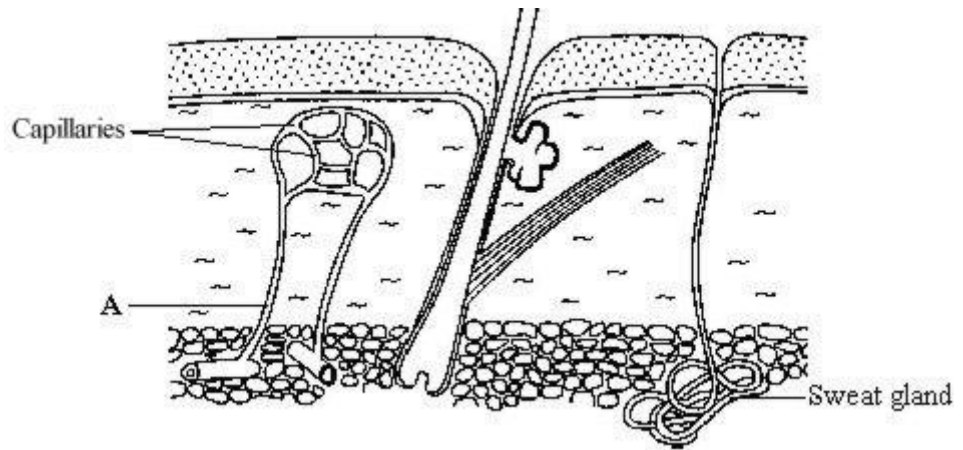
(1)

(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)

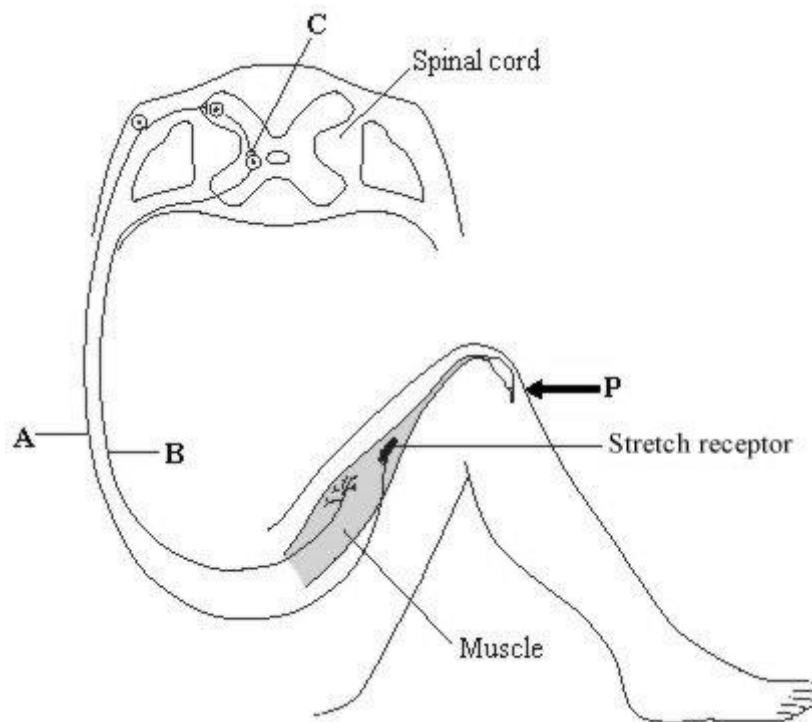
- (c) Body temperature is monitored and controlled by the thermoregulatory centre. Where in the body is the thermoregulatory centre?

(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**.

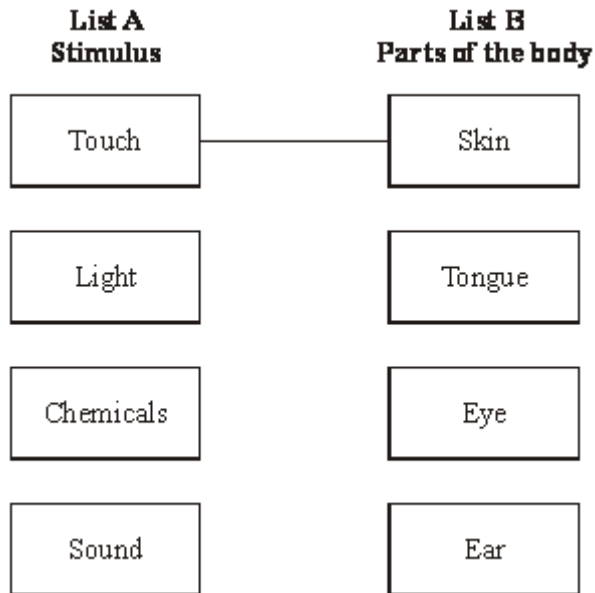
(1)

(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

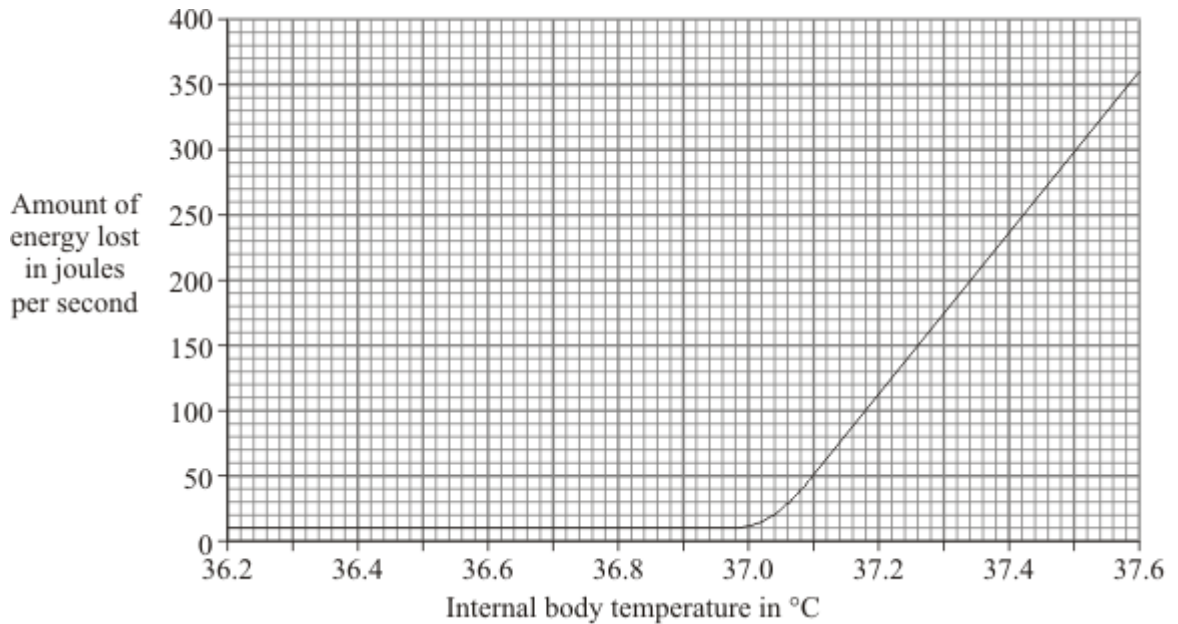
to the _____

(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)

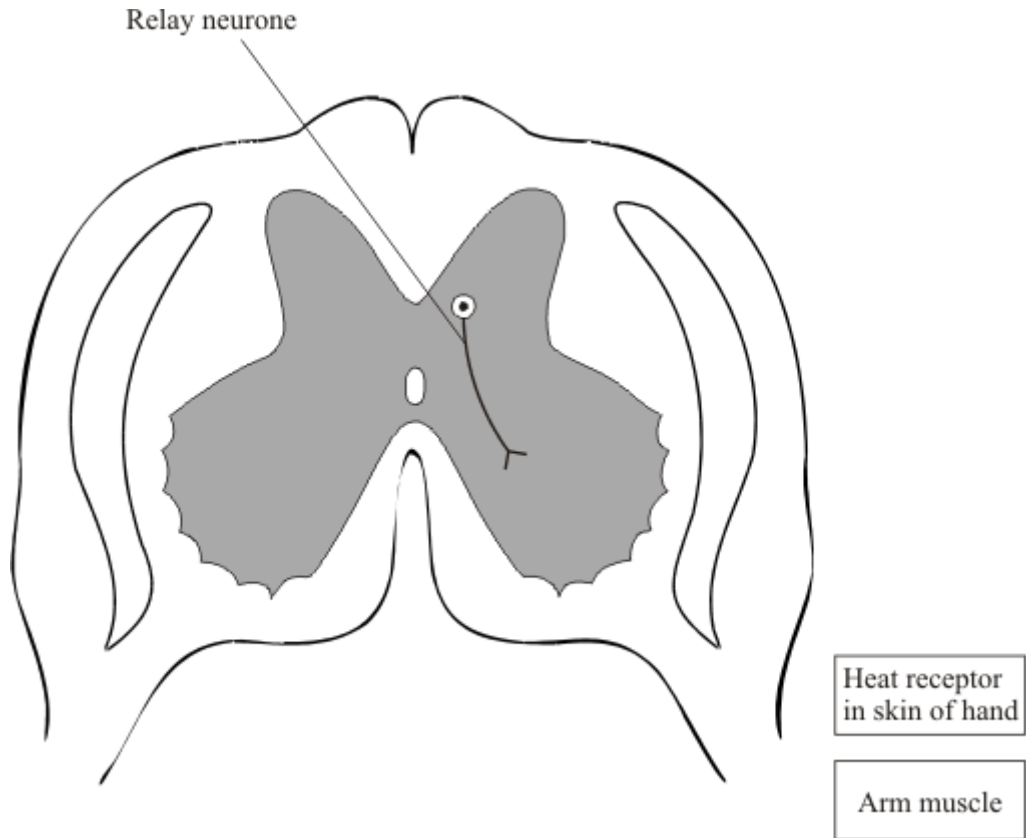
- (c) Explain how sweating helps to control body temperature.

(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



36.8 °C

Horse



38.0 °C

Sheep



39.2 °C

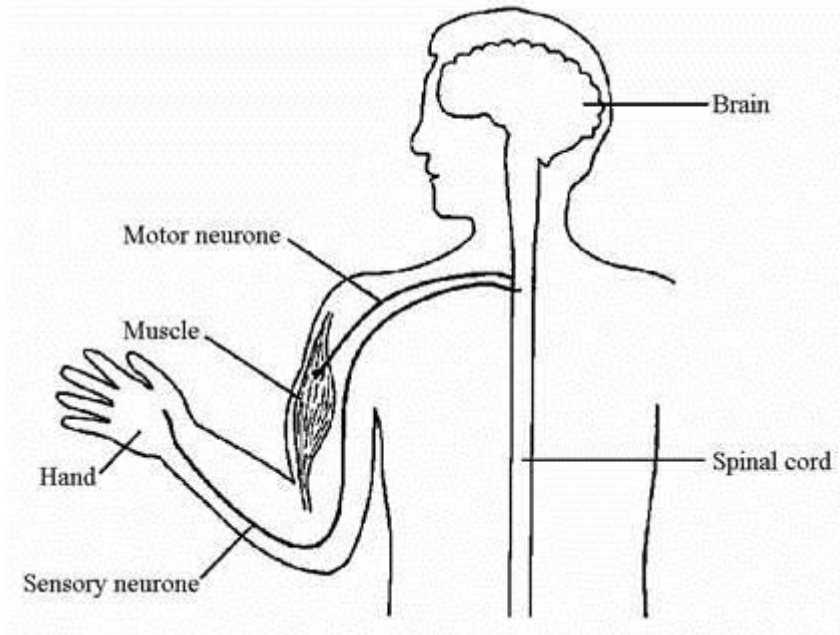
NOT TO SCALE

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.

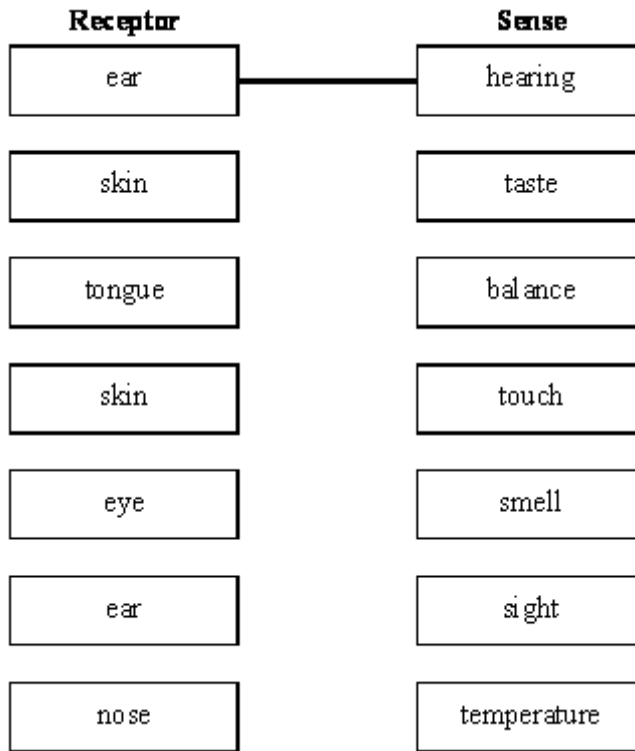


- (a) Label the *receptor* on the diagram. (1)
- (b) Label the *effector* on the diagram. (1)
- (c) (i) Suggest a stimulus to the hand that could start a reflex response.
 _____ (1)
- (ii) Describe the response that this stimulus would cause. _____

 _____ (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.



(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.



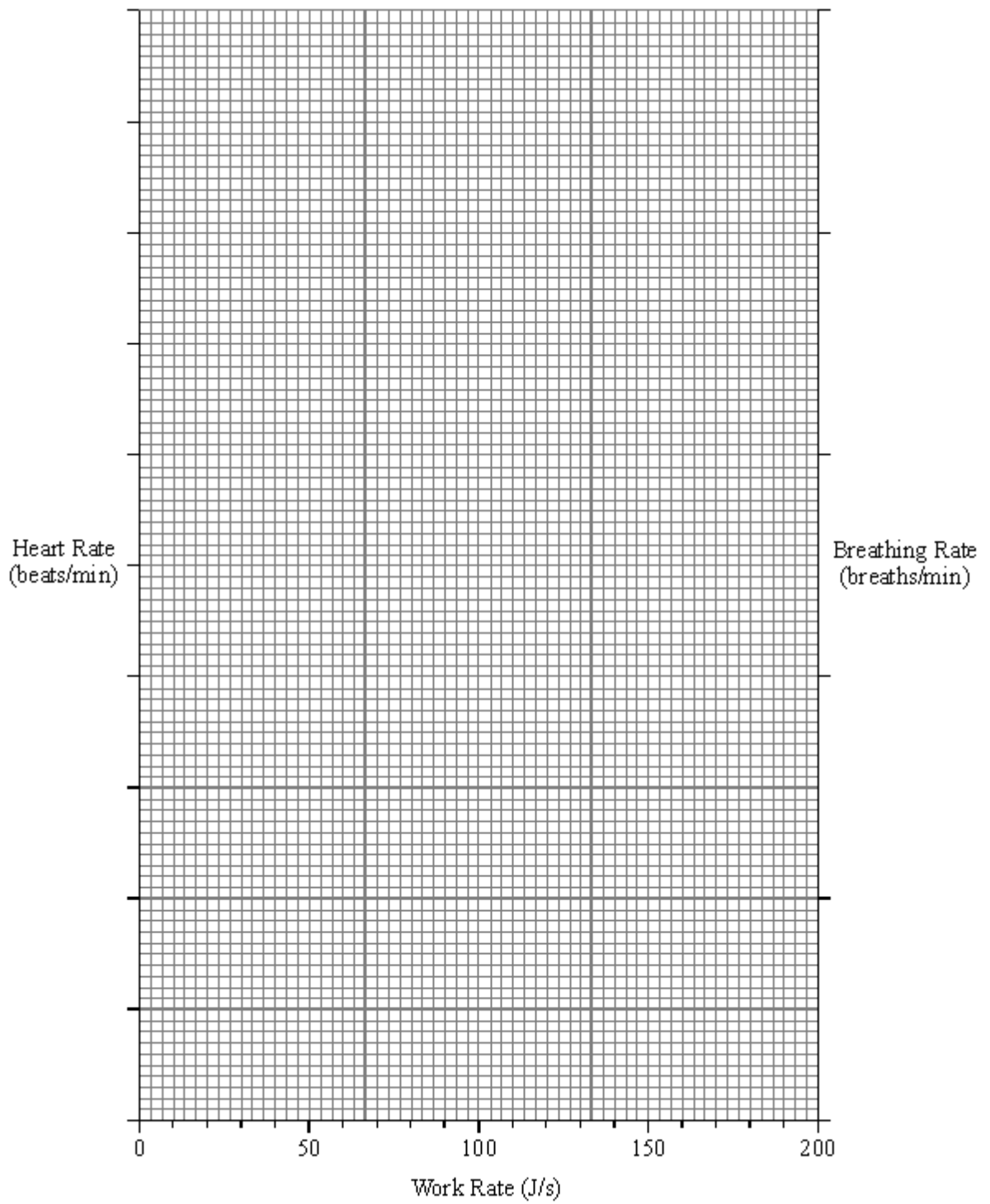
The athlete's heart rate and breathing rate were measured at different work rates.

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:

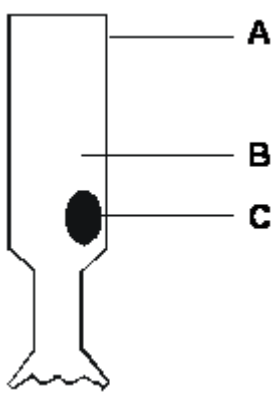
- (i) the stimulus; _____
- (ii) the co-ordinator; _____
- (iii) the effector. _____

(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 _____

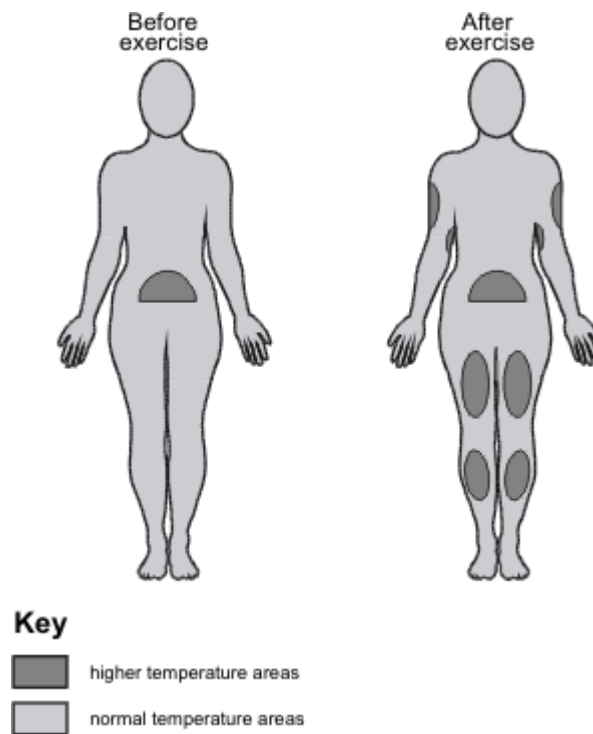
(3)

- (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.

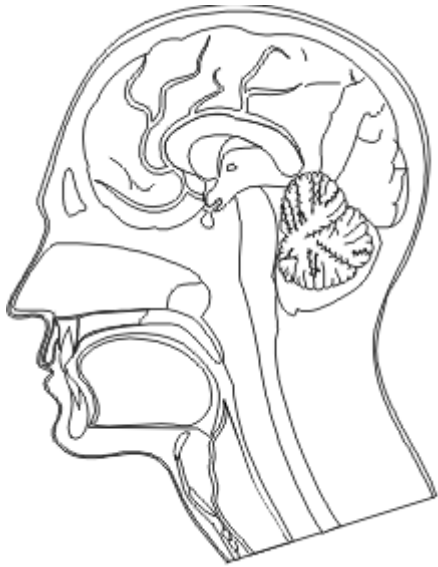
The temperature at the surface of the skin can be measured by using a technique called thermography. Areas with higher temperature appear as a light shade on the thermographs. The drawings below show the results of an investigation in which thermographs were taken before and after exercise.



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)

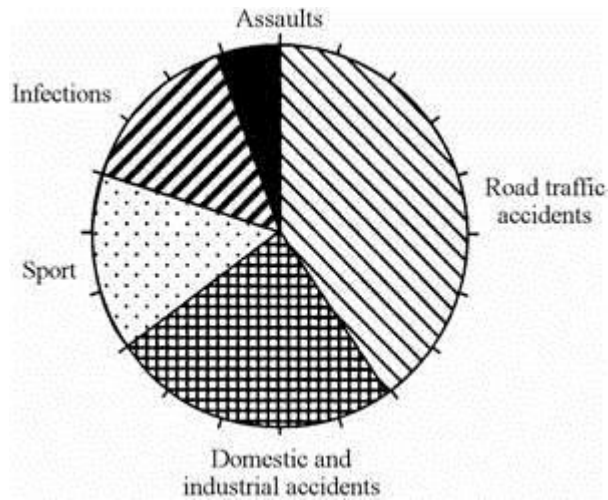
Q26.

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.

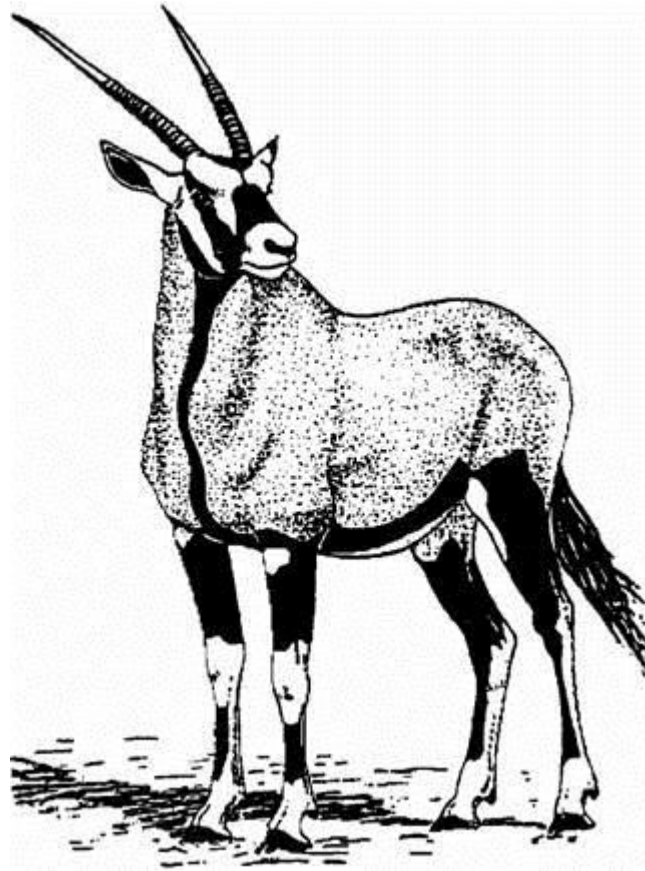
Proportion _____ (1)

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

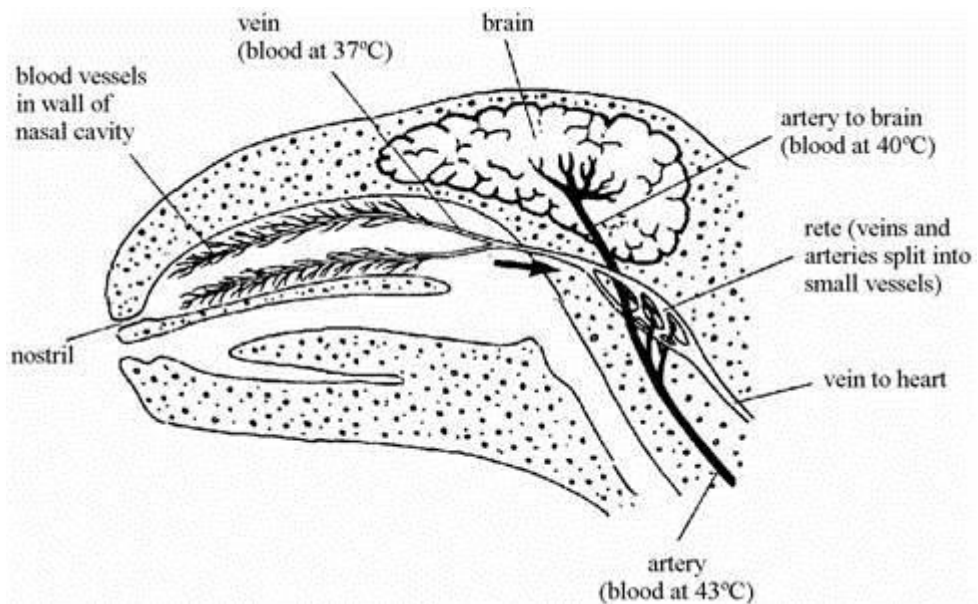
(3)
(Total 5 marks)

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)

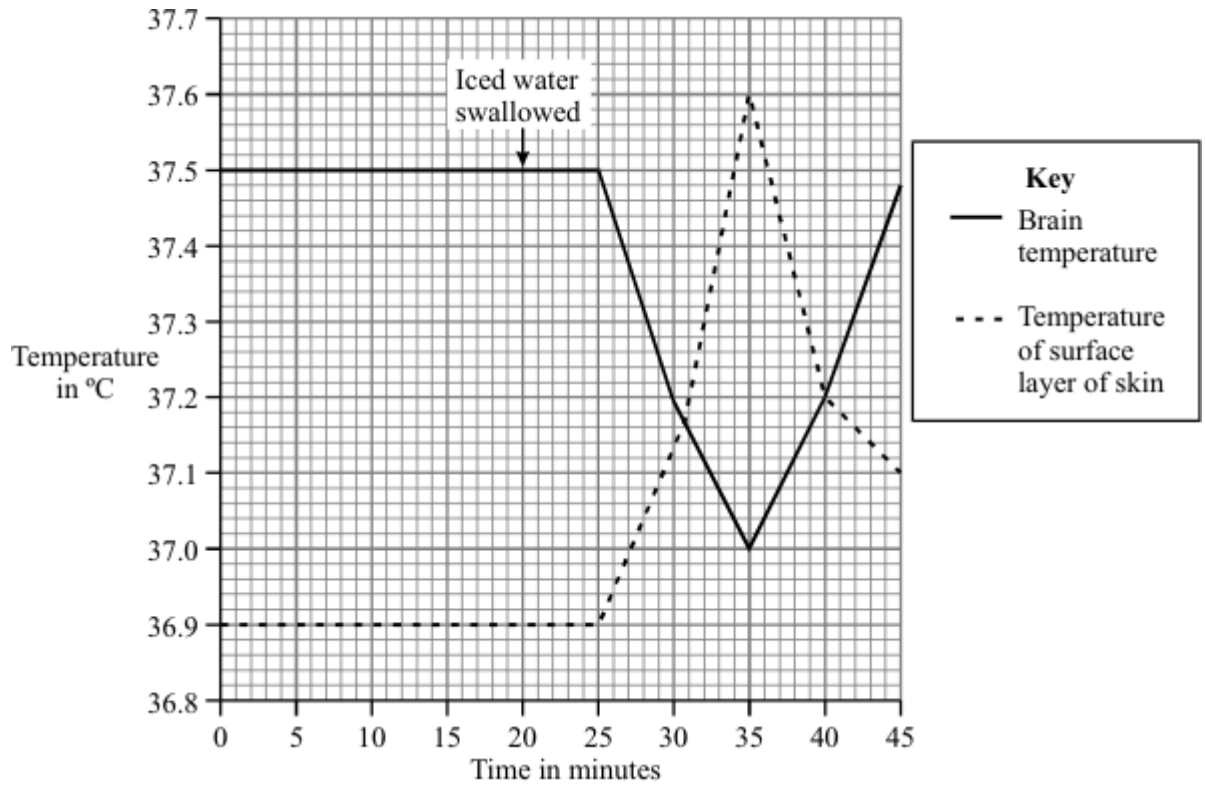
(Total 6 marks)

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.

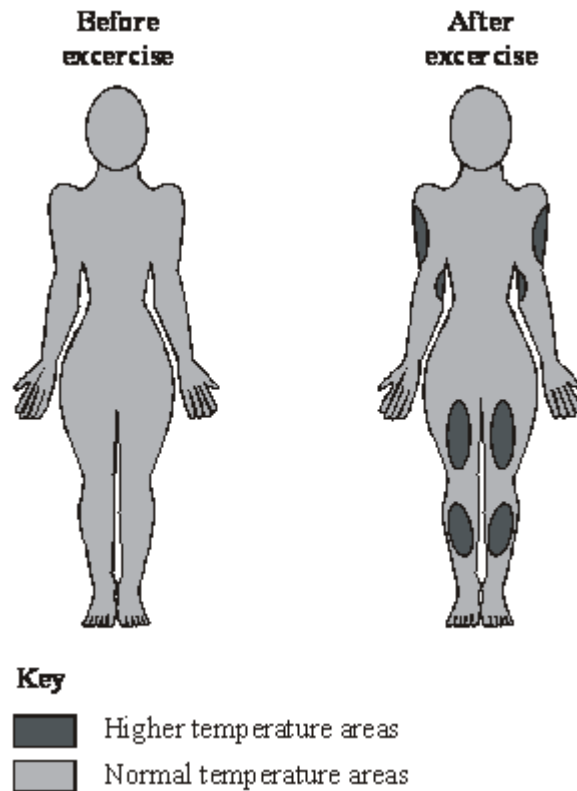
(3)

(Total 7 marks)

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.



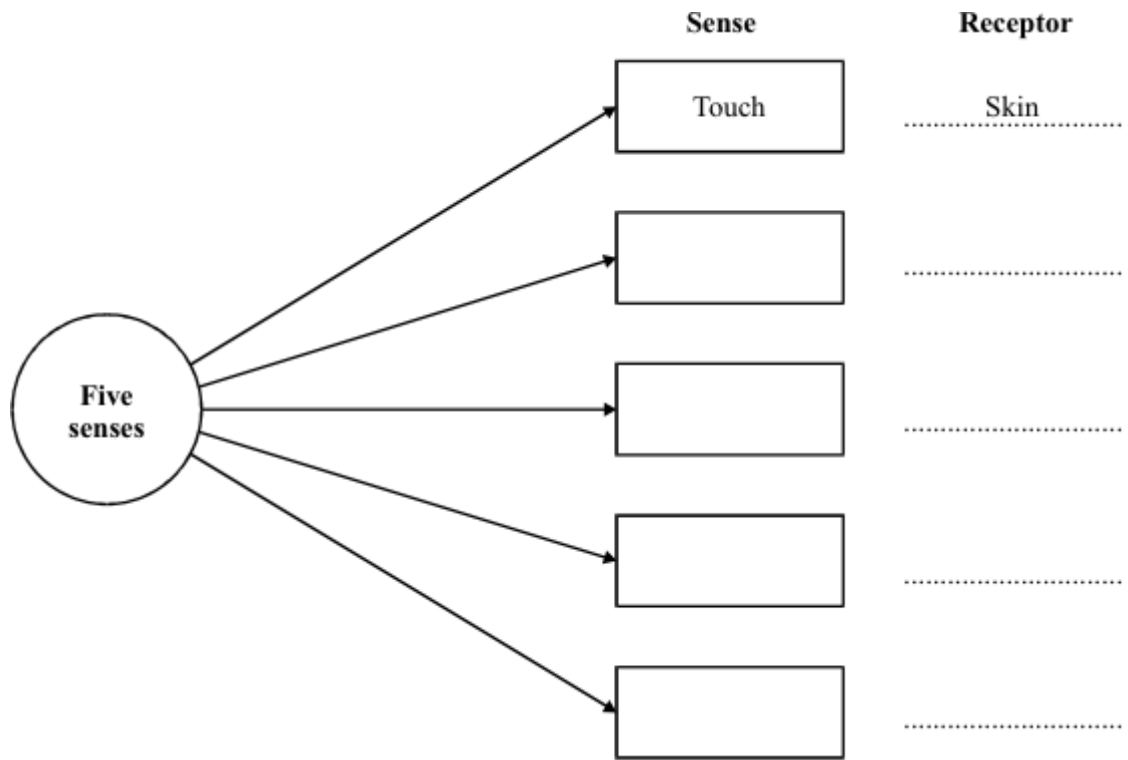
Describe and explain, as fully as you can, the effects of exercise on skin temperature.

(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.

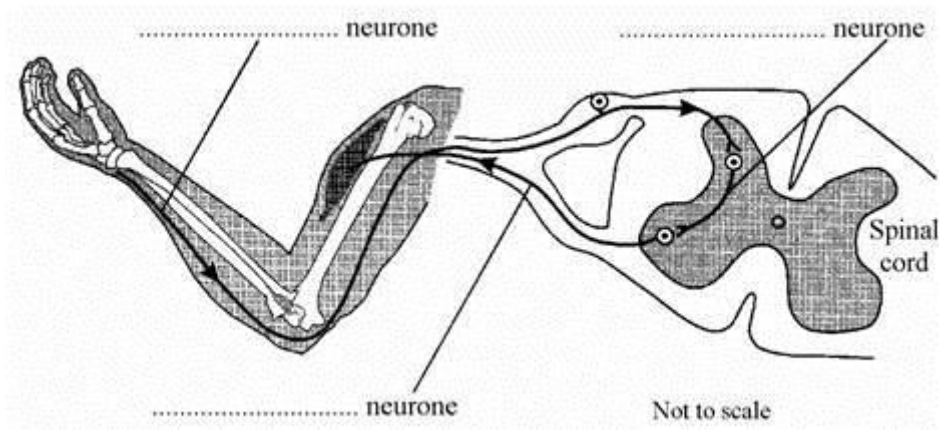
(Total 3 marks)

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)

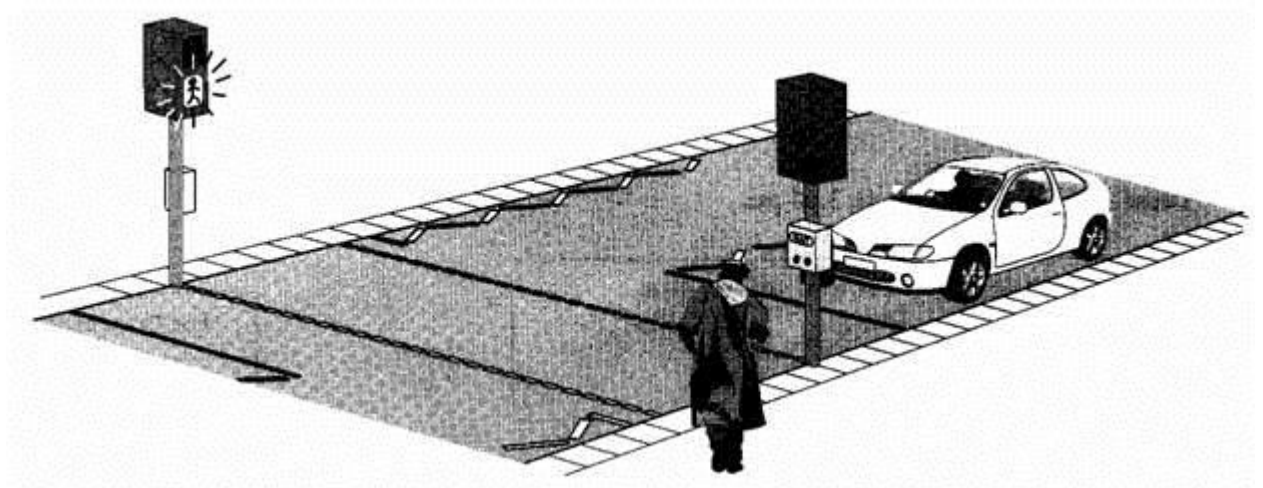
(d) Describe the stages that happen in a reflex action.

(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?

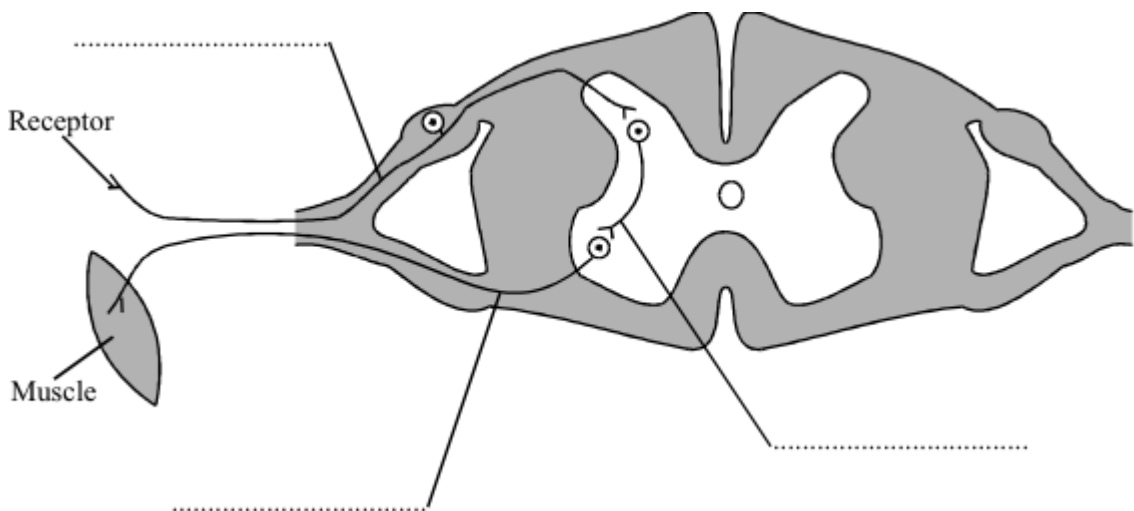
(1)

(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.

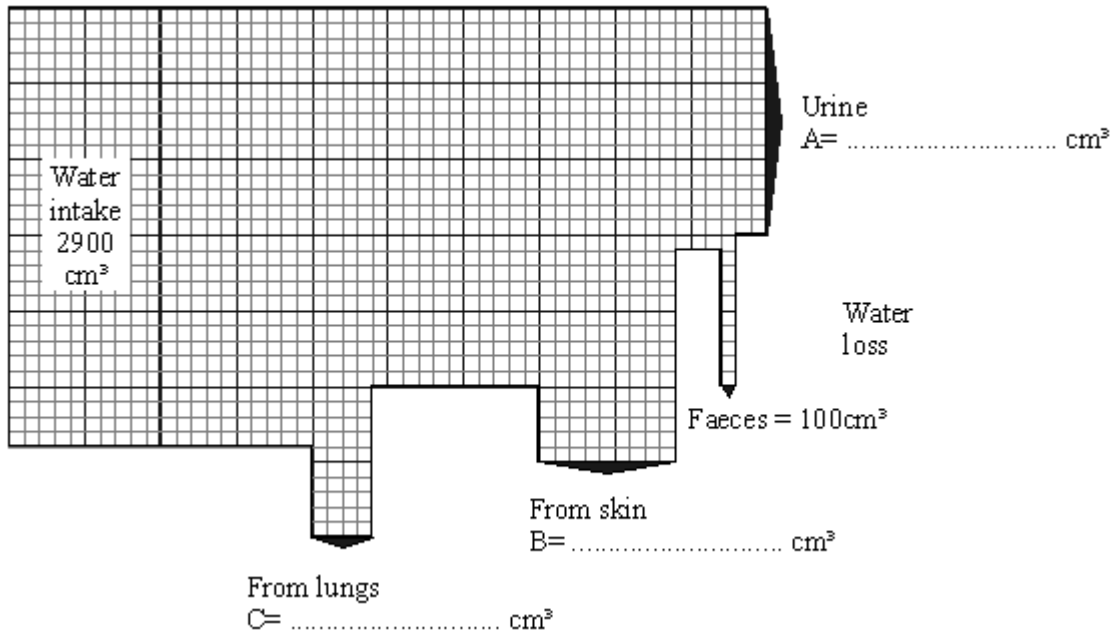


(Total 3 marks)

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.

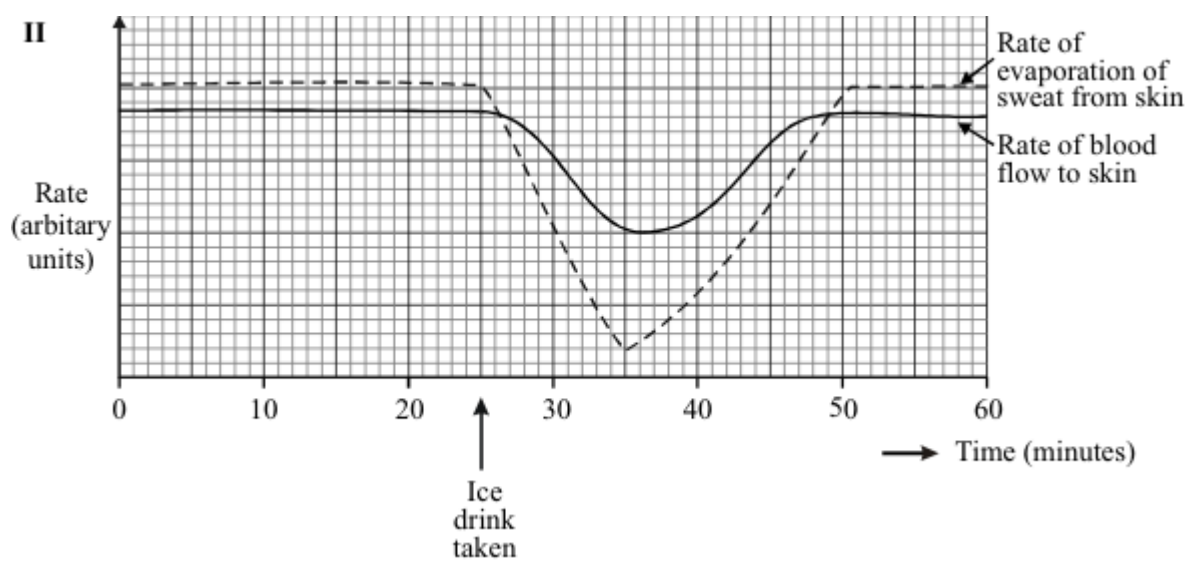
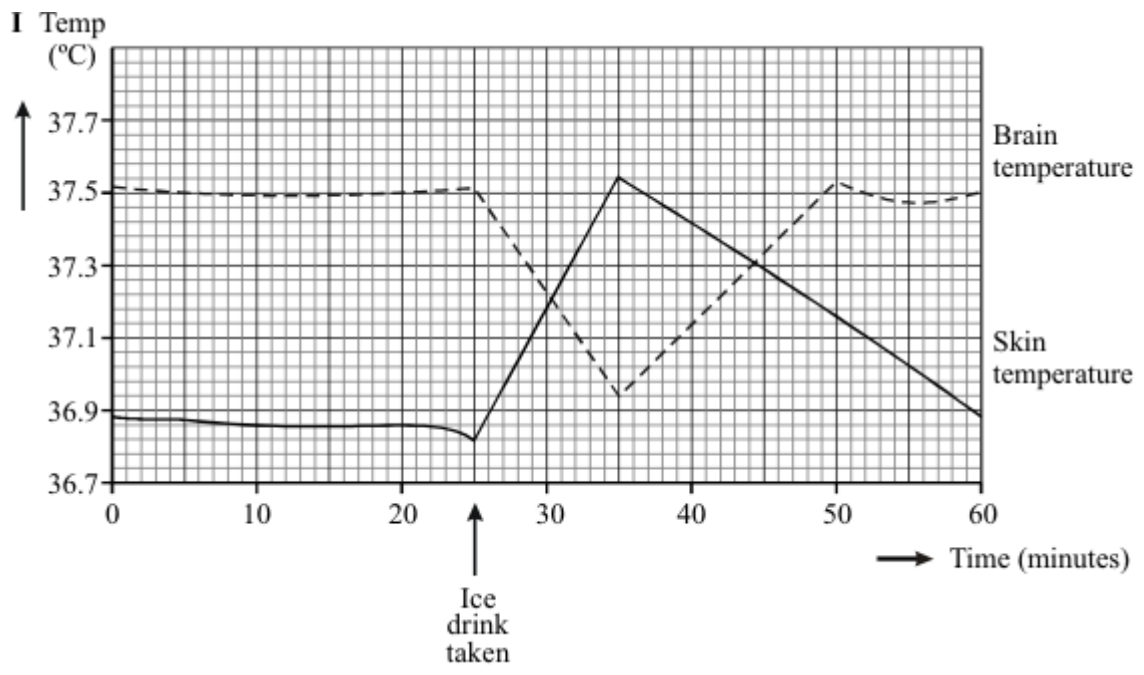
(3)

(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)

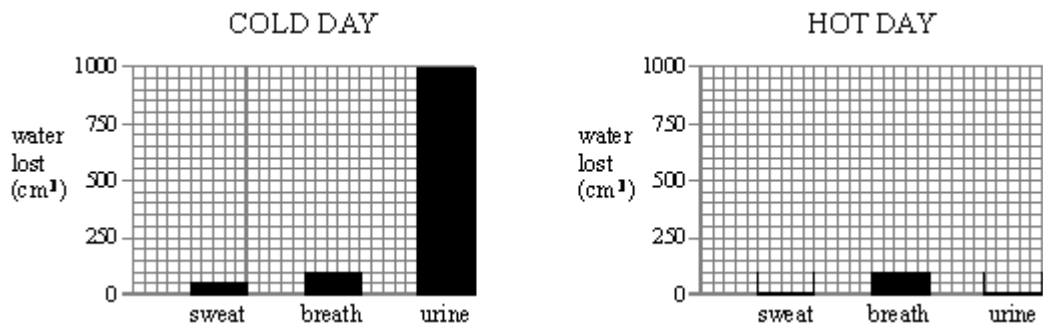
Q39.

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)

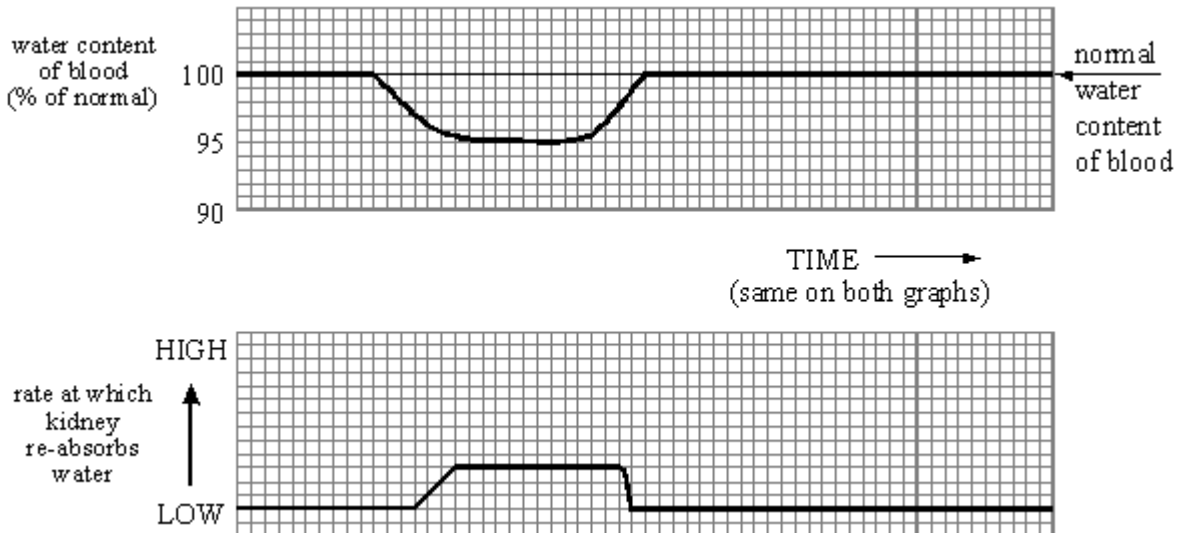
- (b) The boy does the same things for the same amount of time on both days.
Explain why the amounts of water lost in sweat and urine change.

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?

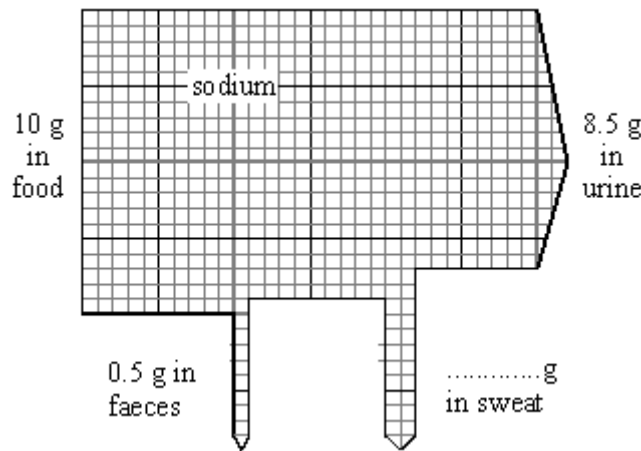
(2)

(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?

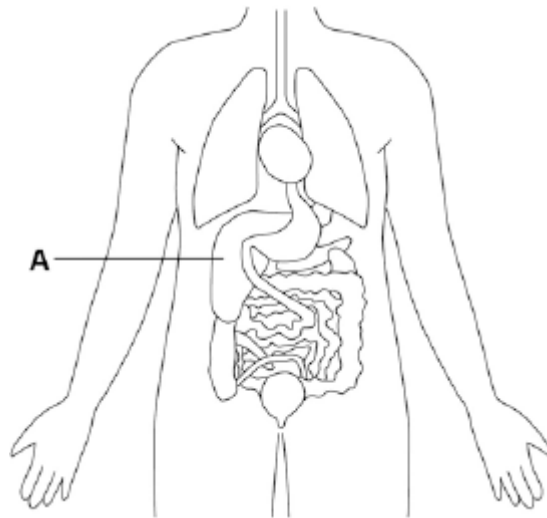
(1)

(Total 5 marks)

Q42.

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.

Brain

Lungs

Kidney

Thyroid

(1)

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

Explain why.

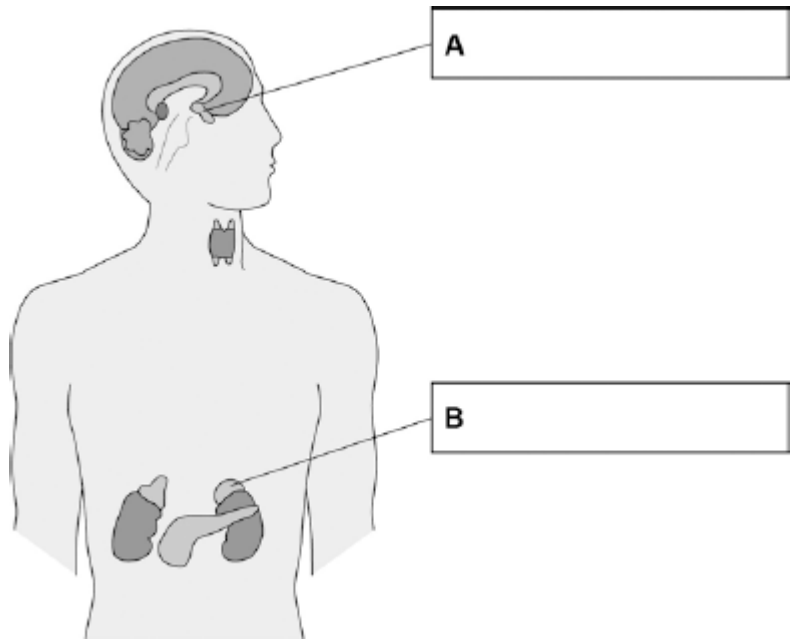
(2)
(Total 5 marks)

Q43.

Glands in the body produce hormones.

(a) Use words from the box to label gland **A** and gland **B** on the diagram below.

Adrenal	Pancreas	Pituitary	Testis	Thyroid
----------------	-----------------	------------------	---------------	----------------



(2)

(b) Which gland produces oestrogen?

Tick **one** box.

- Ovary
- Pancreas
- Testis
- Thyroid

(1)

(c) **Table 1** shows some methods of contraception.

Table 1

Type of	Percentage (%) of pregnancies
---------	-------------------------------

contraception	prevented
Oral pill	>99
Implant	99
Condom	98
Diaphragm	<96

Which method of contraception in **Table 1** is **least** effective at preventing pregnancy?

(1)

- (d) Which method of contraception in **Table 1** will protect against sexually transmitted diseases like HIV?

(1)

- (e) Another method of contraception is called the intrauterine device (IUD).

There are two main types of IUD:

- copper
- plastic.

Both types of IUD are more than 99% effective.

Look at **Table 2**.

Table 2

	Copper IUD	Plastic IUD
How the IUD works	<ul style="list-style-type: none"> • releases copper • copper changes the fluids in the uterus to kill sperm 	<ul style="list-style-type: none"> • releases a hormone • hormone thickens mucus from the cervix so the sperm have more difficulty swimming to the egg
Benefits	<ul style="list-style-type: none"> • prevents pregnancy for up to 10 years • can be removed at any time • can be used as emergency contraception 	<ul style="list-style-type: none"> • prevents pregnancy for up to 5 years • can be removed at any time
Possible side effects	<ul style="list-style-type: none"> • very painful periods • heavy periods or periods which last for a long time • feeling sick, back pain 	<ul style="list-style-type: none"> • painful periods • light periods or no periods • feeling sick, headaches, breast

(4)

(c) Look at the table below.

Population of UK in 2015	6.5×10^7
Number of people diagnosed with diabetes	3.45×10^6
Estimated number of people with undiagnosed diabetes	5.49×10^5

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

Estimated percentage of population with diabetes = ____ %

(3)

(d) A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

(1)

(e) A blood test called the glucose tolerance test checks how well the body processes glucose.

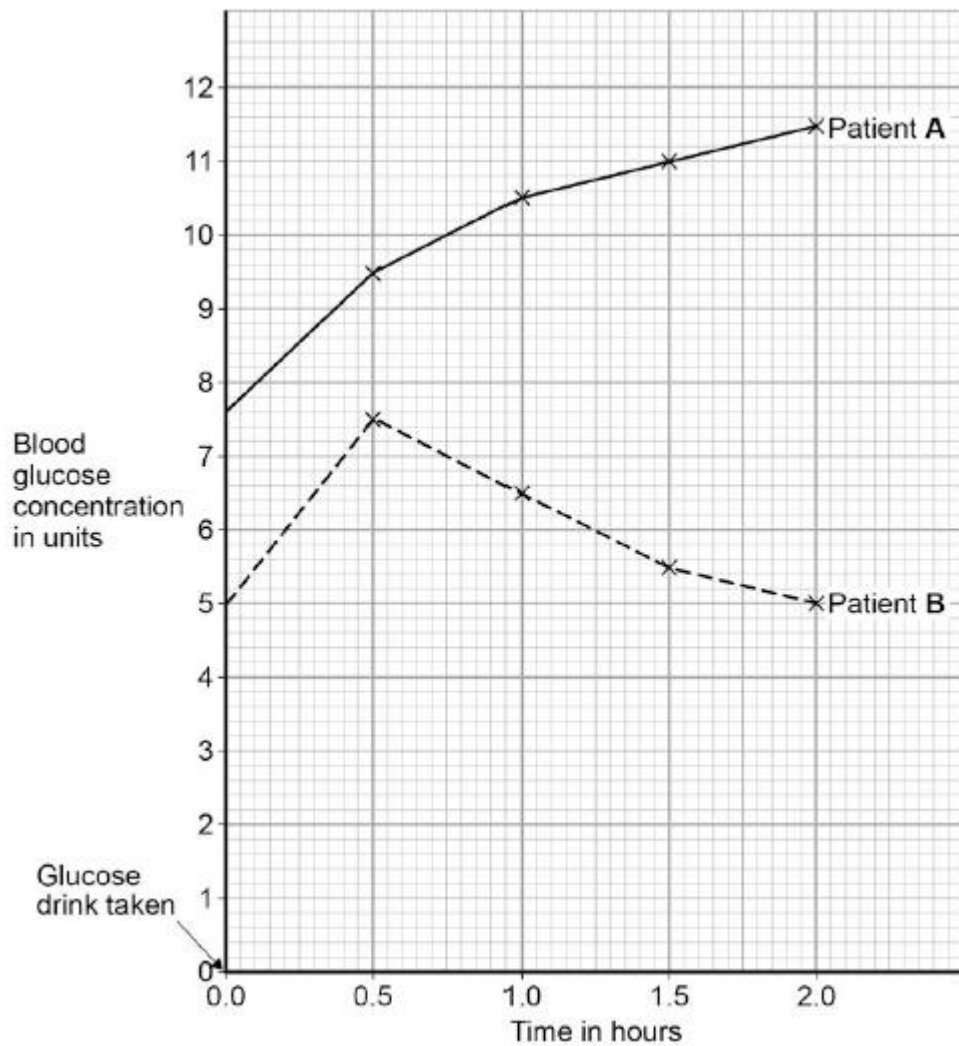
Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are **not** allowed to eat for 8 hours before the test.

(1)

- (f) The diagram below shows the results of a glucose tolerance test for two patients, **A** and **B**.



Which patient has diabetes?

Justify your answer.

Patient _____

Justification _____

Q45.

Endocrine glands produce hormones.

- (a) Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

(3)

- (b) Describe the roles of FSH and LH in the menstrual cycle.

(2)

- (c) The combined pill is a contraceptive that contains progesterone **and** oestrogen.

The 'mini-pill':

- is a contraceptive that **only contains** the progesterone hormone
- has to be taken at the same time each day to prevent pregnancy.

The success rate of the mini-pill in preventing pregnancy is lower than that of the combined pill.

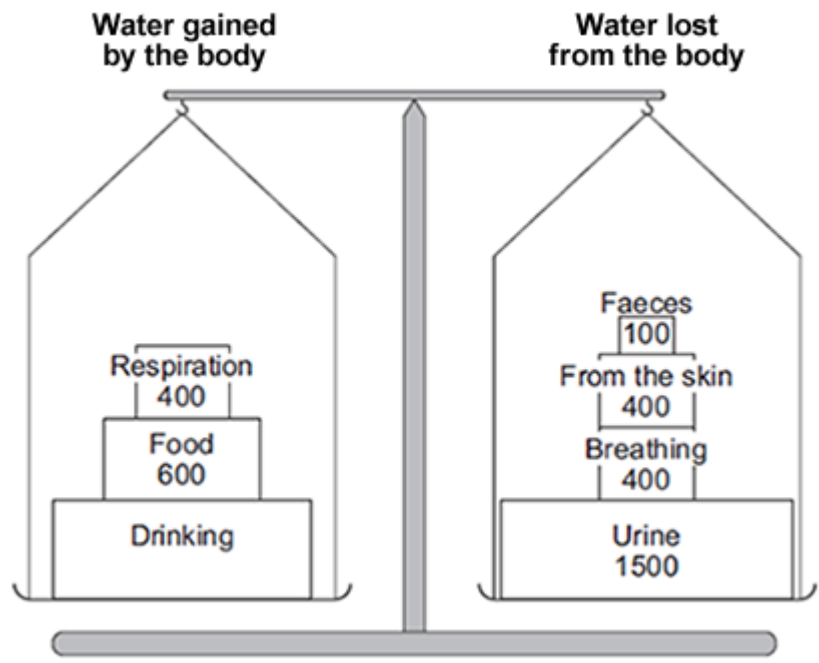
Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

(4)
(Total 9 marks)

Q46.

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.

- 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?

Volume of water = _____ cm^3

(2)

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

_____ (1)

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

_____ (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.

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.

decrease

increase

no change

(1)

(Total 7 marks)

Q47.

Hormones are involved in controlling the menstrual cycle and fertility.

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

auxin	follicle stimulating hormone (FSH)	thalidomide
--------------	---	--------------------

A hormone produced by the pituitary gland is _____

(1)

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

luteinising hormone (LH)	oestrogen	statin
---------------------------------	------------------	---------------

A hormone produced by the ovaries is _____

(1)

(b) (i) Why are fertility drugs given to some women?

(1)

- (ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman's ovaries.

How do the hormones travel to the ovaries?

Draw a ring around the correct answer.

**through the
bloodstream**

**through the
neurones**

**through the
skin**

(1)

- (c) Which **two** hormones are used in contraceptive pills?

Tick (✓) **two** boxes.

FSH

oestrogen

LH

progesterone

(2)

(Total 6 marks)

Q48.

- (a) Which organ of the human body produces egg cells?

Draw a ring around the correct answer.

liver

ovary

testis

(1)

- (b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

Draw a ring around the correct answer.

23

46

48

(1)

- (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 1 shows how successful IVF was for women of different ages at one clinic.

Table 1

Age of women in years	Percentage of women who had a baby
<35	35

35–37	31
38–39	25
40–42	32
43–44	7
>44	0

- (i) A student thought that the result for women aged 40–42 was anomalous.
Suggest why the student thought this result was anomalous.

(1)

- (ii) Describe the general trend in the results in **Table 1**.
You should ignore the anomalous result.

(1)

- (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 2 shows the scientists' results.

Table 2

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

- (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

Answer = _____ times

(2)

- (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 1** and **Table 2** in your answer.

1. _____

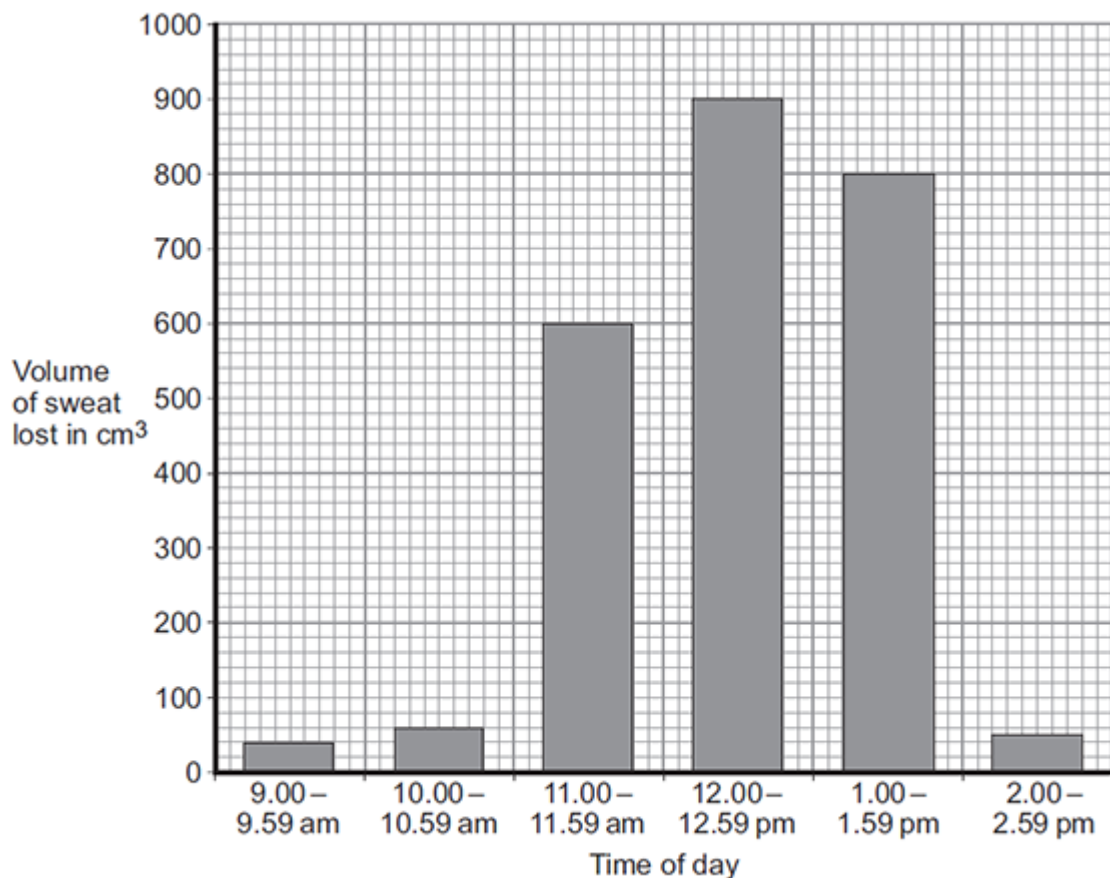
2. _____

(2)

(Total 8 marks)

Q49.

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.

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.

Total volume of sweat lost = _____ cm³

(1)

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

(1)

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

Which organ monitors body temperature?

Tick (✓) **one** box.

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.

capillaries

glands

receptors

(1)

- (c) How does sweating help to control body temperature?

(1)

Q50.

Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

(a) (i) Which organ monitors blood glucose levels?

Tick (✓) **one** box.

liver

pancreas

skin

(1)

(ii) What effect does insulin have on glucose in the blood?

Tick (✓) **one** box.

Insulin causes glucose to move into the cells.

Insulin increases the amount of glucose in the blood.

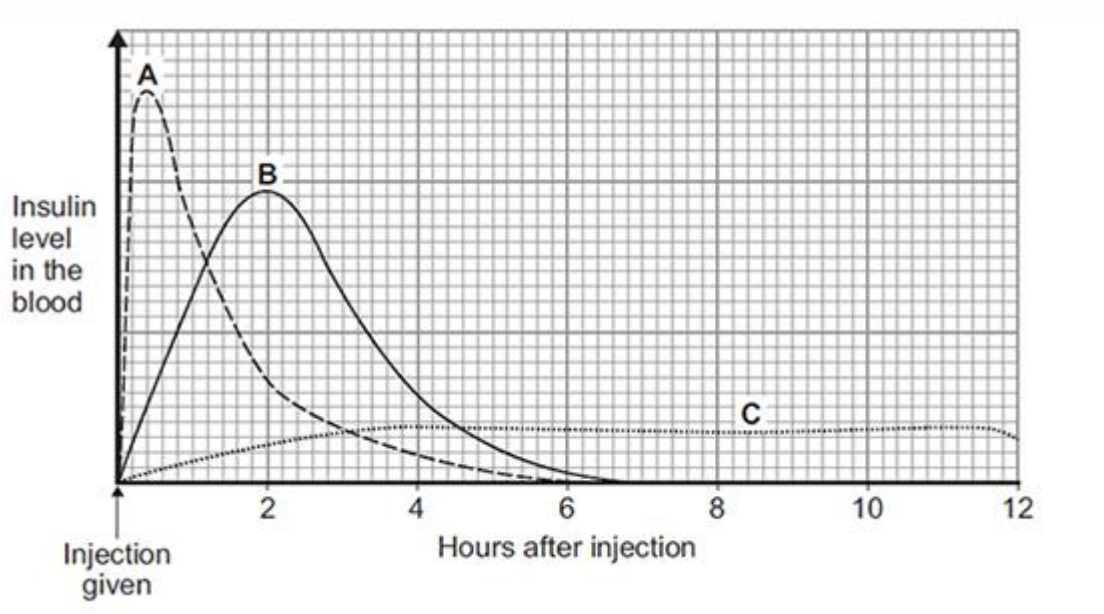
Insulin converts glucose to starch.

(1)

(b) Some people with diabetes inject insulin several times a day.

There are different types of insulin.

The graph shows some information about three different types of insulin, **A**, **B** and **C**.



- (i) Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

Give a reason for your answer.

(2)

- (ii) A woman with diabetes has a blood glucose level of 12 mmol per dm^3 of blood.

The woman's normal blood glucose level is 6 mmol per dm^3 .

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm^3 .

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

Number of units = _____

(1)

- (c) Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

Tick (✓) **one** box.

The pancreas could be rejected.

The patient will need to inject insulin every day.

The patient's blood glucose levels may rise and fall too much.

(1)

(Total 6 marks)

Q51.

People with type 1 diabetes inject insulin to control their blood glucose level.

A pancreas transplant is another treatment for type 1 diabetes.

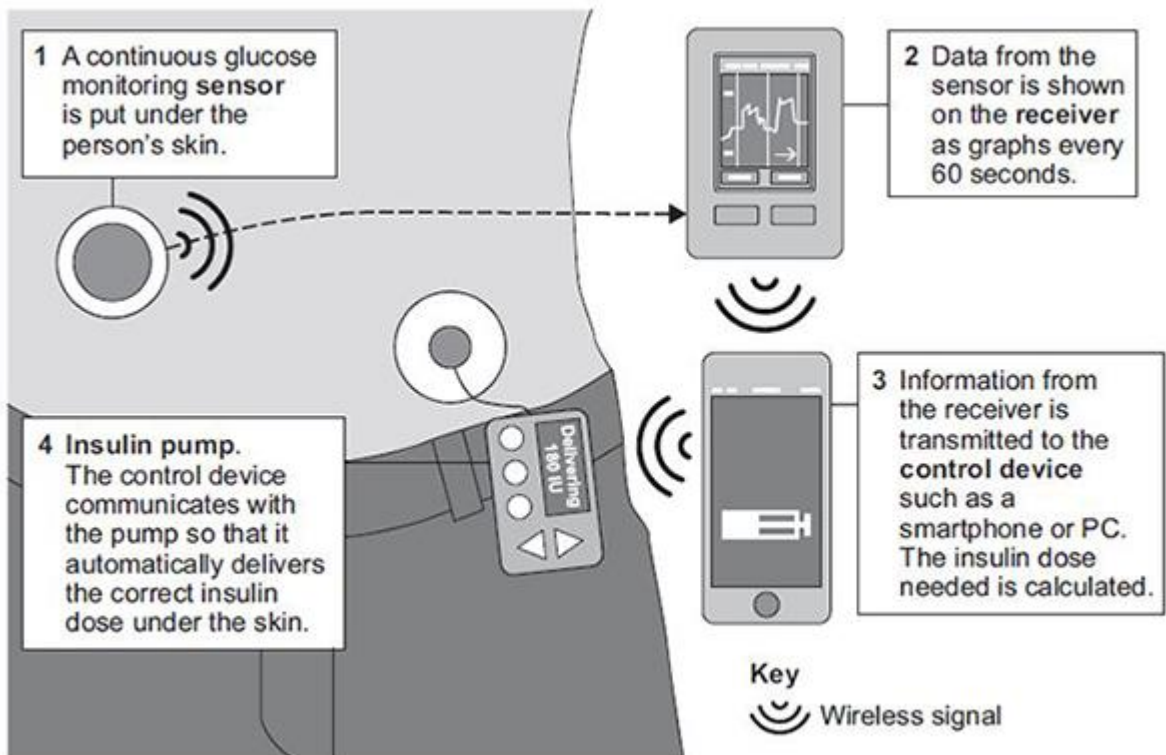
One risk of a pancreas transplant is organ rejection.

- (a) Explain why a transplanted organ may be rejected.

(3)

(b) Scientists have developed an artificial pancreas to treat type 1 diabetes.

The diagram below shows how an artificial pancreas works.



(i) A woman with type 1 diabetes has an artificial pancreas. The woman eats a meal high in sugar. The meal causes her blood glucose level to rise.

Use information from the diagram above to describe what happens to bring the blood glucose level of the woman back to normal.

(4)

- (ii) The traditional way of monitoring and treating type 1 diabetes is to take a small sample of blood and put it on a test strip to find out how much insulin to inject.

Suggest **one** possible advantage, other than not having to do blood tests, of the method used in the diagram above.

(1)
(Total 8 marks)

Q52.

This question is about hormones.

- (a) (i) Hormones carry messages.

What type of messenger is a hormone?

Draw a ring around the correct answer.

chemical electrical environmental

(1)

- (ii) Which part of the brain secretes hormones?

Draw a ring around the correct answer.

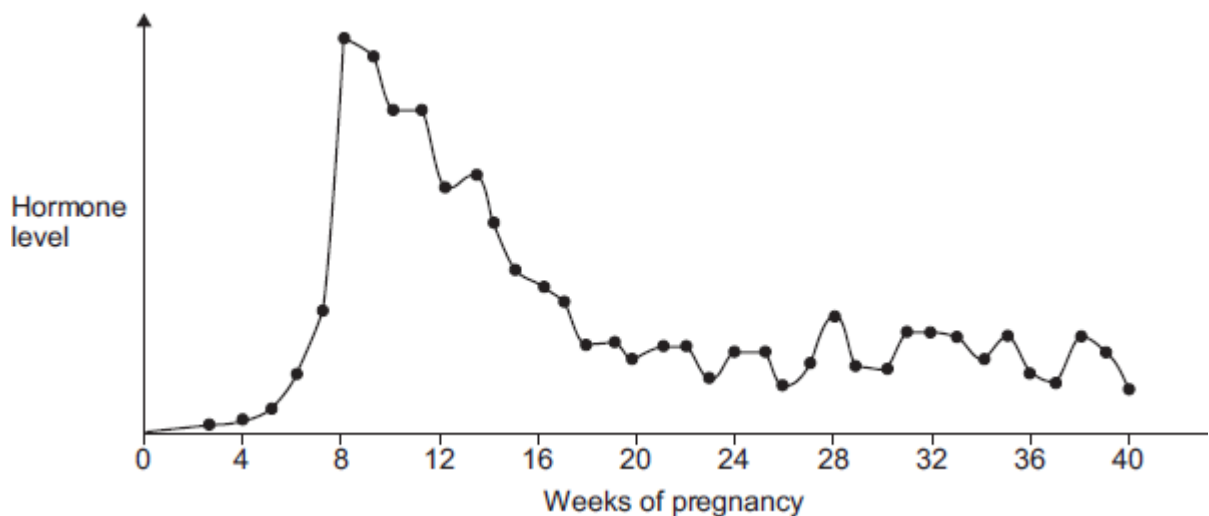
cerebellum medulla pituitary gland

(1)

- (b) **Figure 1** shows the level of a pregnancy hormone over a 40-week pregnancy.

This hormone can be detected in a pregnancy test.

Figure 1



A woman takes a pregnancy test.

In which week of pregnancy is the test most likely to give a positive result?

Use information from **Figure 1**.

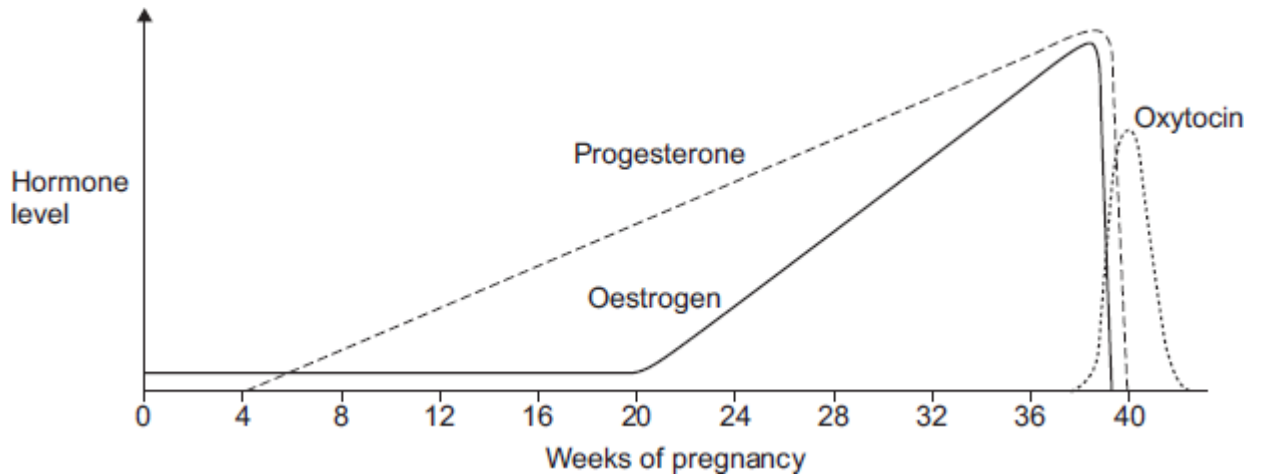
Write the correct answer in the box.

(1)

(c) **Figure 2** shows the levels of three other hormones during pregnancy.

The baby is usually born at about 40 weeks.

Figure 2



Adaptation by kind permission of Biozone International

(i) Describe the patterns in the levels of oestrogen and progesterone from 0 to 36 weeks.

(4)

(ii) Which hormone is likely to stimulate contractions of the uterus (womb) when the baby is born?

Use information from **Figure 2** to give a reason for your answer.

Q53.

- (a) Control systems help to keep conditions in the human body relatively constant.

What is the general name for the processes that keep body conditions relatively constant?

Draw a ring around the correct answer.

eutrophication homeostasis hydrotropism

(1)

- (b) The concentration of glucose in the blood is controlled by hormones.

Use the correct answer from the box to complete each sentence.

glucagon	glycerol	glycogen
kidney	liver	pancreas

When the blood glucose concentration increases, an organ called the _____ releases the hormone insulin.

Insulin causes glucose to move from the blood into the cells of the muscles and the _____ .

Inside these organs, the glucose is changed into a carbohydrate called _____ , which can be stored.

When the blood glucose concentration falls, another hormone is released, which causes the storage carbohydrate to break down into glucose again.

This hormone is called _____ .

(4)

- (c) A person with Type 1 diabetes does not make enough insulin.

The person needs to test their blood at intervals throughout the day.

If the concentration of glucose in their blood is too high, the diabetic person needs to inject insulin.

- (i) Insulin is a protein.

It must be injected and cannot be taken by mouth.

Explain why.

(2)

- (ii) Apart from injecting insulin, give **one other** way that a diabetic person could help to control the concentration of glucose in their blood.

(1)

- (d) Pet dogs have been trained to detect if the concentration of glucose in the blood of their diabetic owners is outside the normal healthy range. These dogs are called 'medical response dogs'.
The dogs respond in different ways. They may bark, jump up, or stare at their owners. They may even fetch a blood-testing kit.

- (i) Suggest what stimulus the dogs might be responding to when they behave like this.

(1)

- (ii) **Table 1** shows how the concentration of glucose varied in blood samples from five diabetic people. Measurements were made both before and after getting a medical response dog.

Table 1

		Mean percentage of blood samples with different concentrations of glucose from the five diabetic people			
		Number of blood samples measured	Low glucose	Within normal range of glucose	High glucose
Before getting a dog	1704	32.6	54.8	12.6	
After getting a dog	1724	18.6	61.6	19.8	

A survey was made of the effect of a medical response dog on the lives of 16 diabetic people.

Table 2 shows how well these diabetic people agreed with each statement in the survey.

Table 2

Statement in	Totally	Somewhat	Neither	Somewhat	Totally
--------------	---------	----------	---------	----------	---------

survey	agree	agree	agree nor disagree	disagree	disagree
I am more independent since getting my dog.	12	2	2	0	0
There are disadvantages to having a medical response dog.	0	0	4	4	8
I trust my dog to alert me when my sugar levels are low.	11	3	1	0	1
I trust my dog to alert me when my sugar levels are high.	6	7	0	1	2

Evaluate how useful medical response dogs are for warning diabetic people that the concentration of glucose in their blood is outside the normal range.

Use information from **Tables 1** and **2**.

(5)

- (e) **Table 3** shows the concentrations of some substances in the urine of a non-diabetic person and in the urine of a diabetic person.

Table 3

Substance	Concentration of substance in urine in g per dm ³	
	Non-diabetic person	Diabetic person
Protein	0	0

Glucose	0	2.0
Urea	20.0	19.5
Sodium ions	6.0	5.8

Compare the results for the non-diabetic person and the diabetic person.
Give reasons for any differences.

Use your knowledge of how the kidney works.

(5)
(Total 19 marks)

Q54.

- (a) Humans need to remove waste products from their bodies.

Which organ removes waste carbon dioxide from the body?

Tick (✓) **one** box.

Liver

Lung

Skin

(1)

- (b) Kidneys make urine. Urine is stored in the bladder.

Which **one** of the following stages is involved in making urine in a healthy kidney?

Tick (✓) **one** box.

Filtering the blood

Reabsorbing **all** of the ions

Reabsorbing **all** of the water

(1)

(c) A healthy kidney keeps the correct amount of water in the blood.

If there is too much water in the blood, what might happen to the blood cells?

Tick (✓) **one** box.

They will take in water and burst.

There will be no change.

They will lose water and shrink.

(1)

(d) A child has kidney failure.

A doctor recommends dialysis to treat the kidney failure.

Before dialysis starts, the doctor measures the concentration of glucose and of urea in the child's blood.

The concentration of glucose in the dialysis fluid is 6 mmol per dm³.

The results are shown below in the table.

	Concentration in the blood before dialysis starts in mmol per dm ³
Glucose	6
Urea	28

(i) Suggest what the concentration of glucose in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 6

6

more than 6

(1)

- (ii) Suggest what the concentration of urea in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 28

28

more than 28

(1)

- (iii) Give a reason for your answer to part **(d)(ii)**.

(1)

- (e) (i) Some patients have kidney transplants. Transplanted kidneys may be rejected by the body.

Use the correct answer from the box to complete the sentence.

antibodies

hormones

tissues

Transplanted kidneys have proteins on the surface of the cells. These proteins may be

attacked by the patient's _____ .

(1)

- (ii) It is important to prevent rejection of a new kidney.

Which **one** of the following helps to prevent the kidney from being rejected?

Tick (✓) **one** box.

Giving the patient antibodies

Giving the patient painkillers

Tissue typing the donor kidney

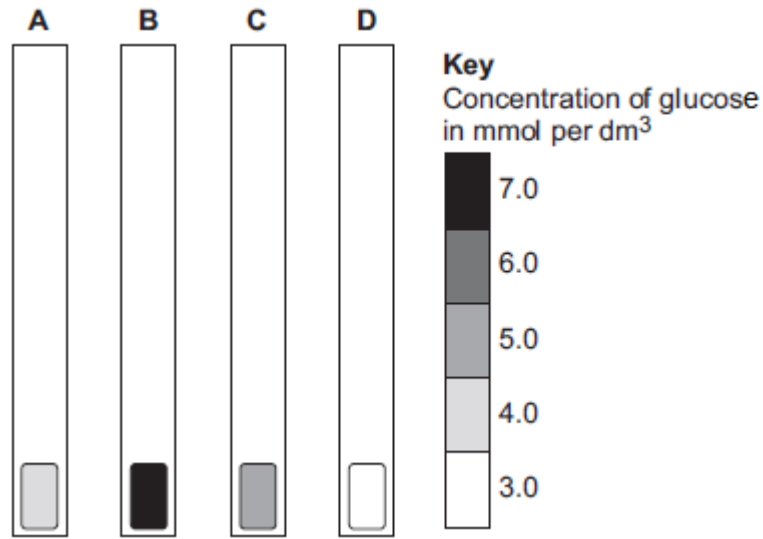
(1)

(Total 8 marks)

Blood glucose concentration in humans must be kept between 4.4 and 6.1 mmol per dm³.

Four students, **A**, **B**, **C** and **D**, tested their blood glucose concentration with glucose testing strips.

The diagram shows the results of their tests and the key from the test strip bottle.



- (a) (i) Which student, **A**, **B**, **C** or **D**, has diabetes and has eaten a large piece of cake?

(1)

- (ii) Which student, **A**, **B**, **C** or **D**, is in most need of eating carbohydrates?

(1)

- (iii) Which student, **A**, **B**, **C** or **D**, has a healthy blood glucose concentration?

(1)

- (b) (i) Name the hormone that people with diabetes inject to prevent their blood glucose concentration from becoming too high.

(1)

- (ii) Blood glucose concentration is monitored in the body.

Which organ monitors blood glucose concentration?

Draw a ring around the correct answer.

brain

liver

pancreas

(1)
(Total 5 marks)

Q56.

Many runners drink sports drinks to improve their performance in races.

A group of students investigated the effects of three brands of sports drink, **A**, **B** and **C**, on the performance of three runners on a running machine. One of the runners is shown in the image below.



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Table 1 gives information for each drink.

Table 1

Nutrient per dm^3	Brand of sports drink		
	A	B	C
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

- (a) (i) In the investigation, performance was measured as the time taken to reach the point of exhaustion.

Exhaustion is when the runners could not run anymore.

All three runners:

- ran on a running machine until the point of exhaustion
- each drank 500 cm³ of a different brand of sports drink
- rested for 4 hours to recover
- ran on the running machine again and recorded how much time they ran until the point of exhaustion.

The speed at which the runners ran was the same and all other variables were controlled.

The students predicted that the runner drinking brand **B** would run for the shortest time on the second run before reaching the point of exhaustion.

Use information from **Table 1** to suggest an explanation for the students' prediction.

(2)

- (ii) If the balance between ions and water in a runner's body is not correct, the runner's body cells will be affected.

Describe **one** possible effect on the cells if the balance between ions and water is **not** correct.

(1)

- (b) When running, a runner's body temperature increases.

Describe how the brain monitors body temperature.

(3)

- (c) (i) **Table 2** is repeated here to help you answer this question.

Table 2

Brand of sports drink

Nutrient per dm ³	A	B	C
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

People with diabetes need to be careful about drinking too much sports drink.

Use information from **Table 2** to explain why drinking too much sports drink could make people with diabetes ill.

(3)

- (ii) Other than paying attention to diet, how do people with diabetes control their diabetes?

(1)

(Total 10 marks)

Q57.

It is important to remove waste products from our bodies.

Healthy kidneys help to keep our internal environment constant.

- (a) Describe how a healthy kidney produces urine.

(b) A child has kidney failure and is treated with dialysis.

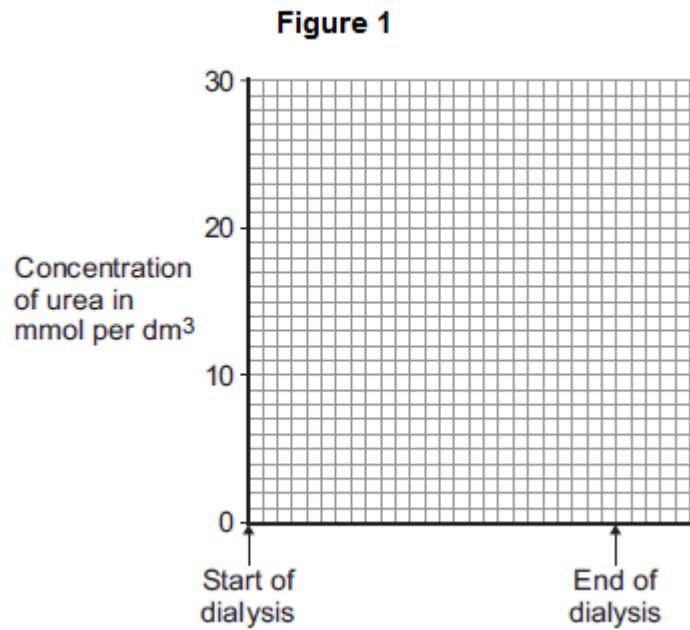
Before the dialysis starts, the doctor measures the concentration of urea and glucose in the child's blood.

The table shows the results.

	Concentration in the blood before dialysis starts in mmol per dm ³
Urea	28
Glucose	6

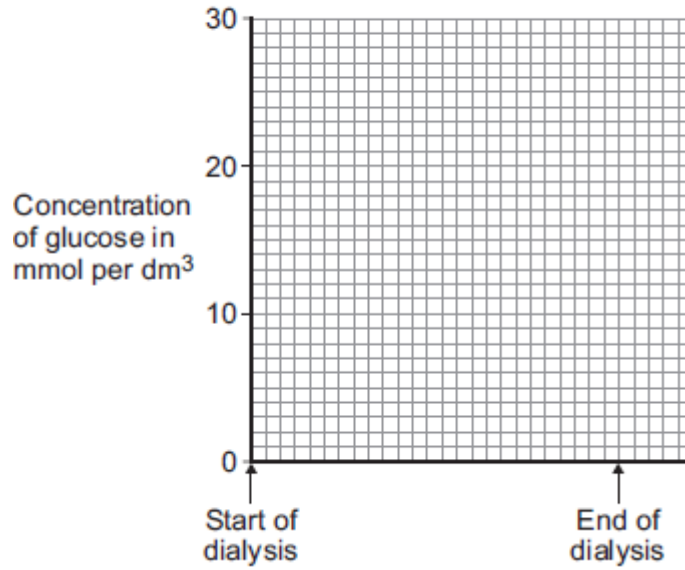
The child has a normal blood glucose concentration.

(i) Sketch a graph on **Figure 1** to suggest what will happen to the concentration of urea in the blood during dialysis.



(ii) Sketch a graph on **Figure 2** to suggest what will happen to the concentration of glucose in the blood during dialysis.

Figure 2



(1)

(c) (i) Another way of treating kidney failure is with a kidney transplant.

A transplanted kidney can be rejected.

Explain why the new kidney may be rejected.

(3)

(ii) Describe **one** way in which doctors try to prevent kidney rejection.

(1)

(Total 11 marks)

Q58.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Homeostasis keeps conditions in the body relatively constant.

The amount of water in the body is controlled by homeostasis.

Kidney function is controlled by a gland in the brain.

