

## Detecting a Change

### Recall Questions

1. Match the following with a line

1. Receptors for detecting light.	A. Detect stimuli
2. Specialised nerve endings called receptors	B. detected by your skin.
3. Central Nervous System	C. reacts to your surroundings and coordinate your behaviour
4. Touch	D. are found in the eyes
5. Sense of smell detects	E. electrical impulses.
6. Sensory neurons carry	F. chemicals in the air

2. Name two sense organs and what they detect.

### Application Questions

1. A dog hears a cat moving in the garden so runs towards it.

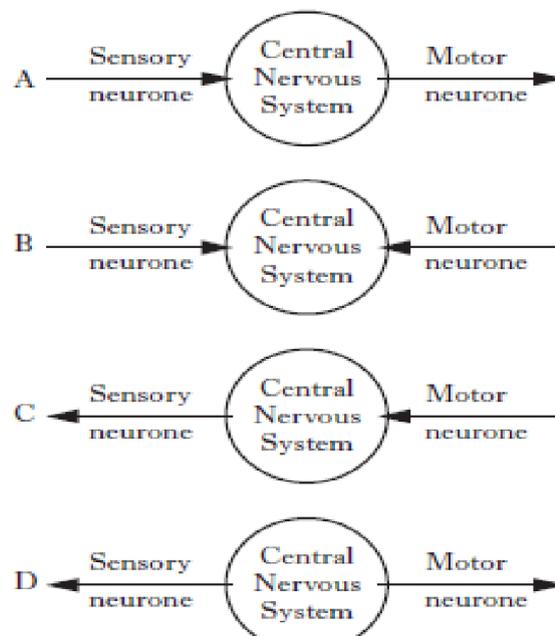
a) What is the stimulus in this situation?

b) What detects the stimulus?

## The Nervous System

1. What is the CNS made up of?
2. Which type of neurone detects the stimulus?
3. Which type of neurone are involved in the response?
4. What name do we give to the specialised nerve endings which detect the stimulus?
5. What is an effector?
- 6.

Which of the diagrams below correctly identifies neurones and the direction of travel of nerve impulses?



7.

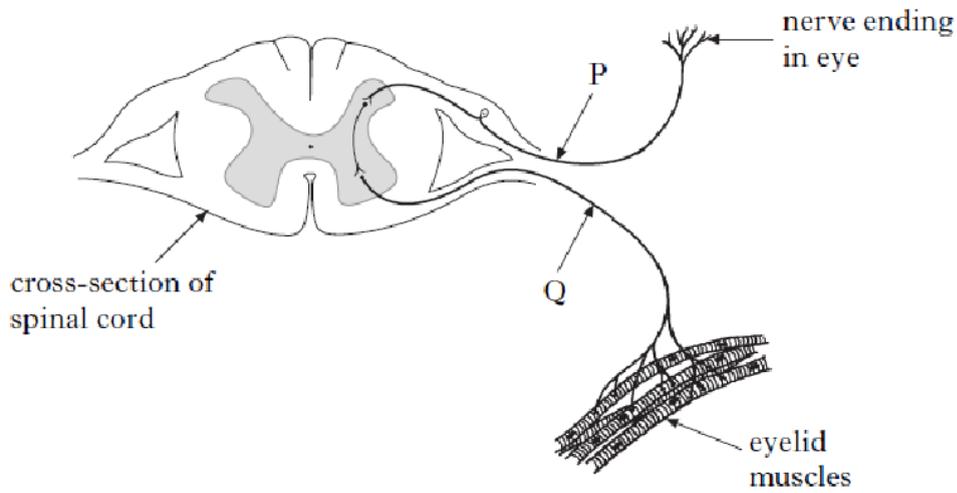
Touching a hot object produces a reflex action.

Describe the pathway of a nerve impulse through a reflex arc and the functions of this reflex action.

5

8.

The three types of neurone involved in the reflex arc for blinking are shown in the diagram below.



(a) Name neurones P and Q.

P \_\_\_\_\_

Q \_\_\_\_\_

2

(b) Which labelled structure is the effector in this response?

\_\_\_\_\_

1

(c) What is the function of a reflex action?

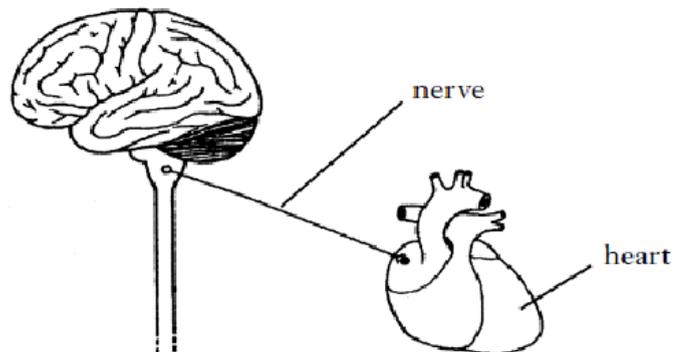
\_\_\_\_\_

\_\_\_\_\_

1

9.

(a) The diagram below shows parts of the central nervous system (CNS) and a nerve to the heart.



(i) Name the two parts, shown in the diagram, which make up the central nervous system (CNS).

1 \_\_\_\_\_

2 \_\_\_\_\_

1

(ii) Name the area, shown in the diagram, which controls heart rate.

\_\_\_\_\_

1

(b) Reflex arcs contain relay fibres.

(i) Which structure sends impulses to the relay fibre?

\_\_\_\_\_

1

(ii) What is the function of relay fibres in a reflex arc?

\_\_\_\_\_

1

(c) Explain the function of a reflex response.

\_\_\_\_\_

\_\_\_\_\_

1

10.

The following stages occur in a reflex action.

- 1 The effector produces a response.
- 2 A sense organ is stimulated.
- 3 An impulse passes along a sensory neurone.
- 4 An impulse passes along a motor neurone.

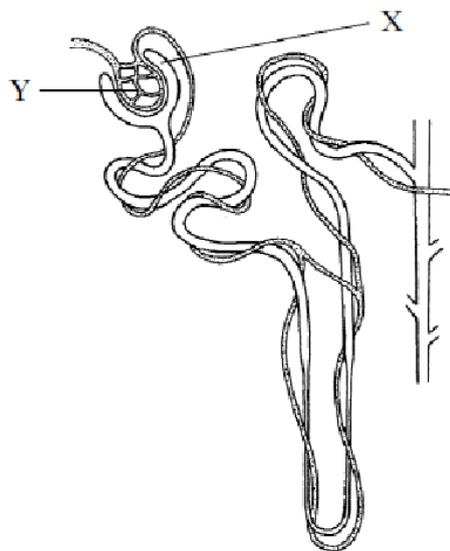
The correct order of the stages is

- A 2, 3, 4, 1
- B 2, 1, 4, 3
- C 1, 2, 3, 4
- D 3, 4, 1, 2.

## Regulation of Water Balance

1. What name do we give to the tiny filtering units within the kidneys?
2. What is the name of the bundle of capillaries inside the Bowman's Capsule?
3. Which molecule is not filtered out of the blood in the kidneys?
4. Where does the waste, such as urea, collect in the kidney before leaving to go to the bladder?
5. Urea is broken down from protein. Where is urea produced in the first place?
- 6.

The following diagram represents a kidney nephron.



- (a) The following sentences describe some processes that occur in the nephron. Underline one option in each set of brackets to make the sentences correct.

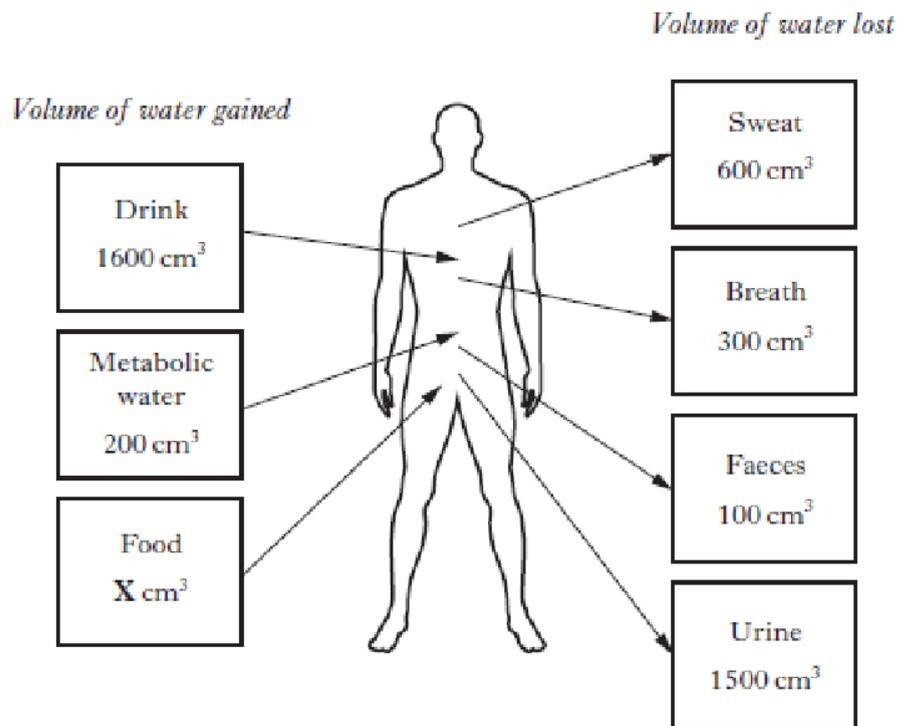
The glomerulus is shown by letter  $\left\{ \begin{array}{c} X \\ Y \end{array} \right\}$  and the process carried out in this

structure is  $\left\{ \begin{array}{c} \text{absorption} \\ \text{filtration} \end{array} \right\}$ .

7.

- (a) In an investigation, a student's water gains and losses were measured for 24 hours.

The results are shown in the diagram below.



- (i) The total volume of water gained equals the total volume of water lost.  
Calculate the volume of water (X) gained from food.

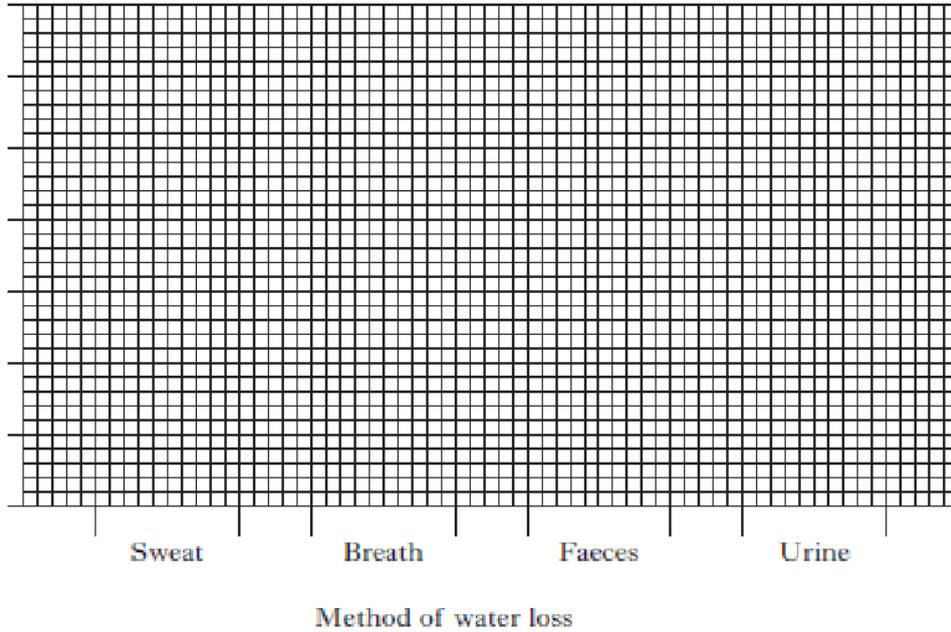
*Space for calculation*

**X** = \_\_\_\_\_ cm<sup>3</sup>    **1**

(a) (continued)

- (ii) Use the information on volume of water lost from the diagram to construct a **bar graph** on the grid below.

(Additional graph paper, if required, will be found on *Page thirty-six*)



2

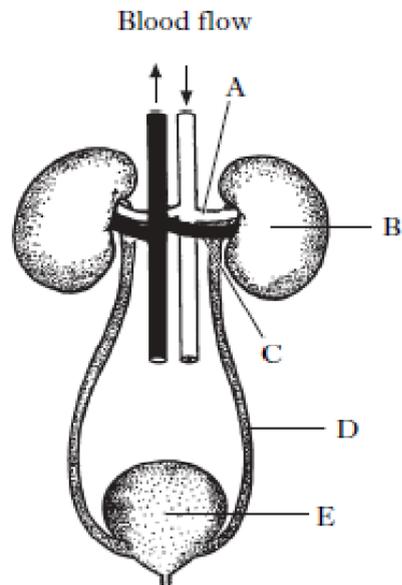
- (iii) Body mass is 70% water. The student had a body mass of 65 kg.  
Calculate the mass of water in the student's body.

*Space for calculation*

\_\_\_\_\_ kg water    1

8.

(a) The diagram below shows the structure of the human urinary system.

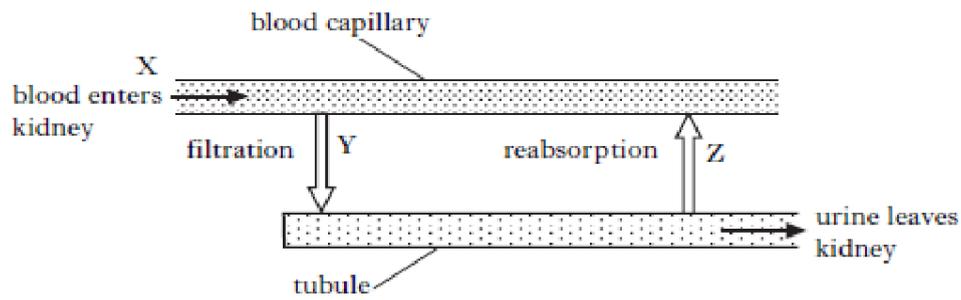


Complete the table to identify the structures and their functions.

<i>Structure</i>	<i>Letter</i>	<i>Function</i>
Bladder	E	
	A	Carries blood into the kidney
Ureter		Carries urine away from the kidney

2

(b) The diagram below represents filtration and reabsorption in the kidney.



A hormone controls the volume of water reabsorbed at Z.

(i) Name this hormone.

\_\_\_\_\_

1

(ii) If there is a decrease in the level of this hormone, what will happen to the volume of water reabsorbed at Z?

\_\_\_\_\_

1

**(b) (continued)**

- (iii) Tick (✓) the boxes in the table below to indicate which two blood components are filtered out of the blood at Y.

<i>Blood components</i>	<i>Filtered out at Y</i>
glucose	
salts	
blood cells	

**1**

- (iv) The rate of flow at X, Y and Z is measured.

Rates of flow:

$$X = 1200 \text{ cm}^3 \text{ per minute}$$

$$Y = 125 \text{ cm}^3 \text{ per minute}$$

$$Z = 124 \text{ cm}^3 \text{ per minute}$$

How much urine will be produced in one hour?

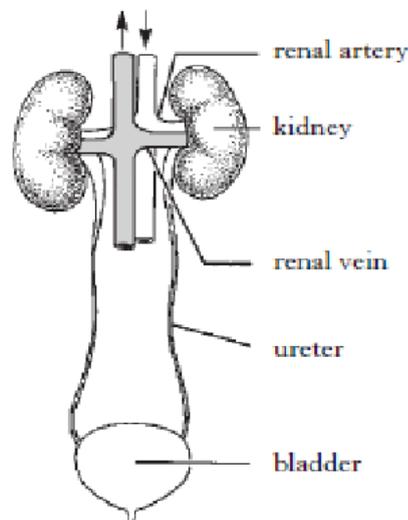
*Space for calculation*

Volume of urine produced in one hour \_\_\_\_\_  $\text{cm}^3$  **1**

9.

The diagram below shows the human urinary system with its blood supply.

blood flow



(a) An investigation was carried out to measure the concentration of three substances in samples of blood and urine.

The table below shows the results of this investigation.

Sample site	Concentration (grams per litre)		
	Glucose	Urea	Salts
Renal artery	1.0	0.3	8.0
Renal vein	0.8	0.0	6.0
Ureter	0.0	20.0	15.0

(i) Calculate the percentage of glucose remaining in the blood after it passes through the kidney.

*Space for calculation*

\_\_\_\_\_ % 1

(ii) Explain how the data in the table supports the statement that urea is a waste product.

\_\_\_\_\_  
 \_\_\_\_\_ 1

(iii) Name one substance, not shown in the table, which is present in urine.

\_\_\_\_\_ 1

**(continued)**

- (b) Name the two processes in the kidney which cause the differences in salt concentration between blood and urine.

Process 1 \_\_\_\_\_ **1**

Process 2 \_\_\_\_\_ **1**

- (c) Freshwater bony fish use their kidneys to overcome a water balance problem. Describe this problem and **one** method used by the kidneys to overcome it.

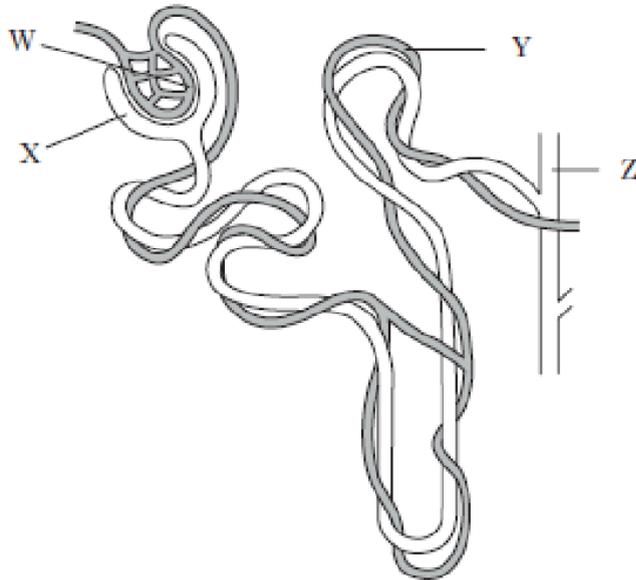
Problem \_\_\_\_\_ **1**

Method \_\_\_\_\_ **1**

10.

*Mark*

The diagram represents a microscopic part of a kidney.



(a) Complete the table to show the names and functions of the structures shown on the diagram.

	<i>Name</i>	<i>Function</i>
W	glomerulus	
X		collection of filtrate
Y		reabsorption
Z	collecting duct	

2

(continued)

Marks

(b) The table shows information about kidney function.

Fluid	Component (g per 100cm <sup>3</sup> )				
	urea	glucose	amino acids	salts	proteins
blood plasma	0.03	0.10	0.05	0.9	8.0
glomerular filtrate	0.03	0.10	0.05	0.9	none
urine	1.75	none	none	0.90–3.60	none

- (i) In which organ is urea produced and how is it transported to the kidneys?

Organ \_\_\_\_\_

Means of transport \_\_\_\_\_

1

- (ii) Name **one** component in the table which can pass through the wall of the glomerulus, and **one** component which cannot.

Can pass through \_\_\_\_\_

Cannot pass through \_\_\_\_\_

1

(c) In one investigation, the kidneys of an adult male were found to filter 1254cm<sup>3</sup> of blood per minute. This produced 114cm<sup>3</sup> of filtrate per minute and 1.2 cm<sup>3</sup> of urine per minute.

- (i) Express these volumes as a simple whole number ratio.

Space for calculation

$\frac{\quad}{\text{blood}} : \frac{\quad}{\text{filtrate}} : \frac{\quad}{\text{urine}}$

1

- (ii) Using the results of this investigation and information from the table, calculate the mass of urea which would be excreted by this person in 24 hours.

Space for calculation

\_\_\_\_\_ g

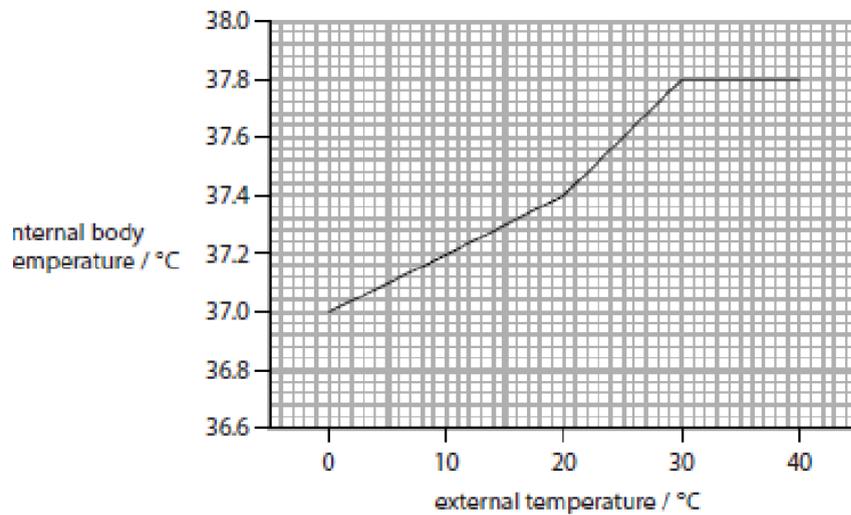
1

## Thermoregulation

1. Which process produces heat in every living cell?
  - a. digestion
  - b. protein synthesis
  - c. respiration
  - d. photosynthesis
2. Which organ of the body produces the most heat?
  - a. the brain
  - b. the liver
  - c. the small intestine
  - d. the heart
3. How is heat transferred around the body?
4. What should your core body temperature be?
  - a. 35°C
  - b. between 35 and 36.5°C
  - c. between 36 and 37.5°C
  - d. 38°C
5. What happens if your body temperature drops below 35°C?
6. What happens if your core body temperature rises above 40.6°C?
7. Suggest three ways your body can lose heat
8. Which of the following pairs of corrective mechanisms would occur in response to an increase in body temperature?
  - a - Dilation of blood capillaries in the skin **and** increased activity of sweat glands
  - b - Dilation of blood capillaries in the skin **and** decreased activity of the sweat glands
  - c - Constriction of blood capillaries in the skin **and** increased activity of sweat glands
  - d - Constriction of blood capillaries in the skin **and** decreased activity of sweat glands

9. A scientist investigated the effect of changes in external temperature on a person's internal body temperature.

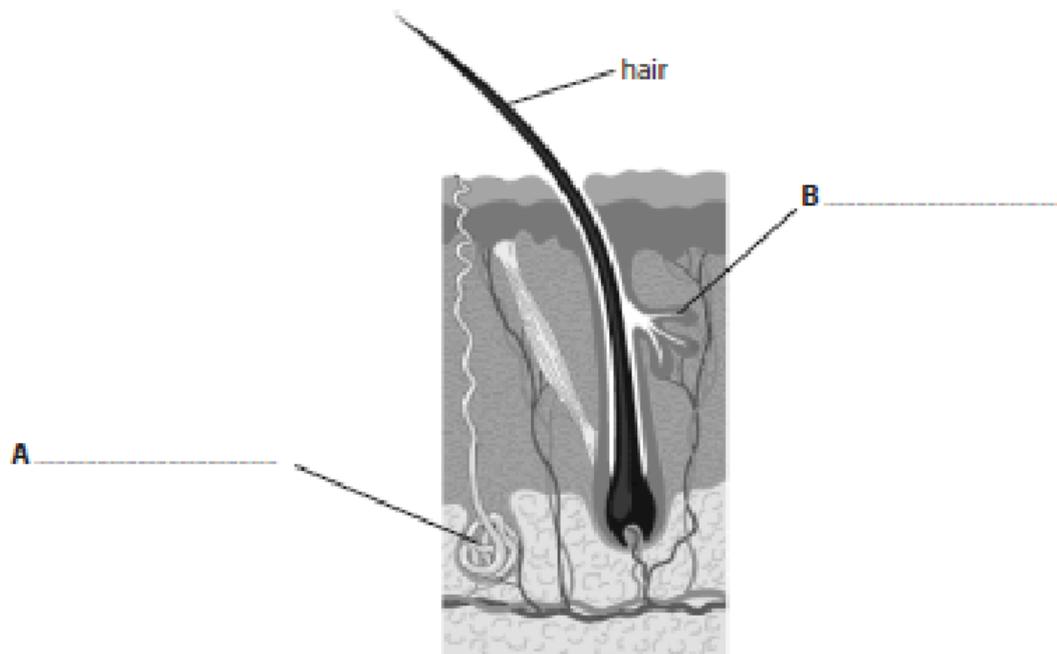
The graph shows the results in this investigation.



- a) i) Calculate the difference in internal body temperature and external body temperature of 20°C and 40°C.
- ii) Explain why it is important that body temperature does not rise above 40°C

10.a) i) The diagram shows a cross section of the skin.

Name the parts labelled A and B on the diagram.



ii) Explain the role of the part labelled A in regulating body temperature.

b) Complete the sentence by selecting the correct organ.

Human body temperature is controlled by the

a - brain

b - heart

c - lungs

d - stomach

c) If a person is badly burnt the hairs on the skin are lost and blisters can cover the surface of the skin.

Explain how burns to the skin affect temperature regulation in the human body.