

Part 4: How do living systems respond to change?

- Activity 4.1 Can you change how an organism behaves without touching it?
- Activity 4.2 Preserving the status quo
- Activity 4.3 What is homeostasis?
- Activity 4.4 How does the human body change during exercise?

4 PART

Activity 4.1 Can you change how an organism behaves without touching it?

Activity type



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Can your group design an experiment to change an organism's behaviour without touching it?

START THINKING

What organism are you investigating?

What external stimuli could you alter without direct touching?

What behaviour in the organism will you measure and observe as you change an external stimulus?

Can you formulate a question that can be investigated scientifically?

Note:

Your teacher will give you special instructions for this activity.

Activity 4.2 Preserving the status quo

Activity type



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How does your body maintain a constant internal environment?

Maintaining a constant internal environment

What to use:

Each STUDENT will require:

- Student Guide
- e-Notebook.

What to do:

Step 1

In groups move to the first station.

Step 2

Read the activity card carefully.

Step 3

Before starting, make your prediction in your **e-Notebook** about what will happen and why.

Step 4

Complete the activity. Record your observations in your **e-Notebook**.

Step 5

In your group, discuss possible explanations for your observations and record them in your **e-Notebook**.

Step 6

Put the equipment away neatly ready for the next group and wait to rotate to the next station.

Discussion:



From your experiments can you identify and describe some ways in which humans restore constant internal conditions when their temperatures change?

Can you sweat?



Can you change your breathing rate?



Can you cool down?

Can you get goose bumps?



What is in a kidney?

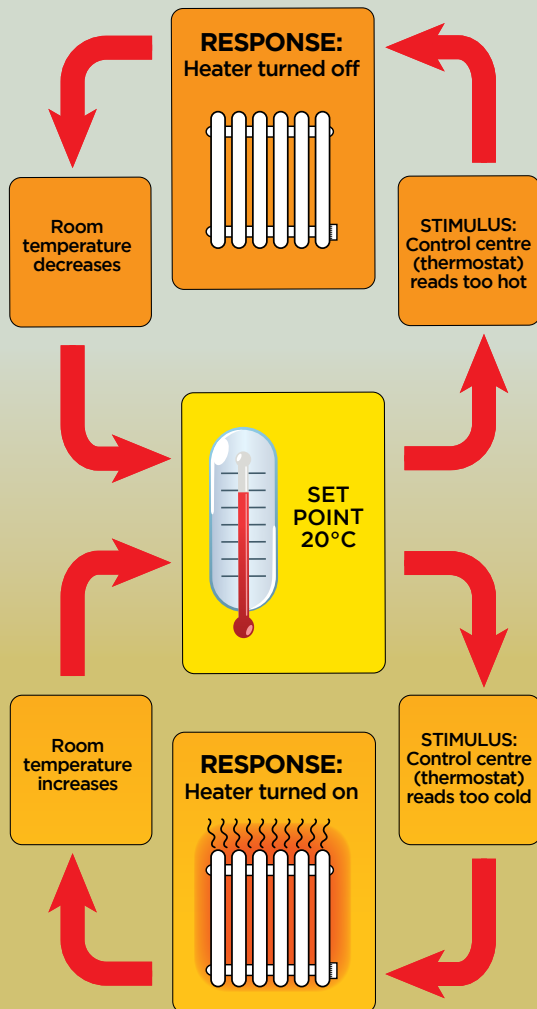


Activity 4.3 What is homeostasis?

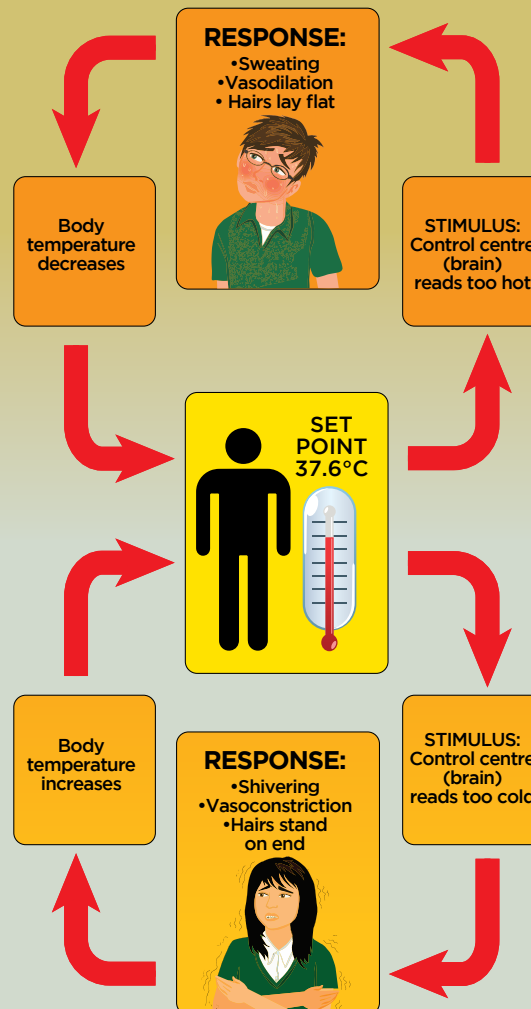


NEGATIVE FEEDBACK is a response that reduces a stimulus and so helps a system return to its set point.

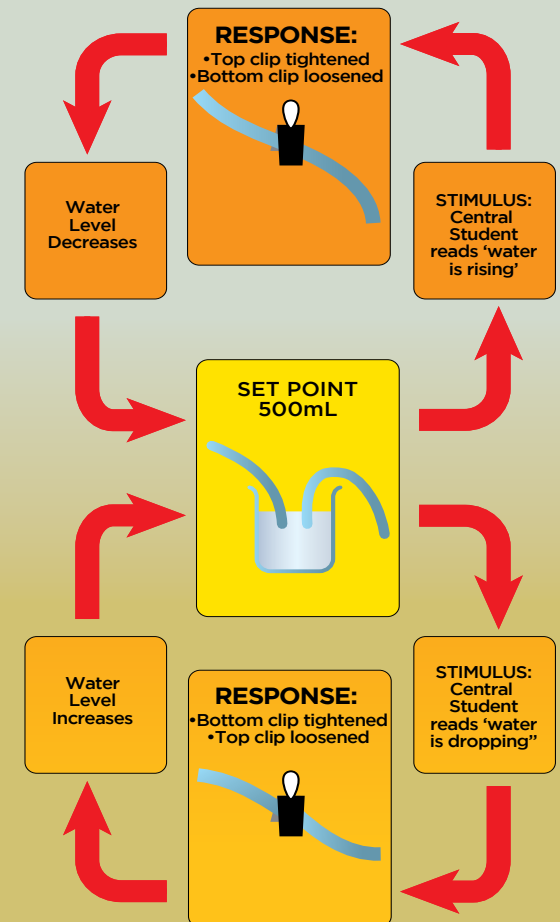
CONTROLLING ROOM TEMPERATURE



CONTROLLING BODY TEMPERATURE



CONTROLLING A WATERFALL



Click here to explore the concept of homeostasis.

Activity 4.4 How does the human body change during exercise?

Activity type



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Working in groups you will design and carry out an investigation into a human body's reaction to exercise.

START THINKING

What do you think happens to a human body before, during and after exercise?

Which variables will you investigate?

How and when will you measure them?

What type and length of exercise will occur?

Can you formulate a question that can be investigated?

Activity 4.4 How does the human body change during exercise? Continued

HOW DOES THE HUMAN BODY REACT AND RECOVER TO STRESS CAUSED BY EXERCISE?

Your body reacts and changes during and after exercise. What changes are actually occurring? Can you measure them? Can you explain them?

Your task is to work in a cooperative group to plan and carry out an investigation into a how the human body reacts and recovers to stress caused by exercise. You will need to:

1. Develop a question to investigate
2. Plan a fair investigation
3. Conduct your investigation and gather results
4. Present your results in a table and a graph. Analyse any patterns or trends in the data
5. Use knowledge of human body systems and homeostasis to help you draw conclusions about your results
6. Evaluate your investigation and suggest improvements to its design.

Investigation into the effects of exercise on the human body

What to do:

Use the investigation guide in the **e-Notebook** to help you plan and conduct your investigation.

Summary

4 PART

Our bodies have various **control mechanisms** to maintain a **constant internal environment**. This is called **homeostasis**.

Goose bumps occur when the body is cold. They are formed when tiny muscles at the base of each hair contract and pull the hair erect. The rising hair traps air between the hairs and skin, creating insulation and warmth. This demonstrates one of the body's homeostatic control mechanisms for dealing with a drop in temperature.

Exercising causes the body's temperature to rise due to heat production from the muscles. Our skin becomes red during exercise due to **vasodilation**; the widening or dilation of blood capillaries in the skin. This vasodilation causes an increase in blood flow near the body's surface and enables some of the heat energy that is carried by the blood to transfer to the atmosphere. **Sweat production** also acts to cool the body.

When we hold our breath the CO_2 level increases in our blood and the level of oxygen drops. Our **breathing rate** increases to compensate and bring these levels back to normal **set points**.

Negative feedback is a **response** that reduces a **stimulus** to help a system return to its **set point**.

When our brain registers that we are too hot (**stimulus**) we begin to sweat and our blood vessels vasodilate (**negative feedback response**) and so our temperature drops back to our **set point** of about 37°C .

When our brain registers that we are too cold (**stimulus**) we begin to shiver, our blood vessels vasoconstrict and we get goose bumps (**negative feedback response**) and so our temperature rises back to our **set point** of about 37°C .

When **blood sugar (glucose) rises** above the set point the **pancreas** produces the hormone **insulin** that is secreted into the blood. The insulin causes the liver to take the glucose from the blood and **convert it into glycogen and store it**. Hence the blood sugar level in the blood drops.

When **blood sugar (glucose) falls** below the set point the **pancreas** produces the hormone **glucagon** that is secreted into the blood. The glucagon causes the liver to turn the **glycogen back into glucose** and release it into the blood. Hence the blood sugar level in the blood rises.

