SCIENCE FOUNDATIONS

Homeostasis

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how your body keeps your temperature near 37 degrees even on a freezing day or a hot run, by sweating, shivering, and adjusting blood flow to correct the change. A nurse checks blood sugar because the body normally holds it in a narrow range, and a reading outside that range is a warning sign. A thermostat in your house does the same job, sensing a change and switching the heat on or off to bring it back. Knowing homeostasis tells you why your body works so hard to stay steady inside, even when everything outside is changing.



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Rule

Homeostasis: the body keeps its internal conditions steady by negative feedback.

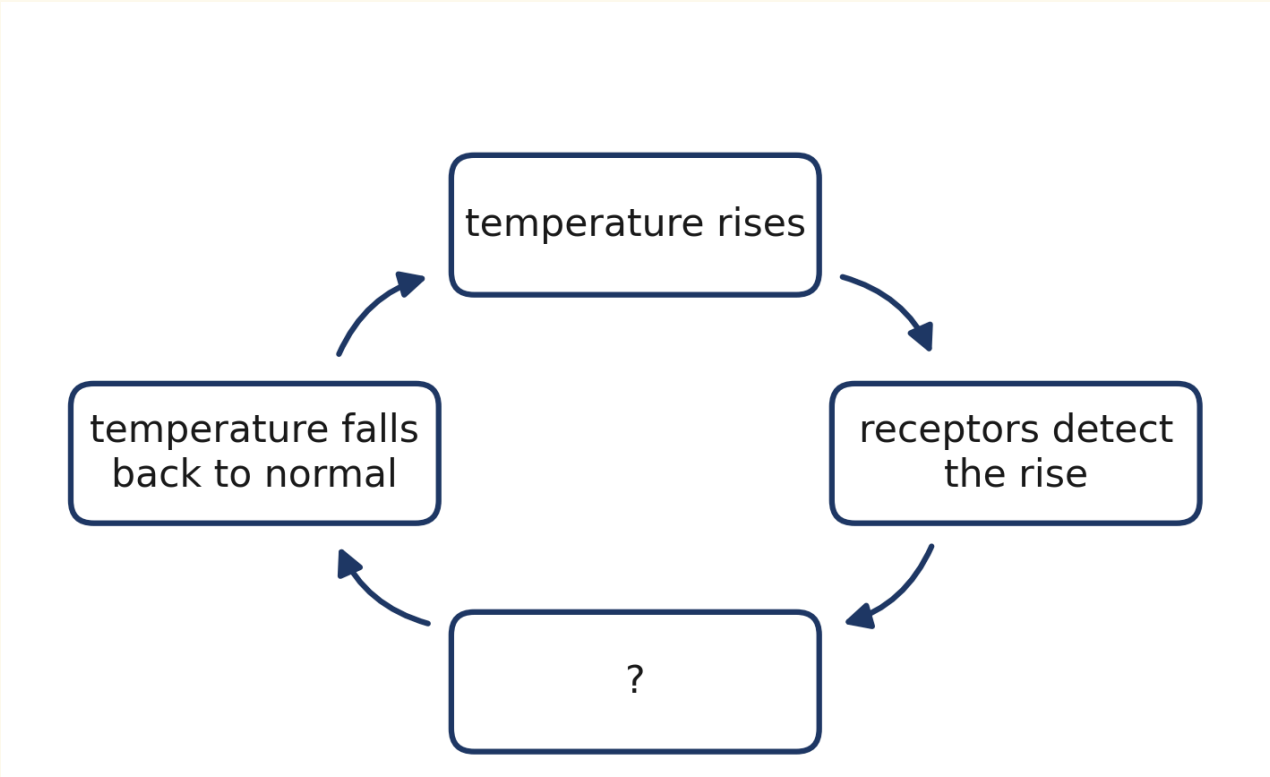
When a condition moves away from its set point, the body senses the change and responds in the opposite direction to bring it back.

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Worked examples

EXAMPLE 1

Q Body temperature rises. How does negative feedback correct it?



SOLUTION

Sense the change: temperature receptors detect the rise.

Respond: sweating and widened skin blood vessels cool the body.

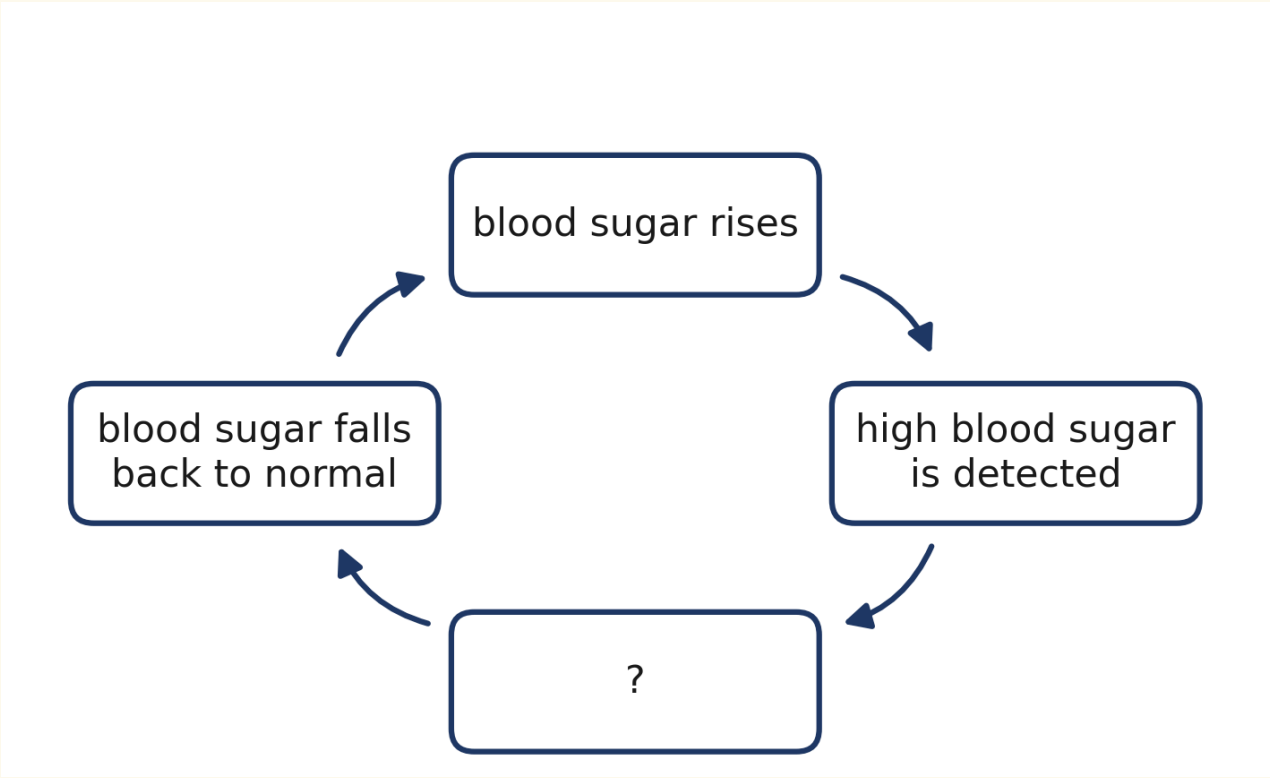
The result is temperature falls back toward normal, stopping the response.

The result is sweating and vessel widening restore normal temperature.

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EXAMPLE 2

Q Blood sugar rises after eating. What corrects it?



SOLUTION

Sense the change: high blood sugar is detected.

Respond: insulin is released, moving sugar into cells.

The result is blood sugar falls back toward normal.

The result is insulin lowers blood sugar toward normal.

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Practice questions

1 **A student exercises hard and sweats a lot, losing water from the body. How does negative feedback restore the water balance?**

- **A** Sweating increases to cool the body further
- **B** Thirst rises and urine output falls, so water is kept and replaced
- **C** The body stops making urine forever
- **D** Blood sugar rises to replace the water

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2

Blood pressure rises above normal after a stressful moment. How does negative feedback bring it back down?

A The heart beats faster and faster

B Blood vessels narrow to raise the pressure more

C Receptors detect the rise and blood vessels widen, so pressure falls

D The kidneys stop filtering blood

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3 **Blood sugar falls below normal between meals. How does negative feedback bring it back up?**

- **A** Glucagon is released and stored sugar is freed into the blood
- **B** Insulin is released to move sugar into cells
- **C** The pancreas stops working
- **D** Sweating cools the body

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4 **A person drinks a lot of water and the water level in the blood rises above normal. What corrects it?**

- **A** Thirst rises so more water is drunk
- **B** Sweating stops completely
- **C** Insulin is released
- **D** More urine is made, so excess water leaves the body

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5 Homeostasis definition?

- A Conditions that never change
- B The body heating up
- C Stable internal conditions
- D A disease of the blood

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6 Negative feedback definition?

- A A change triggers a bigger change
- B A change triggers a correction
- C The body ignores a change
- D A correction triggers a change

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7 **Body temperature falls on a cold day. What is the response?**

- **A** Sweating, widened vessels
- **B** Shivering, narrowed vessels
- **C** Thirst rises, urine output falls
- **D** Insulin release

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8 **Blood pressure falls below normal. How does negative feedback bring it back up?**

- **A** Heart beats faster, vessels narrow
- **B** Heart beats slower, vessels widen
- **C** The kidneys stop filtering blood
- **D** Sweating cools the body

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9 Positive or negative feedback: which keeps things stable?

A Positive

B Negative

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10 Too far outside the normal range: what is the result?

A Harm or death

B Nothing happens

C The body works better

D The range widens forever

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ANSWER KEY

1. Thirst rises and urine output falls, so water is kept and replaced
2. Receptors detect the rise and blood vessels widen, so pressure falls
3. Glucagon is released and stored sugar is freed into the blood
4. More urine is made, so excess water leaves the body
5. Stable internal conditions
6. A change triggers a correction
7. Shivering, narrowed vessels
8. Heart beats faster, vessels narrow
9. Negative
10. Harm or death

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