Ben's Bad Day

Homeostasis · Negative Feedback Worksheet

Ben cannot catch a break. For each situation below, work out the negative-feedback loop his body uses to fight back. Fill in the stimulus, receptor, control centre, effector, and response.

Key Terms

Term	What it means
Stimulus	A change in the internal or external environment that pushes a variable away from its normal set point.
Receptor	A cell, tissue, or organ that detects the stimulus and converts it into a signal — a nerve impulse or a hormone.
Control Centre	The part of the body that receives the signal, compares it against the set point, and decides what response is needed.
Effector	A muscle or gland that carries out the control centre's instructions.
Response	The change the effector produces, which counteracts the original stimulus and restores the set point.

8:00 AM · The Wake-Up Jolt

Ben fell asleep hunched over his desk after an all-nighter. A classmate slams a book down and he leaps out of his chair — the room instantly goes fuzzy and dark at the edges. He grabs the desk so he doesn't go down.

Step	Your answer
Stimulus	
Receptor	
Control Centre	
Effector	
Response	

8:30 AM · Cold Walk to Lab

Still shaky, Ben steps outside into a cold morning without a jacket, rushing to Chem lab. Within a minute his teeth are chattering and his arms are covered in goosebumps.

Step	Your answer
Stimulus	
Receptor	
Control Centre	
Effector	
Response	

11:50 AM · The Sprint

Ben's lab report blows off his desk and out an open door. He bolts down the hallway after it, sprinting harder than he has all semester.

Step	Your answer
Stimulus	
Receptor	
Control Centre	
Effector	
Response	

8:30 PM · Forgot to Drink Water

Ben's been so busy he hasn't had a sip of water since breakfast. By evening his mouth is bone dry and his blood is far more concentrated than it should be.

Step	Your answer
Stimulus	
Receptor	
Control Centre	
Effector	
Response	

12:00 AM · Midnight Snack

Finally home, Ben devours a big bowl of pasta before bed. Half an hour later his blood glucose is climbing fast.

Step	Your answer
Stimulus	
Receptor	
Control Centre	
Effector	
Response	

Check Your Understanding

True or False? Circle your answer for each statement.

1. A stimulus is the body's way of correcting an imbalance.

True / False

2. Baroreceptors in the carotid arteries and aorta detect Ben's drop in blood pressure when he stands up too fast.

True / False

3. Shivering is an effector response controlled by the thermoregulatory centre in the hypothalamus.

True / False

4. The lactic acid produced during Ben's sprint raises his blood pH.

True / False

5. When Ben is dehydrated, the pituitary gland releases ADH to make the kidneys reabsorb more water.

True / False

6. In the pancreas's response to Ben's midnight snack, the pancreas acts as both the receptor and the control centre.

True / False

7. An effector is the structure that first detects a stimulus.

True / False

8. All five of Ben's homeostatic responses in this activity are examples of positive feedback.

True / False

Multiple Choice Questions

Circle the letter of the best answer for each question.

1. Which correctly orders the components of a negative feedback loop?

A. Stimulus → Effector → Receptor → Control Centre → Response
B. Stimulus → Receptor → Control Centre → Effector → Response
C. Receptor → Stimulus → Effector → Control Centre → Response
D. Control Centre → Stimulus → Receptor → Effector → Response

2. In Ben's cold-walk scenario, which pair of effector responses helped restore his body temperature?

A. Sweating and vasodilation
B. Shivering and vasoconstriction of skin blood vessels
C. Increased breathing rate and heart rate
D. Insulin release and glucose uptake

3. Why does eating a meal trigger insulin release from the pancreas?

A. To raise blood glucose levels further
B. To lower blood glucose by helping cells take up glucose from the blood
C. To break down fat stores for energy
D. To increase thirst and water retention

4. Which best describes the role of an effector in a negative feedback loop?

A. It detects the original stimulus
B. It carries out the response that corrects the imbalance
C. It compares the change to the normal set point
D. It causes the imbalance to occur

5. In the water balance scenario, what does ADH do once released?

A. Increases urine production to flush out excess water
B. Makes the kidneys reabsorb more water, producing more concentrated urine
C. Signals the pancreas to release more insulin
D. Widens blood vessels to lower blood pressure