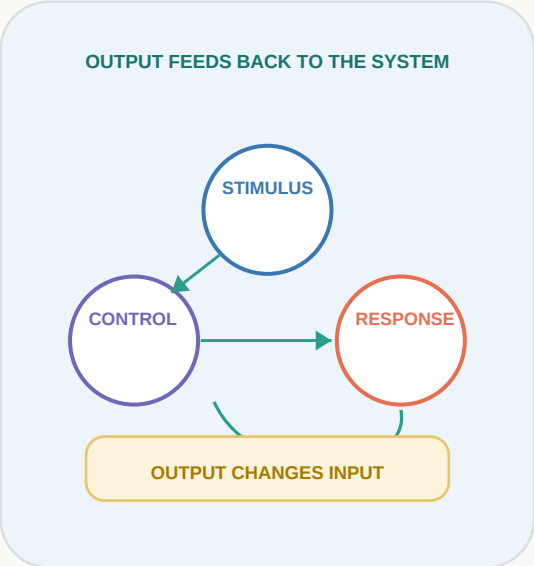
AP BIOLOGY | UNIT 4

TOPIC 4.4

Feedback

Feedback mechanisms use the result of a process to reduce, reverse, or amplify the original change in a regulated system.



THE CORE CAUSAL CHAIN

STIMULUS
condition changes

→

SENSOR
detects change

→

RESPONSE
effectors act

→

FEEDBACK
alters condition

BY THE END, YOU SHOULD BE ABLE TO...

1. Identify the parts of a biological feedback loop.
2. Compare negative and positive feedback.
3. Explain how disrupted feedback affects homeostasis.

CENTRAL IDEA

Negative feedback counteracts deviation and supports a stable range. Positive feedback reinforces deviation until a short-term process is completed.

1 Negative feedback maintains a functional range

A deviation activates responses that oppose the original change, moving the regulated variable back toward its target range.

THE LOOP COUNTERACTS CHANGE

VARIABLE RISES
condition leaves target range

→

SENSOR / CONTROL
change is detected and compared

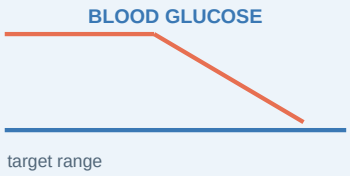
→

EFFECTORS ACT
response opposes the change

→

VARIABLE FALLS
condition returns toward range

EXAMPLE: BLOOD GLUCOSE AFTER A MEAL



HIGH GLUCOSE
pancreatic beta cells detect

→

INSULIN
signals uptake and storage

→

GLUCOSE FALLS
moves toward target range

THE RESPONSE REDUCES THE ORIGINAL STIMULUS

HOMEOSTASIS IS A RANGE, NOT A PERFECTLY FIXED VALUE

SMALL DEVIATIONS -> CORRECTIVE RESPONSES -> FUNCTIONAL RANGE

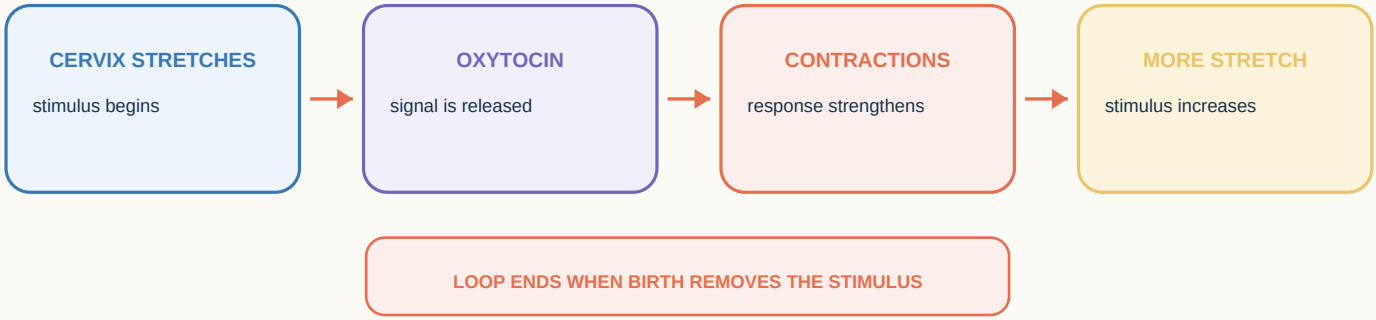
COMMON ERROR

Negative feedback does not mean a harmful response. Negative describes the direction: the response opposes the original change.

2 Positive feedback drives a process to completion

The response reinforces the original change, producing a self-amplifying loop that ends when a specific event stops the stimulus.

EXAMPLE: CHILDBIRTH



NEGATIVE VS POSITIVE FEEDBACK

FEATURE	NEGATIVE	POSITIVE
EFFECT ON CHANGE	reduces or reverses	amplifies
SYSTEM ROLE	maintains range	drives completion
DURATION	continuous regulation	short-term loop
EXAMPLE	blood glucose	childbirth

WHEN FEEDBACK IS DISRUPTED

SENSOR FAILURE
change is not detected

SIGNAL FAILURE
control message is not delivered

EFFECTOR FAILURE
response cannot correct condition

COMMON ERROR

Positive feedback is not automatically beneficial. Positive describes amplification; the loop can be useful or harmful depending on context.