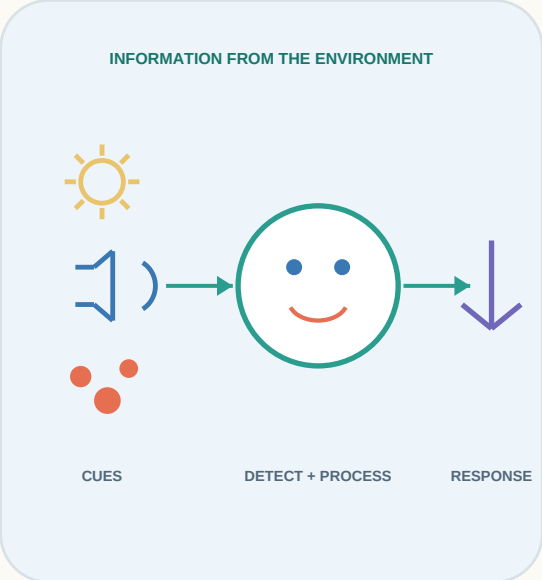
AP BIOLOGY | UNIT 8

TOPIC 8.1

Responses to the Environment

Organisms detect internal and external changes, process information, and produce responses that can affect survival and reproduction.



THE INFORMATION-TO-FITNESS CHAIN

STIMULUS
a condition changes

→

DETECTION
receptors receive data

→

RESPONSE
body or behavior shifts

→

FITNESS
outcome affects success

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

1. Distinguish behavioral responses from physiological responses.
2. Explain how signals change the behavior of receivers.
3. Connect innate, learned, and cooperative behavior to fitness.

CENTRAL IDEA

A response is adaptive only when its benefits in a particular environment increase survival or reproductive success enough to outweigh its costs.

1 Organisms respond to information

A stimulus can originate inside the organism or outside it. The response may be an action or a change in body function.

WHERE DOES THE STIMULUS COME FROM?

INTERNAL CHANGE

- blood glucose falls
- body temperature rises
- water balance shifts

EXTERNAL CUE

- light direction changes
- predator odor appears
- a mating call is heard

TWO TYPES OF RESPONSE

BEHAVIORAL RESPONSE

An observable action changes how the organism interacts with its surroundings.

1. A lizard moves into shade.
2. A plant shoot bends toward light.
3. An animal flees a predator.

PHYSIOLOGICAL RESPONSE

An internal body process changes to regulate conditions or performance.

1. Sweating increases heat loss.
2. Insulin lowers blood glucose.
3. Stomata close to reduce water loss.

COMMUNICATION CHANGES A RECEIVER'S BEHAVIOR

SENDER produces → **SIGNAL** carries information → **RECEIVER** detects → **RESPONSE** behavior changes

VISUAL | AUDIBLE | TACTILE | ELECTRICAL | CHEMICAL

2 Behavior can change through learning and selection

Behavior has immediate causes within an organism and evolutionary consequences when it affects survival or reproduction.

INNATE AND LEARNED BEHAVIOR

INNATE BEHAVIOR

An inherited pattern performed without prior learning.

- Triggered reliably by a cue.
- May be shaped by natural selection.
- Example: a reflex or fixed action pattern.

LEARNED BEHAVIOR

A response modified by experience or practice.

- Can adjust to local conditions.
- Includes habituation and conditioning.
- Learning ability may have a heritable basis.

COOPERATION: BENEFITS MUST BE WEIGHED AGAINST COSTS

GROUP HUNTING

BENEFIT	larger or faster prey captured
COST	food must be shared; injury risk

ALARM CALLS

BENEFIT	nearby individuals avoid danger
COST	caller may attract attention

PARENTAL CARE

BENEFIT	offspring survival increases
COST	time and energy are required

SELECTION CONNECTION

If a heritable tendency causes greater reproductive success in a particular environment, alleles contributing to that tendency can become more common over generations.

HOW TO TEST WHETHER A RESPONSE IS ADAPTIVE

1. IDENTIFY	the stimulus, response, and environmental context
2. COMPARE	survival or reproduction with and without the response
3. CONTROL	other factors that could explain the outcome