Food Chains, Food Webs, and Energy Flow

Matthew Williams • Biology • May 8, 2026

Food Chains, Food Webs, and Energy Flow

Feeding relationships show how organisms obtain energy and matter. In CSEC Biology, this topic often appears through food webs, trophic levels, ecological pyramids, and questions about what happens when one population changes.

Food chains should be studied in different habitats, including terrestrial and aquatic habitats.

Habitat Type	Meaning	Examples
Terrestrial	land-based	forest floor, garden, tree
Arboreal	living mainly in trees	tree canopy
Edaphic	living in or on soil	leaf litter, soil surface
Aquatic	water-based	pond, river, sea
Marine	salt water	coral reef, seagrass bed
Freshwater	fresh water	pond, stream

Producers, Consumers, and Decomposers

Producers make their own food. They are autotrophs, such as green plants, algae, phytoplankton, and mosses. Producers are important because they trap light energy from the sun and convert it into chemical energy in food.

Consumers cannot make their own food. They are heterotrophs.

Consumer Type	Feeding Pattern	Example
Herbivore	eats plants	grasshopper
Carnivore	eats animals	hawk
Omnivore	eats plants and animals	human
Decomposer	breaks down dead matter and waste	bacteria, fungi

In exam questions, herbivores, carnivores, and omnivores may come from unfamiliar habitats. Work from what the organism eats, not from whether the animal is familiar.

Decomposers break down dead plants, dead animals, and waste materials. Bacteria and fungi are the main decomposers.

Detritivores feed on decomposing organic matter. Examples include earthworms and dung beetles. Decomposers return nutrients to the environment; without them, nutrients would stay trapped in dead organisms and producers would eventually lack minerals for growth.

Trophic Levels

A trophic level is a feeding position in a food chain or food web.

Trophic Level	Role	Example
First	producer	grass
Second	primary consumer	grasshopper
Third	secondary consumer	lizard
Fourth	tertiary consumer	hawk

Food Chains

A food chain shows the transfer of energy and matter from one organism to another.

Example: Grass ’grasshopper ’lizard ’hawk. Grass is the producer, grasshopper is the primary consumer, lizard is the secondary consumer, and hawk is the tertiary consumer. The arrow means "is eaten by" or "energy passes to", so it points in the direction of energy transfer.

Food Webs

A food web is a network of interconnected food chains. It is more realistic than a single food chain because most organisms feed on more than one type of food.

Simple food web (/media/biology/foodweb.png)

Interdependence

Organisms in a food web are interdependent. A change in one population can affect several others.

If grasshoppers decrease:

- lizards may have less food
- small birds may have less food
- grass may increase because fewer grasshoppers feed on it
- hawks may be affected indirectly if their prey decrease

Food web answers are strongest when they follow the arrows carefully and explain both direct and indirect effects.

Predator, Prey, and Biological Control

A predator hunts, kills, and eats another organism. The organism eaten is the prey.

Predator-prey relationships can be used in **biological control**, where a living organism is used to reduce the population of a pest.

> **Biological control**
> If a pest insect damages crops, a predator or parasite of that insect may be introduced or encouraged to reduce the pest population. This can reduce the need for chemical pesticides, but it must be managed carefully so the control organism does not become a new problem.

Energy Flow

Energy flow is non-cyclic. Energy enters most ecosystems as sunlight, moves through food chains, and leaves as heat.

Sunlight ’producers ’consumers ’decomposers ’heat loss

Energy decreases at each trophic level because organisms use energy for movement, respiration, growth and repair, reproduction, temperature regulation, excretion, and waste. Not all parts of an organism are eaten or digested, and some energy remains in dead material and waste where decomposers act on it.

> 🧠 **Remember**
> Matter cycles through ecosystems, but energy flows through ecosystems and is eventually lost as heat.

Ecological Pyramids

Ecological pyramids show relationships between trophic levels.

Pyramid Type	What It Shows	Key Point
Energy	energy available at each trophic level	always upright
Biomass	dry mass of organisms at each trophic level	usually upright
Numbers	number of organisms at each trophic level	may be irregular

Example energy pattern:

Trophic Level	Energy Available
Producers	10,000 J
Primary consumers	1,000 J
Secondary consumers	100 J
Tertiary consumers	10 J

A pyramid of numbers may be unusual. One oak tree can support many greenflies, so the producer level may contain fewer organisms than the consumer level.

The pyramid of energy is the best pyramid for showing energy transfer because it accounts for energy loss between trophic levels.

Bioaccumulation

Bioaccumulation is the build-up of toxic substances in the tissues of organisms. These substances may become more concentrated at higher trophic levels because predators eat many contaminated prey.

Examples:

- DDT built up in birds of prey and caused thin eggshells
- mercury can build up in large predatory fish

Core idea

Energy becomes less available up a food chain, while persistent pollutants may become more concentrated.

[Code: flashcard[Feeding Relationships and Energy Flow]]

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Producer === An organism that makes its own food, usually by photosynthesis.
Consumer === An organism that obtains food by feeding on other organisms.
Decomposer === An organism, usually bacteria or fungi, that breaks down dead matter and waste.
Trophic level === A feeding position in a food chain or food web.
Food chain === A simple feeding pathway showing energy transfer between organisms.
Food web === A network of connected food chains.
Pyramid of energy === A diagram showing energy available at each trophic level; it is always upright.
Bioaccumulation === The build-up of toxic substances in organisms, often becoming more concentrated at higher trophic levels.
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