

Energy flow, food chains and food webs

Revision notes · How energy flows from the Sun through producers, consumers and decomposers to the environment, and how food chains and webs show feeding links.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

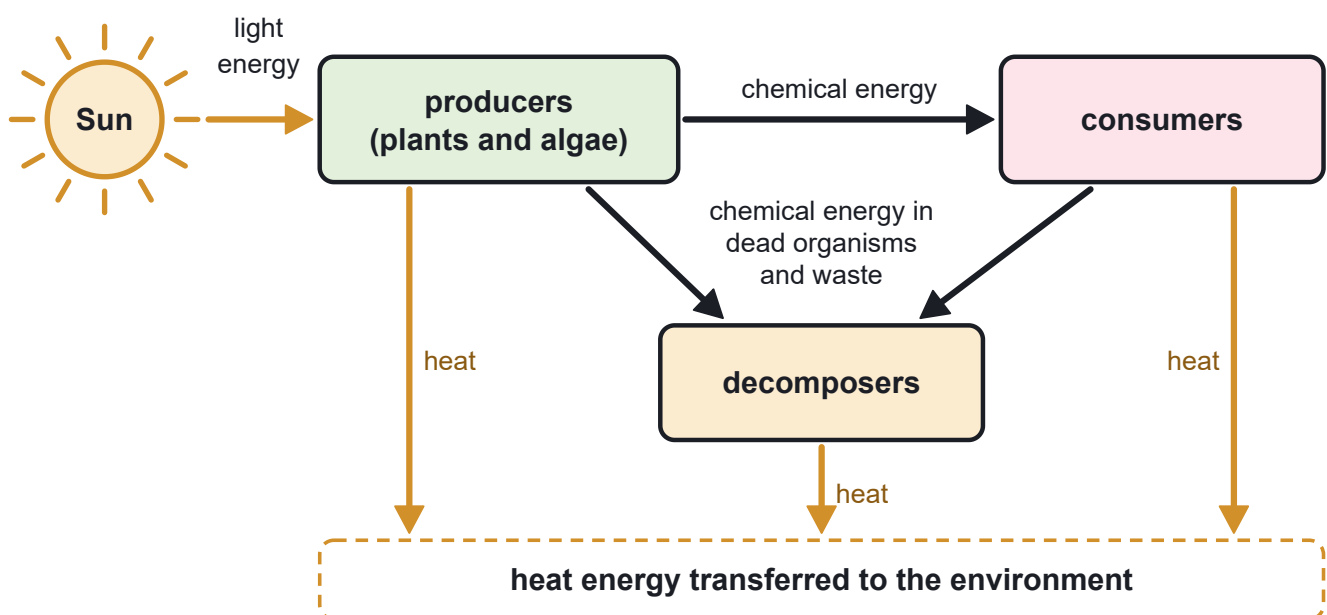
Energy flow, food chains and food webs Spec 19.1, 19.2.1-19.2.10

Energy flow Spec 19.1.1, 19.1.2

The **Sun** is the principal source of energy input to biological systems. Without light from the Sun there would be almost no energy entering living things.

Energy does not go round in a cycle. It **flows through** living organisms in one direction and is eventually transferred to the environment.

1. Light energy from the Sun is absorbed by green plants and algae. They transfer it to **chemical energy** in organic nutrients (such as glucose) by photosynthesis.
2. Chemical energy passes to animals when they eat plants, and to other animals when they eat those animals.
3. Chemical energy passes to decomposers when they feed on dead organisms and waste.
4. At every stage, organisms transfer energy by respiration. Much of it is eventually transferred to the environment as **heat**.



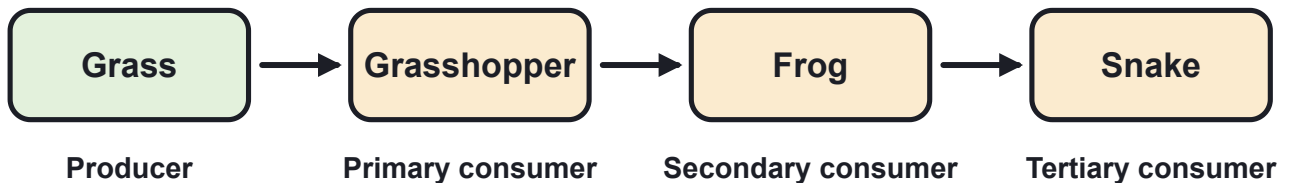
Energy **flows in one direction** through organisms and is not recycled: it ends up as heat in the environment.

Exam tip: Name the forms of energy: light energy from the Sun, chemical energy in organisms, and heat lost to the environment. Do not say that energy is 'used up' or 'destroyed'.

Food chains and food webs Spec 19.2.1, 19.2.2, 19.2.3, 19.2.10

Food chain	Shows the transfer of energy from one organism to the next, beginning with a producer.
Food web	A network of interconnected food chains.

In a **food chain** the arrows show the **transfer of energy**. Each arrow points from the organism that is eaten to the organism that eats it. The chain always begins with a producer.



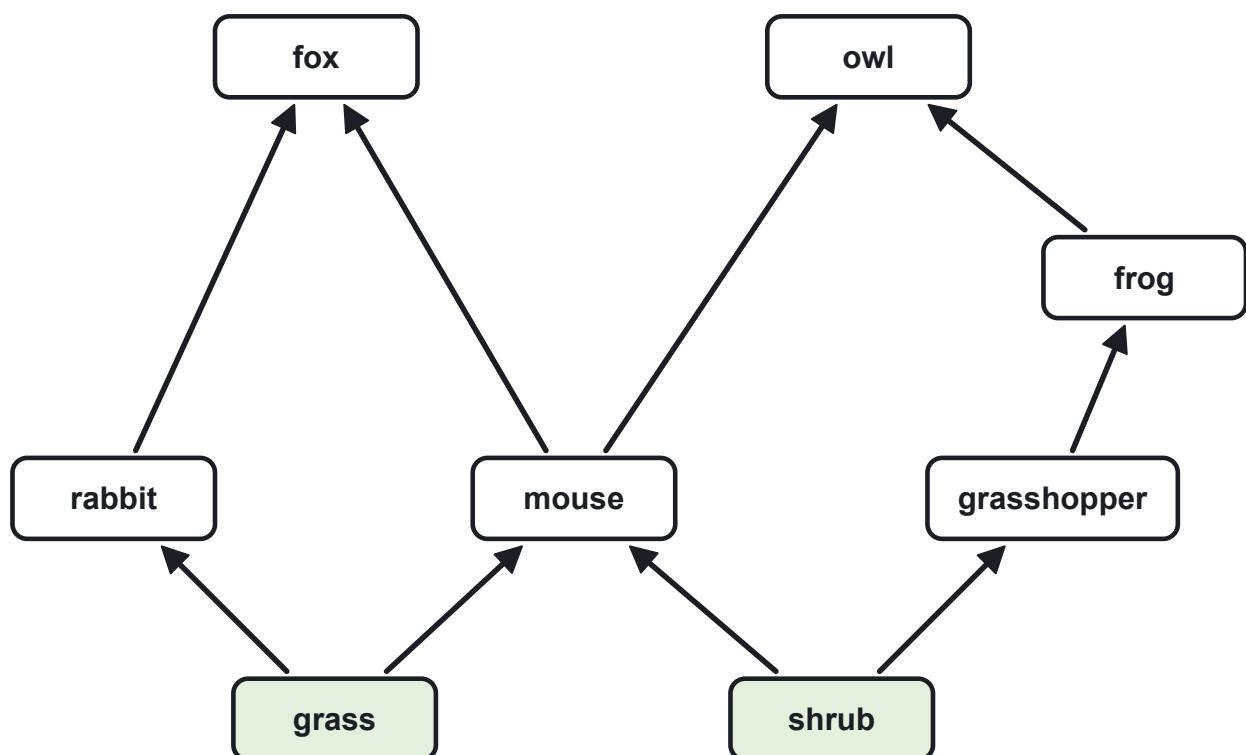
A food chain. The arrows show the **transfer of energy** from each organism to the one that eats it.

Common mistake: Arrows point from the food to the feeder. Grass → rabbit means the rabbit eats the grass and energy passes to the rabbit.

Food webs

Most organisms eat more than one type of food, and are eaten by more than one type of predator. A **food web** shows these links as a network of interconnected food chains.

To interpret a food web, trace each food chain from a producer, following the arrows. You can then say what an organism eats, what eats it, and what might happen if one population changes.



A food web. Arrows point from the food to the feeder. The owl is a secondary consumer when it eats mice and a tertiary consumer when it eats frogs.

Human impact on food chains and food webs

Food chains and food webs can be used to describe the impact humans have on an ecosystem.

- **Overharvesting** of a food species, such as overfishing, reduces the population of that species. Predators that feed on it have less food, so their populations may fall. Species that the harvested species eats may increase in number.
- **Introducing foreign species** to a habitat adds a new organism to the food web. It may eat native species, so their numbers fall, or compete with them for food, so those species have less food and their populations fall.

Exam tip: For 'what happens if' questions, work along the arrows. Say what happens to the organisms that eat it (less food) and to those it eats (fewer eaten, so more of them). Mention that effects can be indirect.

Producers, consumers and decomposers Spec 19.2.4, 19.2.5, 19.2.6, 19.2.7, 19.2.8, 19.2.9

Producer	An organism that makes its own organic nutrients, usually using energy from sunlight, through photosynthesis.
Consumer	An organism that gets its energy by feeding on other organisms.
Herbivore	An animal that gets its energy by eating plants.
Carnivore	An animal that gets its energy by eating other animals.
Decomposer	An organism that gets its energy from dead or waste organic material.

Consumers are classed by their position in a food chain.

Classes of consumer		
Class	What it eats	Example
Primary consumer	Producers (so it is a herbivore)	Grasshopper
Secondary consumer	Primary consumers (a carnivore)	Frog
Tertiary consumer	Secondary consumers (a carnivore)	Snake
Quaternary consumer	Tertiary consumers (a carnivore)	Eagle

Decomposers, such as bacteria and fungi, feed on dead organisms and waste. They get their energy from dead or waste organic material, and they return nutrients to the soil.

*Exam tip: Learn the definitions word for word. A producer makes its own **organic nutrients**, usually by photosynthesis. Do not just say that it 'makes its own food'.*

Quick check

1. State the principal source of energy input to biological systems.
2. What does a food chain show?
3. What is a food web?
4. Define a consumer.
5. Define a decomposer.

Quick check answers

Energy flow, food chains and food webs

1. The Sun.
2. The transfer of energy from one organism to the next, beginning with a producer.
3. A network of interconnected food chains.
4. An organism that gets its energy by feeding on other organisms.
5. An organism that gets its energy from dead or waste organic material.