

Organisms & their Environment

IGCSE Biology ■ Topic 19

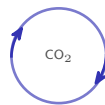
IGCSE Biology



Organisms & their Environment

What we will cover

- 1 Energy flow & food chains
- 2 Food webs & feeding roles
- 3 Pyramids & energy loss
- 4 The carbon cycle
- 5 The nitrogen cycle
- 6 Populations



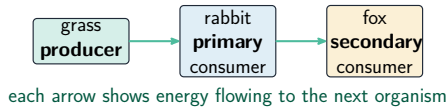
in and out

the carbon cycle

1

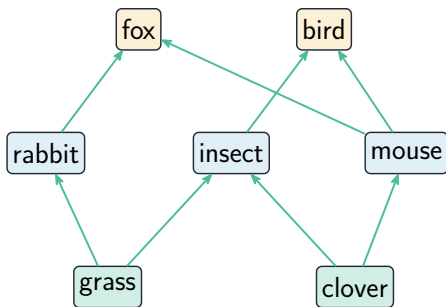
Feeding

Energy flow and food chains



- a **population** 种群 is a group of organisms of one **species** 物种, living in the same area at the same time.
- a **community** 群落 is all the populations of different species in one place.
- an **ecosystem** 生态系统 is the community together with its **environment**, all interacting.

Food webs and feeding roles

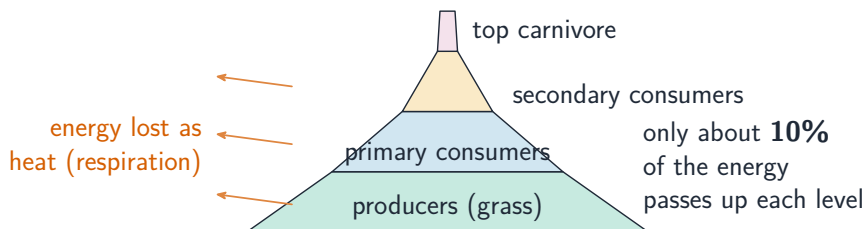


A **food chain** 食物链 shows the transfer of energy from one organism to the next, starting with a producer.

Each arrow points in the direction the energy flows: grass → rabbit → fox A **food web** 食物网 is many food chains linked together.

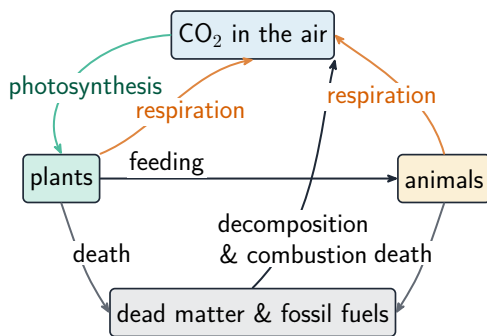
Pyramids and energy loss

Each **trophic level** 营养级 passes only ~10% of its energy up, so levels shrink & chains are short. Eating crops directly wastes less than eating animals. Humans harm webs by **overharvesting** 过度捕捞.



2 Cycles

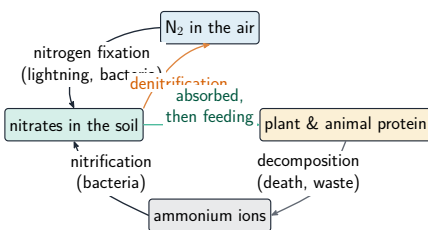
The carbon cycle



Carbon is **recycled**:

- **photosynthesis** 光合作用 removes CO₂
- respiration & **combustion** 燃烧 return it
- **decomposition** 分解 & fossil fuels too

The nitrogen cycle



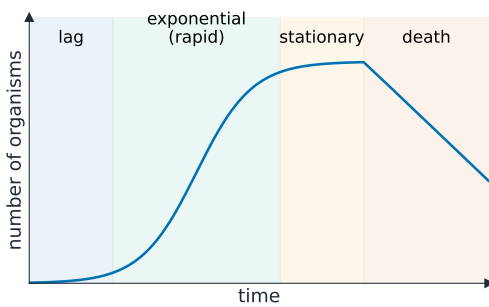
Microorganisms 微生物 move nitrogen:

- **nitrogen fixation** 固氮作用 – N₂ to nitrates
- **nitrification** 硝化作用 – ammonium to nitrate
- **denitrification** 反硝化作用 – nitrate to N₂

Plants absorb nitrates for protein.

3 Populations

Populations



A **population** 种群 is one species in one area; a **community** 群落 is all of them; with the environment it is an **ecosystem** 生态系统.
Growth: lag, exponential, stationary, death.

4 Recap

Worked example – why food chains are short

Explain why a food chain rarely has more than four or five links.

- Only about 10% of the energy at one level reaches the next.
- The rest is lost as heat from respiration, in faeces, and in urine.
- Some parts are also not eaten (bones, roots).
- After a few links there is too little energy left to support another population.

Energy enters as sunlight and leaves as heat – it flows through, it does not cycle. Nutrients do cycle. That difference is worth marks.

Topic 19 – key takeaways

1 Energy

from the Sun; one way; lost as heat

2 Pyramids

only ~10% passes up each level

3 Cycles

carbon & nitrogen are recycled

4 Populations

lag, exponential, stationary, death

Check yourself

- 1 What does a food-chain arrow show?
- 2 Roughly how much energy passes up a level?
- 3 Which process removes CO₂ from the air?
- 4 What are the four phases of population growth?



Answers 1. the direction energy flows 2. about 10% 3. photosynthesis 4. lag, exponential, stationary, death