

Organisms & their Environment

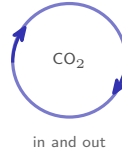
IGCSE Biology ■ Topic 19

IGCSE Biology



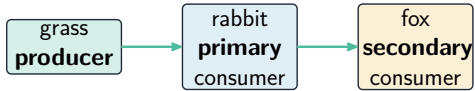
What we will cover

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



the carbon cycle

Energy flow and food chains

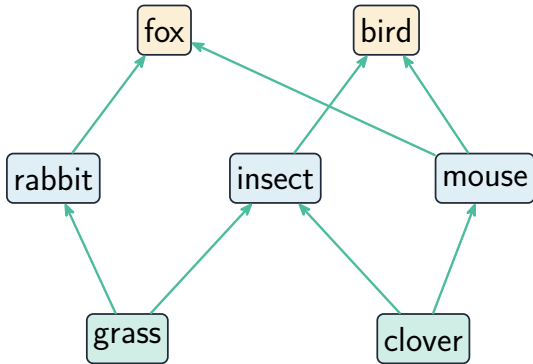


each arrow shows energy flowing to the next organism



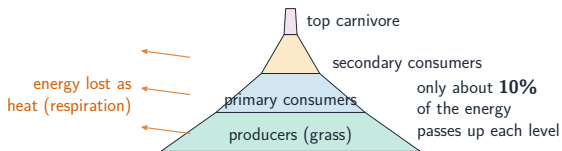
Ecosystems support many interacting species

Food webs and feeding roles



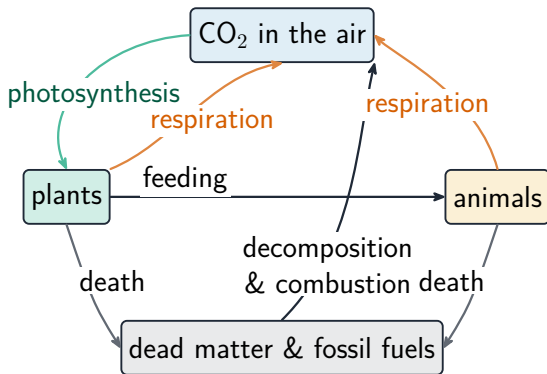
Energy flows through food chains and webs

Pyramids and energy loss



Each **trophic level** 营养级 passes only $\sim 10\%$ 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.

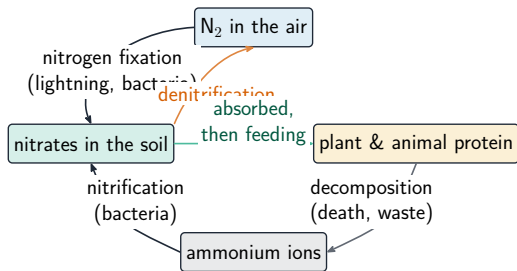
The carbon cycle



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

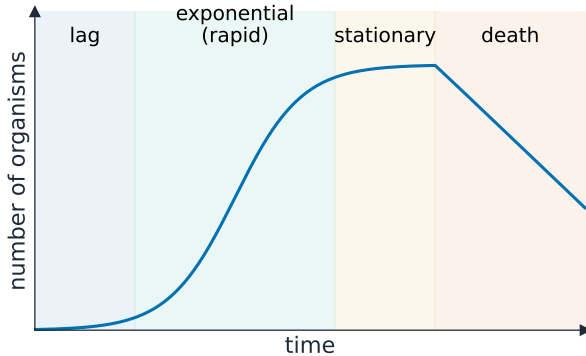


Microorganisms 微生物 move nitrogen:

- **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.

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.

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 $\sim 10\%$ 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 CO_2 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