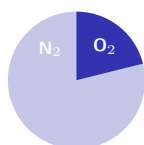


Chemistry of the Environment

IGCSE Chemistry ■ Topic 10

IGCSE Chemistry



Chemistry of the Environment

What we will cover

- 1 Water: testing & treating
- 2 Fertilisers
- 3 The composition of air
- 4 Air pollutants & their effects
- 5 The greenhouse effect
- 6 Reducing pollution

1

Water

Water: testing and purity

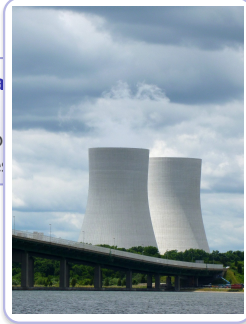
is water present?

anhydrous 无水 cobalt
chloride blue→pink; cop-
per sulfate white→blue

Natural water carries dissolved O_2 , minerals,
nitrates 硝酸盐 & **phosphates** 磷酸盐 (which
cause **deoxygenation** 缺氧), and microbes.

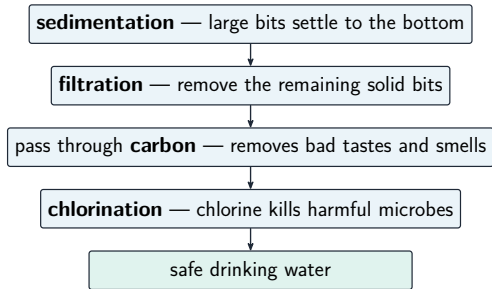
is wa

pure water
 $0^\circ C$ & b
impurities



Air pollution
harms health and the environment

Treating drinking water



Steps to make water safe:

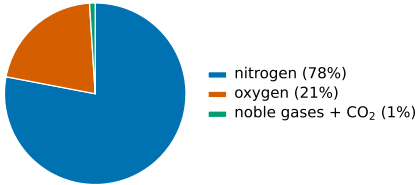
- **sedimentation** 沉降 & **filtration** 过滤 remove solids
- **carbon** 碳 removes tastes & smells
- **chlorination** 氯消毒 kills microbes

Fertilisers 肥料 (NPK) add
nitrogen, phosphorus & potassium.

2

Air

The composition of air



Clean, dry air:

- 78% **nitrogen** 氮气 (N₂)
- 21% **oxygen** 氧气 (O₂)
- ~1% noble gases & CO₂

Air pollutants and their sources

CO₂ – complete **combustion** 燃烧 of carbon fuels (a greenhouse gas)

CO & particulates – **incomplete combustion** 不完全燃烧 of fuels

oxides of nitrogen – hot car engines

sulfur dioxide – burning fuels that contain **sulfur** 硫

Effects of pollutants

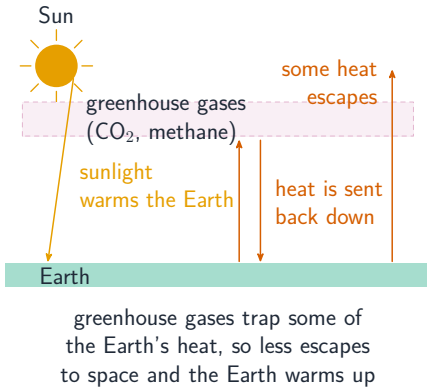
CO₂ & **methane** 甲烷: greenhouse → global warming

SO₂ & NO_x: **acid rain** 酸雨

carbon monoxide: a toxic gas

particulates 颗粒物: breathing problems

The greenhouse effect



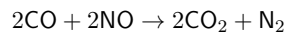
Greenhouse gases 温室气体 let sunlight in but **absorb** the heat the Earth gives off.

Less heat escapes to space, so the Earth warms – driving **climate change** 气候变化.

Reducing pollution



- climate: trees, less fossil fuel, **renewable energy** 可再生能源
- acid rain: **catalytic converters** 催化转化器, low-sulfur fuels



3

Recap

Worked example – stopping rust

Iron rusts but zinc-coated iron does not, even when the coating is scratched. Explain.

- Rusting needs **both** oxygen and water.
- A coat of paint or plastic works only as a **barrier** – scratch it and rust starts.
- Zinc is **more reactive** than iron, so it loses electrons in preference.
- The zinc corrodes instead $\Rightarrow$ **sacrificial protection**, which still works when scratched.

Barrier methods fail once broken; **sacrificial protection** does not, because the more reactive metal is **oxidised instead**. Galvanising does both at once.

Topic 10 – key takeaways

1 Water

settle, filter, carbon, chlorinate

2 Air

78% N₂, 21% O₂, ~1% other

3 Pollutants

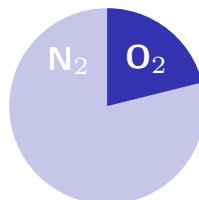
CO₂/CH₄ warm; SO₂/NO_x acid rain

4 Greenhouse

traps the heat the Earth gives off

Check yourself

- 1 What step in water treatment kills microbes?
- 2 What are the two main gases in clean air?
- 3 Which two pollutants cause acid rain?
- 4 Why does the greenhouse effect warm the Earth?



Answers 1. chlorination 2. nitrogen & oxygen 3. sulfur dioxide & oxides of nitrogen
4. it traps heat the Earth radiates