

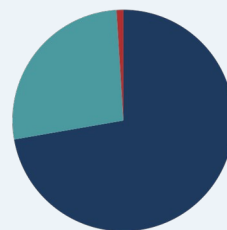
## 2.3 Gases in the Atmosphere

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### 1. KEY VOCABULARY

TERM	MEANING
Atmosphere	The layer of gases surrounding the Earth.
Combustion	Burning — a reaction with oxygen that releases energy.
Greenhouse gas	A gas that traps heat in the atmosphere, e.g. CO <sub>2</sub> .
Oxide	A compound of an element with oxygen.
Thermal decomposition	Breaking a compound down using heat.

### 2. COMPOSITION OF CLEAN AIR



■ Nitrogen, N<sub>2</sub> — about 78%

■ Oxygen, O<sub>2</sub> — about 21%

■ Other — about 1%  
(argon, CO<sub>2</sub>, water vapour)

Carbon dioxide is only ~0.04% but is rising due to human activity.

### 3. COMBUSTION OF ELEMENTS

element + oxygen → oxide

**Magnesium:** burns with a bright white flame → white magnesium oxide.

**Sulfur:** burns with a blue flame → sulfur dioxide gas (acidic).

**Metal oxides are basic; non-metal oxides are usually acidic.**

### 4. CARBON DIOXIDE

**Sources:** combustion of fuels, respiration, reaction of acids with carbonates, thermal decomposition of carbonates.

**CO<sub>2</sub> is a greenhouse gas.** Its level is rising because of burning fossil fuels and deforestation, contributing to climate change.

### 5. THE CARBONATE CONNECTION

acid + carbonate → salt + water + carbon dioxide

**Thermal decomposition:** metal carbonate → metal oxide + carbon dioxide (e.g. heating copper carbonate).

### 6. THE WHY

**Why we test gases:** they are colourless, so a chemical test is the only reliable way to identify them.

**Why CO<sub>2</sub> matters:** even at ~0.04% it traps heat — small changes in its concentration affect the climate.

### 7. COMMON EXAM MISTAKES

- ✗ "Air is about 21% nitrogen."
- ✓ Air is ~78% nitrogen, ~21% oxygen.
- ✗ "CO<sub>2</sub> makes up a large part of air."
- ✓ CO<sub>2</sub> is only ~0.04% — but still important.
- ✗ "All oxides are acidic."
- ✓ Metal oxides are basic; non-metal oxides are usually acidic.

### 8. SELF-CHECK · cover & quiz

Can you...

1. State the approximate percentages of N<sub>2</sub> and O<sub>2</sub> in air?
2. Write the general equation for combustion of an element?
3. Describe what you see when magnesium and sulfur burn?
4. Name four sources of carbon dioxide?
5. Explain why rising CO<sub>2</sub> is a concern?
6. Write the equation for acid + carbonate?