Air pollutants and the greenhouse effect

Student activity • observation and reasoning

YEAR 11 / LESSON 112 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

How do pollutant effects differ from greenhouse warming mechanisms?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, pencil and ruler
- Pollutant cards and infrared-energy diagram

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 4.12–4.15. Air pollution and climate.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

YEAR 11 / LESSON 112 / BIOLOGY + SCIENCE (DOUBLE AWARD)

1. Separate sulfur dioxide effects, carbon monoxide effects and greenhouse-gas effects into distinct causal explanations.

2. Link sulfur dioxide with respiratory irritation and acid deposition; link carbon monoxide with reduced oxygen carriage through haemoglobin binding.

3. Identify H_2O vapour, CO_2, CH_4, N_2O and CFCs as greenhouse gases named in the course.

4. Explain absorption and re-emission of outgoing terrestrial infrared radiation, distinguishing this from a physical blanket or the ozone-hole mechanism.

5. Connect fossil-fuel use, land-use change, agriculture and industrial activities with relevant emissions; explain water vapour mainly as a climate feedback in this context.

6. Evaluate consequences for temperature, sea level, habitats and extreme-event risks using evidence, distinguishing a long-term climate trend from one day's weather.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

YEAR 11 / LESSON 112 / BIOLOGY + SCIENCE (DOUBLE AWARD)

Reference and task data

The natural greenhouse effect supports a warmer surface; added long-lived greenhouse gases enhance warming. Carbon monoxide and sulfur dioxide have different direct biological effects. CFCs can be greenhouse gases and can also damage stratospheric ozone, but those are distinct mechanisms. No gases are generated in this activity.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

YEAR 11 / LESSON 112 / BIOLOGY + SCIENCE (DOUBLE AWARD)

1. What does CO do to oxygen transport?

2. Give one SO_2 consequence.

3. Name two greenhouse gases with formulas.

4. What radiation is absorbed by greenhouse gases?

5. Is ozone depletion the same mechanism as enhanced greenhouse warming?

6. Why is one cold day not a refutation of a long-term warming trend?