

Exercise walk-through

Acid Rain ■ 7.7

eXercise

You must be able to

- explain how **acid rain** 酸雨 forms from SO_2 and NO_x
- describe effects on water, soil, forests, and buildings
- suggest solutions

Method — How acid rain forms

Burning fossil fuels releases **SO₂** and **NO_x**, which react with water in the atmosphere to form **sulfuric** and **nitric acids**. These fall as **acid rain** (pH below normal ~5.6).

Method — Effects

- **Lakes/streams** become acidic, killing fish and aquatic life.
- **Soil** loses nutrients and releases toxic aluminum.
- **Forests** are damaged (leaf/needle loss).
- **Buildings/statues** (limestone, marble) are eroded.

Method — It travels

Acid rain often falls **far from** the source (carried by wind), so pollution in one country can harm another — a transboundary problem.

Method — Solutions

Reduce SO_2/NO_x using **scrubbers**, low-sulfur fuels, and catalytic converters; adding **lime** can temporarily neutralize acidified lakes.

Practice 2.1 ■ 2 marks

Which two pollutants cause acid rain?

Solution 2.1

Worked steps

SO₂ and NO_x **B1** **B1**.

Practice 2.2 ■ 1 mark

State one effect of acid rain on aquatic life.

Solution 2.2

Worked steps

It acidifies the water, killing fish/aquatic life **B1**.

Practice 2.3 ■ 1 mark

State one way to reduce acid rain.

Solution 2.3

Worked steps

Any one: scrubbers, low-sulfur fuel, catalytic converters, less fossil-fuel use **B1**.

Exam-style 3.1 ■ 1 mark

Acid rain forms when SO_2 and NO_x react in the atmosphere with

- A** oxygen only
- B** water to form acids
- C** nitrogen gas
- D** ozone

Solution 3.1

Method: How acid rain forms

- A oxygen only
- B water to form acids 
- C nitrogen gas
- D ozone

Worked steps

B — water to form acids.

Exam-style 3.2 ■ 3 marks

A coal-burning region downwind has acidified lakes.

- (a) Explain how the coal plants cause the acidified lakes.
- (b) State one solution to reduce the emissions.

Solution 3.2

Method: Solutions

Worked steps

- (a) The plants emit SO_2 and NO_x ; these react with water in the air to form sulfuric and nitric acids; the acid rain falls into the lakes and acidifies them **M1** **M1** **A1**.
- (b) Any one: scrubbers, low-sulfur fuel, reduce coal use **B1**.

Exam-style 3.3 ■ 2 marks

Explain why acid rain is considered a transboundary (cross-border) problem.

Solution 3.3

Method: It travels

Worked steps

The pollutants are carried by wind and fall as acid rain far from where they were emitted, so one country's emissions can damage another's ecosystems **M1** **A1**.