

# 7.7 Acid Rain

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**Total: 11 marks**

## Objective

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Build the skills to answer exam questions on **acid rain**.

**You must be able to:**

- explain how **acid rain** 酸雨 forms from  $\text{SO}_2$  and  $\text{NO}_x$
- describe effects on water, soil, forests, and buildings
- suggest solutions

## 1 Worked examples

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Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

### ■ How acid rain forms

Burning fossil fuels releases  $\text{SO}_2$  and  $\text{NO}_x$ , which react with water in the atmosphere to form **sulfuric** and **nitric acids**. These fall as **acid rain** (pH below normal ~5.6).

### ■ 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.

### ■ It travels

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

### ■ Solutions

Reduce  $\text{SO}_2/\text{NO}_x$  using **scrubbers**, low-sulfur fuels, and catalytic converters; adding **lime** can temporarily neutralize acidified lakes.

## 2 Practice

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Now apply the methods above.

2.1 Which two pollutants cause acid rain? [2]

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2.2 State one effect of acid rain on aquatic life. [1]

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2.3 State one way to reduce acid rain. [1]

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### 3 Exam-style questions

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3.1 Acid rain forms when  $\text{SO}_2$  and  $\text{NO}_x$  react in the atmosphere with [1]

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

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3.2 A coal-burning region downwind has acidified lakes.

(a) Explain how the coal plants cause the acidified lakes. [3]

(b) State one solution to reduce the emissions. [1]

3.3 Explain why acid rain is considered a transboundary (cross-border) problem. [2]

### 4 Go further

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You are now ready for the real exam questions on this subtopic:

- work through the **7.7 Acid Rain** lesson on the **Learn** page;
- read the **Acid Rain** section of the AP Environmental Science handout on the **Know** page.

## Solutions

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**2.1**  $\text{SO}_2$  and  $\text{NO}_x$ .

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

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

**3.1 B** —water to form acids.

**3.2** (a) The plants emit  $\text{SO}_2$  and  $\text{NO}_x$ ; these react with water in the air to form sulfuric and nitric acids; the acid rain falls into the lakes and acidifies them. (b) Any one: scrubbers, low-sulfur fuel, reduce coal use.

**3.3** 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.