

Exercise walk-through

7.7

Acid Rain

AP Environmental Science

Acid rain

Acid rain : **sulfur dioxide** (coal) and nitrogen oxides (cars) form acids in cloud water.

- drops **pH** of soil and lakes below 4
- kills **forests** and fish, eats stone

Cut it at the source: **scrubbers** and cleaner fuels.



Acid rain damages forests, lakes, and stone

Worked example – how much more acidic is acid rain?

Normal rain is about pH 5.6; an acid-rain sample measures pH 3.6. How many times more acidic is it?

- pH is a **base-10 logarithmic** scale: one unit is a $10\times$ change in $[\text{H}^+]$
- $10^{(5.6-3.6)} = 10^2 = 100$ times more acidic

A two-unit drop is a hundred-fold jump. That is why acid rain strips leaves, leaches soil nutrients and eats limestone so fast.

Exercises 2.1-2.3

2.1 Which two pollutants cause acid rain?

[2]

2.2 State one effect of acid rain on aquatic life.

[1]

2.3 State one way to reduce acid rain.

[1]

Exercises 2.1-2.3

2.1 Which two pollutants cause acid rain?

[2]

2.1

- SO_2 and NO_x

2.2 State one effect of acid rain on aquatic life.

[1]

2.2

- It acidifies the water, killing fish/aquatic life

2.3 State one way to reduce acid rain.

[1]

2.3

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

Exercise 3.1

3.1 Acid rain forms when SO_2 and 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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3.1 B

- water to form acids

Exercise 3.2 (a)

3.2 A coal-burning region downwind has acidified lakes.

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

[3]

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

[3]

(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

Exercise 3.2 (b)

3.2 A coal-burning region downwind has acidified lakes.

(b) State one solution to reduce the emissions.

[1]

Exercise 3.2 (b)

3.2 A coal-burning region downwind has acidified lakes.

(b) State one solution to reduce the emissions.

[1]

(b)

- Any one: scrubbers, low-sulfur fuel, reduce coal use

Exercise 3.3

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

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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