

Exercise walk-through

Introduction to Air Pollution ■ 7.1

eXercise

You must be able to

- distinguish **primary** 一次 and **secondary** 二次 pollutants
- name major pollutants and their sources
- link combustion to air pollution

Method — Primary vs secondary pollutants

- **Primary pollutants** are emitted **directly** (e.g. CO, SO₂, NO_x, particulates from burning fuel).
- **Secondary pollutants** form **in the air** from reactions of primary ones (e.g. ozone in smog, sulfuric acid in acid rain).

Method — Major pollutants and sources

- **CO** — incomplete combustion (cars).
- **SO₂** — burning coal (sulfur) → acid rain.
- **NO_x** — high-temperature combustion → smog, acid rain.
- **Particulate matter (PM)** — soot, dust → lung damage.

Method — A worked classification

SO₂ from a coal plant is a **primary** pollutant; the sulfuric acid it forms in the atmosphere is a **secondary** pollutant.

Method — The main cause

Most air pollution comes from **burning fossil fuels** in vehicles, power plants, and industry.

Practice 2.1 ■ 2 marks

Distinguish a primary from a secondary pollutant.

Solution 2.1

Method: A worked classification

Worked steps

Primary pollutants are emitted directly; secondary pollutants form in the air from primary ones **B1** **B1**.

Practice 2.2 ■ 1 mark

Name one pollutant from burning coal.

Solution 2.2

Worked steps

SO₂ (or particulates) **B1**.

Practice 2.3 ■ 1 mark

What is the main human source of air pollution?

Solution 2.3

Method: The main cause

Worked steps

Burning fossil fuels **B1**.

Exam-style 3.1 ■ 1 mark

A secondary pollutant is one that

- A** is emitted directly
- B** forms in the air from other pollutants
- C** is always harmless
- D** comes only from volcanoes

Solution 3.1

Method: A worked classification

- A is emitted directly
- B forms in the air from other pollutants** 
- C is always harmless
- D comes only from volcanoes

Worked steps

B — forms in the air from other pollutants.

Exam-style 3.2 ■ 2 marks

A coal power plant emits SO_2 , which later forms sulfuric acid in the atmosphere.

- (a) Classify SO_2 and sulfuric acid.
- (b) State one environmental effect of this.

Solution 3.2

Method: A worked classification

Worked steps

(a) SO_2 = primary; sulfuric acid = secondary **B1** **B1**. (b) Acid rain **B1**.

Exam-style 3.3 ■ 2 marks

Explain why reducing fossil-fuel combustion reduces most air pollution.

Solution 3.3

Method: The main cause

Worked steps

Most primary and secondary pollutants come from burning fossil fuels, so cutting combustion cuts emissions of CO, SO₂, NO_x, and particulates at the source **M1** **A1**.