

Exercise walk-through

Thermal Inversion ■ 7.3

eXercise

You must be able to

- describe a **thermal inversion** 逆温
- explain how it traps pollutants
- link inversions to smog events

Method — Normal conditions

Usually air is **warmest near the ground** and cools with height, so warm polluted air **rises** and disperses.

Method — A thermal inversion

In a **thermal inversion**, a layer of **warm air sits above cooler air** near the ground. The cool surface air cannot rise through the warm layer, so it — and the pollutants in it — are **trapped** near the ground.

Method — Effect on pollution

Pollutants accumulate under the inversion, causing severe **smog** and health hazards until the inversion breaks (e.g. wind or heating).

Method — Where it happens

Inversions are common in **valleys** (cool air pools) and cities surrounded by mountains, especially on calm, clear nights.

Practice 2.1 ■ 1 mark

In normal air, how does temperature change with height near the ground?

Solution 2.1

Method: Normal conditions

Worked steps

It gets cooler with height (warmest near the ground) **B1**.

Practice 2.2 ■ 1 mark

What is the arrangement of air in a thermal inversion?

Solution 2.2

Method: A thermal inversion

Worked steps

Warm air sits above cooler air near the ground **B1**.

Practice 2.3 ■ 1 mark

Why does an inversion worsen pollution?

Solution 2.3

Method: Effect on pollution

Worked steps

The trapped surface air cannot rise, so pollutants accumulate near the ground **B1**.

Exam-style 3.1 ■ 1 mark

A thermal inversion traps pollutants because warm air

- A** below cool air lets pollution rise
- B** above cool air stops the surface air from rising
- C** removes all pollution
- D** cools the ground

Solution 3.1

Method: A thermal inversion

- A below cool air lets pollution rise
- B above cool air stops the surface air from rising** 
- C removes all pollution
- D cools the ground

Worked steps

B — above cool air stops the surface air from rising.

Exam-style 3.2 ■ 2 marks

A city in a valley experiences a thermal inversion.

- (a) Explain why pollution builds up near the ground.
- (b) State one condition that could break the inversion.

Solution 3.2

Method: A thermal inversion

Worked steps

(a) The warm layer above traps the cool surface air, which cannot rise, so pollutants accumulate near the ground **M1** **A1**. (b) Wind (or the ground heating to break the inversion) **B1**.

Exam-style 3.3 ■ 2 marks

Explain why thermal inversions are common in valleys.

Solution 3.3

Method: Where it happens

Worked steps

Cool, dense air sinks and pools at the valley floor while warmer air sits above it, creating the inversion layer, especially on calm clear nights [M1](#) [A1](#).