AP ENVIRONMENTAL SCIENCE • EXERCISE SHEET

7.3 Thermal Inversion

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **thermal inversion**.

You must be able to:

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

1 Worked examples

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.

Normal conditions

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

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.

Effect on pollution

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

Where it happens

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

2 Practice

Now apply the methods above.

2.1 In normal air, how does temperature change with height near the ground? [1]

2.2 What is the arrangement of air in a thermal inversion? [1]

2.3 Why does an inversion worsen pollution? [1]

3 Exam-style questions

3.1 A thermal inversion traps pollutants because warm air [1]

- **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

3.2 A city in a valley experiences a thermal inversion.

(a) Explain why pollution builds up near the ground. [2]

(b) State one condition that could break the inversion. [1]

3.3 Explain why thermal inversions are common in valleys. [2]

4 Go further

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

- work through the **7.3 Thermal Inversion** lesson on the **Learn** page;
- read the **Thermal Inversion** section of the AP Environmental Science handout on the **Know** page.

Solutions

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

2.2 Warm air sits above cooler air near the ground.

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

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

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

3.3 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.