

7.2 Photochemical Smog

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS photochemical smog 光化学烟雾 • ozone 臭氧

Objective

Build the skills to answer exam questions on **photochemical smog**.

You must be able to:

- explain how **photochemical smog** 光化学烟雾 forms
- identify the role of **NO_x**, **VOCs**, and **sunlight**
- link smog to traffic and health

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.

■ How smog forms

Photochemical smog forms when **NO_x** and **VOCs** (volatile organic compounds) from vehicle exhaust react in **sunlight**, producing ground-level **ozone** (O₃) and other irritants.

■ The key ingredients

- **NO_x** — from vehicle/industry combustion.
- **VOCs** — from fuels, solvents.
- **Sunlight** — drives the reaction (so smog is worst on **sunny, warm** days).

■ Where and when

Smog is worst in **sunny cities with heavy traffic** (e.g. Los Angeles), peaking in the afternoon when sunlight is strongest.

■ Health effects

Ground-level ozone irritates the lungs and eyes, worsening asthma and breathing problems.

■ A worked link

Morning traffic emits NO_x and VOCs; midday sun drives reactions that build up ozone, so smog peaks in the afternoon.

2 Practice

Now apply the methods above.

2.1 What two pollutants react to form photochemical smog? [2]

2.2 What drives the smog-forming reaction? [1]

2.3 What harmful gas is a main component of smog? [1]

3 Exam-style questions

3.1 Photochemical smog is worst on days that are [1]

- **A** cold and dark
- **B** sunny and warm with heavy traffic
- **C** rainy
- **D** windy at night

3.2 A sunny city has heavy morning traffic.

(a) Explain why smog peaks in the afternoon. [2]

(b) State one health effect of the ozone in smog. [1]

3.3 Explain how reducing vehicle emissions would reduce photochemical smog. [2]

Solutions

2.1 NO_x and VOCs.

2.2 Sunlight.

2.3 Ground-level ozone (O_3).

3.1 B — sunny and warm with heavy traffic.

3.2 (a) Morning traffic emits NO_x and VOCs; the midday sun drives reactions that build up ozone, so smog peaks in the afternoon. (b) It irritates the lungs/eyes and worsens asthma.

3.3 Fewer vehicle emissions mean less NO_x and VOCs available to react in sunlight, so less ozone/smog forms.