

9.3 The Greenhouse Effect

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS greenhouse effect 温室效应 • greenhouse gases 温室气体 • cfc 氯氟烃
• methane 甲烷 • ultraviolet 紫外线

Objective

Build the skills to answer exam questions on the **greenhouse effect**.

You must be able to:

- explain the **greenhouse effect** 温室效应
- name the main **greenhouse gases** 温室气体
- distinguish the natural effect from the enhanced (human) one

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 it works

The **greenhouse effect**: the Sun warms Earth, which re-emits **infrared (heat)** radiation. **Greenhouse gases** absorb some of this heat and re-radiate it back, keeping the surface warmer than it would otherwise be.

■ The natural effect is essential

The **natural** greenhouse effect keeps Earth's average temperature livable (about 15°C instead of freezing). Without it, Earth would be too cold for life.

■ The enhanced effect

Human emissions **add** greenhouse gases, strengthening the effect (the **enhanced greenhouse effect**), trapping more heat and warming the planet.

■ The main gases

- **Carbon dioxide (CO₂)** — burning fossil fuels.
- **Methane (CH₄)** — livestock, landfills.
- **Nitrous oxide, water vapor**, and CFCs.

2 Practice

Now apply the methods above.

2.1 What type of radiation do greenhouse gases absorb? [1]

2.2 Name two greenhouse gases. [2]

2.3 Why is the natural greenhouse effect important? [1]

3 Exam-style questions

3.1 Greenhouse gases warm the Earth by absorbing and re-emitting [1]

- **A** visible light
- **B** infrared (heat) radiation
- **C** ultraviolet only
- **D** sound

3.2 Human activity is strengthening the greenhouse effect.

(a) Explain the difference between the natural and enhanced greenhouse effect. [2]

(b) State the main gas responsible and its main source. [2]

3.3 Explain why the natural greenhouse effect is necessary for life on Earth. [2]

Solutions

2.1 Infrared (heat) radiation.

2.2 Any two: CO₂, methane, nitrous oxide, water vapor, CFCs.

2.3 It keeps Earth warm enough for life.

3.1 B — infrared (heat) radiation.

3.2 (a) The natural effect keeps Earth livably warm; the enhanced effect is the extra warming from human-added greenhouse gases. (b) CO₂, mainly from burning fossil fuels.

3.3 Without greenhouse gases trapping heat, Earth's average temperature would be well below freezing, too cold for most life.