

Exercise walk-through

The Greenhouse Effect ■ 9.3

eXercise

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

Method — 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.

Method — 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.

Method — The enhanced effect

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

Method — The main gases

- **Carbon dioxide (CO_2)** — burning fossil fuels.
- **Methane (CH_4)** — livestock, landfills.
- **Nitrous oxide, water vapor**, and CFCs.

Practice 2.1 ■ 1 mark

What type of radiation do greenhouse gases absorb?

Solution 2.1

Method: How it works

Worked steps

Infrared (heat) radiation **B1**.

Practice 2.2 ■ 2 marks

Name two greenhouse gases.

Solution 2.2

Worked steps

Any two: CO₂, methane, nitrous oxide, water vapor, CFCs **B1** **B1**.

Practice 2.3 ■ 1 mark

Why is the natural greenhouse effect important?

Solution 2.3

Method: The natural effect is essential

Worked steps

It keeps Earth warm enough for life **B1**.

Exam-style 3.1 ■ 1 mark

Greenhouse gases warm the Earth by absorbing and re-emitting

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

Solution 3.1

Method: How it works

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



Worked steps

B — infrared (heat) radiation.

Exam-style 3.2 ■ 2 marks

Human activity is strengthening the greenhouse effect.

- (a) Explain the difference between the natural and enhanced greenhouse effect.
- (b) State the main gas responsible and its main source.

Solution 3.2

Method: The enhanced effect

Worked steps

(a) The natural effect keeps Earth livably warm; the enhanced effect is the extra warming from human-added greenhouse gases **M1** **A1**. (b) CO₂, mainly from burning fossil fuels **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain why the natural greenhouse effect is necessary for life on Earth.

Solution 3.3

Method: The natural effect is essential

Worked steps

Without greenhouse gases trapping heat, Earth's average temperature would be well below freezing, too cold for most life **M1** **A1**.