

This is the **Higher Separate** version — includes all Higher Tier content (marked ★) and all Separate Science content.

Global warming is the increase in average global temperatures caused by rising concentrations of greenhouse gases in the atmosphere.

- Greenhouse gases: CO<sub>2</sub> (from burning fossil fuels, deforestation), methane (from cattle, rice paddies, landfill), water vapour, nitrous oxide.
- Greenhouse effect: greenhouse gases absorb infrared radiation from the Earth's surface and re-emit it → atmosphere warms.
- Consequences of global warming: rising sea levels (glaciers and ice caps melt), more extreme weather events, habitat change (species migrate or go extinct), ocean acidification (CO<sub>2</sub> dissolves in seawater).
- ★ HT Positive feedback loop: warming → melting permafrost → releases methane → more warming.
- ★ HT Ocean acidification: CO<sub>2</sub> + H<sub>2</sub>O → carbonic acid → lowers pH → harms marine organisms with calcium carbonate shells (e.g. coral).
- Responses: reduce fossil fuel use, increase renewable energy, reduce deforestation, carbon capture and storage, international agreements (Paris Agreement).
- ★ HT Uncertainty: scientific consensus agrees global warming is human-caused, but exact future effects are complex to predict.

### Key Terms

<b>Greenhouse gas</b>	A gas (e.g. CO <sub>2</sub> , methane) that absorbs and re-emits infrared radiation, warming the atmosphere
<b>Global warming</b>	Rise in average global surface temperatures due to increased greenhouse gas concentrations
<b>Climate change</b>	Long-term changes in global weather patterns associated with global warming
<b>Positive feedback</b>	A feedback loop where the response amplifies the original change — e.g. warming → more methane → more warming
<b>Ocean acidification</b>	Decrease in ocean pH due to absorption of CO <sub>2</sub> — harms marine life with calcium carbonate structures

■ **Exam Tip:** Distinguish greenhouse effect (natural and necessary) from enhanced greenhouse effect (extra warming due to human CO<sub>2</sub> emissions). Global warming is not the same as "holes in the ozone layer" — these are different problems caused by different gases.