What is the ozone layer?

KS2 KS3 Ages 7-14 ⏰ 3 min read

The ozone layer is a region of Earth's stratosphere, 15–35km above the surface, where the molecule ozone (O_3 — three oxygen atoms rather than the usual two) is concentrated. It's not thick or dense — if you compressed all the ozone in the stratosphere to sea-level pressure, it would form a layer just 3mm thick. But those few millimetres absorb roughly 97–99% of the Sun's harmful ultraviolet (UV) radiation.

Why does UV matter?

UV radiation from the Sun damages DNA. Too much UV exposure causes skin cancer, cataracts, and weakens immune systems. Without the ozone layer, the surface of Earth would receive levels of UV radiation lethal to most organisms. Life as we know it only exists on land because the ozone layer developed — early life was largely confined to deep water (shielded by the water column) until the ozone layer built up enough to make land habitable, roughly 500 million years ago.

The ozone layer is like a pair of sunglasses for the entire planet. Life on Earth is fine in visible sunlight but needs protection from the UV component. The ozone absorbs the UV before it reaches the surface, letting the benign visible light through while filtering out the harmful wavelengths. Without it, going outside would be like staring into a welding torch — damaging at the cellular level within minutes.

The hole we nearly made

In the 1970s and 80s, scientists discovered that chemicals called CFCs (chlorofluorocarbons) — used in aerosol spray cans and refrigerators — were destroying ozone in the stratosphere. Each CFC molecule can destroy up to 100,000 ozone molecules through a catalytic chain reaction. By the 1980s, a significant "hole" (actually a thinning) appeared over Antarctica each spring. In 1987, the Montreal Protocol was signed — an international agreement to phase out CFCs. It's one of the most successful environmental agreements in history.

Is the ozone layer recovering?

Yes — and it's a genuine environmental success story. CFC concentrations are declining, and the ozone hole has been shrinking since about 2000. Scientists expect it to return to pre-1980 levels by around 2066. The Montreal Protocol demonstrates that international cooperation on environmental problems can work — which makes it an important example in discussions about other global challenges.