

Ozone ( $O_3$ ) is an atmospheric trace gas that occurs naturally in the stratosphere. It is also formed as a consequence of human activity in the troposphere, immediately above Earth's surface. The location of ozone in the atmosphere determines whether the gas protects or damages the environment.

- Take HW FRQ
- (a) **Identify** the type of solar radiation that is absorbed by stratospheric ozone, and **describe** one human health benefit that results from the absorption of this solar energy.
  - (b) The absorption of solar energy by stratospheric ozone causes ozone molecules to undergo chemical decomposition and formation. **Describe** the chemical processes that lead to this natural balance between decomposition and formation of stratospheric ozone (you may use chemical equations in your answer).
  - (c) The Montreal Protocol of 1987 provided a global framework to phase out chlorofluorocarbon (CFC) production and use. Although the Montreal Protocol has led to a dramatic decrease in CFCs released into the atmosphere, stratospheric ozone destruction has decreased only slightly.
    - i. **Explain** the process by which CFCs lead to the destruction of stratospheric ozone. (You may use chemical equations in your answer.)
    - ii. **Explain** why the rapid decrease in CFC emissions has not led to a similarly rapid decrease in the destruction of stratospheric ozone.
  - (d) **Identify** a human activity that leads to the formation of tropospheric ozone as a secondary pollutant and explain why tropospheric ozone levels peak in the daytime.
  - (e) **Identify** one negative ecological impact and one negative human health impact that result from the formation of tropospheric ozone.