**STAGE 2 CHEMISTRY**

### READING

The Essentials book pg 42-43

**Elemental and Environmental Chemistry**

**Unit 6**

# Greenhouse Effect: natural and enhanced greenhouse effect

The Syllabus statement says:

| Key Ideas | Intended Student Learning |
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| Some gases in the atmosphere, called ‘greenhouse gases’, serve as insulation to maintain the temperature of the Earth’s atmosphere. This is known as the ‘natural greenhouse effect’. | Describe the action of the common greenhouse gases, carbon dioxide and methane, that serve to maintain a steady temperature in the Earth’s atmosphere. |
| Human activity that affects the concentration of greenhouse gases has the potential to disrupt the thermal balance of the atmosphere. This is known as the ‘enhanced greenhouse effect’. | Explain the enhanced greenhouse effect and its potential consequences for the environment. |

The **KEY IDEAS** here are:

* The natural greenhouse effect maintains a temperature to support life
* Human activities enhance this natural greenhouse effect that in turn promotes climate change

**Natural Greenhouse Effect**

The Earth’s surface absorbs short-wave radiation from the sun (visible light and UV rays), which is then re-emitted as long wave infra-red (IR) radiation. Some gases in the atmosphere trap part of this IR radiation, thereby warming the Earth’s atmosphere. These gases are referred to as greenhouse gases. Common greenhouse gases are CO2, N2O (nitrous oxide), H2O and CH4 (methane). Their polar covalent bonds stretch and bend to absorb the IR radiation.

The mechanism by which these gases maintain a temperature in the Earth’s atmosphere that can support life is known as the **Natural Greenhouse Effect**.

**The Enhanced Greenhouse Effect**

Human activities affect the concentration of certain greenhouse gases and therefore have the potential to disrupt the thermal equilibrium of the atmosphere. An increase in the concentration of greenhouse gases in the atmosphere traps a greater amount of IR radiation.

The net result is that the temperature of the Earth’s atmosphere is raised. This is known as the **enhanced greenhouse effect.**

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| **Cause** | **Effect** |
| Burning carbon based fuels | Increased CH4 emissions |
| Deforestation | Decreased CO2 conversion via photosynthesis |
| Agriculture – rice paddies, natural gas fields, cows, sheep, industrial activities, garbage dumps | Increased CH4 emissions |
| Fertiliser use | Increased N2O emissions |

**Predicted Effects of the Enhanced Greenhouse Effect**

* Increase in global temperature
* Rise in sea levels due to water expansion at higher temperatures
* Disruption of ecosystems
* Climate change and shift in weather patterns
* Melting polar ice caps

**Possible Solutions to the Enhanced Greenhouse Effect**

* Plant more trees and/or reduce emissions
* Burn less carbon-based fuels
* Use alternative energy sources
* Capture and storage of CO2 emissions