**Topic 4.4: Climate Change**

**Essential Idea: Concentrations of gases in the atmosphere affect climates experienced at the Earth’s surface.**

**4.4.U1 Carbon dioxide and water vapor are the most significant greenhouse gases.​**

State the sources of CO2 and water vapor in the atmosphere.

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

Outline the mechanism by which greenhouse gases trap heat in the atmosphere**.**

**(Outline**: Give a brief account or summary)

**4.4.U2 Other gases including methane and nitrogen oxides have less impact.**

State the sources of methane and NO gases in the atmosphere.

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

**4.4.U3 The impact of a gas depends on its ability to absorb long wave radiation as well as on its concentration in the atmosphere.**

State two factors that determine the warming impact of a greenhouse gas.

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

State two variables that determine the concentration of a gas in the atmosphere.

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

Compare the impact of atmospheric methane to CO2.

State how long water, methane and CO2 remain in the atmosphere, on average**. ​**

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

**4.4.U4 The warmed Earth emits longer wavelength radiation (heat).**

**State that the Earth absorbs short-wave energy from the sun and re-emits**

**longer wavelengths.**

**​**

Compare wavelengths of UV, visible and infrared radiation.

**(Compare**: Give an account of the similarities between two (or more) items or situations, referring to both(all) of them throughout)

**4.4.U5 Longer wave radiation is absorbed by greenhouse gases that retain the heat in the atmosphere.​**

Explain the greenhouse effect, with reference to short wave radiation from the sun, long wave radiation from the Earth and the effects of ozone and greenhouse gases.

(**Explain**: Give a detailed account including reasons or causes)

Explain why water vapor, CO2, methane and NO are greenhouse gases.

(**Explain**: Give a detailed account including reasons or causes)

**4.4.U6 Global temperatures and climate patterns are influenced by concentrations of greenhouse gases.​​**

Explain why atmospheric CO2 concentration would logically impact global temperatures.

(**Explain**: Give a detailed account including reasons or causes)

Outline the effect of global temperature on climate, specifically location and frequency of rain and frequency of severe storms.

**(Outline**: Give a brief account or summary)

**4.4.U7 There is a correlation between rising atmospheric concentrations of carbon dioxide since the start of the industrial revolution 200 years ago and average global temperatures.**

State the atmospheric CO2 concentration prior to the industrial revolution.

**(State** “ Give a specific name, value or other brief answer without explanation or calculation.)

Outline the impact of the industrial revolution on atmospheric CO2 concentration.

**(Outline**: Give a brief account or summary)

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Describe the correlation between atmospheric CO2 concentrations since the industrial revolution and global temperatures.

**(Describe**: Give a detailed account)

**4.4.U8 Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter.**

Explain why industrial revolution would increase atmospheric CO2 concentrations.

(**Explain**: Give a detailed account including reasons or causes)

**4.4.A1 Correlations between global temperatures and carbon dioxide concentrations on Earth.​**

Explain how historical temperature data has been collected.

(**Explain**: Give a detailed account including reasons or causes)

Using ice core data, outline the correlation between atmospheric CO2 concentration and global temperatures.

**(Outline**: Give a brief account or summary)

**4.4.A2 Evaluating claims that human activities are not causing climate change.​**

Outline three reasons why there is vigorous debate around the claim that human activities are causing climate change.

**(Outline**: Give a brief account or summary)

**4.4.A3 Threats to coral reefs from increasing concentrations of dissolved carbon dioxide.**

Outline the effect of atmospheric CO2 concentration on ocean pH.

**(Outline**: Give a brief account or summary)

Describe the impact of lower ocean pH on animals that make skeletons from calcium carbonate.​

**(Describe**: Give a detailed account)

**4.4.NOS Assessing claims- Evaluating claims that human activities are not causing climate change**

Outline ways by which claims can be evaluated for truth.

**(Outline**: Give a brief account or summary)