**Topic 4.4 Climate Change Skeleton Notes**

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|  | Statement | Guidance |
| 4.4.U1 | Carbon dioxide and water vapour are the most significant greenhouse gases. |  |
| 4.4.U2 | Other gases including methane and nitrogen oxides have less impact. | The harmful consequences of ozone depletion do not need to be discussed and it should be made clear that ozone depletion is not the cause of the enhanced greenhouse effect. |
| 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. | Carbon dioxide, methane and water vapour should be included in discussions. |
| 4.4.U4 | The warmed Earth emits longer wavelength radiation (heat). |  |
| 4.4.U5 | Longer wave radiation is absorbed by greenhouse gases that retain the heat in the atmosphere. |  |
| 4.4.U6 | Global temperatures and climate patterns are influenced by concentrations of greenhouse gases. |  |
| 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. |  |
| 4.4.U8 | Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter. |  |
| 4.4.A1 | Threats to coral reefs from increasing concentrations of dissolved carbon dioxide. |  |
| 4.4.A2 | Correlations between global temperatures and carbon dioxide concentrations on Earth. |  |
| 4.4.A3 | Evaluating claims that human activities are not causing climate change. |  |

4.4 U1 Carbon dioxide and water vapour are the most significant greenhouse gases.

1. What are greenhouse gases? What % do greenhouse gases make up of the atmosphere?
2. What are the two gases that have the largest warming effect?
   1. C
   2. W

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

1. What other gases are present but have less impact?
2. Why is the surface of the earth warmer at night if there is cloud cover?
3. Why is the surface of the earth cooler when there is more cloud coverage?

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.

1. What are the two factors that determine the warming impact of a greenhouse gas?
2. What two factors also impact the abundance (concentration) of gas in the atmosphere?

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

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

1. (Not on PP) What type of wavelengths are ABSORBED by the earth’s surface? Where do they come from?
2. (Not on PP) What type of wavelengths are RE-EMITED by the earth’s surface?
3. Sketch an image of how the greenhouse effect works.
4. The re-emitting of energy creates the global warming effect. Without, what temperature would the earth be?
5. Watch some of the tutorial links and take additional notes on the effects of greenhouse gases.

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.

1. Finish the sentence….”correlation does not equal…”
2. What are the key points to support the correlation between increased CO2 concentrations and average global temperatures?

4.4 A2 Correlations between global temperatures and carbon dioxide concentrations on Earth.

1. How is evidence collected to support this?

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

1. What are the key points to show the link between human emissions and CO2 concentrations?

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

1. Global temperatures are not directly proportional to greenhouse gases. What other factors can influence this?
2. Increases in greenhouse gases will likely cause:
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_ global average temperatures
   2. more \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_ heat waves
   3. some areas becoming more prone to \_\_\_\_\_\_\_\_\_\_\_\_\_
   4. some areas more prone to intense periods of \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
   5. \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_ to be more frequent and more powerful
   6. Changes to ocean currents, e.g. weakening of the Gulf Stream would mean \_\_\_\_\_\_\_\_\_ temperatures in north-west Europe

4.4.A1 Threats to coral reefs from increasing concentrations of dissolved carbon dioxide

1. What percentage of the CO2 emitted is absorbed by the ocean?
2. What do marine animals (such as reef building corals) use to build their skeletons?
3. What is the chemical formula to show the process? (ADDITIONAL FORMULA provided in class for clarification)