Edexcel GCSE Chemistry

Topic 8: Fuels and Earth science

Earth and atmospheric science

Notes

8.18 Recall that the gases produced by volcanic activity formed the Earth's early atmosphere

- There was intense volcanic activity that released gases that formed the early atmosphere
    - At the start of this period, the atmosphere may have been like the atmospheres of Mars and Venus today, mainly CO_2 with little or no O_2(g)
    - Volcanoes also produced nitrogen which gradually built up in the atmosphere & there may have been small proportions of methane (CH_4) and NH_3

8.19 Describe that the Earth's early atmosphere was thought to contain…and interpret evidence relating to this

- Little or no oxygen
- A large amount of CO_2
- Water vapour
- Small amounts of other gases

8.20 Explain how condensation of water vapour formed oceans

- Water vapour condensed to form the oceans – H_2O (g) -> H_2O (l)

8.21 Explain how the amount of CO_2 in the atmosphere was decreased when CO_2 dissolved as the oceans formed

- CO_2 dissolved in the water and carbonates were precipitated producing sediments, reducing the amount of CO_2 in the atmosphere

8.22 Explain how the growth of primitive plants used CO_2 and released O_2 by photosynthesis and consequently the amount of O_2 in the atmosphere gradually increased

- Algae & plants produced the O_2 that is now in the atmosphere by photosynthesis

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

carbon dioxide + water –(light)-> glucose + oxygen

- Algae first produced oxygen about 2.7 billion years ago and soon after this oxygen appeared in the atmosphere
- Over the next billion years plants evolved and the % oxygen gradually increased to a level that enabled animals to evolve
- Algae and plants decreased the % CO_2 in the atmosphere by photosynthesis

8.23 Describe the chemical test for O_2

- Uses a glowing splint inserted into a test tube of the gas
    - Splint relights in oxygen

8.24 Describe how various gases in the atmosphere, including CO_2, CH_4 and water vapour, absorb heat radiated from the Earth, subsequently releasing energy which keeps the Earth warm: this is known as the greenhouse effect

- Electromagnetic radiation at most wavelengths from the sun passes through the Earth's atmosphere
- The Earth absorbs some radiation and thus warms up (essential for life on Earth). But some heat is radiated from the Earth as infrared radiation.
- Some of this IR radiation is absorbed by greenhouse gases in the atmosphere
- Atmosphere warms up leading to the greenhouse effect and global warming

8.25 Evaluate the evidence for human activity causing climate change, considering: the correlation between the change in atmospheric carbon dioxide concentration, the consumption of fossil fuels and temperature change, and the uncertainties caused by the location where these measurements are taken and historical accuracy

8.26 Describe: the potential effects on the climate of increased levels of CO_2 and CH_4 generated by human activity, including burning fossil fuels and livestock farming and that these effects may be mitigated: consider scale, risk and environmental implications

- Activities increase levels of CO_2 & CH_4
- Examples of human activity include:
    - Driving (CO_2)
    - Consuming electricity (CO_2)
    - Raising livestock (cows – CH_4)
    - Decay of organic waste in landfill sites (CH_4)
- Based on peer-reviewed evidence, many scientists believe that human activities will cause the temperature of the Earth's atmosphere to increase at the surface and that this will result in global climate change
    - But, it is difficult to model such complex systems as global climate change.
    - This leads to simplified models, speculation and opinions presented in the media that may be based on only parts of the evidence and which may be biased.