# AQA GCSE Chemistry

# Topic 9: Chemistry of the atmosphere

## The composition and evolution of the Earth's atmosphere

**Notes**

(Content in bold is for Higher Tier only)

## *The proportions of different gases in the atmosphere*

- For 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today:
    - ~4/5 (80%) nitrogen
    - ~1/5 (20%) oxygen
    - Small proportions of various other gases, i.e. $CO_2$, $H_2O(g)$ and noble gases
- ~ means around/approximately

## *The Earth's early atmosphere*

- Evidence is limited because of the time scale of 4.6 billion years and theories have changed/developed over time
- One theory suggests that during the first billion years of the Earth's existence…
    - 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 ($N_2$) which gradually built up in the atmosphere & there may have been small proportions of methane ($CH_4$) and ammonia ($NH_3$)
    - Water vapour condensed to form the oceans
        - $CO_2$ dissolved in the water and carbonates were precipitated producing sediments, reducing the amount of $CO_2$ in the atmosphere
- this theory is the only theory of the early atmosphere you need to know

## *How oxygen 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

## *How carbon dioxide decreased*

- Algae and plants decreased the % $CO_2$ in the atmosphere by photosynthesis

- $CO_2$ was also decreased by the formation of sedimentary rocks that contain carbon (e.g. limestone and coal) and by the production of fossil fuels from the remains of dead plants and animals when they decayed