**C13 Chemistry Specification**

**Module:** Module 4 Analysis and the Earth’s resources

**Chapter:** C13 The Earth’s Atmosphere

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| Lesson | Specification Link |  |
| C13 Lesson 1  History of our atmosphere (C13 L1) | For 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today:  • about four-fifths (approximately 80 %) nitrogen  • about one-fifth (approximately 20 %) oxygen  • small proportions of other gases, including carbon dioxide, water vapour and noble gases. |  |
| C13 Lesson 2 Evolving Atmosphere (C13 L2) | Theories about what was in the Earth’s early atmosphere and how the atmosphere was formed have changed and developed over time.  Evidence for the early atmosphere is limited because of the time scale of 4.6 billion years.  One theory suggests that there was intense volcanic activity during the first billion years of the Earth’s existence, which released gases that formed the early atmosphere and water vapour that condensed to form the oceans. At the start of this period, the Earth’s atmosphere may have been like the atmospheres of Mars and Venus today, consisting of mainly carbon dioxide but no oxygen gas.  Nitrogen from these volcanoes gradually built up in the atmosphere and there may have been small proportions of methane and ammonia released.  Carbon dioxide dissolved in the newly oceans leading to the precipitation of carbonate sediments, and a reduction of carbon dioxide in the atmosphere.  Photosynthesis by algae and plants produced the oxygen that is now in the atmosphere.    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 percentage of oxygen gradually increased to a level that enabled animals to evolve.  Algae and plants decreased the percentage of carbon dioxide in the atmosphere by photosynthesis.  The formation of sedimentary rocks and fossil fuels that contain carbon, also caused a decrease in carbon dioxide  Students should be able to:  • describe the main changes in the atmosphere over time and some of the likely causes of these changes  • describe and explain the formation of deposits of limestone, coal, crude oil and natural gas. |  |
| C13 Lesson 3 Greenhouse gases and global Climate Change (C13 L3) | Greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life. Water vapour, carbon dioxide and methane are greenhouse gases. The greenhouse effect is caused the interaction of short and long wavelength radiation with matter In the atmosphere. These include:  • carbon dioxide  • methane.  Students should be able to recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane.  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.  However, 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.  Students should be able to:  • evaluate the quality of evidence in a report about global climate change given appropriate information  • describe uncertainties in the evidence base  • recognise the importance of peer review of results and of communicating results to a wide range of audiences temperature is a major cause of climate change. There are several potential effects of global climate change.  Students should be able to:  • describe briefly four potential effects of global climate change  • discuss the scale, risk and environmental implications of global climate change. dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event.  If emissions of carbon dioxide and methane, the carbon footprint can be reduced.  Students should be able to:  • describe actions to reduce emissions of carbon dioxide and methane  • give reasons why actions may be limited. |  |
| C13 Lesson 4 Atmospheric Pollutants (C13 L4) | The combustion of fuels is a major source of atmospheric pollutants.  Most fuels, including coal, contain carbon and/or hydrogen and can contain some sulfur.  When a fuel is burned carbon dioxide, water vapour, carbon monoxide, sulfur dioxide and oxides of nitrogen may be released into the atmosphere. Solid particles and unburned hydrocarbons may also be released that form particulates in the atmosphere.  Students should be able to:  • describe how carbon monoxide, soot (carbon particles), sulphur dioxide and oxides of nitrogen are produced by burning fuels  • predict the products of combustion of a fuel given appropriate information about the composition of the fuel and the conditions in which it is used.  Carbon monoxide is a colourless,odourless, and toxic gas which is not easily detected.  Sulfur dioxide and oxides of nitrogen cause respiratory problems in humans and cause acid rain.  Particulates cause global dimming and health problems for humans.  Students should be able to describe and explain the problems caused by increased amounts of these pollutants in the air |  |