



Chemistry Scheme of Learning

Year 11 – Term 1 Topic 9

Intent – Rationale

Pupils learn about the composition of the Earth’s Atmosphere and how it changed from its early atmosphere, as well as how it is continuing to change due to human activity. The students investigate different pollutants released due to human activity, including their causes and their impact on health and the environment. Pupils consider methods in which human impact can be reduced, including thinking about their own carbon footprint. Throughout the topic there is a strong emphasis on evidence based research, scientific theories and the importance of peer reviewed science in order to draw effective conclusions.

<p>Sequencing – what prior learning does this topic build upon?</p> <ul style="list-style-type: none"> • Year 7 Topic 1 Atoms and Elements, Topic 4 Physics Energy Resources • Year 8 Topic 10 Describing Chemical Reactions, Topic 11 Earth and Atmosphere 	<p>Sequencing – what subsequent learning does this topic feed into?</p> <ul style="list-style-type: none"> • GCSE Topic 10 Using Resources • A level Chemistry Topic 11 Organic Chemistry, Topic 12 Alkanes, Topic 14 Alkenes and Topic 16 Organic Analysis
<p>What are the links with other subjects in the curriculum?</p> <ul style="list-style-type: none"> • Base the content here on what you already know but there will be time in future to liaise further as part of our collaborative work 	<p>What are the links to SMSC, British Values and Careers?</p> <ul style="list-style-type: none"> • SP- learning about the world around them and their own impact on the environment, M – moral issues surrounding reducing carbon emissions without halting progress of developing nations etc • BV2 • GB4 a,c,d,e,g,h,i
<p>What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?</p>	<p>What are the opportunities for developing mathematical skills?</p>
<p>FROM THE LIBRARY <i>Air Pollution: Our Impact on the Planet-363.7</i> <i>Environmental Hazards-363.7</i> <i>Global Climate Change-363.7</i></p>	<p>Pie charts, percentages, balancing equations (ratios), graphs, interpreting data, correlations</p>



Chemistry Scheme of Learning

Year 11 Term 3 Topic 9

Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?

Know

- I know that for 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today
- I know the 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
- I know that algae and plants produced the oxygen that is now in the atmosphere by photosynthesis, as well as decreasing the percentage of carbon dioxide
- I can describe the main changes in the atmosphere over time and some of the likely causes of these changes
- I know that some human activities increase the amounts of greenhouse gases in the atmosphere. These include carbon dioxide and methane
- I can recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane.
- I can recognise the importance of peer review of results and of communicating results to a wide range of audiences
- I know that an increase in average global temperature is a major cause of climate change
- I can describe briefly four potential effects of global climate change
- I know that the carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event
- I know that the carbon footprint can be reduced by reducing emissions of carbon dioxide and methane
- I know that the combustion of fuels is a major source of atmospheric pollutants
- I know that the gases released into the atmosphere when a fuel is burned may include carbon dioxide, water vapour, carbon monoxide, sulfur dioxide and oxides of nitrogen. Solid particles and unburned hydrocarbons may also be released that form particulates in the atmosphere
- I know that carbon monoxide is a toxic gas. It is colourless and odourless and so is not easily detected
- I know that particulates cause global dimming and health problems for humans

Apply

- I know that volcanoes also produced nitrogen which gradually built up in the atmosphere and there may have been small proportions of methane and ammonia
- I know that when the oceans formed carbon dioxide dissolved in the water and carbonates were precipitated producing sediments, reducing the amount of carbon dioxide in the atmosphere
- I know that carbon dioxide was also decreased by the formation of sedimentary rocks and fossil fuels that contain carbon
- I can describe and explain the formation of deposits of limestone, coal, crude oil and natural gas.
- I know that greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life. Water vapour, carbon dioxide and methane are greenhouse gases
- I know that 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
- I can discuss the scale, risk and environmental implications of global climate change
- I can describe actions to reduce emissions of carbon dioxide and methane and give reasons why actions may be limited
- I know that most fuels, including coal, contain carbon and/or hydrogen and may also contain some sulfur
- I can describe how carbon monoxide, soot (carbon particles), sulfur dioxide and oxides of nitrogen are produced by burning fuels
- I know that sulfur dioxide and oxides of nitrogen cause respiratory problems in humans and cause acid rain
- I can describe and explain the problems caused by increased amounts of these pollutants in the air

Extend

- I can interpret evidence and evaluate different theories about the Earth's early atmosphere
- I can describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter
- I can evaluate the quality of evidence in a report about global climate change given appropriate information
- I can 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



What subject specific language will be used and developed in this topic?		What opportunities are available for assessing the progress of students?
Atmosphere	The relatively thin layer of gases that surround the planet	<ul style="list-style-type: none"> • Long answer questions after lessons 1, 2 and 6 • Test after lesson 6
Carbon capture and storage	The method of pumping carbon dioxide produced in fossil fuel power stations deep underground to be absorbed by porous rock	
Carbon footprint	The total amount of carbon dioxide and greenhouse gases emitted over the full life cycle of a product, service or event	
Global dimming	When particulates travel into the upper atmosphere reflecting sunlight back into space	
Global warming	Increased proportions of greenhouse gases from human activities increasing average global temperatures	
Greenhouse gas	Gas molecules that absorb infrared radiation radiated by Earth as it cools down. This increases the energy store of the gases in the atmosphere and warms the Earth	
Incomplete combustion	When a fuel burns in insufficient oxygen producing carbon monoxide as a toxic product	
Nitrogen oxides	These are produced when high temperatures in car engines allow normally unreactive nitrogen gas in the air to react with oxygen. They are toxic and cause acid rain.	
Particulates	Small solid particle given from motor vehicles as a result of incomplete combustion of its fuel. This is often unburnt carbon or hydrocarbons	
Photosynthesis	The chemical reaction in which plants use light energy from the sun to convert carbon dioxide and water into glucose and oxygen	

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Lesson 1 Composition of the Atmosphere	<ul style="list-style-type: none"> • I know that for 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today • I know the 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 	<ul style="list-style-type: none"> • I know that volcanoes also produced nitrogen which gradually built up in the atmosphere and there may have been small proportions of methane and ammonia • I know that when the oceans formed carbon dioxide dissolved in the water and carbonates were precipitated producing sediments, reducing the amount of carbon dioxide in the atmosphere 	



<p>Lesson 2 Changes to the Atmosphere</p>	<ul style="list-style-type: none"> • I know that algae and plants produced the oxygen that is now in the atmosphere by photosynthesis, as well as decreasing the percentage of carbon dioxide • I can describe the main changes in the atmosphere over time and some of the likely causes of these changes 	<ul style="list-style-type: none"> • I know that carbon dioxide was also decreased by the formation of sedimentary rocks and fossil fuels that contain carbon • I can describe and explain the formation of deposits of limestone, coal, crude oil and natural gas. • I can interpret evidence and evaluate different theories about the Earth's early atmosphere 	
<p>Lesson 3 & 4 Greenhouse Gases and Human Activity</p>	<ul style="list-style-type: none"> • I know that some human activities increase the amounts of greenhouse gases in the atmosphere. These include carbon dioxide and methane • I can recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane. • I can recognise the importance of peer review of results and of communicating results to a wide range of audiences • I know that an increase in average global temperature is a major cause of climate change <p>I can describe briefly four potential effects of global climate change</p>	<ul style="list-style-type: none"> • I know that greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life. Water vapour, carbon dioxide and methane are greenhouse gases • I know that 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 • I can describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter 	
<p>Lesson 5 Carbon Footprint</p>	<ul style="list-style-type: none"> • I know that the carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event • I know that the carbon footprint can be reduced by reducing emissions of carbon dioxide and methane 	<ul style="list-style-type: none"> • I can discuss the scale, risk and environmental implications of global climate change • I can describe actions to reduce emissions of carbon dioxide and methane and give reasons why actions may be limited • I can evaluate the quality of evidence in a report about global climate change given appropriate information 	
<p>Lesson 6 Pollutants</p>	<ul style="list-style-type: none"> • I know that the combustion of fuels is a major source of atmospheric pollutants • I know that the gases released into the atmosphere when a fuel is burned may include carbon dioxide, water vapour, carbon monoxide, sulfur dioxide and oxides of nitrogen. Solid particles and unburned hydrocarbons may also be released that form particulates in the atmosphere • I know that carbon monoxide is a toxic gas. It is colourless and odourless and so is not easily detected 	<ul style="list-style-type: none"> • I know that most fuels, including coal, contain carbon and/or hydrogen and may also contain some sulfur • I can describe how carbon monoxide, soot (carbon particles), sulfur dioxide and oxides of nitrogen are produced by burning fuels • I know that sulfur dioxide and oxides of nitrogen cause respiratory problems in humans and cause acid rain • I can describe and explain the problems caused by increased amounts of these pollutants in the air 	

