Chemistry Unit C1 - Topic 1

	The Earth's sea and atmosphere	Links
1.1	Recall that the gases produced by volcanic activity formed the Earth's early atmosphere	
1.2	Recall that the early atmosphere contained: a little or no oxygen b a large amount of carbon dioxide c water vapour and small amounts of other gases	
1.3	Explain why there are different sources of information about the development of the atmosphere which makes it difficult to be precise about the evolution of the atmosphere	
1.4	Describe how condensation of water vapour formed oceans	
1.5	Describe how the amount of carbon dioxide in the atmosphere was reduced by: a the dissolution of carbon dioxide into the oceans b the later incorporation of this dissolved carbon dioxide into marine organisms which eventually formed carbonate rocks	
1.6	Explain how the growth of primitive plants used carbon dioxide and released oxygen by photosynthesis and consequently the amount of oxygen in the atmosphere gradually increased	
1.7	*Investigate the proportion of oxygen in the atmosphere*	
1.8	Describe the current composition of the atmosphere and interpret data sources showing this information	
1.9	Demonstrate an understanding of how small changes in the atmosphere occur through: a volcanic activity b human activity, including the burning of fossil fuels, farming and deforestation	

Chemistry Unit C1 - Topic 2

	Materials from the Earth	Links
2.1	Describe that igneous rocks, such as granite, are: a formed by the solidification of magma or lava b made of crystals whose size depends on the rate of cooling	
2.2	Describe chalk and limestone as examples of sedimentary rocks	
2.3	Describe how sedimentary rocks are formed by the compaction of layers of sediment over a very long time period	
2.4	Recall that sedimentary rocks: a may contain fossils b are susceptible to erosion	
2.5	Describe marble as an example of a metamorphic rock	
2.6	Describe the formation of metamorphic rocks by the action of heat and/or pressure, including the formation of marble from chalk or limestone	
2.7	Recall that limestone, chalk and marble exist in the Earth's crust and that they are all natural forms of calcium carbonate	
2.8	Demonstrate an understanding of the balance between the demand for limestone and the economic, environmental and social effects of quarrying it	
2.9	Demonstrate an understanding of the commercial need for quarrying calcium carbonate on a large scale, as a raw material, for the formation of glass, cement and concrete	
2.10	Describe the thermal decomposition of calcium carbonate into calcium oxide and carbon dioxide	
2.11	*Investigate the ease of thermal decomposition of carbonates, including calcium carbonate, zinc carbonate and copper carbonate*	
2.12	Describe the ease of thermal decomposition of different metal carbonates	
2.13	Demonstrate an understanding that: a atoms are the smallest particles of an element that can take part in chemical reactions b during chemical reactions, atoms are neither created nor destroyed c during chemical reactions, atoms are rearranged to make new products with different properties from the reactants	
2.14	Describe the effect of water on calcium oxide	
2.15	Describe how calcium hydroxide dissolves in water to form a solution, known as limewater	
2.16	Demonstrate an understanding that the total mass before and after a reaction in a sealed container is unchanged, as shown practically by a precipitation reaction	

2.17	Explain how calcium oxide, calcium hydroxide and calcium carbonate can be used to neutralise soil acidity	
2.18	Explain how calcium carbonate can be used to remove acidic gases from coal-fired power station chimneys, reducing harmful emissions and helping to reduce acid rain	

Chemistry Unit C1 - Topic 3

	Problems of, and solutions to a changing environment	Links
3.1	Recall that hydrochloric acid is produced in the stomach to: a help digestion b kill bacteria	
3.2	Describe indigestion remedies as containing substances that neutralise excess stomach acid	
3.3	*Investigate the effectiveness of different indigestion remedies*	
3.4	Recall that acids are neutralised by: a metal oxides b metal hydroxides c metal carbonates to produce salts (no details of salt preparation techniques or ions are required)	
3.5	Recall that: a hydrochloric acid produces chloride salts b nitric acid produces nitrate salts c sulfuric acid produces sulfate salts	
3.6	Describe electrolysis as a process in which electrical energy, from a d.c. supply, decomposes compounds, by considering the electrolysis of dilute hydrochloric acid to produce hydrogen and chlorine (explanations of the reactions at the electrodes are not required)	
3.7	*Investigate the electrolysis of dilute hydrochloric acid*	
3.8	Describe the chemical test for hydrogen	
3.9	Describe the chemical test for chlorine	
3.10	Recall that chlorine can be obtained from sea water by electrolysis (explanations of the reactions at the electrodes are not required)	
3.11	Describe chlorine as a toxic gas and that this leads to potential hazards associated with its large-scale manufacture	
3.12	Describe the use of chlorine in the manufacture of bleach and of the polymer poly(chloroethene) (PVC)	
3.13	Recall that water can be decomposed by electrolysis to form hydrogen and oxygen	
3.14	Describe the chemical test for oxygen	

Chemistry Unit C1 - Topic 4

	Obtaining and using metals	
4.1	Recall that: a most metals are extracted from ores found in the Earth's crust b unreactive metals are found in the Earth as the uncombined elements	
4.2	Describe how most metals are extracted from their ores by: a heating with carbon, illustrated by iron b electrolysis, illustrated by aluminium (knowledge of the blast furnace or the electrolytic cell for aluminium extraction are not required)	
4.3	Explain why the method used to extract a metal is related to its position in the reactivity series and cost of the extraction process	
4.4	*Investigate methods for extracting a metal from its ore*	
4.5	Describe oxidation as the gain of oxygen and reduction as the loss of oxygen	
4.6	Recall that the extraction of metals involves reduction of ores	
4.7	Recall that the oxidation of metals results in corrosion	
4.8	Demonstrate an understanding that a metal's resistance to oxidation is related to its position in the reactivity series	
4.9	Discuss the advantages of recycling metals, including economic implications, and how recycling preserves both the environment and the supply of valuable raw materials	
4.10	Describe the uses of metals in relation to their properties, including: a aluminium b copper c gold d steel	
4.11	Use models to explain why converting pure metals into alloys often increases the strength of the product	
4.12	Demonstrate an understanding that iron is alloyed with other metals to produce alloy steels with a higher strength and a greater resistance to corrosion	
4.13	**Describe how alloying changes the properties of metals, including:** a **smart or shape memory alloys, including nitinol, an alloy of nickel and titanium** **b gold alloys with higher strength, including fineness (parts per thousand) and carats to indicate the proportion of pure gold**	
4.14	**Demonstrate an understanding that new materials are developed by chemists to fit new applications, such as the creation of new shape memory alloys for use, for example, in spectacle frames and as stents in damaged blood vessels**	

Chemistry Unit C1 - Topic 5

	Fuels	
5.1	Describe hydrocarbons as compounds that contain carbon and hydrogen only	
5.2	Describe crude oil as a complex mixture of hydrocarbons	
5.3	Describe the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation (details of fractional distillation are not required)	
5.4	Recall the name and uses of the following fractions: a gases, used in domestic heating and cooking b petrol, used as fuel for cars c kerosene, used as fuel for aircraft d diesel oil, used as fuel for some cars and trains e fuel oil, used as fuel for large ships and in some power stations f bitumen, used to surface roads and roofs	
5.5	Describe that hydrocarbons in different fractions differ from each other in: a the number of carbon and hydrogen atoms their molecules contain b boiling points c ease of ignition d viscosity	
5.6	Describe how the complete combustion of hydrocarbons: a involves the oxidation of the hydrocarbons b produces carbon dioxide and water c gives out energy	
5.7	Describe the chemical test for carbon dioxide (using limewater)	
5.8	Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide	
5.9	Describe how carbon monoxide behaves as a toxic gas	
5.10	Demonstrate an understanding of the problems caused by incomplete combustion producing carbon monoxide and soot in appliances that use carbon compounds as fuels	
5.11	Explain why impurities in some hydrocarbon fuels result in the production of sulfur dioxide	
5.12	Demonstrate an understanding of some problems associated with acid rain caused when sulfur dioxide dissolves in rain water	
5.13	Describe how various gases in the atmosphere, including carbon dioxide, methane and water vapour, trap heat from the Sun and that this keeps the Earth warm	

5.14	Demonstrate an understanding that the Earth's temperature varies and that human activity may influence this	
5.15	Demonstrate an understanding that the proportion of carbon dioxide in the atmosphere varies due to human activity, and that chemists are investigating methods to control the amount of the gas in the atmosphere by: a iron seeding of oceans b converting carbon dioxide into hydrocarbons	
5.16	Evaluate how far the correlation between global temperature and the proportion of carbon dioxide in the atmosphere provides evidence for climate change	
5.17	Describe biofuels as being possible alternatives to fossil fuels	
5.18	Recall that one example of a biofuel is ethanol obtained by processing sugar cane or sugar beet and that it can be used to reduce the demand for petrol	
5.19	Evaluate the advantages and disadvantages of replacing fossil fuels with biofuels, including: a the fact that biofuels are renewable b that growing the crops to make biofuels requires land and may affect the availability of land for growing food c the balance between the carbon dioxide removed from the atmosphere as these crops grow and the carbon dioxide produced when they are transported and burned	
5.20	Demonstrate an understanding of the factors that make a good fuel, including: a how easily it burns b the amount of ash or smoke it produces c the comparative amount of heat energy it produces (calculations involving conversion to joules are not required) d how easy it is to store and transport	
5.21	Recall that a simple fuel cell combines hydrogen and oxygen to form water and that this reaction releases energy	
5.22	Evaluate the advantages and disadvantages of using hydrogen, rather than petrol, as a fuel in cars	
5.23	Describe petrol, kerosene and diesel oil as non-renewable fossil fuels obtained from crude oil and methane as a non-renewable fossil fuel found in natural gas	
5.24	*Compare the temperature rise produced when the same volume of water is heated by different fuels*	
5.25	Recall that alkanes are saturated hydrocarbons, which are present in crude oil	
5.26	Recall the formulae of the alkanes methane, ethane and propane, and draw the structures of these molecules to show how the atoms are bonded together (no further knowledge of bonding is required in this unit)	

5.27	Recall that alkenes are unsaturated hydrocarbons	
5.28	Recall the formulae of the alkenes ethene and propene, and draw the structures of their molecules to show how the atoms are bonded together (no further knowledge of bonding is required in this unit)	
5.29	Describe how bromine water is used to distinguish between alkanes and alkenes	
5.30	Describe how cracking involves the breaking down of larger saturated hydrocarbon molecules (alkanes) into smaller, more useful ones, some of which are unsaturated (alkenes)	
5.31	**Explain why cracking is necessary, including by using data on the composition of different crude oils and the demand for fractions in crude oil**	
5.32	Describe the cracking of liquid paraffin in the laboratory	
5.33	Recall that: a many ethene molecules can combine together in a polymerisation reaction b the polymer formed is called poly(ethene) (conditions and mechanisms not required but **equations required**)	
5.34	Describe how other polymers can be made by combining together other monomer molecules, to include poly(propene), poly(chloroethene) (PVC) and PTFE	
5.35	Relate uses of the polymers poly(ethene), poly(propene), poly(chloroethene) (PVC) and PTFE to the properties of the compounds	
5.36	Recall that most polymers are not biodegradable, that they persist in landfill sites and that many produce toxic products when burnt	
5.37	Explain how some problems associated with the disposal of polymers can be overcome: a by recycling b by developing biodegradable polymers	