LONGSANDS ACADEMY
Astrea Academy Trust
INSPIRING BEYOND MEASURE

Knowledge Organiser

Chemistry Trilogy

GCSE Chemistry Trilogy AQA

Chemistry Trilogy
GCSE AQA

YEAR 10 & 11

2023-2025

NAME: _____

TUTOR GROUP: _____

1.1	Atomic Structure and Periodic Table 1	What is an atom?	The smallest part of an element that can exist
1.2		What is an element?	A substance made of only one type of atom
1.3		What is a compound?	A substance made of two or more different atoms chemically bonded together
1.4		How are compounds formed?	From chemical reactions
1.5		What is involved in a chemical reaction?	The formation of one or more new substances and an energy change
1.6		What is a molecule?	A substance made of more than one atom chemically bonded together
1.7		What is a mixture?	A substance made of more than one thing not chemically bonded together
1.8		How can mixtures be separated?	Physical processes (filtration, crystallisation, simple distillation, fractional distillation and chromatography)
1.9		Name the three subatomic particles	Protons, neutrons, electrons
1.10		State the relative masses and charges of the subatomic particles	Mass: Protons: 1, neutrons: 1, electrons: 0 Charge: Protons: +1, neutrons: 0, electrons: -1
1.11		What is the plum pudding model of the atom?	A ball of positive charge with negative electrons studded into it
1.12		What did the gold foil experiment (alpha particle scattering) prove?	That atoms have dense nucleuses with a positive charge
2.1	Atomic Structure and Periodic Table 2	What did Chadwick discover?	The neutron
2.2		What did Bohr's experiments show?	That electrons are in specific shells
2.3		What is the atomic number of an atom?	The number of protons in an atom
2.4		What is the mass number of an atom?	The number of protons + the number of neutrons in an atom
2.5		In the electron shell model, how are the subatomic particles arranged in an atom?	Protons and neutrons in the nucleus, electrons orbiting the shells
2.6		Why is the number of electrons in an atom equal to the number of protons?	As their charges cancel out
2.7		How many electrons can go in the first shell?	2
2.8		How many electrons can go in the second and third shells?	8
2.9		What are groups in the periodic table?	The columns, numbered 1, 2, 3, 4, 5, 6, 7, 0
2.10		What can the group tell you about the electrons in an atom	How many electrons in the outer shell. E.g. carbon is in group 4 so has 4 electrons in the outer shell
2.11		What are the periods in the periodic table?	The rows in the periodic table
2.12		What can the period tell you about the electrons in an atom?	How many shells an atom has. E.g. carbon is in the second period so has two shells

3.1	Atomic Structure and Periodic Table 3	Why do atoms have no overall charge?	The number of electrons and protons are equal
3.2		Approximately how large are atoms?	Radius is about 0.1nm
3.3		How large is the nucleus compared to the whole atom?	About 1/10000 the size
3.4		What are isotopes?	Atoms of the same element with a different number of neutrons
3.5		What is abundance?	The % of atoms in a sample with a particular mass
3.6		What is the relative atomic mass of an element?	An average value for the mass that takes account of the abundance of the isotopes of the element
3.7		In the modern periodic table, how are the atoms arranged?	By their atomic number and in groups according to chemical properties
3.8		Why do elements in the same group have similar chemical properties?	Because they have the same number of electrons in their outer shell
3.9		Before the discovery of protons, neutrons and electrons, how did scientists organise the elements?	By their atomic weight
3.10		Why did Mendeleev leave gaps in his periodic table?	For elements that had not yet been discovered
3.11		Which discovery meant that organising elements by their atomic weight was not always correct?	Isotopes
3.12		Where are metals on the periodic table found?	To the left and bottom of the periodic table
4.1	Atomic Structure and Periodic Table 4	What is an ion?	An atom which has lost or gained electrons
4.2		What kinds of ions do metals and non-metals form?	Metals form positive, non-metals form negative
4.3		What name is given to elements in group 0?	Noble gases
4.4		Why are the group 0 elements unreactive?	They have full outer shells so do not need to lose or gain electrons
4.5		How does the boiling point of group 0 elements change down the group?	Increases down the group
4.6		Explain why the group 1 elements are called alkali metals	They are metals that form alkalis when they react with water
4.7		What are the products of the alkali metals in a reaction with: oxygen, water, halogen?	Oxygen: metal oxide, Water: metal hydroxide + hydrogen Halogen: metal halide
4.8		Explain why the group 1 elements get more reactive down the group	More electrons, more shielding, weaker electrostatic attraction form the nucleus to the outer shell, easier to lose an electron
4.9		What name is given to elements in group 7?	Halogens
4.10		How does the boiling point of group 7 elements change down the group?	Increases down the group

4.11		Explain why the group 7 elements get less reactive down the group	More electrons, more shielding, weaker electrostatic attraction from the nucleus to the outer shell, harder to gain an electron
4.12		What is a displacement reaction?	Where a more reactive element displaces a less reactive one from a compound
5.1	Bonding and Structure 1	What are the three types of bond?	Covalent, ionic and metallic
5.2		What happens to the electrons in an ionic bond?	They are transferred
5.3		If an atom has gained electrons, what charge will it have as an ion?	Negative
5.4		If an atom has lost electrons, what charge will it have as an ion?	Positive
5.5		What type of elements will form ionic bonds?	Metal + non-metal
5.6		What is the charge on elements from group one and two?	Group 1: 1+, group 2: 2+
5.7		What is the charge on elements from group six and seven?	Group 6: 2-, Group 7: 1-
5.8		Describe the structure and bonding in an ionic compound	Giant ionic lattice held together by strong electrostatic force of attraction between positive and negative ions
5.9		State the melting and boiling points of ionic compounds	High
5.10		Explain the melting and boiling points of ionic compounds	High due to strong electrostatic forces of attraction which require a lot of energy to break
5.11		Explain why ionic compounds do not conduct electricity when solid	The ions are not free to move and carry charge
5.12		Explain why ionic compounds conduct electricity when molten or in solution	The ions are free to move and carry charge
6.1	Bonding and Structure 2	What happens to the electrons in a covalent bond?	They are shared
6.2		What type of elements will form covalent bonds?	Non-metal + non-metal
6.3		What two types of substance have covalent bonds?	Giant covalent substances and small molecules
6.4		How many bonds does each carbon have in diamond?	4
6.5		Explain why diamond and silicon dioxide have high melting points	Giant structures, strong covalent bonds between the atoms, requires a lot of energy to break
6.6		Explain why most covalent substances do not conduct electricity	There are no electrons or ions that are free to move and carry charge
6.7		Making full reference to structure and bonding in graphite, explain how it conducts electricity	Each carbon has 3 bonds, 1 electron is delocalised and therefore free to carry charge through the graphite
6.8		Explain why graphite can act as a lubricant	Weak forces between layers which are free to slide over each other
6.9		What type of substance are methane and water?	Small molecules

6.10		Describe the structure of small molecules	Strong covalent bonds between atoms, weak intermolecular forces holding the molecules together
6.11		Explain why small molecules have low melting points	It is a simple molecular substance with weak forces between the molecules (which are easy to break)
6.12		What is a polymer?	Millions of small molecules joined together in a chain to form a large molecule
7.1	Bonding and Structure 3	Why do larger molecules have higher melting points than smaller ones?	Intermolecular force strengthens with increased molecule size
7.2		What is graphene?	One layer of graphite
7.3		What is graphene used for?	Electronics and composite materials
7.4		What is a fullerene?	Substance made of carbon atoms arranged in a cage
7.5		What are nanotubes?	Cylindrical fullerenes
7.6		What are nanotubes used for?	Electronics, nanotechnology and materials
8.1	Quantitative Chemistry	What is the conservation of mass?	That atoms cannot be created or destroyed
8.2		When a metal forms a metal oxide, why does the mass increase?	Because oxygen atoms have been added
8.3		When an acid reacts with a metal, why does the mass decrease?	Because a gas is produced and escapes
8.4		What is relative formula mass?	The sum of the relative masses of each atom in a compound
8.5		What are the four state symbols and what do they stand for?	(s) solid (l) liquid (g) gas (aq) aqueous
8.6		What symbol do we use for relative formula	Mr
8.7		(HT) What is a mole?	A number of particles
8.8		(HT) What is Avogadro's number	6.022×10^{23}
8.9		(HT) What formula relates moles, mass and Mr	Moles = mass/Mr
8.10		(HT) What is a limiting reactant?	A reactant that does not have enough mass to react with all the product
8.11		What is the unit for concentration?	g/dm^3
8.12		Which formula relates concentration, mass and volume?	concentration = mass/volume
9.1	Chemical Changes 1	What is the reactivity series?	A list of elements ordered by their reactivity
9.2		How can metals be placed in order of their reactivity?	Add the metals to water or acid and see which ones react the most vigorously
9.3		What is the name for a reaction where oxygen is removed from a compound?	Reduction
9.4		Why is gold found in the Earth's crust as the metal itself?	It is unreactive
9.5		What process is used to extract metals more reactive than carbon?	Reduction with carbon

9.6	Chemical Changes 1	What process is used to extract metals more reactive than carbon?	Electrolysis
9.7		What is an ore?	A material containing enough metal in it for it to be economically worthwhile to extract the metal
9.8		What is a displacement reaction?	A reaction in which a more reactive element takes the place of a less reactive element in one of its compounds or in solution
9.9		Define oxidation in the context of loss and gain of electrons	Oxidation is the loss of electrons
9.10		Define reduction in the context of loss and gain of electrons	Reduction is the gain of electrons
9.11		Define acid in terms of pH	A substance with a pH of less than 7
9.12		Define acid in terms of ions	A substance which releases H^+ ions in solution
9.13		State the three common acids and give their formulae	Hydrochloric acid, HCl(aq), Sulphuric acid, H_2SO_4(aq), Nitric acid, HNO_3(aq)
10.1	Chemical Changes 2	Which ions do the common acids form in solution?	HCl forms H^+ and Cl^-, H_2SO_4 forms $2H^+$ and SO_4^{2-}, HNO_3 forms H^+ and NO_3^-
10.2		What is a neutral solution?	A solution with a pH of 7 Water is an example
10.3		How do you measure pH?	With an indicator or pH probe
10.4		What is a base?	A metal oxide, hydroxide or carbonate that will react with an acid. E.g. copper oxide
10.5		What is an alkali?	A soluble base. E.g. sodium hydroxide
10.6		Which ions are always present in a solution of an alkali?	OH^-
10.7		What is a salt?	A compound formed when some or all of the hydrogen from an acid is replaced by a metal
10.8		What type of salts are formed by the three main acids?	Hydrochloric acid produces chlorides, sulphuric acid = sulphates, nitric acid = nitrates
10.9		What is a neutralisation reaction?	A reaction involving an acid that results in a neutral solution
10.10		Which ions always react together in a neutralization reaction between acids and alkalis?	H^+ and OH^-
10.11		Write the equation showing the reaction between H^+ and OH^- ions	$H^+ + OH^- \rightarrow H_2O$
10.12		Complete the equation: metal + acid →	→ salt + hydrogen gas
10.13		Complete the equation: metal hydroxide + acid →	→ salt + water
11.1	Chemical Changes 3	Complete the equation: metal oxide + acid →	→ salt + water
11.2		Complete the equation: metal carbonate + acid →	→ salt + water + carbon dioxide
11.3		How do you make a soluble salt from an acid?	React the acid with a base. E.g. to make copper sulphate react copper oxide with sulphuric acid
11.4		If a salt is in solution, now do you extract it as a solid?	Allow the water to evaporate and it will leave the salt behind as a solid (crystallisation)

11.5	Chemical Changes 3	What is a strong acid?	An acid which completely splits up into its ions in water. E.g. when HCl is in water all the HCl molecules split up into H^+ and Cl^-
11.6		What is a weak acid?	An acid which will have some molecules which do not split up into their ions. E.g. in ethanoic acid only some of the molecules will have split up into the ethanoate ion and H^+ ions
11.7		What is the relationship between the strength of an acid and its pH	As an acid increases in strength the pH decreases
11.8		What is a concentrated acid?	An acid where there are lots of acid particles in the water
11.9		What is a dilute acid?	An acid where there are fewer acid particles in the water
11.10		How does pH depend on the concentration of H^+ in a solution?	As the concentration of H^+ increases by a factor of ten, the pH decreases by 1
11.11		What is electrolysis?	Using electricity to produce elements from an ionic compound
11.12		What is an electrolyte?	A liquid or aqueous ionic compound
11.13		What is the name for the positive electrode?	The anode
12.1	Chemical Changes 4	What is the name for the negative electrode?	The cathode
12.2		Do positive ions move to the anode or the cathode?	Cathode
12.3		Do negative ions move to the anode or the cathode?	Anode
12.4		What are the two main disadvantages of using electrolysis to extract metals?	Requires a large amount of energy to melt the compounds and to produce the necessary electricity
12.5		Why is aluminium oxide mixed with cryolite when extracting aluminium?	To lower the melting point
12.6		What is produced at the anode and cathode in the electrolysis of aluminium oxide?	Aluminium at the cathode and oxygen at the anode
12.7		Why does the anode need to be replaced in the electrolysis of aluminium oxide?	The oxygen reacts with the carbon electrode to produce carbon dioxide
12.8		For a simple ionic liquid, where is the metal produced?	Cathode
12.9		For a simple ionic liquid, where is the non-metal produced?	Anode
12.10		In the electrolysis of an ionic solution, when will hydrogen be produced?	If it is more reactive than hydrogen
12.11		In the electrolysis of an ionic solution, when will oxygen be produced?	If the non-metal is not a halogen
12.12		What can happen to water molecules in the electrolysis of solutions?	They break down into hydrogen and hydroxide ions

12.13		What is a half equation?	An equation which shows electron transfer at one of the electrodes
13.1	Energy Changes	State the law of conservation of energy	Energy cannot be created or destroyed; it can only be transferred from one place to another
13.2		What is an exothermic reaction?	A reaction where energy is transferred to the surroundings
13.3		Give two examples of exothermic reactions	Combustion, respiration
13.4		What happens to the temperature of the surroundings during exothermic reactions?	Increases
13.5		What is an endothermic reactions	A reaction where energy is transferred from the surroundings.
13.6		Give two examples of endothermic reactions	Thermal decomposition reactions, citric acid and sodium hydrogencarbonate
13.7		What happens to the temperature of the surroundings during an endothermic reaction?	Decreases
13.8		State two uses of exothermic reactions	Self-heating cans, hand warmers
13.9		State two uses of endothermic reactions	Some cooling sports injury packs
13.10		What is a reaction profile?	A diagram which shows whether the reactants have more or less energy than the products
13.11		(HT) State which of bond breaking and bond making is endothermic, and which is exothermic	Breaking: exothermic, making: endothermic
13.12		(HT) How do we work out the overall energy change of a reaction?	Work out the difference between the energy needed to break all the bonds in the reactants and the energy released for form all the bonds in the products
14.1	Rate of Reaction 1	What is the formula for a mean rate of reaction in terms of reactants?	Quantity of reactant used/time taken
14.2		What is the formula for a mean rate of reaction in terms of products?	Quantity of reactant product formed/time taken
14.3		How can you measure the quantity of a reactant or product?	In grams or in cm^3
14.4		What are the two possible units for rate of reaction?	g/s or cm^3/s (where s is seconds)
14.5		How could you measure the rate of reaction from a graph?	Draw a tangent to the curve and calculate the gradient.
14.6		What is “collision theory”?	The theory that chemical reactions only occur when particles collide with sufficient energy
14.7		What five factors can affect the rate of reaction?	Temperature, surface area of a solid, concentration of reactants in solution, pressure of gases, catalyst
14.8		State the effect of increasing the surface area on the rate of a reaction	Increases the rate

14.9	Rate of Reaction 1	Explain why increasing the surface area increases the rate of reaction	More particles are available to collide, there are therefore more frequent collisions between reactants
14.10		State the effect of increasing the concentration on the rate of reaction	Increases
14.11		Explain why increasing the concentration increases the rate of reaction	More concentrated means more particles in solution, therefore more frequent collisions between reactants
14.12		State the effect on increasing the pressure of a gas on the rate of reaction	Increases
15.1	Rates of Reactions 2	Explain why increasing the pressure of a gas increases the rate of a reaction	Less space for the particles to move around in, therefore more frequent collisions
15.2		State the effect of increasing the temperature on the rate of reactions	Increases
15.3		What is the activation energy?	The amount of energy a particle needs before it will be able to react when it collides with another particle
15.4	Rates of Reactions 2	Explain why increasing the temperature increases the rate of reaction	Increases the speed at which particles move therefore more frequent collisions. Increases the number of particles which have the activation energy therefore more collisions result in a reaction.
15.5		What is a catalyst?	Something which changes the rate of a reaction but is not used up in that reaction
15.6		How do catalyst speed up reactions?	They provide another route for the reaction to take place which has a lower activations energy
16.1	Reversible Reactions	What is a reversible reaction?	A reaction which can go from reactants to products but also from products to reactants
16.2		What chemical symbol represents a reversible reaction?	
16.3		If a reaction is exothermic in the forward direction what will it be in the reverse direction?	Endothermic
16.4		What is dynamic equilibrium?	The point in a reversible reaction when the forward and reverse reactions are occurring at the same rate
16.5		How is the amount of reactant changing at equilibrium?	It is not changing
16.6		How is the amount of product changing at equilibrium?	It is not changing
16.7		(HT) What is Le Chatelier's principle?	When a reaction at equilibrium is changed, it will seek to counteract that change
16.8		(HT) A reaction is exothermic in the forward direction. What will occur if the temperature is increased?	The backward reaction will increase as it is endothermic and will reduce the temperature

16.9		(HT) A reaction is at equilibrium when some product is removed. What will occur?	The forward reaction will increase as that will increase the amount of product
16.10		(HT) How does increasing the pressure affect equilibrium?	Favours the side with fewer gaseous molecules
17.1	Organic Chemistry 1	What is crude oil?	A mixture of hydrocarbons
17.2		What is crude oil formed from?	The remains of ancient biomass (mostly plankton) that was buried in mud
17.3		What is a finite resource?	One that will run out
17.4		Why is crude oil a finite resource?	Because it takes longer to form than the rate at which we are using it up
17.5		What is a hydrocarbon?	A compound made of atoms of carbon and hydrogen only
17.6		What is a general formula?	A mathematical formula which allows you to work out the chemical formula of a substance
17.7		What is an alkane?	A hydrocarbon with only single bonds
17.8		Name the first four alkanes	Methane, ethane, propane, butane
17.9		What is the general formula for alkanes?	C_nH_{2n+2}
17.10		How does boiling point change with the length of an alkane?	The longer the alkane, the higher its boiling point
17.11		How does the viscosity change with the length of an alkane?	The longer the alkane, the more viscous (the thicker) it is
17.12		How does the flammability change with the length of the alkane?	The longer the alkane, the less flammable it is
17.13		What is fractional distillation?	A process used to separate mixtures of substances with different boiling points
17.14		What are the steps involved in fractional distillation?	Crude oil is vaporised, different molecules rise up the fractionating column and cool down. Condense at different points on the column
18.1	Organic Chemistry 2	Why is fractional distillation important?	Because the different fractions have different uses
18.2		What is a fuel?	A substance which when reacted with oxygen releases energy
18.3		Name five fuels we obtain from crude oil	Petrol, diesel, kerosene, heavy fuel oil and liquefied petroleum gases
18.4		What other uses are there for products of fractional distillation?	Solvents, lubricants, polymers and detergents
18.5		What is combustion?	The reaction of fuel with oxygen
18.6		What are the products of complete combustion?	Carbon dioxide and water
18.7		When does incomplete combustion occur?	When there is not enough oxygen present
18.8		What is cracking?	The process of breaking down a long hydrocarbon into smaller hydrocarbons
18.9		What are the products of cracking?	Short alkanes and alkenes
18.10		Why is cracking important?	Because smaller hydrocarbons are more useful than longer ones
18.11		What are the two types of cracking?	Catalytic and steam cracking

18.12		What are alkenes?	A different type of hydrocarbon which is more reactive than an alkane
18.13		What are alkenes used for?	As a starting material to make more useful chemicals
18.14		How do you test for an alkene?	React it with bromine water
18.15		What is the colour change when an alkene reacts with bromine water?	Turns from orange to colourless
19.1	Chemical Analysis 1	What is chemical analysis?	The process of establishing what chemicals are present in a substance
19.2		In everyday language what is a "pure" substance?	A substance that has had nothing added to it and is in its "natural" state
19.3		In chemistry what is a "pure" substance?	A substance made of a single element or compound
19.4		How can pure substances be distinguished from impure ones?	By their melting/boiling points
19.5	Chemical Analysis 1	Describe the melting and boiling points of pure substances	One very specific temperature
19.6		Describe the melting and boiling points of impure substances	They change state at a range of temperatures
19.7		What is a formulation?	A complex mixture designed as a useful product
19.8		Give three examples of formulations	Fuels, cleaning agents, paints, medicines, allots, fertilisers and foods
19.9		What is chromatography?	A process to separate the constituents of a mixture
19.10		In paper chromatography, what is the stationary phase and what is the mobile phase?	Paper is stationary, solvent (usually water or ethanol) is mobile
19.11		How can chromatography show the difference between pure and impure substances?	Pure ones will not separate into a number of spots
19.12		How is the Rf value calculated?	Distance moved by spot/distance moved by solvent
20.1	Chemical Analysis 2	What does a substance's Rf value depend on?	How soluble it is in the solvent
20.2		In chromatography, why must the substances be placed on a pencil line?	Pencil will not dissolve in the solvent
20.3		In chromatography, why must the solvent height be lower than the pencil line?	So that the substances do not dissolve into the solvent off the paper
20.4		How can hydrogen be tested for?	Makes a squeaky pop when a splint is placed in it
20.5		How can oxygen be tested for?	Relights a glowing splint
20.6		How can carbon dioxide be tested for?	Bubble through limewater, turns it milky (cloudy)

21.1	Chemical of the Atmosphere 1	What is the approximate proportion of nitrogen in Earth's current atmosphere?	80%
21.2		What is the approximate proportion of oxygen in Earth's current atmosphere?	20%
21.3		Which gases are in small proportions in the current atmosphere?	Noble gases, water vapour, carbon dioxide
21.4		When Earth was formed which planets was its atmosphere similar to?	Venus and Mars
21.5		What do Mars and Venus's atmospheres comprise of?	Carbon dioxide with a little or no oxygen
21.6		What produced the gases present in Earth's early atmosphere?	Volcanoes
21.7		Which gases were present in Earth's early atmosphere?	Carbon dioxide, water vapour and nitrogen with small amounts of methane and ammonia
21.8	Chemical of the Atmosphere 1	Why have theories about Earth's early atmosphere developed and changed over time?	Evidence is limited and it was billions of years ago
21.9		By what process do algae and plants produce oxygen?	Photosynthesis
21.10		Write the word equation to represent photosynthesis	Carbon dioxide + water → oxygen + glucose
21.11		How did the world's oceans form?	The Earth's temperature cooled, causing water vapour in the air to condense
21.12		How did the oceans reduce atmospheric levels of carbon dioxide in Earth's early atmosphere?	Carbon dioxide dissolved in the oceans
22.1	Chemistry of the Atmosphere 2	How did algae and plants reduce levels of carbon dioxide in Earth's early atmosphere?	By photosynthesising
22.2		What was formed when shells of organisms made using dissolved carbon dioxide, fell to the bottom of the ocean and were covered and compressed?	Sedimentary rock
22.3		What was formed when plants that grew millions of years ago, died and were trapped and compressed under rocks?	Coal
22.4		What was formed when plankton that lived in the ocean millions of years ago, died and were trapped and compressed under rocks?	Crude Oil and Natural Gas
22.5		Name three greenhouse gases	Water vapour, Carbon Dioxide and Methane
22.6		Describe the wavelength of radiation that comes from the sun and is reflected by the Earth	From the Sun: short wave, From the Earth: long wave

22.7	Chemistry of the Atmosphere 2	What happens to the long wave radiation that is reflected from the Earth in the atmosphere?	It is absorbed by the greenhouse gases
22.8		What is the name given to the process that warms up the surface of the Earth?	The greenhouse effect
22.9		What human activities increase carbon dioxide levels?	Deforestation and burning fossil fuels
22.10		What human activities increase methane levels?	Farming animals and landfill
22.11		What is the name given to the increasing average temperature of the Earth	Climate Change
22.12		Name an effect of climate change	Increased flooding, changes in rainfall patterns, frequency of storms, amount of water in a habitat etc...
23.1	Chemical of the Atmosphere 3	What is the name given to the total amount of carbon dioxide and other greenhouse gases emitted over the full lifecycle of a product, service or event?	Carbon footprint
23.2		What is produced from the complete combustion of a hydrocarbon fuel?	Carbon dioxide and water
23.3		Which products could be produced from the incomplete combustion of a hydrocarbon fuel	Carbon dioxide, water, carbon monoxide, carbon particulates
23.4		Which gas is produced when fuels are burned and contain sulphur impurities?	Sulphur dioxide
23.5		Which gases are produced when nitrogen and oxygen react in the very high temperatures of a car engine?	Oxides of nitrogen
23.6		What are the effects of carbon monoxide?	A toxic gas
23.7		What are the effects of sulphur dioxide?	Causes respiratory problems and acid rain
23.8		What are the effects of the oxides of nitrogen?	Causes respiratory problems and acid rain
23.9		What are the effects of particulates of fuels?	Cause global dimming and health problems for humans

24.1	The Earth's Resources 1	What do humans use resources for?	Warmth, shelter and food
24.2		What are finite resources?	Resources that will run out
24.3		What is sustainable development?	Development that meets the needs of the current generations without compromising the ability of future generations to meet their own needs
24.4		Give an example of a natural product that has been replaced by a synthetic product	Cotton has been replaced by polyester
24.5		What is potable water?	Water that is safe to drink
24.6		In the UK how is potable water produced?	Passing fresh water through filter beds and sterilising
24.7		How is water sterilised?	Using chlorine, ozone or ultraviolet light
24.8		What is desalination?	Removal of salt from sea water
24.9		In what two ways can desalination be carried out?	Reverse osmosis or distillation
24.10		What is the main disadvantage of desalination?	It requires a large amount of energy
24.11		In what kinds of locations is desalination carried out?	Ones where there is limited supply of fresh water
24.12		What needs to be removed from sewage and agricultural wastewater?	Organic matter and harmful microbes
25.1	The Earth's Resources 2	What needs to be removed from industrial wastewater?	Organic matter and harmful chemicals
25.2		How is sewage treated?	Screening, sedimentation, anaerobic digestion, aerobic biological treatment
25.3		(HT) Name two new ways of extracting copper from low-grade ores	Phytomining and bioleaching
25.4		(HT) What is a low grade ore?	Rock with only a small amount of metal compound in it
25.5		(HT) How is phytomining carried out?	Plants absorb metal compounds, are harvested and then burned to produce ash
25.6		(HT) How is bioleaching carried out?	Bacteria are used to produce leachate solution
25.7		(HT) How can copper be produced from the products of phytomining and bioleaching?	Electrolysis or displacement with scrap iron
25.8		What is a life cycle assessment?	A way of assessing the environmental impact of a product across its entire life cycle
25.9		What are the four stages in a product's life cycle?	Extracting and processing raw materials, manufacturing and packaging, use and operation, disposal distribution at each stage
25.10		Why is it important to reduce use, recycle and reuse products?	Reduces the use of limited resources, energy sources and environmental impacts
25.11		Give an example of a product that can be reused	Glass
25.12		Give an example of a product that can be recycled	Metal

26.1	Transition Metals and Nanoparticles	Where are the transition metals found in the periodic table?	In the middle
26.2		Compare the melting point, density, strength, hardness and reactivity of transition metals with group 1 metals	Higher for all but reactivity
26.3		What is distinctive about the ions formed by transition metals?	Can form ions with different charges
26.4		What is distinctive about compounds formed from transition metals?	They are coloured
26.5		What can transition metals be used for?	Catalysts
26.6		How big are nanoparticles?	1-100nm, a few hundred atoms
26.7		Calculate the surface area to volume ratio for a cube with side length 1cm	6:1
26.8		Why do nanoparticles have different properties to bulk materials?	Because of their high SA:V ratio
26.9		Give two examples of what nanoparticles can be used for	Medical applications, sun creams, catalysts, deodorants, cosmetics, electronics

Knowledge Organiser

Chemistry Trilogy

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