KS3 Chemistry

The particulate nature of matter

1. Matter is made of tiny particles that are always moving.
2. Particles are packed closely together in a fixed, regular arrangement.
3. They vibrate around fixed positions.
4. Particles are close together but arranged irregularly.
5. They move around and slide past each other.
6. Particles are far apart and spread out randomly.
7. They move quickly in all directions.
8. The particles are held closely together and can only vibrate around fixed positions.
9. The particles can move and slide past each other.
10. The particles are far apart and move freely in all directions.
11. Particles are closest together in solids, further apart in liquids and much further apart in gases.
12. Solid particles vibrate, liquid particles move around each other, and gas particles move rapidly in all directions.
13. They gain energy and move faster.
14. They lose energy and move more slowly.
15. The particles usually move further apart.
16. Gas pressure is the force caused by gas particles colliding with the walls of a container.
17. Moving gas particles colliding with the walls of their container.
18. The particles gain energy and move faster.
19. The gas pressure increases.
20. A solid changes into a liquid as its particles gain energy and can move more freely.
21. A liquid changes into a solid as its particles lose energy and become fixed in position.
22. Some particles at the surface of a liquid gain enough energy to escape as a gas.
23. A liquid changes into a gas throughout the liquid at its boiling point.
24. A gas changes into a liquid as its particles lose energy.
25. Changes of state happen when particles gain or lose energy, changing how quickly they move and how they are arranged.

Atoms, elements and compounds

1. An atom is a tiny particle that makes up an element.

2. Dalton suggested that matter is made of tiny, solid, indivisible particles called atoms.
3. An element is a substance made from only one type of atom.
4. A compound is a substance made when atoms of two or more different elements are chemically joined.
5. An atom is a single particle, while an element is a substance containing only one type of atom.
6. An element contains one type of atom, while a compound contains atoms of different elements chemically joined together.
7. A mixture contains substances that are not chemically joined, while a compound contains elements that are chemically joined.
8. Chemical symbols are short ways of representing elements.
9. A chemical symbol represents an element.
10. A chemical formula shows which elements are present in a substance and the number of atoms of each element.
11. The symbols show which elements are present, while the small numbers show how many atoms of each element are present.
12. H_2O contains two hydrogen atoms and one oxygen atom.
13. CO_2 contains one carbon atom and two oxygen atoms.
14. Atoms of different elements are chemically joined together in fixed ratios.
15. The atoms become chemically joined together in a new substance.
16. Atoms are rearranged to form new substances.
17. Conservation of mass means that the total mass stays the same during a chemical reaction.
18. Mass is conserved because atoms are not created or destroyed during a chemical reaction.
19. The mass stays the same because the particles are not created or destroyed.
20. The particles are simply rearranged or change their movement and arrangement.
21. The atoms are rearranged into new substances, but the total number of each type of atom stays the same.
22. Chemical reactions only rearrange atoms; they do not destroy them.
23. Chemical formulae represent substances using chemical symbols and numbers.
24. Chemical equations represent chemical reactions using chemical formulae.
25. A chemical equation must have the same number of each type of atom on both sides because atoms are conserved.

Pure and impure substances

1. A pure substance contains only one substance or one type of particle.
2. A mixture contains two or more substances that are not chemically joined.

3. A pure substance contains only one substance, while a mixture contains two or more substances.
4. Its particles become spread throughout the solvent.
5. A solution is a mixture formed when a substance dissolves in a solvent.
6. A solute is a substance that dissolves in a solvent.
7. A solvent is a liquid that dissolves a solute.
8. The solid particles separate and spread between the particles of the liquid.
9. Diffusion is the spreading of particles from an area of higher concentration to an area of lower concentration.
10. Diffusion happens because particles move randomly and spread out.
11. Particles move randomly, causing them to spread from areas where they are more concentrated to areas where they are less concentrated.
12. Increasing temperature usually increases the rate of diffusion because particles move faster.
13. Filtration is used to separate an insoluble solid from a liquid.
14. The mixture is passed through a filter; the liquid passes through while the insoluble solid is trapped.
15. Evaporation can be used to separate a dissolved solid from a solution.
16. The solvent evaporates, leaving the dissolved solid behind.
17. Distillation is used to separate substances with different boiling points.
18. The substance with the lower boiling point evaporates first and is then cooled to form a liquid.
19. Chromatography is used to separate substances in a mixture, such as different dyes.
20. Different substances travel at different speeds through the material used for chromatography.
21. A chromatogram is the pattern of separated substances produced by chromatography.
22. A substance can be identified by comparing its position on a chromatogram with known substances.
23. A pure substance has a specific boiling point, so its boiling point can be used to help identify it.
24. A pure substance has a specific melting point, so its melting point can be used to help identify it.
25. Melting point and boiling point can be compared with known values to help determine whether a substance is pure.

Chemical reactions, equations and reaction types

1. A chemical reaction is a process in which one or more substances change into new substances.
2. During a chemical reaction, atoms are rearranged to form new substances.

3. Chemical reactions are rearrangements of atoms because the atoms present before the reaction are still present afterwards but joined together differently.
4. Reactants are the substances that are present at the start of a chemical reaction.
5. Products are the new substances formed during a chemical reaction.
6. A chemical formula shows which elements are present in a substance and the number of atoms of each element.
7. A chemical equation represents a chemical reaction using chemical formulae.
8. Formulae are used to show the reactants, products and proportions of substances in a chemical reaction.
9. The arrow means "produces" or "reacts to form".
10. Chemical equations must have the same number of each type of atom on both sides because atoms are not created or destroyed in a chemical reaction.
11. magnesium + oxygen → magnesium oxide
12. Combustion is a reaction in which a substance burns in oxygen.
13. Oxygen is needed for combustion to occur.
14. During combustion, a substance reacts with oxygen and releases energy, usually as heat and light.
15. fuel + oxygen → carbon dioxide + water
16. Thermal decomposition is the breakdown of a compound into simpler substances when it is heated.
17. During thermal decomposition, heat causes one compound to break down into two or more substances.
18. calcium carbonate → calcium oxide + carbon dioxide
19. Oxidation is a reaction in which a substance reacts with oxygen.
20. When a substance is oxidised, it combines with oxygen.
21. A displacement reaction is a reaction in which a more reactive element takes the place of a less reactive element in a compound.
22. During a displacement reaction, a more reactive element replaces a less reactive element.
23. A metal can displace another metal from a compound if it is more reactive.
24. If one metal is more reactive than another metal, it can displace the less reactive metal from its compound.
25. A reactant is a substance used in a reaction, while a product is a new substance formed by the reaction.

Acids, alkalis, salts and catalysts

1. An acid is a substance with a pH below 7.
2. An alkali is a soluble substance with a pH above 7.

3. Neutralisation is a reaction between an acid and an alkali that produces a salt and water.
4. An acid and an alkali can be identified by their opposite effects on pH and their ability to react together in neutralisation.
5. The pH scale is used to measure how acidic or alkaline a solution is.
6. A pH below 7 shows that a solution is acidic.
7. A pH of 7 shows that a solution is neutral.
8. A pH above 7 shows that a solution is alkaline.
9. Indicators are used to show whether a solution is acidic, neutral or alkaline.
10. An indicator changes colour depending on the pH of the solution.
11. When an acid reacts with a metal, it produces a salt and hydrogen gas.
12. The two types of products are a salt and hydrogen.
13. Hydrogen gas is produced.
14. Hydrogen can be tested by bringing a lit splint close to the gas; it produces a squeaky pop if hydrogen is present.
15. acid + metal → salt + hydrogen
16. A salt is a compound formed when the hydrogen in an acid is replaced by a metal or another positive ion.
17. When an acid reacts with an alkali, they neutralise each other.
18. The two products are a salt and water.
19. acid + alkali → salt + water
20. It is called neutralisation because the acidic and alkaline properties are reduced or cancelled out.
21. Adding an alkali to an acidic solution generally increases its pH towards 7.
22. Adding an acid to an alkaline solution generally decreases its pH towards 7.
23. A catalyst is a substance that increases the rate of a chemical reaction without being used up.
24. A catalyst increases the rate of a chemical reaction.
25. No. A catalyst is not used up during the reaction.

Energetics

1. An energy change is the transfer of energy during a process or reaction.
2. Energy is transferred when particles change their arrangement or movement.
3. Energy is taken in as the particles gain energy and move further apart.
4. Energy is taken in as particles gain energy and move further apart.
5. Energy is released as particles lose energy and come closer together.
6. Energy is released as particles lose energy and become more closely arranged.
7. Particles need to gain or lose energy to change their arrangement or movement.

8. An exothermic reaction is a reaction that transfers energy to the surroundings.
9. The surroundings become warmer.
10. An endothermic reaction is a reaction that takes in energy from the surroundings.
11. The surroundings become cooler.
12. If the temperature of the surroundings increases, the reaction is likely to be exothermic.
13. If the temperature of the surroundings decreases, the reaction is likely to be endothermic.
14. The temperature of the surroundings increases.
15. The temperature of the surroundings decreases.
16. An exothermic reaction releases energy to the surroundings, while an endothermic reaction takes in energy from the surroundings.
17. Energy is transferred from the reaction to the surroundings.
18. Energy is transferred from the surroundings to the reaction.
19. Particles must gain or lose energy when their arrangement changes.
20. The particles gain energy and usually move faster.
21. The particles lose energy and usually move more slowly.
22. Energy is transferred as particles change their movement and arrangement.
23. Heating gives particles more energy, which can cause them to change state.
24. Cooling removes energy from particles, which can cause them to change state.
25. Energy changes help explain how chemical reactions and changes of state happen.

The Periodic Table

1. The Periodic Table is a table that organises all the known elements.
2. Elements are arranged to show patterns in their properties.
3. It provides information such as the names, symbols and positions of elements.
4. A period is a horizontal row of elements.
5. A group is a vertical column of elements.
6. A period is a horizontal row, while a group is a vertical column.
7. Metals are generally found on the left and in the centre.
8. Non-metals are generally found on the right.
9. Physical properties are properties that can be observed or measured without making a new substance.
10. Chemical properties describe how a substance reacts with other substances.

11. Their atoms have different structures and arrangements, giving them different properties.
12. Different elements have different atoms, so they react in different ways.
13. Mendeleev developed an early version of the Periodic Table and arranged elements to show patterns in their properties.
14. He arranged elements mainly in order of increasing atomic mass, while also considering their properties.
15. He left gaps where he thought undiscovered elements should fit.
16. He used patterns in the properties of known elements to predict the properties of undiscovered elements.
17. Elements in the same group often have similar chemical properties, so position can help predict how an element will react.
18. Metals are generally shiny, strong, good conductors of heat and electricity, and often have high melting points.
19. Non-metals are generally poor conductors of heat and electricity and often have lower melting points.
20. Metals and non-metals usually react differently and form different types of compounds.
21. A metal oxide is a compound formed when a metal reacts with oxygen.
22. A non-metal oxide is a compound formed when a non-metal reacts with oxygen.
23. Many metal oxides form alkaline solutions when they react with water.
24. Many non-metal oxides form acidic solutions when they react with water.
25. The Periodic Table shows patterns in element properties, allowing scientists to predict how elements are likely to behave and react.

Materials

1. The reactivity series is a list of metals arranged from most reactive to least reactive.
2. Metals are placed in a reactivity series so their reactivities can be compared.
3. Carbon is placed between aluminium and zinc in the reactivity series.
4. Metals such as potassium, sodium, lithium, calcium, magnesium and aluminium are more reactive than carbon.
5. Metals such as zinc, iron, tin, lead, copper, silver and gold are less reactive than carbon.
6. A metal is more reactive if it reacts more easily or more vigorously than another metal.
7. The reactivity series shows which metals are more or less reactive than others.
8. A metal oxide is a compound made from a metal and oxygen.
9. Carbon can be heated with a metal oxide to remove the oxygen, leaving the metal.

10. Carbon can remove oxygen from some metal oxides because carbon is more reactive than those metals.
11. Metals below carbon in the reactivity series, such as zinc, iron and lead, can be extracted from their oxides using carbon.
12. Metals above carbon are too reactive because they hold onto oxygen more strongly than carbon does.
13. Ceramics are materials made from substances such as clay and are usually produced by heating them.
14. Ceramics are usually hard, strong, brittle and resistant to high temperatures.
15. Polymers are materials made from very long chains of repeating molecules.
16. Polymers are often light, flexible, waterproof and resistant to corrosion.
17. Composites are materials made by combining two or more different materials.
18. A composite is made from a matrix material and a reinforcing material.
19. A composite can have different and improved properties compared with the materials used to make it.
20. Ceramics are useful because they are hard and can withstand high temperatures.
21. Polymers are useful because they are often light, flexible and resistant to corrosion.
22. Composites are useful because they can be strong, light or specially designed for particular uses.
23. The more reactive a metal is, the more difficult it is to extract from its ore.
24. Carbon is useful because it can remove oxygen from the oxides of less reactive metals.
25. Ceramics are generally hard and brittle, polymers are generally light and flexible, and composites can be designed to have useful combinations of properties.

Earth and atmosphere

1. The main layers of the Earth are the crust, mantle, outer core and inner core.
2. The crust is the thin, solid outer layer of the Earth.
3. The mantle is the thick layer of hot, solid rock beneath the crust.
4. The outer core is a very hot layer of mainly liquid metal surrounding the inner core.
5. The inner core is a very hot, solid layer of mainly iron and nickel at the centre of the Earth.
6. The Earth is mainly made of rock and metals, including iron and nickel.
7. A rock is a naturally occurring solid material made from one or more minerals.

8. The rock cycle describes how rocks are continuously changed from one type into another.
9. Igneous rocks form when molten rock cools and solidifies.
10. Sedimentary rocks form when layers of sediment are deposited, compacted and cemented together.
11. Metamorphic rocks form when existing rocks are changed by heat and pressure.
12. Weathering is the breakdown of rocks at or near the Earth's surface.
13. Rocks can be broken down by water, ice, temperature changes, wind, plants and chemical reactions.
14. Sediments can become sedimentary rock when they are compacted and cemented together.
15. Heat and pressure can change the minerals and structure of existing rocks, forming metamorphic rocks.
16. Earth's natural resources include rocks, minerals, metals, fossil fuels, water and biological resources.
17. Some resources are limited because they take a very long time to form and can be used faster than they are replaced.
18. Recycling is the process of collecting and processing used materials so they can be used again.
19. Recycling reduces the need to extract new raw materials, helping conserve limited resources.
20. The carbon cycle describes how carbon moves between the atmosphere, living organisms, oceans and rocks.
21. Carbon dioxide is removed from the atmosphere mainly by photosynthesis.
22. Carbon dioxide is returned to the atmosphere by processes such as respiration, combustion and decomposition.
23. The gases making up most of Earth's atmosphere are nitrogen and oxygen.
24. Human activities such as burning fossil fuels and deforestation increase the amount of carbon dioxide in the atmosphere.
25. Increased carbon dioxide strengthens the greenhouse effect, causing global temperatures to rise and contributing to climate change.