

Key Terms

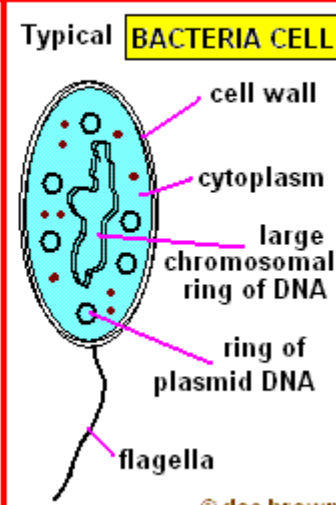
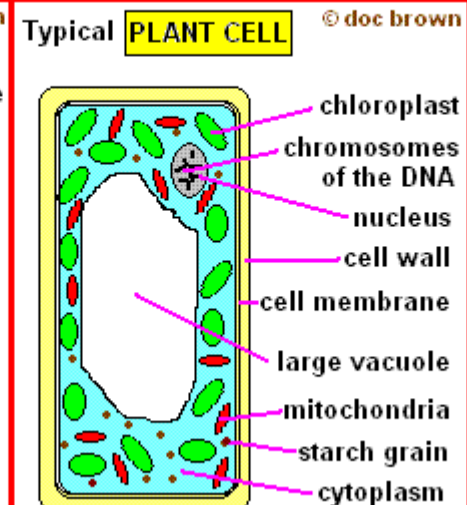
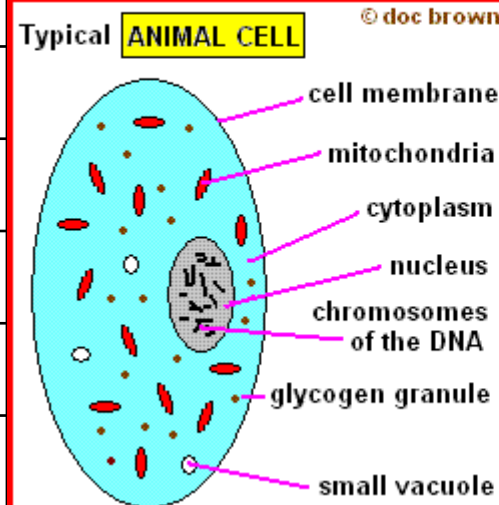
Knowledge Organiser – Cell Structure

Diagrams

Eukaryotic cells	Cells that contain a nucleus
Eukaryote	An organism that is made of eukaryotic cells
Prokaryotic cells	Single-celled organisms that do not contain a nucleus
DNA	Deoxyribonucleic acid – the genetic information found in all living organisms
Ribosome	A cell organelle that makes proteins
Respiration	The release of energy from glucose
Diffusion	The net movement of particles from an area of high concentration to an area of lower concentration
Organelle	A part of a cell with a specific function
Mitochondrion	A cell organelle in which respiration occurs
Chloroplast	A cell organelle in which photosynthesis occurs
Cytoplasm	Jelly like substance in cells where chemical reactions occur
Nucleus	A cell organelle found in eukaryotes containing their genetic material
Cell membrane	Structure surrounding the cell that controls what moves in and out of the cell
Vacuole	Found in plant cells, filled with cell sap, keeps the cell turgid
Cell wall	Made from cellulose and provides structural strength to some cells (not animal cells)
Photosynthesis	Chemical reaction that happens in chloroplasts that stores energy in glucose
Turgid	Describes a swollen cell
Biconcave	Describes a shape with a dip that curves inwards on both sides

Ova	Eggs
Axon	The extension of a nerve cell along which the electrical impulses travel
Phloem	Tubes of living cells that carry sugars to all cells in plants
Xylem	Tubes of dead plant cells through which water flows
Electron microscope	A microscope that uses electrons in place of light to give higher magnification
Resolution	The smallest distance between two separate points

SIMPLIFIED DIAGRAMS OF TYPICAL CELLS A comparison but NOT to scale! © doc brown



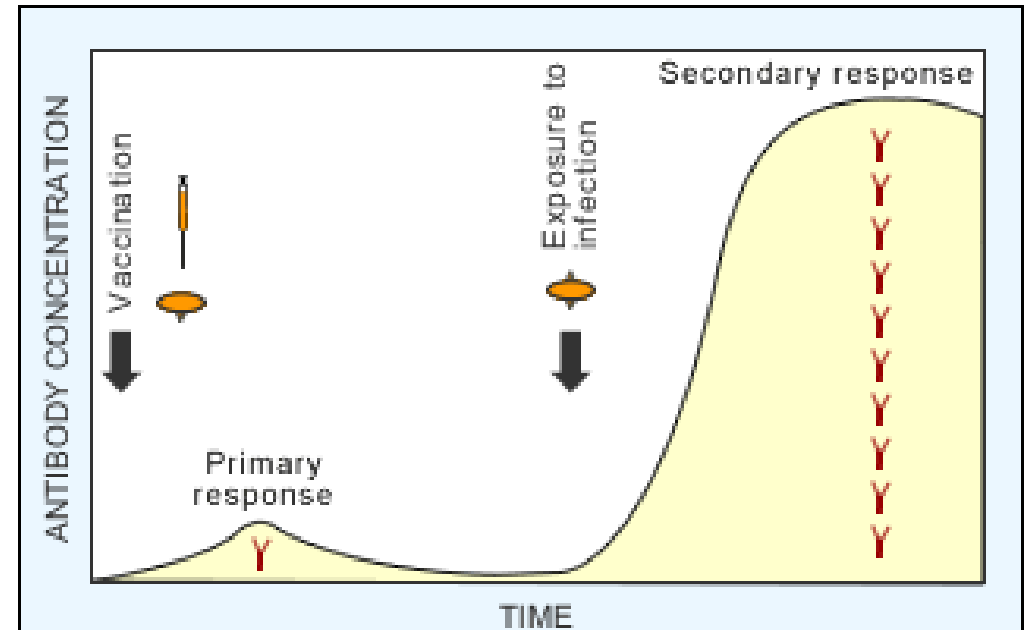
Key Terms

Knowledge Organiser – Infection and Response

Diagrams

Infectious	Describes a pathogen that can easily be transmitted, or an infected person who can pass on the disease.
Vector	An animal that spreads a communicable disease.
Antibiotic	A group of medicines, first discovered by Alexander Fleming, that kill bacteria and fungi but not viruses.
Chitin	A polymer made from sugars that forms the cell walls of fungi and the exoskeleton of insects.
Hyphae	Branching filaments of a fungus that spread out.
Malaria	A communicable disease, caused by a protist transmitted in mosquitos, which attacks red blood cells.
Insecticide	A chemical that kills insects.
Lysozymes	Antibacterial enzymes found in your tears to prevent eye infections.
Cilia	Tiny hair-like projections from ciliated cells that waft mucus out of the gas exchange system.
Antigen	A protein on the surface of a pathogen that your antibodies can recognize as foreign.
Antitoxin	A protein produced by your body to neutralize harmful toxins produced by pathogens.
Vaccine	A medicine containing an antigen from a pathogen that triggers a low level immune response so that if you become infected later your body can respond more quickly to the pathogen.
Antiseptic	A substance applied to the skin or another surface to destroy pathogens.
Anaesthetic	A drug that stops all pain sensation and can be local or general.
Efficacy	How effective a drug is.

Double blind trials	A medical experiment in which the patient and doctors do not know who has been given the drug and who has been given the placebo.
Placebo	A medicine that has only psychological effects.
Phagocytes	A type of white blood cell that engulf pathogens.
Lymphocytes	A type of white blood cell that produce antibodies.
Antibodies	Highly specific Y-shaped proteins that are produced by the immune system to help stop intruders from harming the body.



Primary antibody response: the antibody concentration rises gradually and peaks about 2 weeks after vaccination.

Secondary antibody response: the antibody concentration rises quickly, and the response is more intense. The antibody concentration remains higher for longer.

Key Terms


Knowledge Organiser – Bioenergetics

Diagrams

Endothermic reaction	A reaction that requires energy to be absorbed to work
Photosynthesis	The process by which plants use sunlight to produce glucose. Happens in chloroplasts
Limiting factor	Anything that reduces or stops the rate of a reaction
Yield	The amount of an agricultural product produced
Respiration	The process by which living things release energy from glucose. Happens in mitochondria
Aerobic	In the presence of oxygen
Oxidation	A reaction that uses oxygen
Exothermic reaction	A reaction that gives out thermal energy
Anaerobic	In the absence of oxygen
Oxygen debt	The amount of extra oxygen the body needs after exercise to break down lactic acid
Fermentation	The chemical breakdown of glucose into ethanol and carbon dioxide by respiring micro-organisms such as yeast
Metabolism	The sum of all the chemical reactions that happen in an organism


Photosynthesis

Word equation

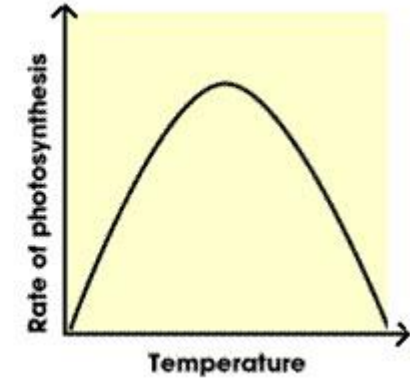
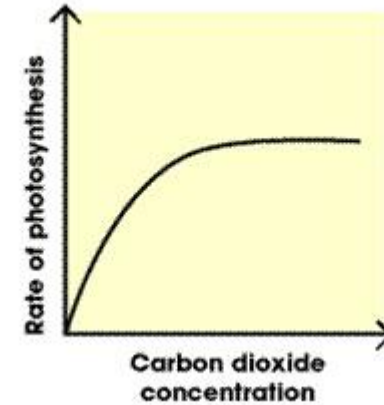
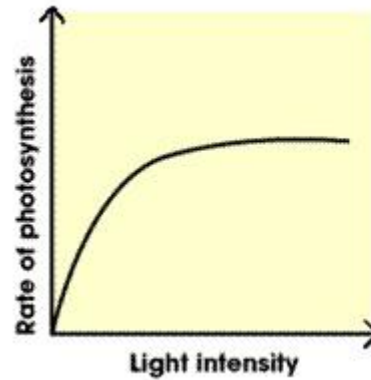


Carbon dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{Light}}$ Glucose + Oxygen

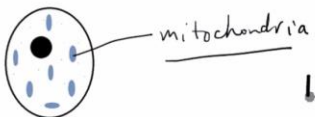
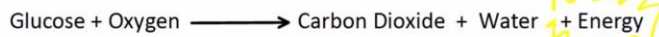
Symbol equation



$6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow[\text{Chlorophyll}]{\text{Light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$



Aerobic Respiration



Anaerobic Respiration

In animals



In plants & fungi



Key Terms

Knowledge Organiser – Atomic Structure and the Periodic Table

Diagrams

Atom	A particle with no electric charge made up of a nucleus containing protons and neutrons and surrounded by electrons.
Proton	A positively charged particle found in the nucleus of an atom.
Neutron	A neutral particle found in the nucleus of an atom.
Electron	Negatively charged particles found on energy levels (shells) surrounding the nucleus inside atoms.
Nucleus	Central part of an atom containing protons and neutrons.
Energy level (shell)	The region an electron occupies surrounding the nucleus inside an atom.
Atomic number	Number of protons in an atom.
Mass number	Number of protons plus neutrons in an atom.
Isotope	Atoms with the same number of protons but a different number of neutrons.
Relative atomic mass	The average mass of atoms of an element taking into account the mass and amount of each isotope it contains. RAM = Total mass of atoms / total number of atoms
Electronic structure	The arrangement of electrons in the energy levels of an atom.
Ion	An electrically charged particle containing different numbers of protons and electrons.
Group	The name given to each column in the periodic table.
Element	A substance containing only one type of atom.
Compound	A substance made from different elements chemically bonded together.
Period	The name given to a row in the periodic table.
Alkali metals	The elements in Group 1 of the periodic table.
Noble gases	The elements in Group 0 of the periodic table.

Halogens	The elements in Group 7 of the periodic table.
Diatomic molecule	A molecule containing 2 atoms.
Halides	Compounds made from Group 7 elements.
Mixture	More than one substance that are not chemically bonded.
Solvent	The liquid that a solute dissolves in.
Solution	A solute dissolved in a solvent.
Soluble	A substance that will dissolve.
Insoluble	A substance that will not dissolve.
Solute	The solid that dissolves in a solvent.

Plum Pudding Model

+ve potential sphere

electron

Nuclear Model

+ve nucleus

Orbiting electrons

Nucleus

Protons

Neutrons

Electron

Atomic Mass = # of Protons + # of Neutrons

4

2He

Atomic Number = # of Protons

Key Terms

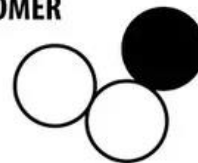
Knowledge Organiser – Bonding, structures and the properties of matter

Diagrams

Giant Lattice	Ionic substances are made up of a giant lattice of positive and negative ions in a regular structure.
Ionic bonding	The electrostatic attraction between positive and negative ions
Molecule	Particle made from atoms joined together by covalent bonds
Covalent bond	Two shared electrons joining atoms together
Intermolecular forces	Weak forces between molecules
Polymer	Long chain molecule made from joining lots of small molecules together by covalent bonds
Monomer	The building block (molecule) of a polymer
Delocalised	Free to move around
Metallic bonding	The attraction between the nucleus of metal atoms and delocalized electrons
Malleable	Can be hammered into shape
Alloy	A mixture of a metal with small amounts of other elements, usually other metals
States of matter	These are solid, liquid and gas
Fullerenes	Family of carbon molecules each with carbon atoms linked in rings to form a hollow sphere or tube
Catalyst	Substance that speeds up a chemical reaction but is not used up in it

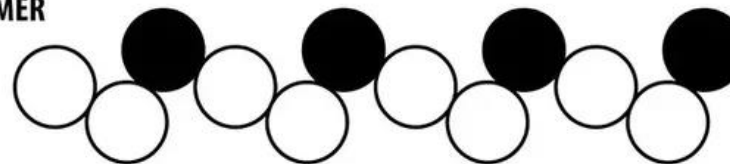
Structure of Monomers and Polymers

MONOMER



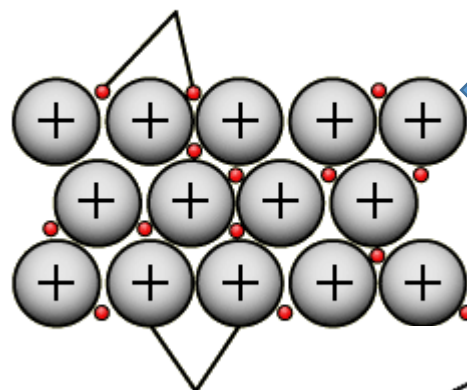
A monomer is a small molecule.

POLYMER



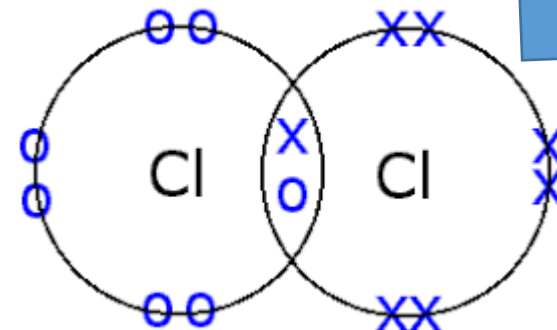
A polymer is a long-chain molecule made up of a repeated pattern of monomers.

free electrons from outer shells of metal atoms

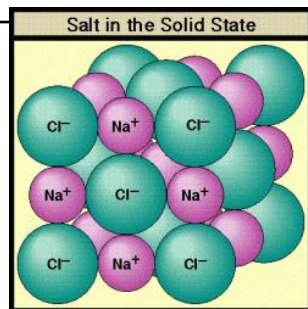
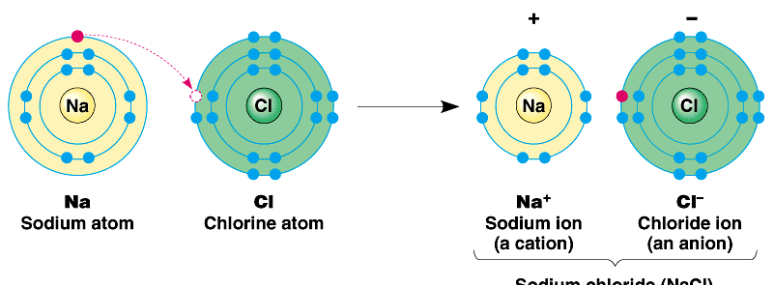


Metallic structure

Covalent bonding



Ionic bonding and structure



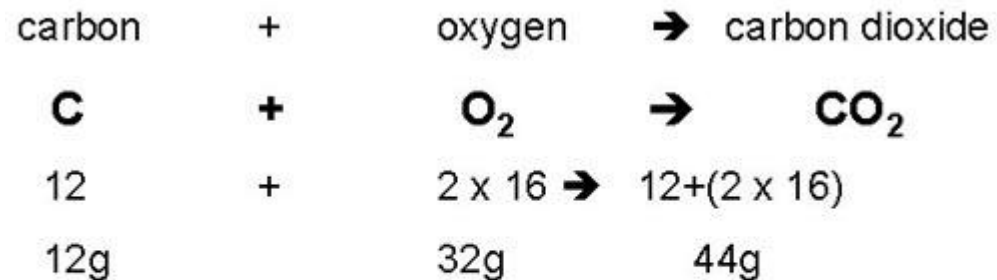
Sodium chloride (NaCl)

Key Terms

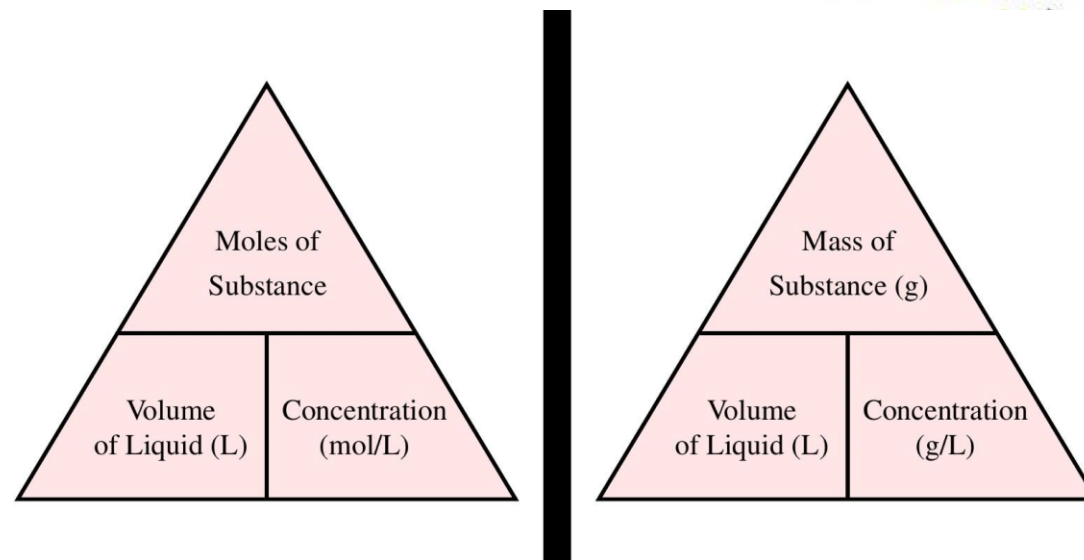
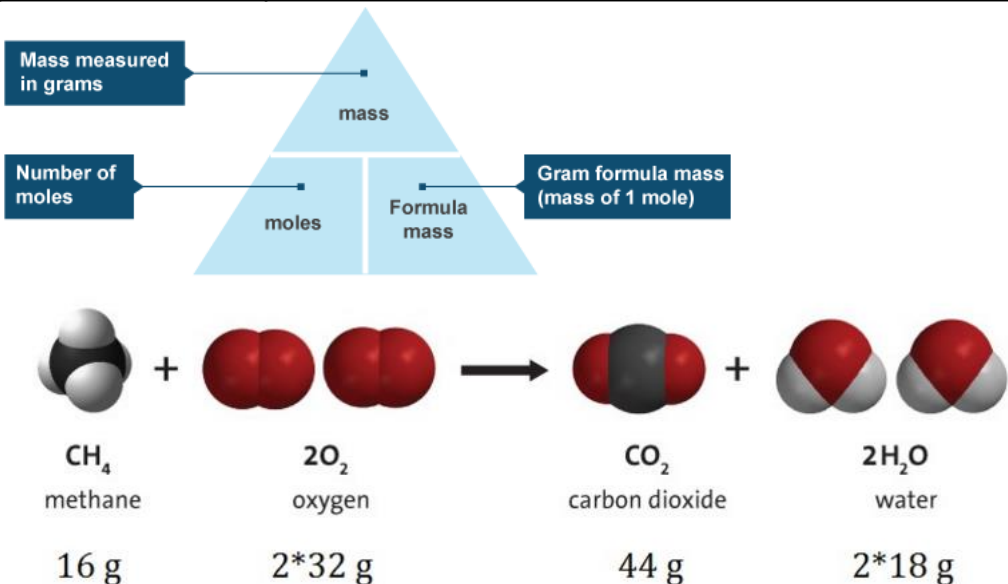
Knowledge Organiser – Quantitative Chemistry

Diagrams

Relative atomic mass	The average mass of atoms of an element, taking into account the mass and the amount of each isotope it contains.
Relative formula mass	The sum of the relative atomic masses of all the atoms in the formula.
Mole	Measurement of the amount of a substance.
Avogadro constant	The number of atoms, molecules or ions in one mole of a given substance (6.02×10^{23}).
Thermal decomposition	Reaction where high temperature causes a substance to break down into simpler substances.
Excess	When the amount of a reactant is greater than the amount that can react.
Limiting reactant	The reactant in a reaction that determines the amount of products formed. Any other reagents are all in excess and will not react.



So we need 32g of oxygen to react with 12g of carbon and 44g of carbon dioxide is formed in the reaction.



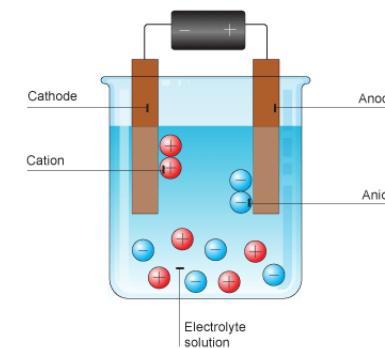
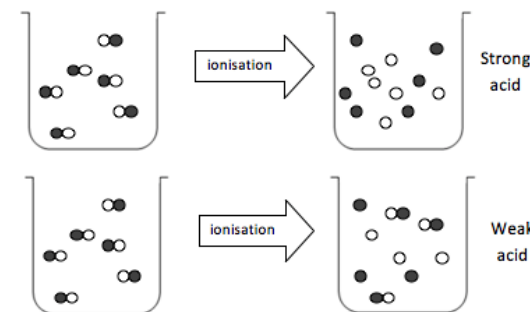
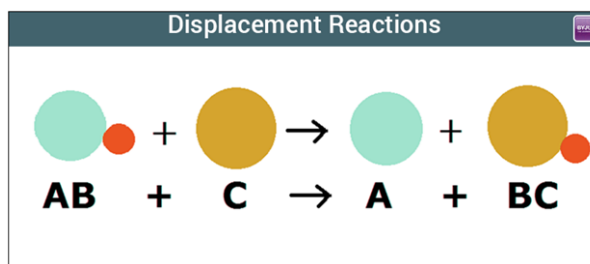
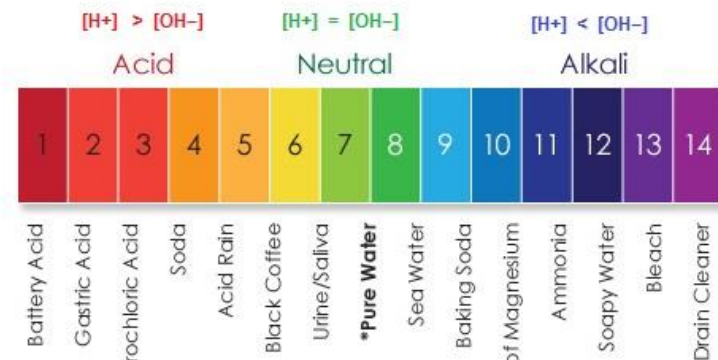
Key Terms

Knowledge Organiser – Chemical Changes

Diagrams

Reactivity series	An arrangement of metals in order of reactivity
Displacement reaction	Reaction where a more reactive element takes the place of a less reactive element in a compound
Oxidation	A reaction in which a substance loses electrons (gains oxygen)
Reduction	Reaction in which a substance gains electrons (loses oxygen)
Ore	A rock from which a metal can be extracted for profit
Acid	Solution with a pH less than 7; produces H ⁺ ions in water
Alkali	Solution with a pH more than 7; produces OH ⁻ ions in water
Aqueous	Dissolved in water
Strong acid	Acid in which all the molecules break into ions in water
Weak acid	Acid in which only a small fraction of the molecules break into ions in water
Dilute	A solution in which there is a small amount of solute dissolved
Concentrated	A solution in which there is a lot of solute dissolved
Neutralisation	A reaction that uses up some or all of the H ⁺ ions from an acid
Electrolysis	Decomposition of ionic compounds using electricity
Electrolyte	A liquid that conducts electricity
Discharge	Gain or lose electrons to become electrically neutral
Inert electrodes	Electrodes that allow electrolysis to take place but do not react themselves

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum	least reactive	Pt



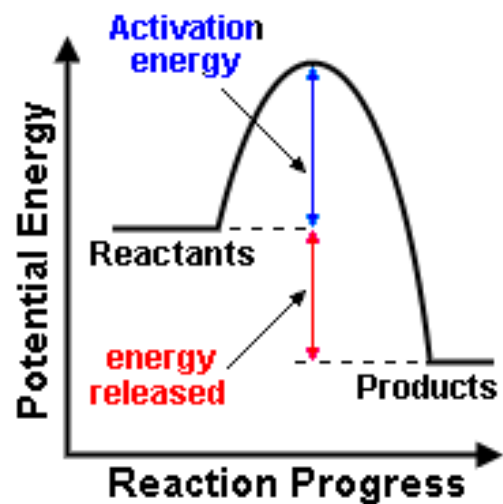
- Acid + Alkali -> salt + water
- Metal + acid -> salt + hydrogen
- Metal oxide + acid -> salt + water
- Metal carbonate + acid -> salt + water + carbon dioxide

Knowledge Organiser – Energy Changes

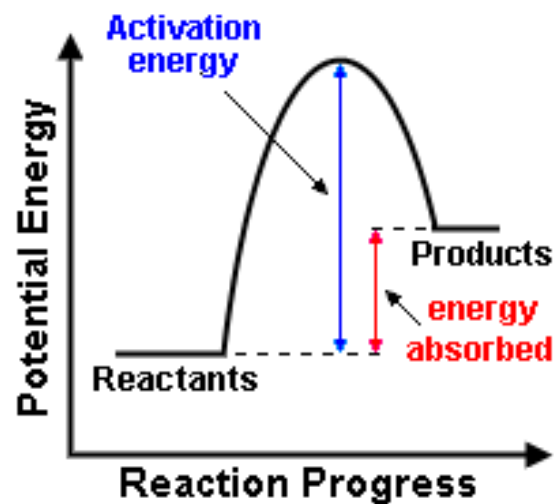
Exothermic reaction	Reaction where thermal energy is transferred from the chemicals to the surroundings and so the temperature increases
Endothermic reaction	Reaction where thermal energy is transferred from the surroundings to the chemicals and so the temperature decreases
Activation energy	The minimum energy particles must have to react

Knowledge Organiser – Energy Changes

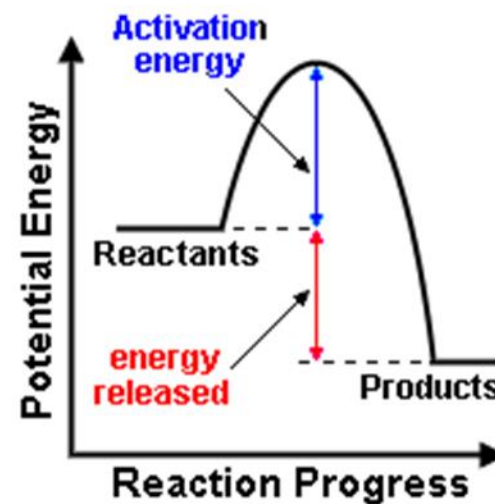
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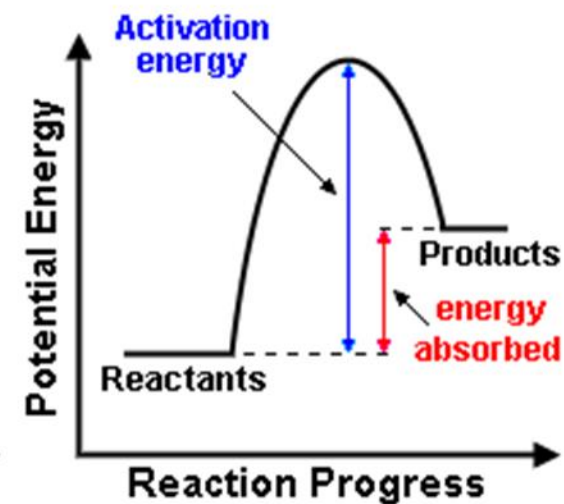
Exothermic reaction



Endothermic reaction



Exothermic reaction



Endothermic reaction

Key Terms

Knowledge Organiser – Formulae and equations

Diagrams

Diatomic molecule	A molecule containing two atoms
Spectator ions	Ions that do not take part in a reaction and do not appear in the ionic equation for the reaction
Ionic equation	Balanced equation for reaction that omits any spectator ions

Common Reactions

Element + oxygen -> oxide of element

Eg Calcium + oxygen -> calcium oxide

Compound + oxygen -> oxides of each element in compound

Eg Methane + oxygen -> carbon dioxide + water

Water + metal -> metal hydroxide + hydrogen (for metals that react with water)

Eg water + sodium -> sodium hydroxide + hydrogen

Acid + metal -> salt + hydrogen

Eg Hydrochloric acid + magnesium -> magnesium chloride + hydrogen

Acid + metal oxide -> salt + water

Eg Sulphuric acid + copper oxide -> copper sulphide + water

Acid + metal hydroxide -> salt + water

Eg nitric acid + potassium hydroxide -> potassium nitrate + water

Acid + metal carbonate -> salt + water + carbon dioxide

Eg hydrochloric acid + calcium carbonate -> calcium chloride + water + carbon dioxide

Acid + ammonia -> ammonium salt

Eg nitric acid + ammonia -> ammonium nitrate

Positive ions

Name Formula

Hydrogen H⁺

Sodium Na⁺

Silver Ag⁺

Potassium K⁺

Lithium Li⁺

Ammonium NH₄⁺

Barium Ba²⁺

Calcium Ca²⁺

Copper(II) Cu²⁺

Magnesium Mg²⁺

Zinc Zn²⁺

Lead Pb²⁺

Iron(II) Fe²⁺

Iron(III) Fe³⁺

Aluminium Al³⁺

Negative ions

Name Formula

Chloride Cl⁻

Bromide Br⁻

Fluoride F⁻

Iodide I⁻

Hydroxide OH⁻

Nitrate NO₃⁻

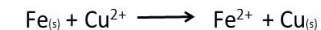
Oxide O²⁻

Sulfide S²⁻

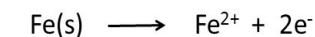
Sulfate SO₄²⁻

Carbonate CO₃²⁻

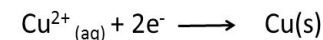
Half Equations



Oxidation Half-Equation:



Reduction Half-Equation:



Specific heat capacity	The energy needed to raise the temperature of 1kg of a substance by 1°C.
Dissipate	To scatter in all directions or to use wastefully. When energy has been dissipated it means we cannot get it back. The energy has spread out and heats up the surroundings.
Non-renewable energy resources	Energy resources which will run out, because they are finite reserves, and which cannot be replenished.
Renewable energy resources	Energy resources which will never run out and (or can be) replenished as they are used.
Alternative energy resource	Resources other than fossil fuels. The resources may or may not be renewable. Nuclear power is not a renewable energy resource, but tidal power is. Alternative energy resources do not contribute to global warming.
Biofuel	Fuel produced from biological material. Biofuels are provided by trees such as willow that can be grown specifically as energy resources.

Energy Equations

Efficiency (%) = (useful energy out ÷ total energy in) x 100.

$$GPE = mgh$$

Gravitational Potential Energy = mass x gravity x height.

$$E_e = \frac{1}{2}ke^2$$

Elastic potential energy = 0.5 x spring constant x extension²

$$KE = \frac{1}{2}mv^2$$

Kinetic Energy = 0.5 x mass x velocity².

$$W = F \times d$$

work done = force x distance.

$$W = E$$

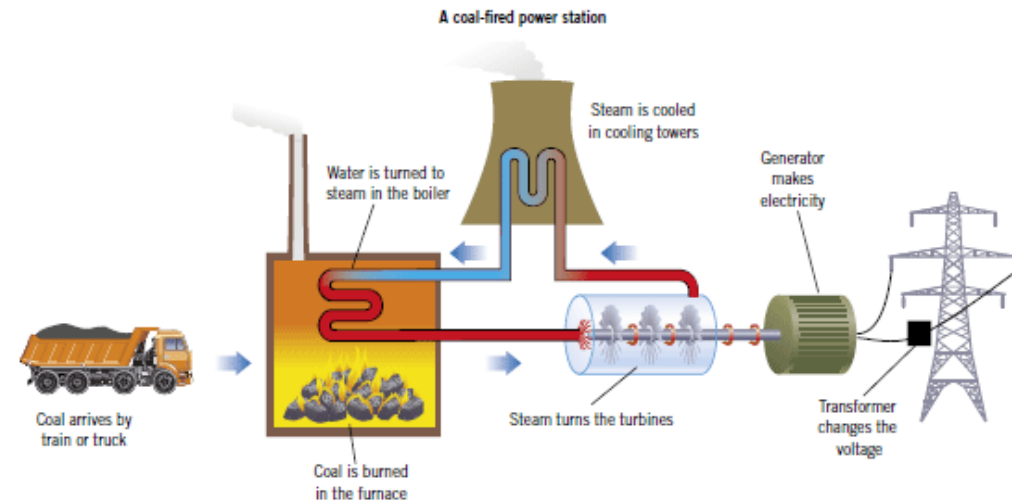
work done = energy transferred.

$$P = E \div t$$

power = energy ÷ time.

$$E = c \times m \times \theta$$

energy = specific heat capacity x mass x change in temperature.

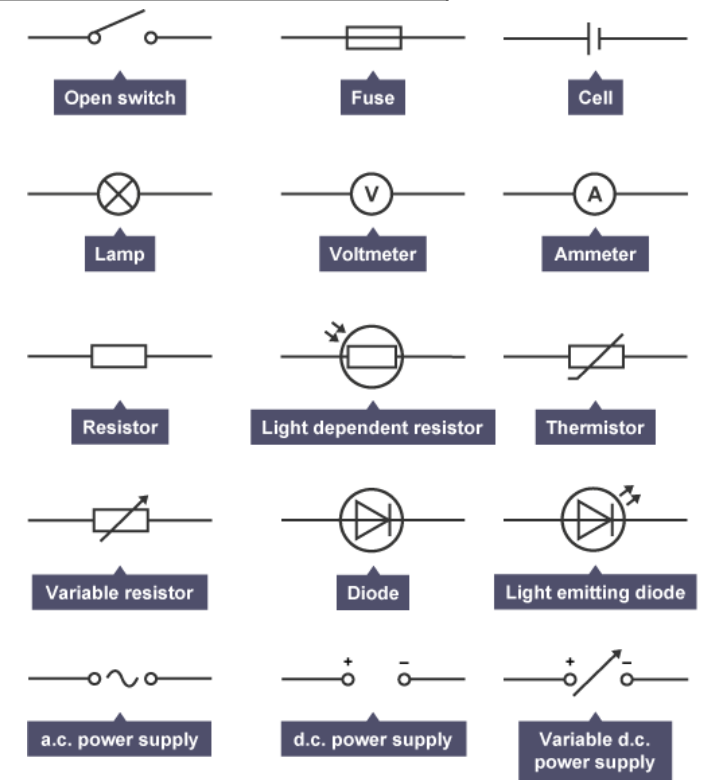


Key Terms

Knowledge Organiser – Electricity

Diagrams

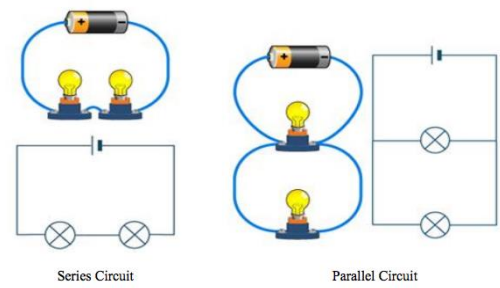
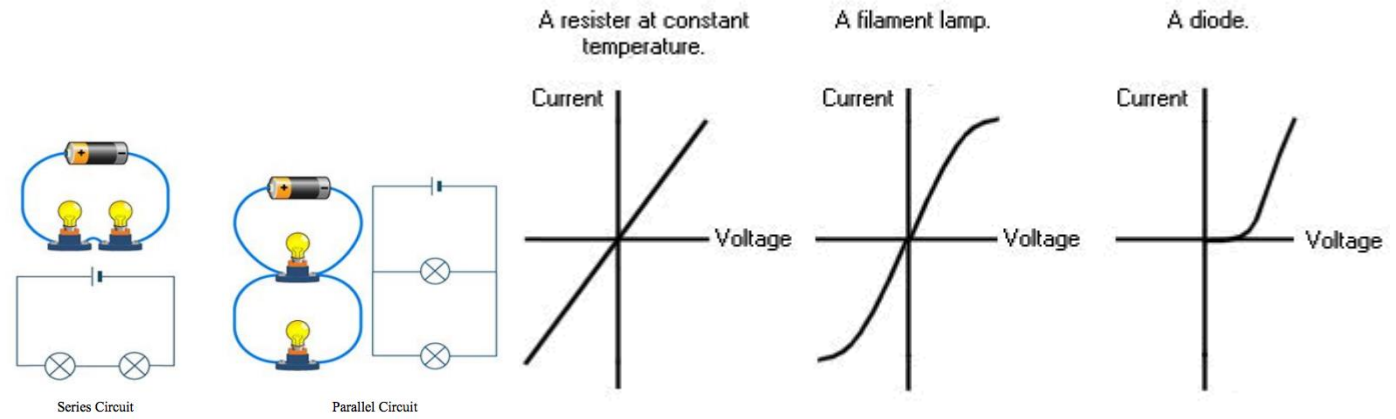
Potential difference (p.d.)	A measure of the electrical work done by a cell (or other power supply) as charge flows round the circuit. Potential difference is measured in volts (V).
Electric current	A flow of electrical charge. The size of the electric current is the rate at which electrical charge flows round the circuit.
Resistor	A component that acts to limit the current in a circuit. When a resistor has a high resistance, the current is low.
Directly proportional	When two quantities are directly proportional, doubling one quantity will cause the other quantity to double. When a graph is plotted, the graph line will be straight and pass through the origin.
Inversely proportional	When two quantities are inversely proportional, doubling one quantity will cause the other quantity to halve
Ohmic	The current flowing through an ohmic conductor is proportional to the potential difference across it. If the p.d. doubles, the current doubles. The resistance stays the same.
Non-ohmic	The current flowing through a non-ohmic resistor is not proportional to the potential difference across it. The resistance changes as the current flowing through it changes.



$P = V \times I$ power = voltage x current.
 $V = I \times R$ voltage = current x resistance.
 $Q = I \times t$ charge = current x time.
 $E = V \times Q$ energy = voltage x charge.
 $E = V \times I \times t$ energy = voltage x current x time.

$\frac{V_p}{V_s} = \frac{N_p}{N_s}$ transformer equation

Total cost = number of units x cost per unit.



Equations

$\rho = m/v$

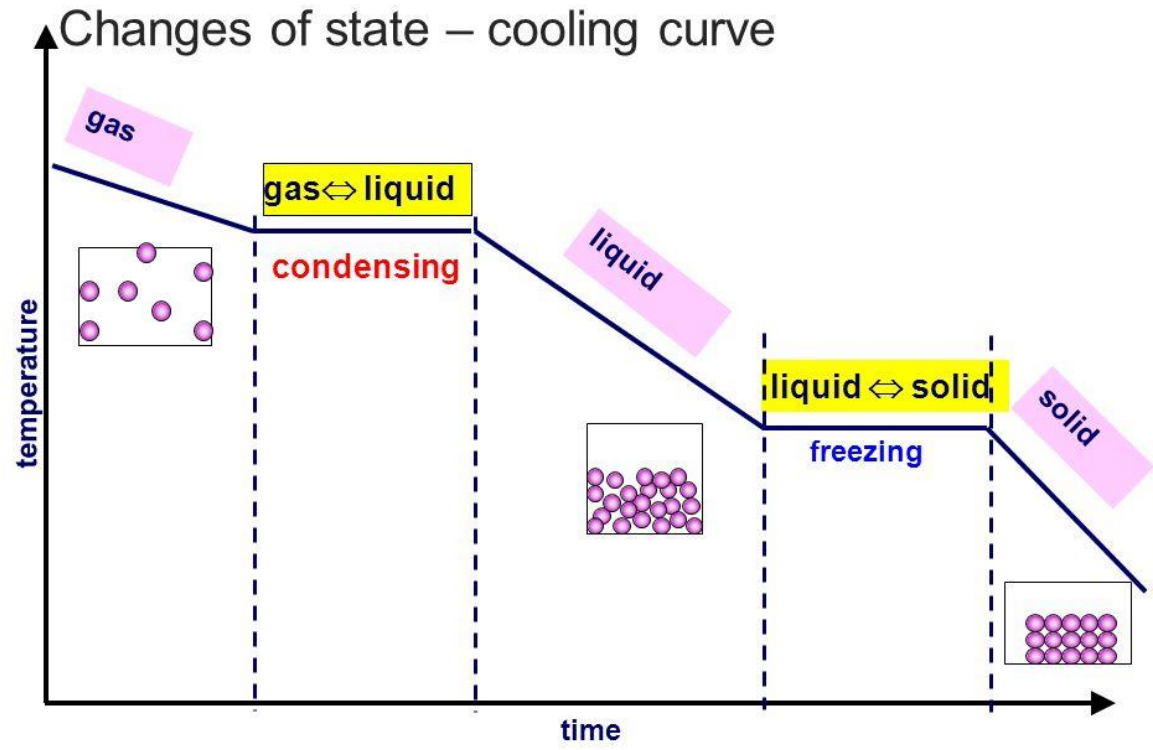
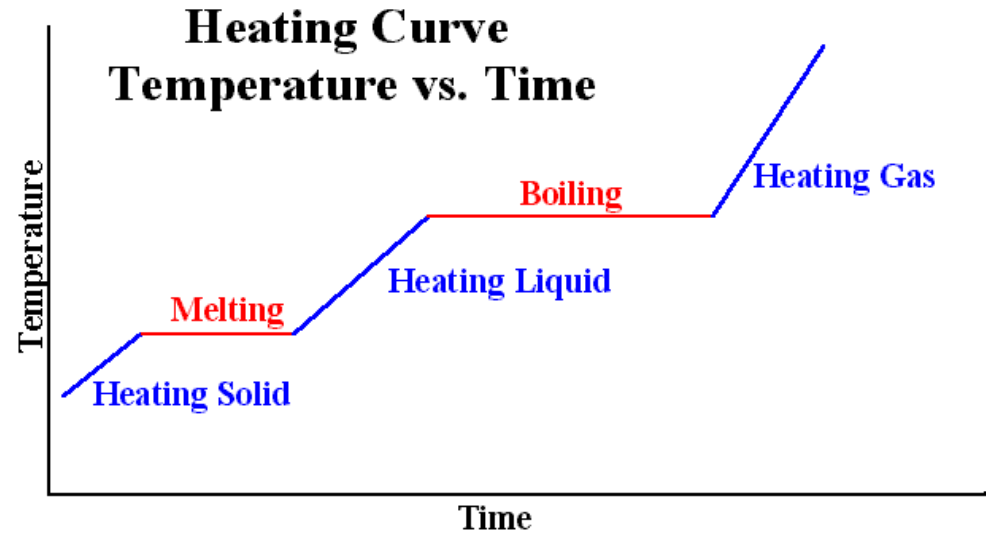
Density = Mass \div volume

$\Delta E = mc \Delta\theta$

Change in thermal energy = mass x specific heat capacity x temperature change

$E = mL$

Energy required to change state = mass x specific latent heat



	Solid	Liquid	Gas
Arrangement of particles	Close together Regular pattern	Close together Random arrangement	Far apart Random arrangement
Movement of particles	Vibrate on the spot	Move around each other	Move quickly in all directions
Diagram			

Key Terms

Knowledge Organiser – Atomic Structure

Diagrams

Proton	A positively charged particle found in the nucleus of an atom.
Neutron	A neutral particle found in the nucleus of an atom.
Electron	Negatively charged particles found on energy levels (shells) surrounding the nucleus inside atoms.
Atomic number	Number of protons in an atom.
Mass number	Number of protons plus neutrons in an atom.
Isotope	Atoms with the same number of protons but a different number of neutrons.
Alpha particle	A particle formed from two protons and two neutrons.
Beta particle	A fast moving electron.
Gamma ray	An electromagnetic wave.
Geiger-Müller (GM) tube	A device which detects ionizing radiation. An electronic counter can record the number of particles entering the tube.
Half-life	The time taken for the number of nuclei in a radioactive isotope to halve. In one half-life the activity or count rate of a radioactive sample also halves.
1 Becquerel (1Bq)	An emission of 1 particle per second

