Glossary

A

Accuracy An accurate measurement is close to the true value.

Acid A substance that produces hydrogen ions when it dissolves in water.

Acid rain Rain that is acidic due to dissolved gases, such as sulphur dioxide, produced by the burning of fossil fuels.

Activation energy The minimum amount of energy needed for a given chemical reaction to take place.

Activity Number of atoms of a radioactive substance that decay each second.

Alkali A soluble base.

Alkali metals A group of soft metals with one electron in the outer shell, which react with water to form alkaline solutions.

Alkane A hydrocarbon with the general formula C_nH_{2n+2}.

Alkene A hydrocarbon with the general formula C_nH_{2n}.

Alloy A metallic substance formed by combining two or more metals.

Anhydrous An anhydrous substance does not contain water.

Anode Positive electrode.

Anomalous A measurement that is well away from the pattern shown by other results.

Aqueous solution A solution with water as the solvent.

Association When two variables change together, but they are both linked by a third variable. E.g. lack of carbon dioxide in soil and poor growth of plants: both could be linked to too much water in the soil.

Atom The smallest part of an element.

Atom economy The efficiency of a chemical reaction in terms of all of the atoms involved.

Atomic nucleus Positively charged object composed of protons and neutrons at the centre of every atom with one or more electrons moving round it.

Atomic number The number of protons in a nucleus, symbol *Z* (also called the proton number).

B

Bar charts Used when the independent variable is categoric and the dependent variable is continuous.

Bases Compounds which react with acids to neutralise them.

Bias The influence placed on scientific evidence because of: wanting to prove your own ideas; supporting the person who is paying you; political influence; the status of the experimenter.

Biodiesel Diesel fuel made from plant materials.

Blast furnace A reaction vessel in which iron oxide is heated with coke and limestone to produce iron.

Bomb calorimeter Apparatus used to measure the enthalpy change of a chemical reaction.

Bond energy The energy needed to break a particular chemical bond.

Bronze An alloy containing copper and tin.

Burette A glass tube with markings and a tap used to add precisely known amounts of liquids to a container.

C

Cast iron Iron containing between 2% and 5% carbon.

Catalyst A substance that speeds up the rate of another reaction but is not used up or changed itself.

Categoric variable These tell us the name of the variable, e.g. copper, iron, magnesium.

Cathode Negative electrode.

Causal link One change in a variable has caused a change in another variable. You can only be reasonably certain of this when you have valid and reliable evidence. E.g. increasing temperature causes an increase in the rate of the reaction.

Cement A building material made from limestone and clay mixed with water.

Chain reaction Reactions in which one reaction causes further reactions, which in turn cause further reactions, etc. A nuclear chain reaction occurs when fission neutrons cause further fission, so more fission neutrons are released. These go on to produce further fission.

Chance When there is no scientific link between the two variables. E.g. increased sea temperatures and increased diabetes.

Chloride ion A chlorine atom that has gained one electron, which gives it a negative charge.

Chromatography A technique used to separate a mixture of substances using a stationary and a moving phase.

Collision theory An explanation of chemical reactions in terms of reacting particles colliding with sufficient energy for a reaction to take place.

Combustion The process of burning.

Compound A substance made of two or more types of atom chemically joined together.

Concentration gradient The gradient between an area where a substance is at a high concentration and an area where it is at a low concentration.

Conclusion A conclusion considers the results and states how those results match the hypothesis. The conclusion must not go beyond the data available.

Concrete A building material made from sand, cement and crushed rock mixed with water.

Conduction Heat transfer in a substance due to motion of particles in the substance.

Conduction electrons Electrons that move about freely inside a metal because they are not attached to individual atoms.

Conservation of energy Energy cannot be created or destroyed.
Continuous variable A continuous variable can be any numerical value, e.g. temperature.
Control groups Often used when there are a large number of control variables that cannot be kept constant. E.g. when testing a drug on thousands of different people, half will be given the drug and half will be given a similar treatment that does not contain the drug (placebo).
Control variable These are the variables that might affect your result and therefore must be kept the same for a valid investigation. E.g. volume of acid used in an investigation of the effect of temperature.
Controlled An experiment is controlled when all variables that might affect your result (apart from the independent variable) have been kept constant.
Convection Heat transfer in a liquid or gas due to circulation currents.
Convection currents The flow of a fluid due to differences in temperature. E.g. circulation of the upper part of the Earth's mantle.
Core The central part of the Earth below the mantle.
Covalent bonds The bonds formed when atoms join together by sharing electrons.
Cracking Breaking a molecule apart using heat.
Crust The outermost layer of the Earth.

D

Data Measurements or observations of a variable. Plural of datum.
Decompose To split up.
Delocalised electrons Electrons in a molecule which do not belong to a single atom or a single bond.
Density Mass per unit volume of a substance.
Dependent variable The variable that you are measuring as a result of changing the independent variable, e.g. the volume of CO_2 produced.
Diffusion The net movement of particles of a gas or a solute from an area of high concentration to an area of low concentration (along a concentration gradient).
Directly proportional A graph will show this if the line of best fit is a straight line through the origin.
Discrete variable These are numerical, but can only be whole numbers, e.g. numbers of layers of insulation.
Dissociation The separation of a substance into two or more simpler substances, or of a molecule into atoms or ions.

E

E number A number given to a food additive in order to identify it.
Economic How science affects the cost of goods and services. E.g. developing the use of catalysts might decrease the cost of production.
Elastic A material is elastic if it is able to regain its shape after it has been squashed or stretched.
Electrolyte A substance that conducts electricity when molten or when dissolved in water.
Electron microscope An instrument used to magnify specimens using a beam of electrons.
Electronic structure The arrangement of electrons around the nucleus of an atom.
Electrons Negative particles found outside the nucleus of an atom.
Element A substance made up of only one type of element.
Empirical formula A chemical formula that shows the ratio of the number of atoms in a compound.
Emulsifier A substance which stops the two liquids in an emulsion separating.
Emulsion A mixture of tiny droplets of one liquid in another liquid.
End point The point in a titration where the reaction is complete and titration should stop.
Endothermic Involving a net absorption of energy.
Energy level See **shells**.
Energy transfer Energy transferred from one place to another.
Ethical Whether it is 'right' or 'wrong' to do something. E.g. experimentation on animals to develop new drugs.
Equilibrium The point at which a reversible reaction takes place at exactly the same rate in both directions.
Evidence Scientific evidence should be reliable and valid. It can take many forms. It could be an observation, a measurement or data that somebody else has obtained.
Exothermic Involving a net release of energy.

F

Fair test Only the independent variable is affecting your dependent variable, all other variables are kept the same.
Fatty acids Building blocks of lipids.
Fluid A liquid or a gas.
Food additive A substance added to food to improve its flavour, texture or shelf-life.
Fossil fuel Coal, oil or gas or any other fuel formed long ago from the fossilised remains of dead plants or creatures.
Fractional distillation A way of separating a mixture of substances according to their different boiling points.
Free electrons Electrons that move about freely inside a metal and are not held inside an atom.
Fullerene A type of giant structure made up of carbon atoms.

G

Galvanising Covering iron with a protective layer of zinc.
Gasohol A mixture of petrol (gasoline) and ethanol.
Giant covalent structures Giant structures held together by many covalent bonds which give them high melting points and hardness, e.g. diamond.
Giant structure Large numbers of atoms or ions arranged in a regular way.
Glass Transparent material made by heating a mixture of sand, sodium carbonate and limestone.

Global dimming A gradual reduction in the amount of light reaching the Earth's surface.
Global warming Warming of the Earth due to greenhouse gases in the atmosphere trapping infra-red radiation from the surface.
Glycerol Building block of lipids.
Grain A metal crystal.
Grain boundaries Where two metal crystals meet.
Greenhouse gases Gases such as carbon dioxide in the atmosphere that absorb infra-red radiation from the Earth's surface.
Group A vertical column of elements in the periodic table.

H

Haber process The industrial process used to make ammonia.
Haematite An ore containing iron combined with oxygen.
Half-life of a radioactive isotope Time taken for the number of nuclei of the isotope (or mass of the isotope) in a sample to halve.
Hardening Adding hydrogen to an oil, replacing the carbon–carbon double bonds in the molecules of an oil with carbon–carbon single bonds.
Hard water Water containing dissolved calcium and/or magnesium salts.
Hydrated A hydrated substance contains water.
Hydrocarbon A compound containing only carbon and hydrogen.
Hypothesis Using theory to suggest explanations for observations, e.g. 'I think that the change in colour is caused by copper ions.'

I

Independent variable The variable that you have decided to change in an investigation, e.g. temperature of the acid.
Indicator A chemical compound that changes colour according to the pH of the solution it is in.
Inert Unreactive.
Inorganic Substances that consist principally of elements other than carbon.
Insoluble Unable to dissolve in a given solvent.
Intermolecular forces Forces of attraction between molecules.
Interval measurements The values of your independent variable that you choose within the range e.g. 10 cm^3; 20 cm^3; 30 cm^3; 40 cm^3; 50 cm^3.
Ionic bond A chemical bond formed when one atom gives up one or more electrons to another atom.
Ionisation Any process in which atoms become charged.
Ionising radiation Radiation that ionises substances it passes through. Alpha, beta, gamma and X-radiation are all ionising.
Ion A charged atom.
Isotopes Atoms of the same element which have different numbers of neutrons in their nuclei.

L

Law of force between charged objects Like charges repel; unlike charges attract.
Lime water Solution of calcium hydroxide, used to test for carbon dioxide.
Limiting factors Factors which limit the rate of a reaction, e.g. photosynthesis.
Line graphs Used when the independent and the dependent variables are both continuous.
Line of best fit Used to show the underlying relationship between the independent and the dependent variables. It should fit the pattern in the results and have roughly the same number of plots on each side of the line. It could be a straight line or a curve. Remember to ignore any anomalies!
Linear These are straight line graphs that can be positive (as the concentration increases so too does the oxygen produced) or negative (as the concentration increases the oxygen produced decreases).
Link due to association When two variables change together, but they are both linked by a third variable. E.g. less oxygen dissolved in water and more sodium chloride dissolved, both could be due to the higher temperature of the water.
Link due to chance When there is no scientific link between the two variables. E.g. increased sea temperatures and increased diabetes.
Lipids Fats and oils.

M

Magnesium A metallic element. Magnesium ions are needed by plants to make chlorophyll.
Malleable Capable of being hammered into shapes without smashing – a property of metals.
Mantle The layer of the Earth between the crust and the core.
Mass number The total number of protons and neutrons in the nucleus of an atom (symbol *A*).
Mass spectrometer An instrument used to measure the mass of atoms and molecules.
Mean Add up all of the measurements and divide by how many measurements there are. Don't forget to ignore any anomalous results.
Mixing occurs when two or more substances are physically mixed but not chemically combined.
Model Description of a theory or theories that suggests further ideas that could test those theories. E.g. 'plum pudding' model of the atom that was tested and found not to be correct. A better model was then suggested.
Mole The relative formula mass of a substance in grams.
Molecular formula A formula that shows the total number of the different kinds of atoms in a molecule.
Monomer A molecule that can combine with other, similar, molecules to form a polymer.
Mortar Mixture of sand, cement and water used to hold building materials together.

N

Net Overall.
Neutral Neither acid nor alkaline.
Neutrons Neutral particles found in the nucleus of an atom.
Nitrogen Inert gas making up around 80% of the Earth's atmosphere.

Noble gas One of the six unreactive gases found in group 0 of the periodic table. They have a complete outer shell of electrons, e.g. neon, argon, helium.

Nuclear model of the atom Every atom contains a positively charged nucleus consisting of neutrons and protons. This is where most of its mass is concentrated, and it is much smaller than the atom. Electrons move about in the space surrounding the nucleus.

O

OILRIG Oxidation Is Loss, Reduction Is Gain (of electrons).

Opinion Opinions are personal judgements. Opinions can be formed from scientific evidence or non-scientific ideas.

Ordered variable Variables that can be put into an order, e.g. small, large, huge lumps of rock.

Ores Rocks that contain enough metal to make it economical to extract the metal.

Organic substances contain (mainly) carbon in combination with other elements.

Osmosis The net movement of water from an area of high concentration (of water) to an area of low concentration (of water) along a concentration gradient.

Oxidation Losing electrons.

Oxidised See **oxidation**.

Ozone layer Layer of ozone gas in the Earth's atmosphere that absorbs ultraviolet radiation.

P

Partially permeable Allowing only certain substances to pass through.

Pay-back period (or time) Length of time for the savings from an improvement to match the actual cost of the improvment.

Percentage yield The percentage of product formed in a chemical reaction compared with the maximum possible amount of product that could be formed.

Period A horizontal row of elements in the periodic table.

pH scale A scale running from 0 to 14 that describes the degree of acidity of a solution.

Pipette A glass tube used to measure precise volumes of liquids.

Plum pudding model of the atom A model of the atom which supposed that the positive charge was evenly spread throughout its matter and the negative charge was held in tiny particles (electrons) inside the atom.

Plasma A gas consisting of bare nuclei (i.e. atoms stripped of their electrons).

Pollution The contamination of air, water or soil by substances which are harmful to living organisms.

Polymer A substance consisting of very large molecules made of smaller identical molecules called monomers.

Precipitate A solid material produced from a solution.

Precipitation See **precipitate**.

Precision Where your repeat results are very close to each other. This is related to the smallest scale division on the measuring instrument used.

Prediction A hypothesis that can be used to design an investigation e.g. I predict that if I increase the concentration of hydrochloric acid, there will be an increase in the volume of carbon dioxide produced.

Proton acceptor A modern definition of an alkali.

Proton donor A modern definition of an acid.

Proton number See **atomic number**.

Protons Positive particles found in the nucleus of an atom.

Q

Quicklime Calcium oxide.

R

Random changes Changes that cannot be predicted.

Random error Measurements when repeated are rarely exactly the same. If they differ randomly then it is probably due to human error when carrying out the investigation.

Range The maximum and minimum values.

Redox A **RED**uction **OX**idation reaction in which electrons are lost by one substance and gained by another.

Reduced See **reduction**.

Reduction Gaining electrons.

Reduction reaction A reaction in which an atom or ion gains electrons.

Relative atomic mass The mass of an atom compared with an atom of $^{12}_{6}C$. This is usually the same as or very similar to the mass number of the element.

Relative formula mass The mass of a chemical compound based on the relative atomic masses of the elements involved.

Reliable Describes data we can trust. E.g. others can get the same results, even using different methods.

Reliability The trustworthiness of data collected.

Renewable energy Energy from sources that never run out, including wind energy, wave energy, tidal energy, hydroelectricity, solar energy and geothermal energy.

Reversible reaction A reaction in which the products immediately react together to produce the original reactants.

S

Saturated A hydrocarbon which contains as many hydrogen atoms as possible in each molecule.

Saturated solution A solution in which no more solute will dissolve.

Scale The substance formed when hard water is boiled.

Scattergrams Used when you want to see how variables relate to each other. E.g. the depth that the ore has been mined and the yield of the metal.

Scum The substance formed when soap reacts with hard water.

Sensitivity The smallest change that an instrument can measure, e.g. 0.1 mm.

Shells The region in which electrons are concentrated as they travel around the nucleus of an atom.

Slag The waste produced when iron is made in a blast furnace.

Slaked lime Calcium hydroxide.

Smart alloy An alloy which returns to its original shape when it is heated.

Social issues How science influences and is influenced by its effects on our friends and neighbours. E.g. building an oil storage depot next to a village.

Stabiliser A substance with molecules that produce large 'cages' full of air when they are mixed with water.

Steels Alloys of iron containing controlled amounts of carbon and/or other metals.

Sodium ion A sodium atom that has lost an electron to give it a positive charge.

Soft water Water containing no dissolved calcium and/or magnesium salts.

Soluble Able to dissolve in a given solvent.

Solubility The extent to which one substance will dissolve in another.

Solubility curve A graph describing the solubility of a substance.

Solute The solid which dissolves in a solvent to form a solution.

Solvent A liquid in which another substance can be dissolved to make a solution.

Strong acid/alkali Acid/alkali that is (almost) completely dissociated when dissolved in water.

Sugars Simple carbohydrates.

Systematic error If the data is inaccurate in a constant way, e.g. all results are 10 mm more than they should be. This is often due to the method being routinely wrong.

T

Tectonic plates Huge sections of the Earth's crust and upper mantle.

Technology Scientific knowledge can be used to develop equipment and processes that can in turn be used for scientific work.

Theory A theory is not a guess or a fact. It is the best way to explain why something is happening. E.g. Sea levels are rising, and the global warming theory is the best way to describe why they are. Theories can be changed when better evidence is available.

Thermal decomposition Splitting up a substance by means of heat.

Thermosetting A polymer that hardens or sets permanently when it is formed by heating the monomers of which it is made.

Thermosoftening A polymer that softens when it is heated.

Titration A method for measuring the amount of substance in a solution.

Transition elements See *transition metals*.

Transition metals The large block of metallic elements in the middle of the periodic table.

Trial run Carried out before you start your full investigation to find out the range and the interval measurements for your independent variable.

Tsunami A large wave caused by an underwater earthquake or volcanic eruption.

U

Universal indicator A substance containing a range of indicators to provide a measurement of pH.

Unsaturated A hydrocarbon which contains a carbon–carbon double bond.

Unsaturated oils Oils in which the molecules contain carbon atoms joined together by carbon–carbon double bonds (C=C).

V

Valid Describes an investigation that successfully gathers the data needed to answer the original question. Data may not be valid if you have not carried out a fair test.

Valid data Evidence that can be reproduced by others and answers the original question. Data may not be valid if you have not carried out a fair test.

W

Water cycle The continuous process by which water is distributed throughout the Earth and its atmosphere.

Weak acid/alkali Acid/alkali that is only slightly dissociated when dissolved in water.

Y

Yield The amount of product formed in a chemical reaction.

Z

Zero error A systematic error, often due to the measuring instrument having an incorrect zero. E.g. forgetting that the end of the ruler is not at zero.