

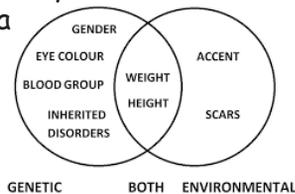
Variation

Threshold Concept

All living things need to change to live.

Variation

Individuals in a population are usually similar to each other, but not identical. Some of the variation within a species is genetic, some is environmental - the conditions in which they have developed and some is a combination of both

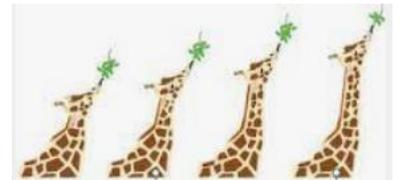


Keywords

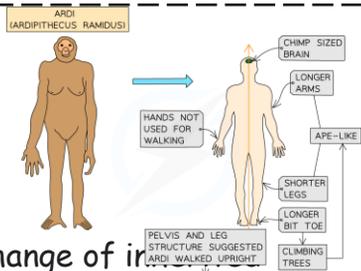
- Variation**..... any difference between the individuals in a species or groups of organisms of any species
- Evolution** the change in the characteristics of a species over several generations and relies on the process of natural selection
- Adaptation**..... the adjustment of organisms to their environment in order to improve their chances at survival in that environment
- Natural Selection**..... the process through which populations of living organisms adapt and change

Natural Selection

In any environment, the individuals that have the best adaptive features are the ones most likely to survive and reproduce



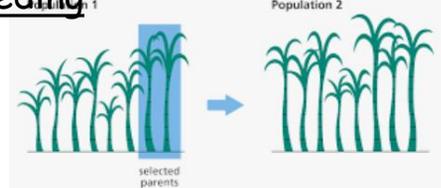
Evolution



Evolution is the change of its characteristics within a population over time through natural selection, which may result in the formation of a new species. Five main processes that lead to evolution:

- mutation
- non-random mating
- gene flow
- finite population size (genetic drift)
- natural selection.

Selective Breeding



Selective breeding or artificial selection is when humans breed plants and animals for particular genetic characteristics. Humans have bred food crops from wild plants and domesticated animals for thousands of years

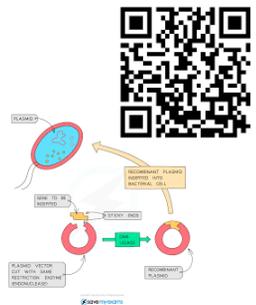
Fossils



A fossil is the preserved remains of a dead organism from millions of years ago. Evidence for early forms of life comes from fossils. By studying fossils, scientists can learn how much (or how little) organisms have changed as life developed on Earth

Genetic Engineering

Genetic engineering involves modifying the genome of an organism by introducing a gene from another organism to result in a desired characteristic



Required Practical

Equations for this topic

Making salts

Threshold Concept

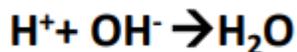
How do metals and acids react to make salts and water

Neutralisation

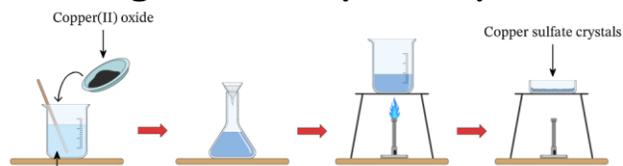
When an acid and alkali react they form neutral product water.

The H^+ ions from the acid react with the OH^- ions from the alkali to form water.

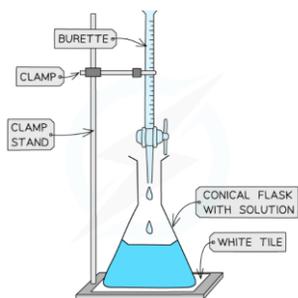
This can be represented using the following ionic equation:



Making salts required pract



Titration req prac (triple)



Redox reactions (higher tier)

Redox reactions are when oxidation and reduction (in terms of electron transfer) take place at the same time.

For example:



The ionic equation can be further split into two half equations.



Oxidation is loss of electrons.



Reduction is gaining of electrons.



Keywords

Reactivity - the ability for an atom or molecule to undergo a chemical reaction

Salt - a substance made of positive and negative ions

Sulphuric acid - an acid that contains sulphate ions

Nitric acid - an acid that contains nitrate ions

Hydrochloric acid - an acid that contains chloride

Balanced - equal on both sides

Symbol equation - a chemical equation using chemical symbols

Acidic - a solution that contains H^+ ions

Alkaline - a solution that contains OH^- ions

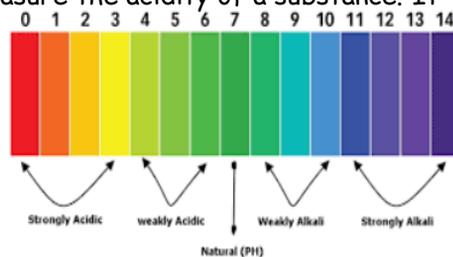
The pH scale

Acids contain H^+ ion and alkalis contain OH^- ions. The pH scale is used to measure the acidity of a substance. It ranges from 0-14.

Acidic = pH < 7

Neutral = pH 7

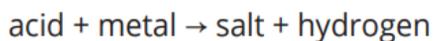
Alkaline = pH > 7



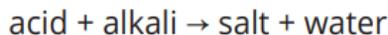
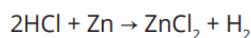
Reactions of acids

Acids react with metals, alkalis and carbonates to form a salt and either hydrogen, water or water and carbon dioxide. Each acid forms a different salt.

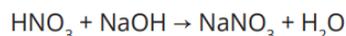
Acid Used	Salt Produced
hydrochloric	chloride
nitric	nitrate
sulfuric	sulfate



hydrochloric acid + zinc \rightarrow zinc chloride + hydrogen

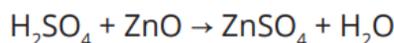


nitric acid + sodium hydroxide \rightarrow sodium nitrate + water



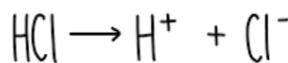
acid + carbonate \rightarrow salt + water + carbon dioxide

sulfuric acid + zinc oxide \rightarrow zinc sulfate + water

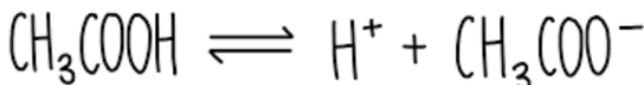


Strong and weak acids

Strong acids are acids that fully ionise in water



Weak acids are acids that partially ionise in water



Particle Models of Matter

Threshold Concept

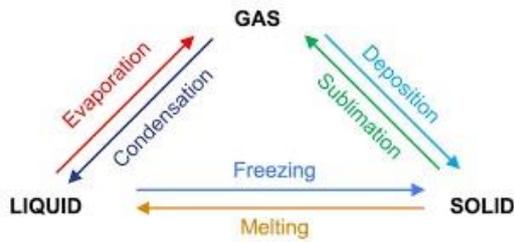
Changes of state are caused by energy changes

States of matter

Solid Liquid Gas



Changes of state



Links to information on the whole topic, consisting of slides, videos, and quizzes

Equations for this topic

$$P = F/A \text{ Pressure} = \text{Force} / \text{Area}$$

$$P = m/V \text{ Density} = \text{mass} / \text{volume}$$

$$\Delta E = m \times c \times \Delta\theta \text{ Change in Energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature}$$

$$\Delta E = m \times L \text{ Change in Energy} = \text{mass} \times \text{Specific Latent Heat}$$

$$P = \rho \times g \times h \text{ Pressure in a liquid column} = \text{density} \times \text{gravity} \times \text{height (TRIPLE ONLY)}$$

$$\text{For gases } p \times v = \text{constant} \text{ For Gases: pressure} \times \text{volume} = \text{constant} \text{ (TRIPLE ONLY)}$$

Keywords

States of matter - solid, liquid or gas.

Particles - the smallest part that a substance can be broken down into.

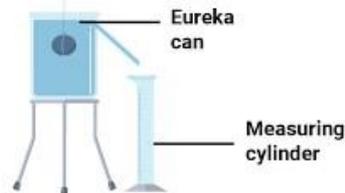
Energy - a property of a substance that is stored or transferred in order for things to be done.

Density - how compact a substance is.

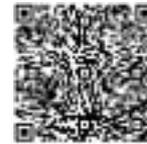
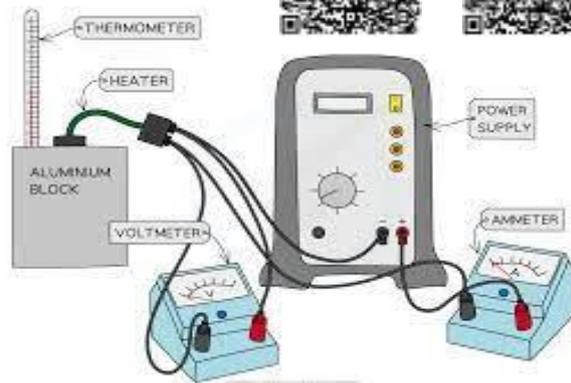
Pressure - continuous force acted on or against an object.

Required Practical

Density



Specific Heat Capacity



Electromagnetism

Threshold Concept

Magnets have two poles that attract or repel.

Common magnetic materials

Iron

Nickel

Cobalt

Steel

Keywords

Permanent Magnet - A material that has its own magnetic field without needing to be helped by another magnetic material.

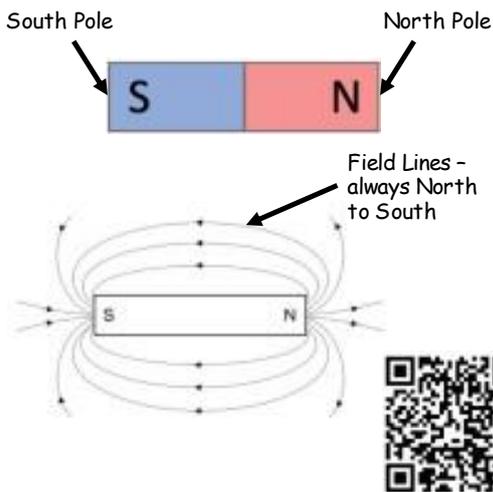
Induced Magnet - a material that only becomes a magnet when placed in another magnetic field.

Magnetic Field - a region around a magnet where the force of magnetism acts.

Solenoid - a coil of wire that carries an electrical current.

Electromagnet - a soft, iron core placed inside a solenoid.

A bar magnet and its magnetic field

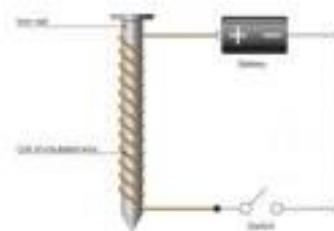


Electromagnets

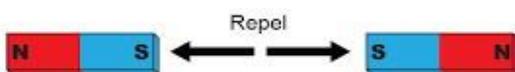
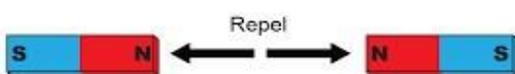
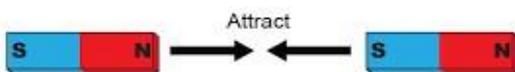


Building an electromagnet

Electromagnets



Attraction and repulsion



Required Practical

Equations for this topic

$$\text{Force} = \text{Magnetic Flux Density} \times \text{Current} \times \text{length of wire}$$

$$F = B \times I \times l$$