FORCES A Pressure Contact Forces Y8 Term1

Keywords

Equilibrium: State of an object when opposing forces are balanced.

Deformation: Changing shape due to a force.

Linear relationship: When two variables are graphed and show a straight line which goes through the origin, and they can be called directly proportional.

Newton: Unit for measuring forces (N).

Resultant force: Single force which can replace all the forces acting on an object and have the same effect.

Friction: Force opposing motion which is caused by the interaction of surfaces moving over one another. It is called 'drag' if one is a fluid.

Tension: Force extending or pulling apart.

Compression: Force squashing or pushing together.

Contact force: One that acts by direct contact.

Keywords

Fluid: A substance with no fixed shape, a gas or a liquid.

Pressure: The ratio of force to surface area, in N/m^2, and how it causes stresses in solids.

Upthrust: The upward force that a liquid or gas exerts on a body floating in it.

Atmospheric pressure: The pressure caused by the weight of the air above a surface.

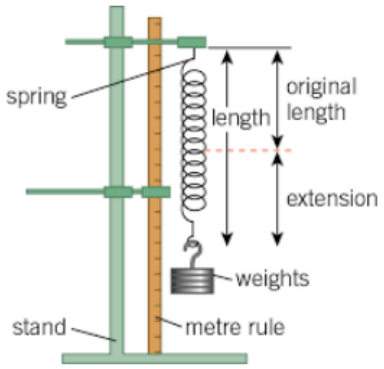
Contact & Non-Contact Forces

All forces between objects are either:
Contact Forces – The objects are physically touching
Non-Contact Forces – The objects are physically separated.

Contact: Friction, Air Resistance, Tension, Normal Contact

Non-Contact: Gravitational, Electrostatic, Magnetic

Hooke's Law Practical



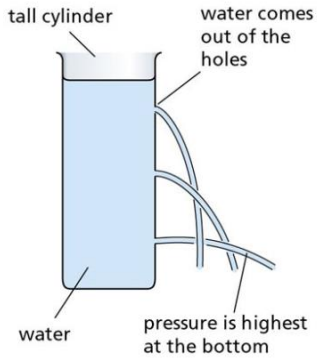
Aim: To investigate how adding mass to a spring affects the springs extension.

Method:
1. Set up the equipment as shown in the diagram.
2. Add 10g mass to the holder and record the spring length.
3. Add another 10g and record the new spring length.
4. Take away the previous spring length from the new length to calculate extension.
5. Repeat by adding 100g masses until 100g is reached.

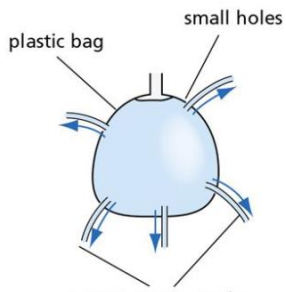
Independent Variable: Mass added (g)
Dependent Variable: Extension (mm/cm)
Controlled Variable: Spring and Slotted Mass

Pressure in liquids

Pressure increases with depth



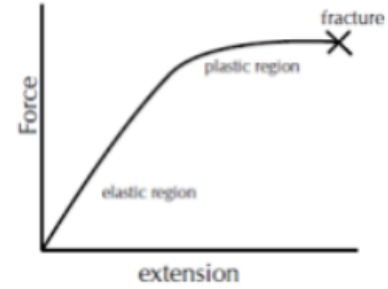
Pressure acts in all directions



The extension of an elastic object, such as a spring, is directly proportional to the force applied, provided that the limit of proportionality is not exceeded.

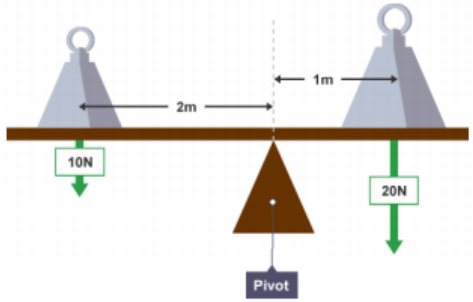
$F = k\,e$

- force, F, in newton's, N
- spring constant, k, in newton's per metre, N/m
- extension, e, in metres, m



To calculate moments, you need two things:
The distance from the pivot that the force is applied and the size of the force applied.

moment (Nm) = force (N) x distance (m)

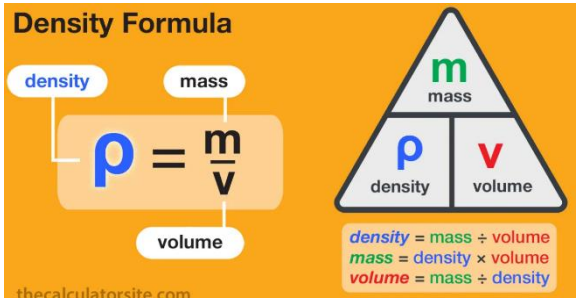


Moment on the left:
moment = force (N) x distance (m)
moment = 10N x 2
Moment = 20Nm

Moment on the right:
moment = force (N) x distance (m)
moment = 20N x 1
Moment = 20Nm

Notice that the two moments in the example above are equal and opposite. They are both 20Nm but the left are acting in an anti-clockwise direction, whilst the right side is acting in a clockwise direction. This is why the beam is balanced.

Density Formula



ELECTROMAGNETS B Electromagnets Magnetism Y8 Term2

Keywords

Electromagnet: A non-permanent magnet turned on and off by controlling the current through it.

Solenoid: Wire wound into a tight coil, part of an electromagnet.

Core: Soft iron metal which the solenoid is wrapped around.

Keywords

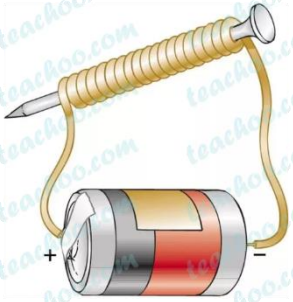
Magnetic force: Non-contact force from a magnet on a magnetic material.

Permanent magnet: An object that is magnetic all of the time.

Magnetic poles: The ends of a magnetic field, called north-seeking (N) and south-seeking poles (S).

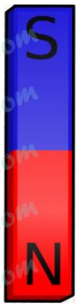
Temporary Magnet Vs Permanent Magnet

Temporary Magnet



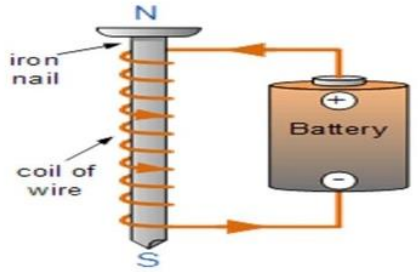
Electromagnet

Permanent Magnet



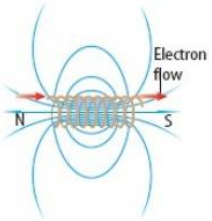
Bar magnet

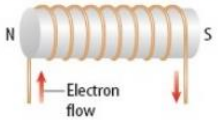
Electromagnetism



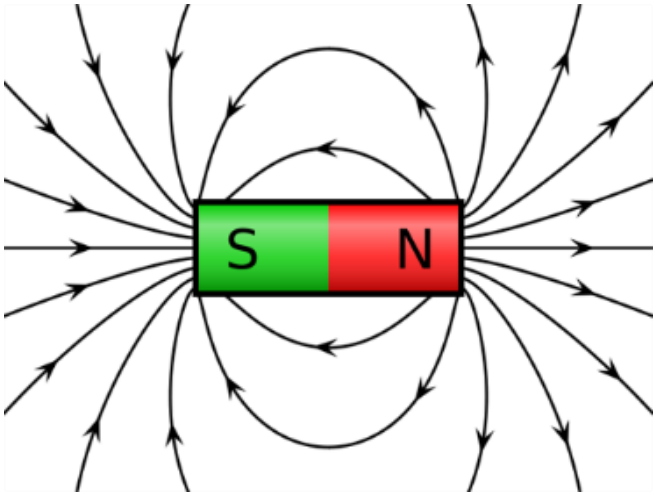
What is an electromagnet?

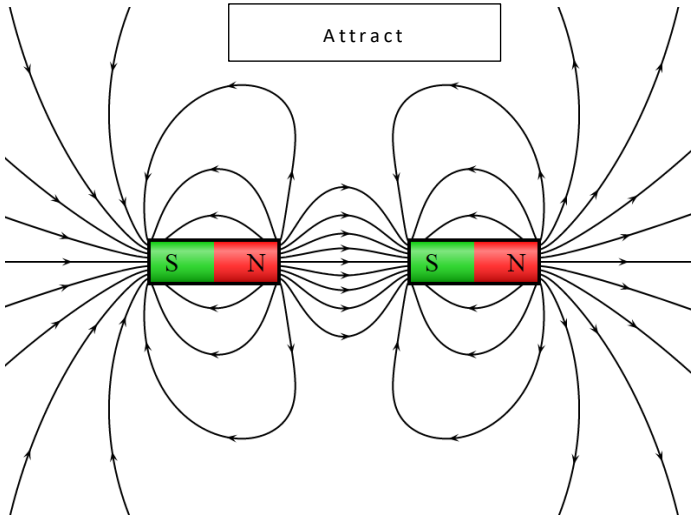
When an electric current is passed through a coil of wire wrapped around a metal core, a very strong magnetic field is produced. This is called an electromagnet.

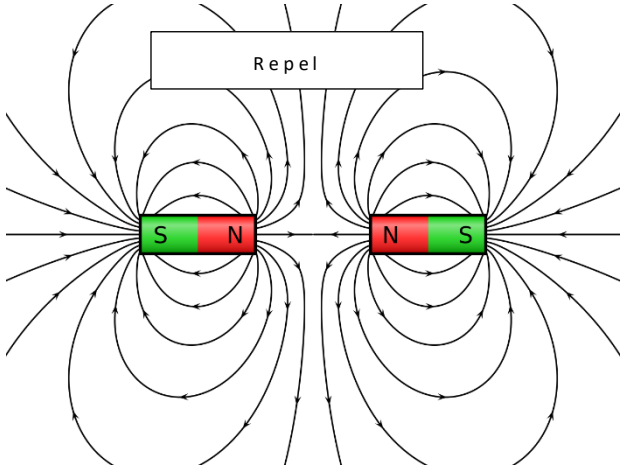




An iron core inserted into the coil becomes a magnet.







ENERGY C Work Heating and cooling Gravity Y8 Term 2

All Saints Science
Catholic High School

Keywords

Work: The transfer of energy when a force moves an object, in joules.

Lever: A type of machine which is a rigid bar that pivots about a point.

Input force: The force you apply to a machine.

Output force: The force that is applied to the object moved by the machine.

Displacement: The distance an object moves from its original position.

Deformation: When an elastic object is stretched or squashed, which requires work.

Keywords

Thermal conductor: Material that allows heat to move quickly through it.

Thermal insulator: Material that only allows heat to travel slowly through it.

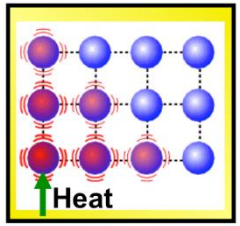
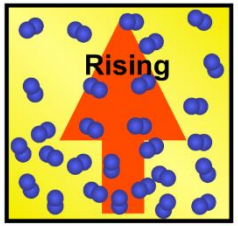
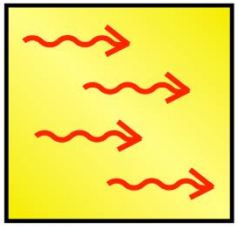
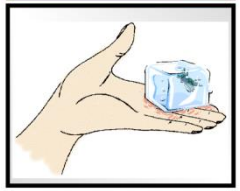
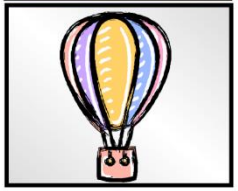
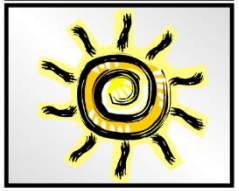
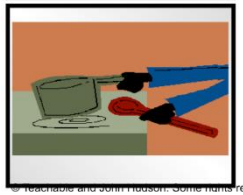
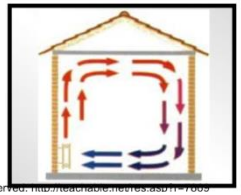
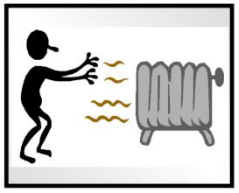
Temperature: A measure of the motion and energy of the particles.

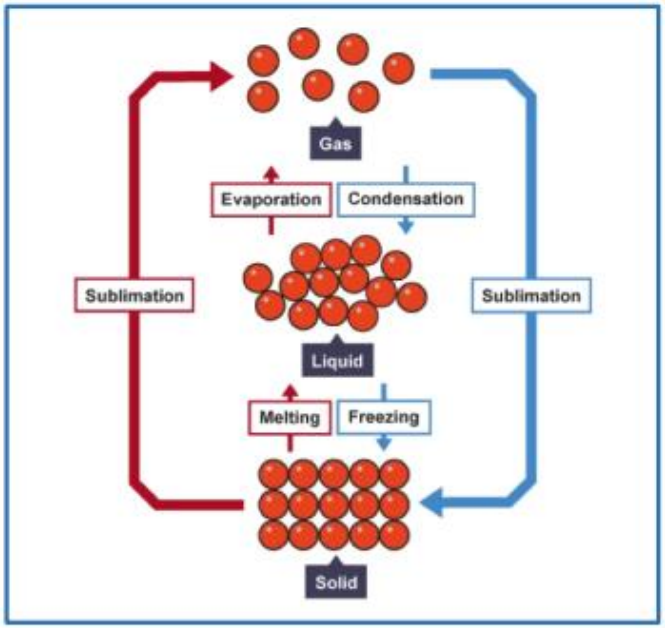
Thermal energy: The quantity of energy stored in a substance due to the vibration of its particles.

Conduction: Transfer of thermal energy by the vibration of particles.

Convection: Transfer of thermal energy when particles in a heated fluid rise.

Radiation: Transfer of thermal energy as a wave.

Conduction	Convection	Radiation
		
Particles with more heat energy vibrate faster. The vibrations pass onto adjacent particles	Particles with more heat energy move faster. Faster moving particles spread out becoming less dense. Less dense material rises	The energy travels in waves. Particles can absorb radiation gaining heat energy
Solids, liquids and gases	**Liquids and gases**	**Can travel through a vacuum**
		
		



Forces between particles:

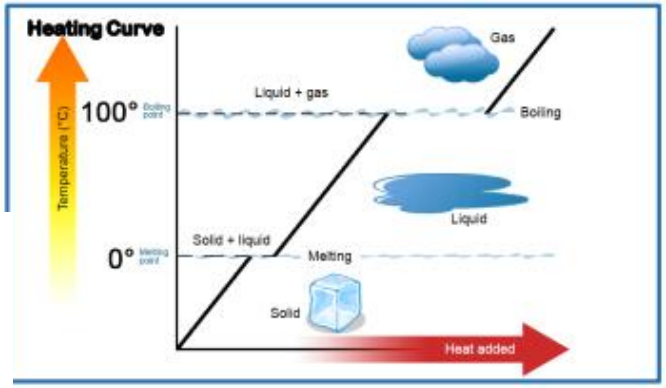
Solid: There are strong forces of attraction between the particles in a solid. Therefore, particles can only vibrate in a fixed position.

Liquid: There are weaker forces of attraction between the particles in a liquid. Therefore, the particles are close together, and are able to move around each other.

Gas: The forces of attraction between the particles are overcome. Therefore, the particles are far apart and move quickly in all directions.

Work = Force x Distance moved in the direction of the force

- scalar quantity
- S.I unit : Joule (J)
- Unit: Nm



WAVES D Wave Effects Wave Properties Y8 Term2

Keywords

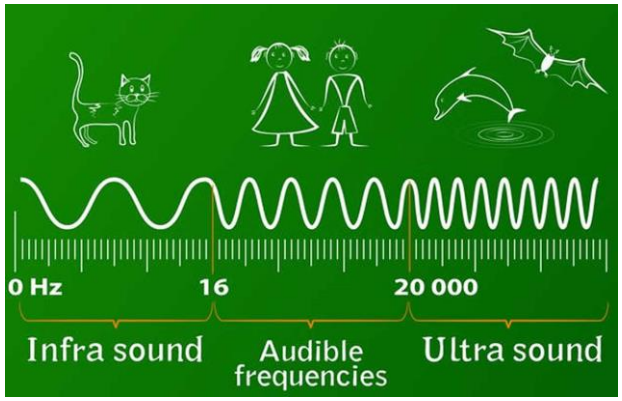
Ultrasound: Sound waves with frequencies higher than the human auditory range.

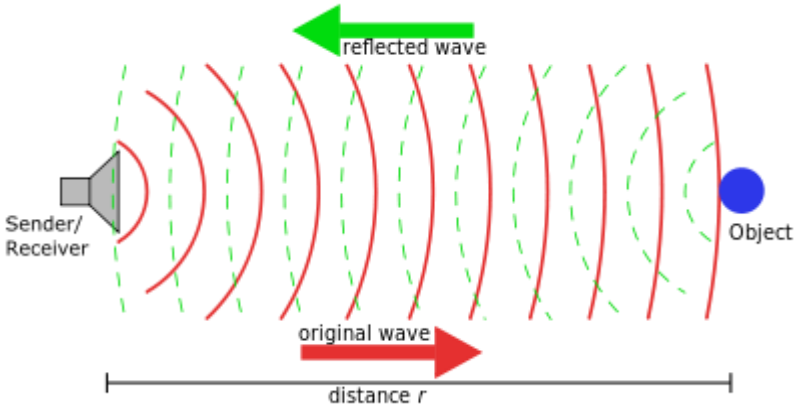
Ultraviolet (UV): Waves with frequencies higher than light, which human eyes cannot detect.

Microphone: Turns the pressure wave of sound hitting it into an electrical signal.

Loudspeaker: Turns an electrical signal into a pressure wave of sound.

Pressure wave: An example is sound, which has repeating patterns of high-pressure and low-pressure regions.





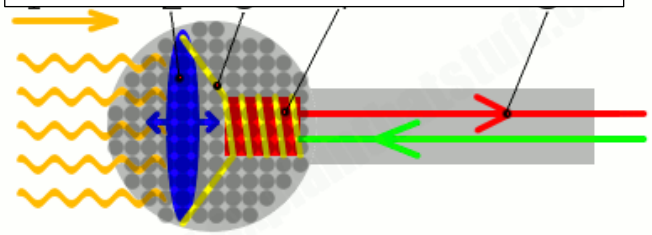
Keywords

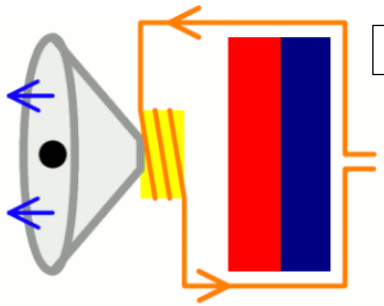
Waves: Vibrations that transport energy from place to place without transporting matter.

Transverse wave: Where the direction of vibration is perpendicular to that of the wave.

Transmission: Where waves travel through a medium rather than be absorbed or reflected.

Microphone

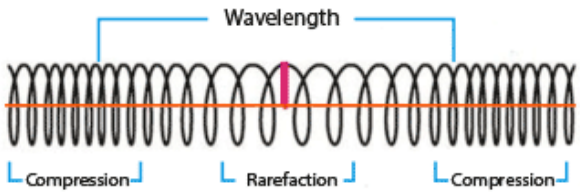


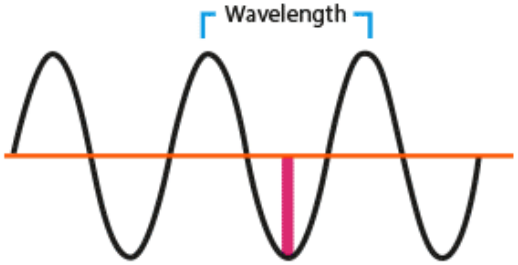


Loudspeaker

LONGITUDINAL WAVE AND TRANSVERSE WAVE

BYJU'S The Learning App





LONGITUDINAL WAVE

Longitudinal waves are those waves in which the particles of the medium move parallel to the propagation of the wave. For example, sound waves are longitudinal waves

TRANSVERSE WAVE

Transverse waves are those waves in which the particles of the medium move perpendicular to the direction of the propagation of the wave. For example, ripples formed on the surface of the water, is a transverse wave.

MATTER E Periodic Table and Elements Y8 Term1

Keyword	Definition
Periodic Table	A tabular representation of all known elements in order based on atomic number.
Atomic Number	The number of protons in the nucleus of an atom. Also called the proton number.
Periods	A horizontal row in the periodic table.
Groups	A vertical column in the periodic table containing elements with similar chemical properties.
Element	A substance made of only one type of atom.
Compound	A Substance where two or more elements have chemically joined together.
Mixture	Two or more substances that are not joined together. The substances can be elements, compounds or both.
Reactive	The tendency of a substance to undergo a chemical reaction.

Further Reading:
https://www.bbc.com/bitesize/guides/z3vwxnb/revision/5
https://www.bbc.com/bitesize/guides/z84wjxs/revision/1

The periodic table is arranged in rows called periods and columns called groups. Groups contain elements with similar chemical properties.

Group 1 – Alkali Metals

Group 1 metals are very soft metals which can be cut with a knife. They have very low melting and boiling points and are very reactive compared to other metals. The elements become more reactive as you go down group 1.

When the group 1 metals react in water they produce a metal hydroxide and hydrogen gas.
E.g.
Lithium + Water → Lithium Hydroxide + Hydrogen

Group 2 – Alkali Earth Metals

Group 2 metals are reactive, but less reactive than group 1 elements.
Group 2 metals react with acids to produce a salt and hydrogen. The name of the salt depends on the acid used.
Hydrochloric Acid – Chloride
Sulfuric Acid – Sulfate
Nitric Acid - Nitrate
E.g.
Magnesium + Hydrochloric Acid → Magnesium Chloride + Hydrogen
Magnesium + Sulfuric Acid → Magnesium Sulfate + Hydrogen
Magnesium + Nitric Acid → Magnesium Nitrate + Hydrogen

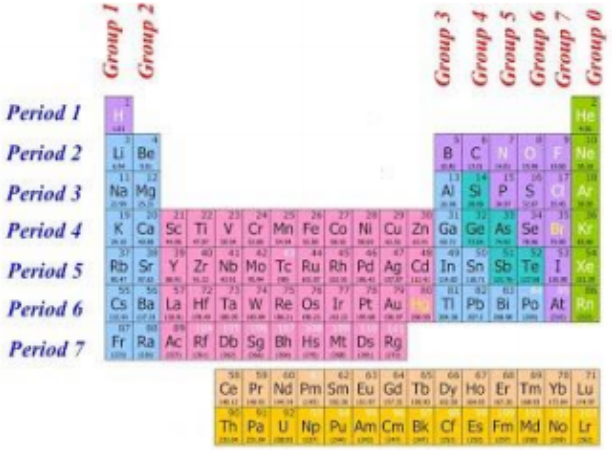
Group 2 metals become more reactive when you go down group 2.

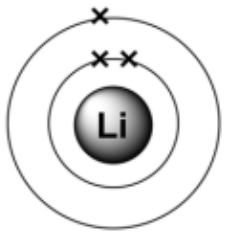
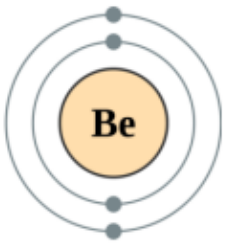
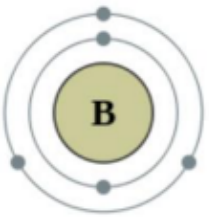
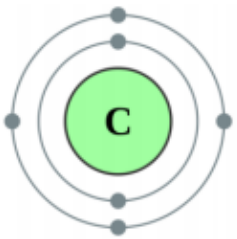
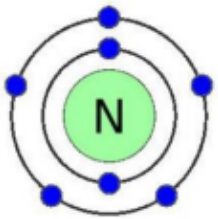
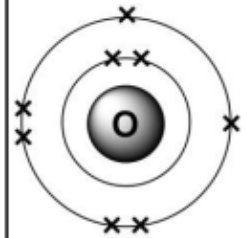
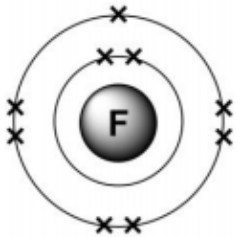
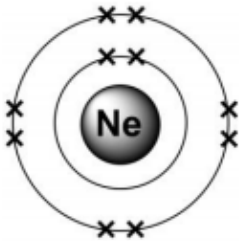
Group 7 – The Halogens

Group 7 elements become less reactive when you move down the group. This can be shown as a displacement reaction.

Group 0 – The Noble Gases

Group 0 elements are not reactive. This is because the atoms have full outer shells.



Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Lithium - Li Sodium - Na Potassium - K	Beryllium – Be Magnesium – Mg Calcium - Ca	Boron – B Aluminium – Al Gallium – Ga	Carbon – C Silicon – Si Germanium – Ge	Nitrogen – N Phosphorus – P Arsenic – As	Oxygen – O Sulfur – S Selenium - S	Fluorine – F Chlorine – Cl Bromine - Br	Helium – He Neon – Ne Argon - Ar
							

Reactions F Chemical energy Types of Reaction Y8 Term2

Keywords

Catalysts: Substances that speed up chemical reactions but are unchanged at the end.

Exothermic reaction: One in which energy is given out, usually as heat or light.

Endothermic reaction: One in which energy is taken in, usually as heat.

Chemical bond: Force that holds atoms together in molecules.

Keywords

Fuel: Stores energy in a chemical store which it can release as heat.

Chemical reaction: A change in which a new substance is formed.

Physical change: One that changes the physical properties of a substance, but no new substance is formed.

Reactants: Substances that react together, shown before the arrow in an equation.

Products: Substances formed in a chemical reaction, shown after the reaction arrow in an equation.

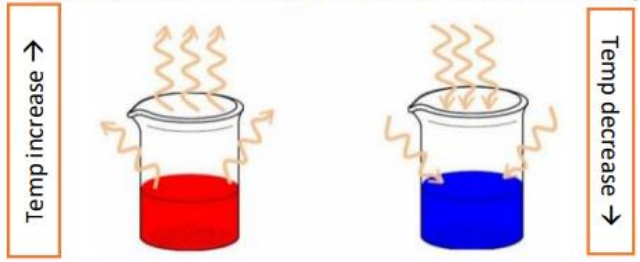
Conserved: When the quantity of something does not change after a process takes place.

Endothermic Reactions

In an endothermic reaction, thermal energy is taken in from the surroundings, therefore there is a temperature decrease. Thermal decomposition is an example.

Exothermic Reactions

In an exothermic reaction, thermal energy is given out to the surroundings, therefore there is a temperature increase. Combustion, oxidation and neutralisation reactions are all examples.



Conservation of Mass

No atoms are created or destroyed in a chemical reaction. Instead, they just joint together in a different way than they were before the reaction, and form products. This means that the total mass of the products in a chemical reaction will be the same as the total mass of the reactants.

Copper + Oxygen → Copper Oxide

10g 0.5g 10.5g

Balancing Equations

A balanced equation gives more information about a chemical reaction because it gives the symbols and formulae of the substances involved.

$Cu + O_2 \rightarrow CuO$

The above equation is not balanced because there is one copper atom on both sides of the arrow, but two oxygen atoms on the left hand side, and only one on the right.

You need to adjust the number of units of some substances until you have equal numbers of atoms on both sides of the arrow. You cannot change formulae of a substance (you can't change the small number).

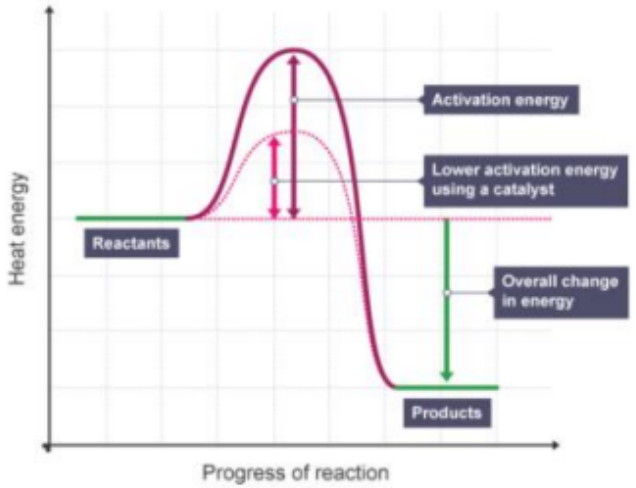
$2Cu + O_2 \rightarrow 2CuO$

Catalysts

A catalyst is a substance that:

- Speeds up the rate of a chemical reaction
- Does not alter the products of the reaction
- Is unchanged chemically and in mass at the end of the reaction.

Catalysts provide an alternative reaction pathway that has a lower activation energy than the uncatalysed reaction.



EARTH G Climate Earth Resources Y8 Term2

Keywords

Global warming: The gradual increase in surface temperature of the Earth.

Fossil fuels: Remains of dead organisms that are burned as fuels, releasing carbon dioxide.

Carbon sink: Areas of vegetation, the ocean or the soil, which absorb and store carbon.

Greenhouse effect: When energy from the sun is transferred to the thermal energy store of gases in Earth's atmosphere.

Keywords

Natural resources: Materials from the Earth which act as raw materials for making a variety of products.

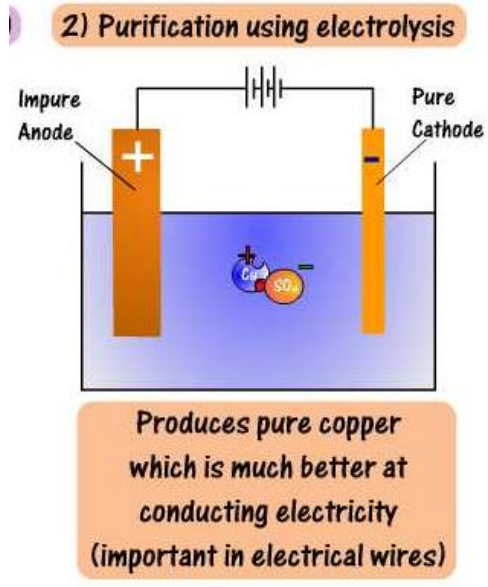
Mineral: Naturally occurring metal or metal compound.

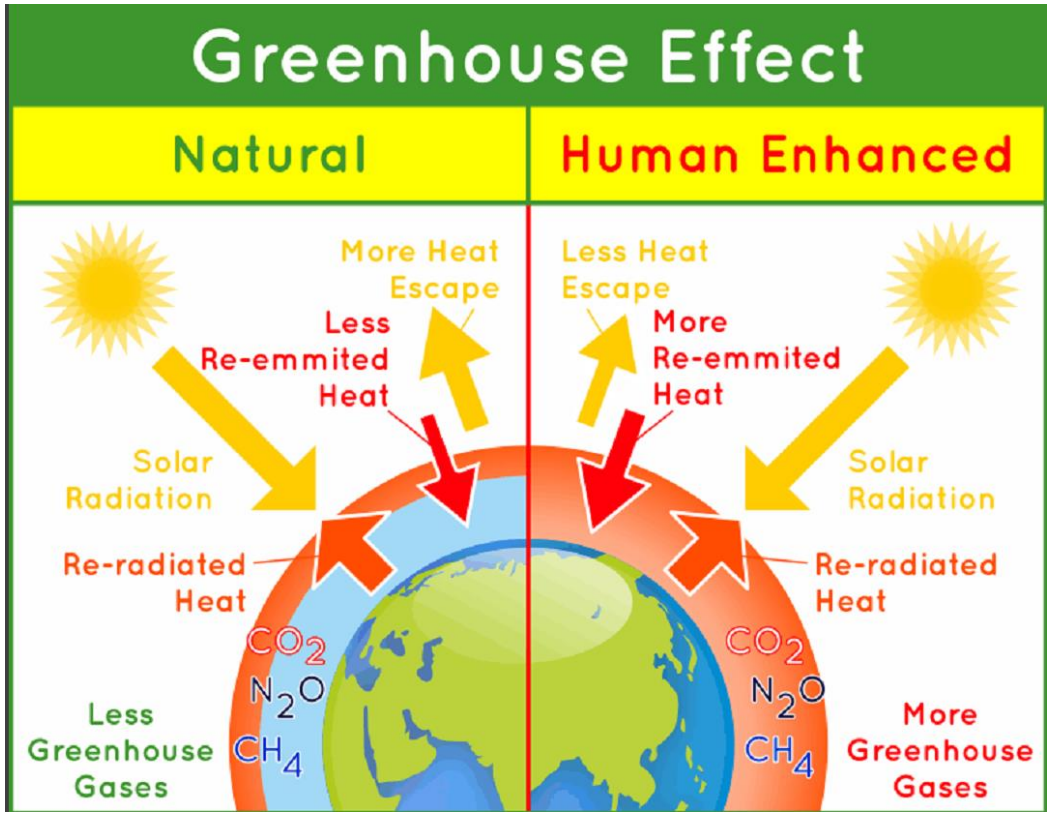
Ore: Naturally occurring rock containing sufficient minerals for extraction.

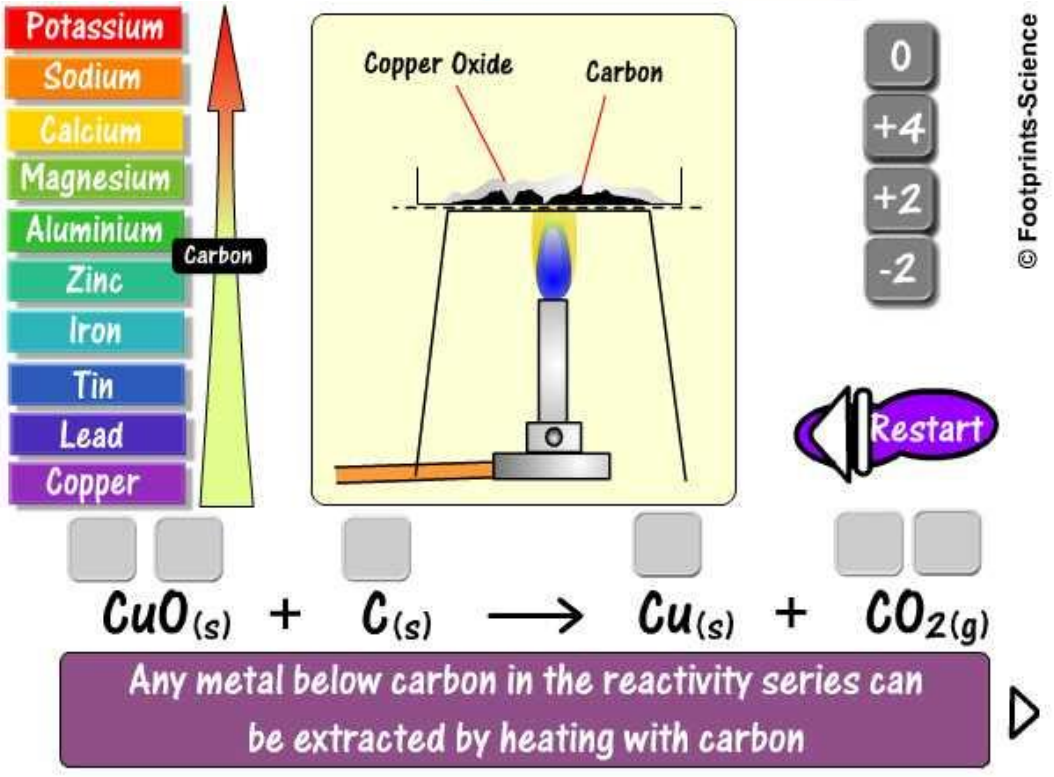
Extraction: Separation of a metal from a metal compound.

Recycling: Processing a material so that it can be used again.

Electrolysis: Using electricity to split up a compound into its elements.

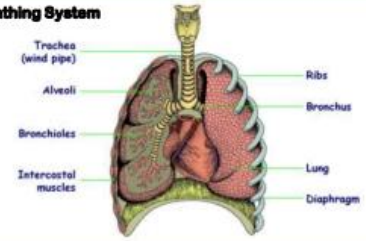




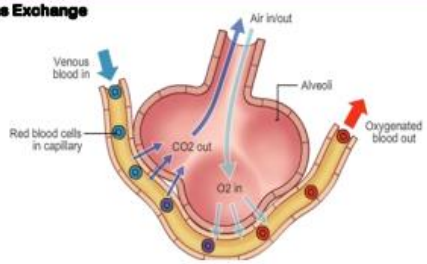


ORGANISMS H Breathing Digestion Y8 Term1

The Breathing System



Gas Exchange



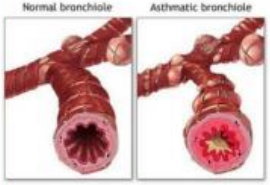
The alveoli are adapted to make gas exchange in the lungs happen easily and efficiently.

- **Alveoli give the lungs a large surface area.**
- **Alveoli have think cells walls (just one cell thick)**
- **Alveoli are surrounded by lots of blood capillaries.**

The gases move by diffusion from where they have a high concentration to a lower concentration.

Oxygen diffuses from the air in the alveoli into the blood. Carbon dioxide diffuses from the blood into the air in the alveoli.

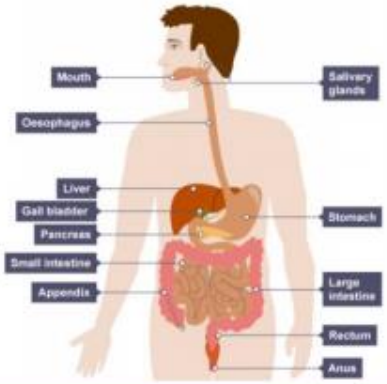
Asthma and Respiration



Air passage for people who are asthmatic become reduced.

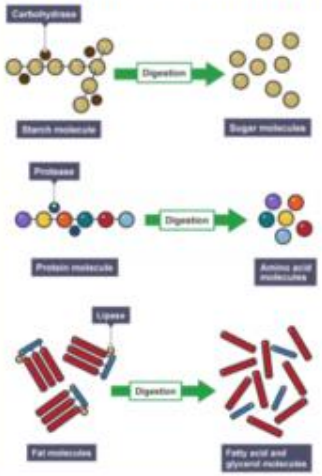
This is why they often struggle during exercise as there is reduced volume of oxygen getting into the blood stream, so rate of respiration is reduced.

The food we eat has to be broken down into other substances that our bodies can use. This is called digestion. Without this process, we could not absorb the food unto our bodies and use it.



Organ	Function
Oesophagus	Also known as the gullet. Connects the mouth to the stomach. Food is pushed down using contractions of muscles.
Liver	Production of bile.
Stomach	Churns and mixes the food with hydrochloric acid and enzymes.
Pancreas	Produces biological catalysts called enzymes which speeds up the digestive reactions.
Small Intestine	Absorption of digested food into the bloodstream, production of enzymes to aid digestion.
Large Intestine	Absorption of excess water.
Rectum	Storage of faeces (undigested material) before excretion.
Anus	Where faeces are excreted (removed from the body).

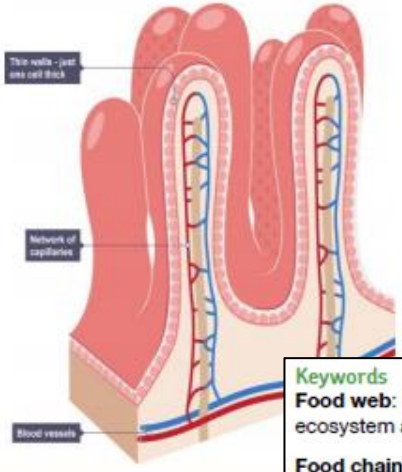
Enzymes are not living things. They are special proteins that can break large molecules into smaller molecules.



Minerals, vitamins and water are already small enough to be absorbed by the body without being broken down, so they're not digested.

Digestive enzymes cannot break down dietary fibre, which is why the body cannot absorb it.

Adaptations of the Small Intestine



The small intestine is adapted for efficient absorption of digested food into the blood stream by:

- Having a very large surface area.
- Surrounded by lots of blood capillaries.
- Thin walls (1 cell thick) for faster absorption.

Keywords

Food web: Shows how food chains in an ecosystem are linked.

Food chain: Part of a food web, starting with a producer, ending with a top predator.

Ecosystem: The living things in a given area and their non-living environment.

Keywords

Pollen: Contains the plant male sex cells found on the stamens.

Ovules: Female sex cells in plants found in the ovary.

Pollination: Transfer of pollen from the male part of the flower to the female part of the flower on the same or another plant.

Fertilisation: Joining of a nucleus from a male and female sex cell.

Seed: Structure that contains the embryo of a new plant.

Fruit: Structure that the ovary becomes after fertilisation, which contains seeds.

Carpel: The female part of the flower, made up of the stigma where the pollen lands, style and ovary.

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Keywords

Breathing: The movement of air in and out of the lungs.

Trachea (windpipe): Carries air from the mouth and nose to the lungs.

Bronchi: Two tubes which carry air to the lungs.

Bronchioles: Small tubes in the lung.

Alveoli: Small air sacs found at the end of each bronchiole.

Ribs: Bones which surround the lungs to form the ribcage.

Diaphragm: A sheet of muscle found underneath the lungs.

Lung volume: Measure of the amount of air breathed in or out.

ECOSYSTEMS I Respiration and Photosynethesis Y8 Term2

Aerobic Respiration

Respiration is a series of reactions that takes place in the cells of animals and plants.
Energy is released in the reaction. The mitochondria, found in the cell cytoplasm, is where respiration happens.

Glucose + Oxygen → Carbon Dioxide + Water (+energy)

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

'Energy' is in brackets because it is not a substance. This type of respiration, where oxygen is used, is known as aerobic respiration. Oxygen (from breathing) is carried from the lungs to all the cells of the body in the blood. The waste products (carbon dioxide and water) are taken away from the cells by the blood and breathed out from the lungs.

Anaerobic Respiration

Although anaerobic respiration does release some energy, it does not release as much as aerobic respiration does.

Glucose → Lactic Acid (+energy)

The lactic acid produced during anaerobic respiration builds up in muscles. This can be felt as an aching in muscles during or after exercise.

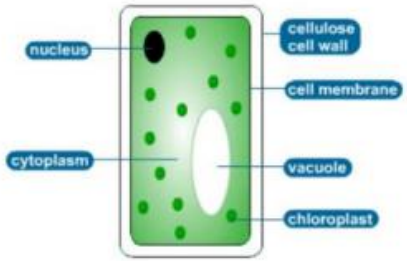
Anaerobic Respiration in Microbes

Anaerobic respiration happens in microorganisms such as bacteria because they need to release energy from glucose. Yeast (unicellular fungi), carry out a process called fermentation.

Glucose → Ethanol + Carbon Dioxide

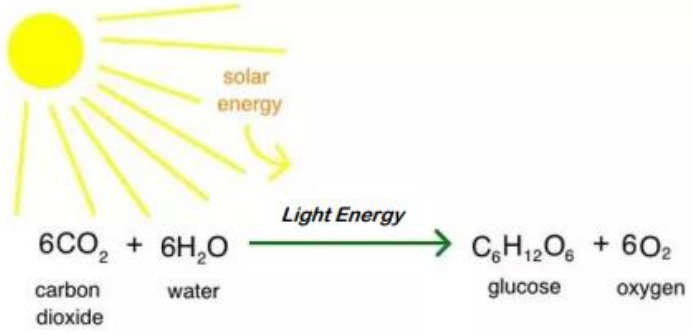
The ethanol (alcohol) is useful for brewers, and carbon dioxide is useful to bakers because it helps their bread rise.

Green plants and algae do not eat food to get their energy, Instead they make their own food by a process called photosynthesis.
Photosynthesis takes place inside plant cells within the chloroplasts.
Below shows a diagram of a plant cell.



Chloroplasts contain a green pigment called chlorophyll. This absorbs light energy needed for photosynthesis to occur.

Plants use the raw materials; Carbon Dioxide and Water. With the presence of light energy from the sun, the raw materials are converted into Glucose and Oxygen.



Keywords
Aerobic respiration: Breaking down glucose with oxygen to release energy and producing carbon dioxide and water.

Anaerobic respiration (fermentation): Releasing energy from the breakdown of glucose without oxygen, producing lactic acid (in animals) and ethanol and carbon dioxide (in plants and microorganisms).

This plant is deficient in nitrate ions.
There is poor grown and yellow leaves.
Nitrate ions are needed to build proteins and to help the plant grow.

This plant is deficient in phosphate ions.
Phosphate ions are needed to ensure good root growth.

The leaves are starting to turn purple.

This plant is deficient in Magnesium ions.
Yellow leaves start to form, so rate of photosynthesis is reduced.
Magnesium ions are needed for photosynthesis.

This plant is deficient in Potassium ions.
Potassium ions are needed for making flowers and fruit.

The leaves are turning yellow, with dea spots.

Keywords
Fertilisers: Chemicals containing minerals that plants need to build new tissues.

Photosynthesis: A process where plants and algae turn carbon dioxide and water into glucose and release oxygen.

Chlorophyll: Green pigment in plants and algae which absorbs light energy.

Stomata: Pores in the bottom of a leaf which open and close to let gases in and out.

GENES J Evolution Inheritance Y8 Term1

Keywords

Inherited characteristics: Features that are passed from parents to their offspring.

DNA: A molecule found in the nucleus of cells that contains genetic information.

Chromosomes: Thread-like structures containing tightly coiled DNA.

Gene: A section of DNA that determines an inherited characteristic.

Keywords

Population: Group of organisms of the same kind living in the same place.

Natural selection: Process by which species change over time in response to environmental changes and competition for resources.

Extinct: When no more individuals of a species remain.

Biodiversity: The variety of living things. It is measured as the differences between individuals of the same species, or the number of different species in an ecosystem.

Competition: When two or more living things struggle against each other to get the same resource.

Evolution: Theory that the animal and plant species living today descended from species that existed in the past.

DNA

DNA is found in the nuclei of cells and organized into chromosomes. This genetic information is passed from one generation to the next. It is called heredity and why we resemble our parents. The genetic information itself is contained in a complex molecule called DNA.

DNA molecules contain two strands. The strands are twisted around each other to form a double helix. These strands are held together by bonds between base pairs.

A DNA molecule showing its base pairs, G–C and A–T

Evolution

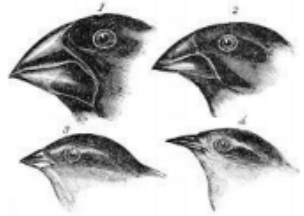
Change in the inherited characteristics of a population over time through a process of natural selection, which may result in the formation of a new species.

The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago.

Natural selection of variants that give rise to phenotypes best suited to their environment.

- Variation (mutation)
- Adaptation
- Survival

& Reproduction



Extinction

The permanent loss of all the members of a species

<u>Reasons for extinction:</u>

- Introduction of a NEW disease
- Introduction of a NEW competitor
- Introduction of a NEW predator / overhunting
- Lack of food / prey
- Environmental change (temp., rainfall, loss of habitat etc.)
- Natural disaster