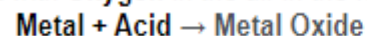


# KS3 Metal reactions

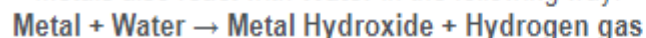
- Rocks which contain a significant amount of metal atoms are called ores.
- The metal atoms in ores are usually found attached to oxygen atoms or carbonate compounds.
- We can use chemical reactions to extract and purify these metal atoms for use later..
- Very low-reactivity metals can be found native in the crust of the Earth so may not need extracting.
- Metals below Hydrogen can be displaced by Hydrogen
- Metals below Carbon can be displaced by Carbon
- Metals above Carbon can be extracted by Electrolysis

Metals react with **Oxygen** in the air in the following way:



E.g. Calcium + Oxygen  $\rightarrow$  Calcium Oxide

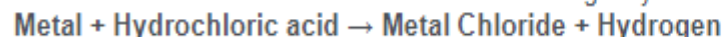
Metals also react with **Water** in the following way:



E.g. Sodium + Water  $\rightarrow$  Sodium Hydroxide + Hydrogen

Metals will react as above, but more quickly with steam

Metals also react with **Acids** in the following way:



E.g. Magnesium + Hydrochloric acid  $\rightarrow$  Magnesium Chloride + Hydrogen

## Keywords

- Acid
- Corrosion
- Displace
- Effervesce
- Electrolysis
- Extract
- Hydrogen
- Metal
- Native
- Neutralise
- Ore
- Oxidation
- pH
- Reactivity series
- Reduction
- Salt

The reactivity series shows which metal is more reactive than another metal by its position in the series.

The higher a metal in the series, the more reactive it is, and the bigger its reaction will be with oxygen or acid.

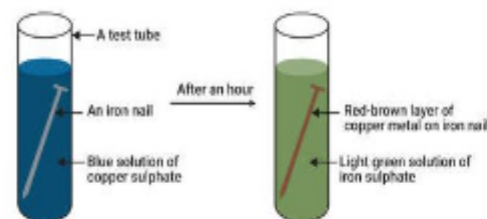
A more reactive metal can 'push' a less reactive metal from its compound by a process called **displacement**.

### Displacement Reaction



### Reactivity series

REACTIVE  
Potassium  
Sodium  
Lithium  
Calcium  
Magnesium  
Aluminium  
**Carbon**  
Zinc  
Iron  
Lead  
**Hydrogen**  
Copper  
Silver  
Gold  
UNREACTIVE



In a displacement reaction, if there is a colour change, the more reactive metal has taken the place of the less reactive metal in its compound.

There are a few different signs that a chemical reaction has taken place. One or more will be obvious in a reaction:

1. The reaction effervesces (bubbles)
2. The reaction changes colour (from its starting colour)
3. The reaction changes temperature (gives out heat or takes heat in)

During electrolysis, large amounts of energy are used to melt a metal compound. Electric current is then used to separate the useful metal from other substances in the mixture.

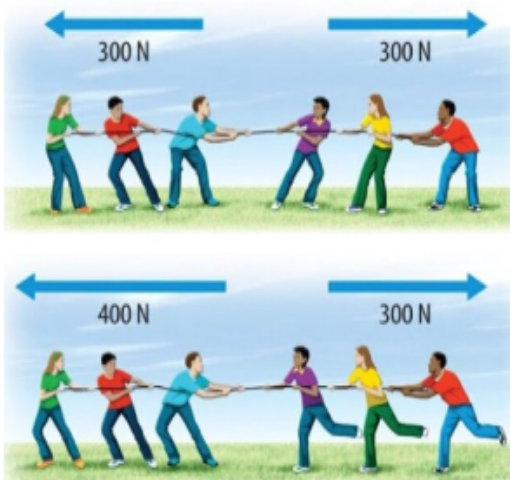
# KS3 Forces

**Force** – a vector quantity, any action that will maintain or alter the motion of a body or to deform it.

**Balanced force** – when two forces are the same size

**Unbalanced force** – when two forces are different sizes.

Balanced vs. Unbalanced Forces



## Examples of Forces

**Gravity** - the force by which a planet or other body draws objects toward its centre.

**Weight** - the measure of the force of gravity acting on a body.

**Air resistance** - the force acting on an object that is moving through air flowing in the opposite direction

**Water resistance** - the force acting on an object that is moving through water flowing in the opposite direction

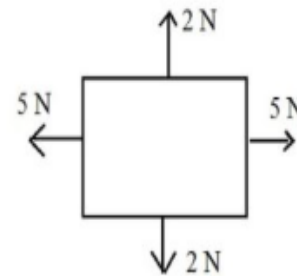
**Upthrust** - a force that pushes things upwards, which happens when a gas or liquid has an object floating in it.

**Tension** - the pulling or stretching force transmitted axially along an object such as a string or rope,

**Friction** – the force that resists the sliding or rolling of one solid object over another.

## Free body diagrams

Forces can be represented by arrows in diagrams where the size of the arrow is directly proportional to the size of the force and the direction of the arrow from the centre of mass shows the direction the force is working.

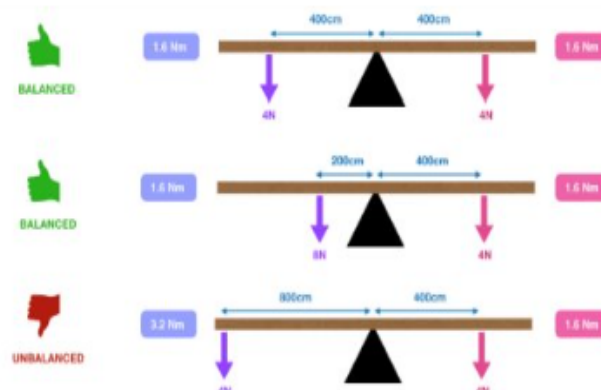


**Resultant force** = the single force that results from combining multiple forces acting on an object. Therefore the resultant force on the above object is 0N.

## Turning Forces

A moment is the turning effect of a force

Levers are used to apply force to an object, by using a smaller force applied at one end of the lever to generate a larger force at the other end.



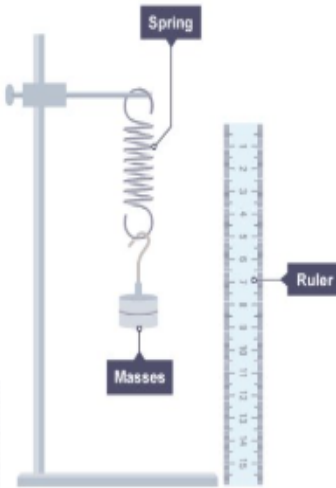
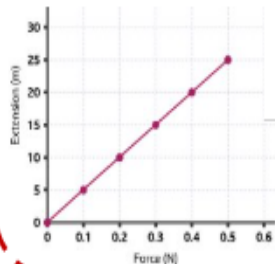
## Keywords

- Force
- Balanced
- Unbalanced
- Gravity
- Weight
- Air resistance
- Water resistance
- Upthrust
- Tension
- Friction
- Resultant force
- Moment
- Lever
- Pivot
- Elasticity
- Mass
- Weight
- Pressure
- Speed
- Velocity
- Accelerating
- Decelerating

## Elasticity

Forces can be used to stretch or squash objects.

There is a linear relationship between force and extension and this can be proven by adding different amounts of force to a spring and measuring the extension.



This relationship is called Hooke's Law.

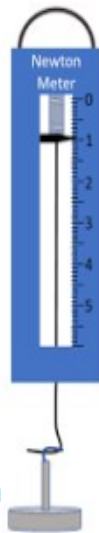
## Friction

Friction is the force that resists the sliding or rolling of one solid object over another.

Friction is increased by making surfaces rougher/more uneven and decreased by making surfaces smoother or adding a lubricant.

Friction generates thermal energy as the surfaces rub against each other (use rubbing hands together to demonstrate).

The size of a force acting on an object can be measured with a Newtonmeter.



# KS3 Forces

## Weight and Mass

**Mass** – a measure of how much matter there is in an object, and is measured in kg.

**Weight** – a measure of the size of the pull of gravity on the object, and is measured in N.

$$\text{Weight} = \text{mass} \times \text{gravity}$$

Weight depends upon the gravitational pull of an object so it varies on different planets/moons.

The larger the object the stronger the gravitational pull, therefore the greater the weight of an object on that planet/moon.

## Speed

Speed is the distance travelled over a period of time.

Speed can be calculated using the following equation:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

## Relative Motion

Relative motion is defined as the motion of one object relative to another object.

Relative motion of two objects can be calculated

As two objects move towards each other the forces they exert are higher than their individual forces

As two objects move in parallel to one another the forces they exert are lower than their individual forces.

## Pressure

Pressure is a measure of the force applied over a specific area and is measured in  $\text{N/m}^2$ .

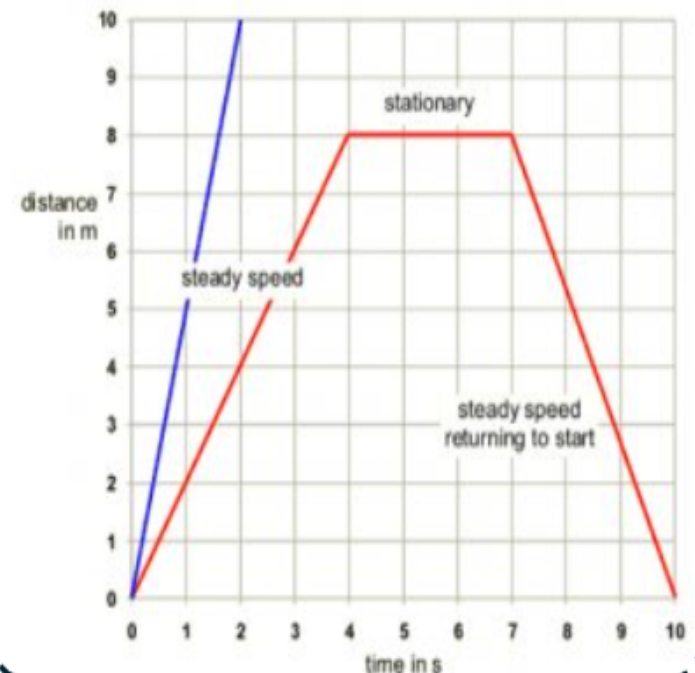
Pressure can be calculated by using the equation:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Atmospheric pressure decreases with increase of height as the weight of air above decreases the higher you go.

Pressure in liquids increases with depth as the weight of water above increases the deeper you go.

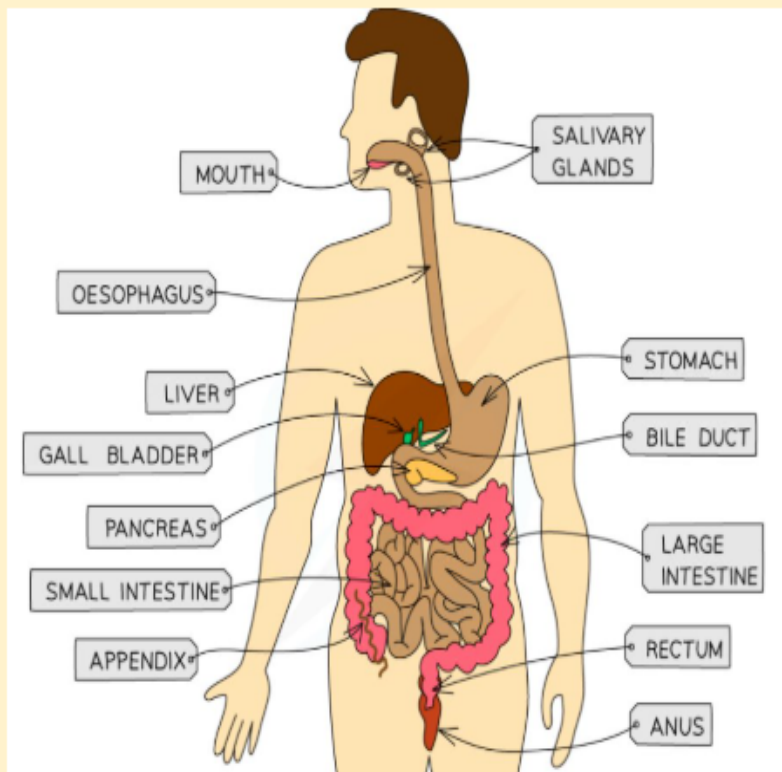
## Distance-Time Graphs





# KS3 Nutrition and Digestion

**Digestion:** the breaking down of the large food we eat into other substances (smaller molecules) that our bodies can absorb and use.



- Digestion starts in the mouth (where mechanical digestion happens and some enzymes begin chemical digestion).
- Food then travels through the oesophagus, a thin tube that connects the mouth to the stomach.
- The stomach is a sac where food is mixed with acidic juices to start the digestion of protein and kill microorganisms. **The stomach does not break food down!**
- The food then enters the small intestine, which is the upper part of the intestine where digestion is completed and nutrients are absorbed by the blood.
- Anything leftover moves to the large intestine, the lower part of the intestine from which water is absorbed and where faeces are formed.
- Faeces are stored in the rectum and leave the body via the anus.

## Keywords

- Respiration
- Energy
- Molecules
- Diffusion
- Bacteria
- Digestion
- Oesophagus
- Stomach
- Small intestine
- Large intestine
- Liver
- Rectum
- Anus
- Faeces
- Gut
- Dietary fibre
- Carbohydrates
- Lipids
- Calcium
- Iron
- Protein
- Vitamins
- Minerals

**Gut bacteria:** Microorganisms that naturally live in the intestine and help food break down. The digestive system contains many bacteria and about half of the dry weight of faeces consists of bacteria. Bacteria in the digestive system are important. For example, they can digest some substances that humans cannot digest, such as certain carbohydrates, reduce the chance of harmful bacteria multiplying and causing disease, produce some vitamins that humans need, such as vitamins B and K.

# KS3 Nutrition and Digestion

**Deficiency diseases** are the result of not consuming enough of a particular nutrient.

**Iron:** a mineral important for red blood cells.

**Calcium:** a mineral needed for strong teeth and bones.

**Vitamins and minerals:** needed in small amounts to keep the body healthy.

**Dietary fibre:** Parts of plants that cannot be digested, which helps the body eliminate waste.

**Carbohydrates:** The body's main source of energy. There are two types: simple (sugars) and complex (starch).

**Lipids (fats and oils):** A source of energy. Found in butter, milk, eggs, nuts.

**Protein:** Nutrient your body uses to build new tissue for growth and repair. Sources are meat, fish, eggs, dairy products, beans, nuts and seeds.

- Food is an example of a chemical energy store.
- Energy is measured in Joules (J)/kilojoules (kJ).
- Body mass index (BMI) is calculated from a person's height and body mass.
- Not consuming enough food can cause BMI to become too low, and eventually lead to starvation.
- Consuming too much food can cause BMI to become too high, and lead to obesity. Obesity can increase the risk of developing other health issues, including heart disease.

- The **glucose** that is absorbed through the small intestine into the blood stream is transported around the body to be used in **respiration**.
- The **energy** released by respiration is used for all living processes, such as movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.
- Plants **produce** their own **glucose** from **photosynthesis** that they then use for respiration. Plants are called 'producers' for this reason. The transfer of energy from sunlight that ultimately allows living things to survive on Earth. All food chains start with producers.

**Organs of the digestive system** are **adapted** to break **large** food molecules into **small** ones which can travel in the blood to cells and are used for life processes. It can do this mechanically or chemically (using enzymes).

**Enzymes:** Substances that speed up the chemical reactions of digestion. **Lipase** break down lipids into fatty acids and glycerol. **Amylase** (a form of carbohydrase) breaks down starch into glucose. **Protease** breaks down proteins into amino acids.

## Keywords

- Enzymes
- Lipase
- Protease
- Carbohydrase
- Amino acids
- Fatty acids and glycerol
- Glucose
- Starch

