

# Eureka

Success in Science

revision notes

Year 9

## Chemical reactions

### 1.2 Everyday changes:

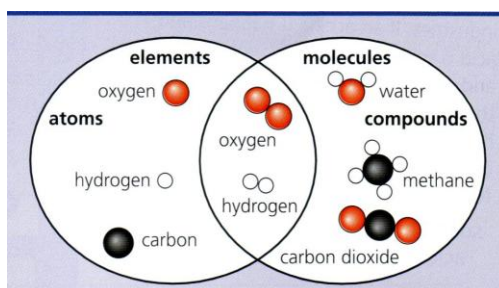
- ⟨ Virtually all of the materials around us are made by chemical reactions.
- ⟨ Some chemical reactions are useful and some are not. Rusting is not useful, but combustion is often useful to us.

### 1.3 Acids on test:

- ⟨ Reactions of acids are used in fire extinguishers, food preserving and manufacturing industries.
- ⟨ Reactions of acids that are not useful include corrosion and the effects of acid rain.

### Atoms elementary my dear!:

- ⟨ Everything is made up of particles. Atoms are smallest particles of an element.
- ⟨ Elements have only one type of atom. Each element has its own symbol.
- ⟨ Molecules have two or more atoms chemically combined.
- ⟨ Compounds are formed by chemical reactions when different atoms combine together. The atoms are joined by chemical bonds.
- ⟨ The chemical formula of a compound shows the ratio of different types of atom in the compound.



### Mass is conserved

- ⟨ In a chemical reaction, mass is conserved because the total number of atoms stays the same.
- ⟨ In a chemical reaction, the atoms are rearranged and combined in different ways to make new compounds.

- Chemical reactions can be shown as **balanced equations**.

### Competition

#### 2.2 The way we are:

- A baby **inherits** features from both its parents. These features are controlled by genes.
- Identical twins have the same genes because they come from the same sperm and ovum.
- Non-identical twins are formed when two sperms fertilise two ova.
- Both genes and the environment cause variation between the members of a species.

#### 2.3 Finding food:

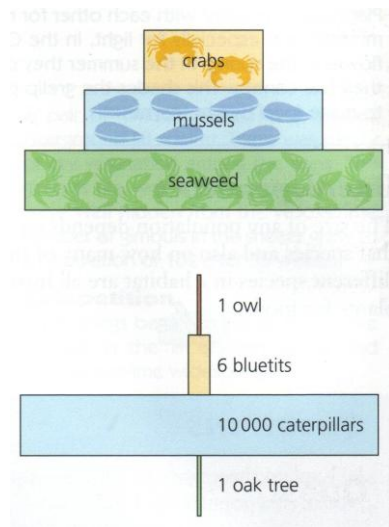
- Parents **feed** their offspring. Being fed by the parents makes the offspring more likely to survive.
- There is **competition** between members of the same species and between different species for food, water, space and light.
- Organisms adapt their behaviour to reduce competition for food with other species, and to avoid harsh conditions.

#### 2.4 Predator eats prey:

- A **population** is the number of individuals of a species living in a habitat.
- An animal that is hunted by another animal as prey is the target of **predation**.
- Competition, predation and disease all affect the size of a population.
- Prey animals have adaptations, such as camouflage that help them to avoid their predators.
- Predators are adapted to hunt by having features such as sharp beaks and claws.
- Plants may have adaptations such as thorns to help them avoid being eaten.

## 2.5 All down to numbers:

- ◁ If we count the number of organisms at each level of a food chain, we can draw a **pyramid of numbers**.
- ◁ In some food chains, a pyramid of numbers is not pyramid shaped, for example if the producer is a large tree.
- ◁ If the number of prey in a food chain increases, the number of predators also increases.



## 2.6 Another pint of milk:

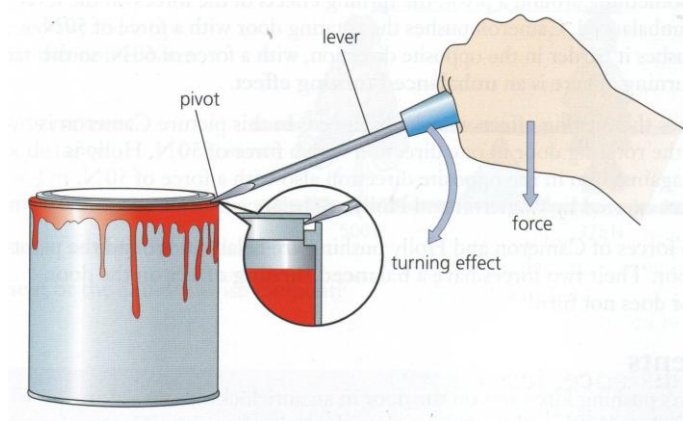
- ◁ **Desirable features** are features you want to pass on.
- ◁ We can select parents with desirable features to produce new varieties of animals or plants that have these desirable features. This is called **selective breeding**.
- ◁ **Genetic engineering** is taking genes out of one species and putting them in another.

### Balanced forces

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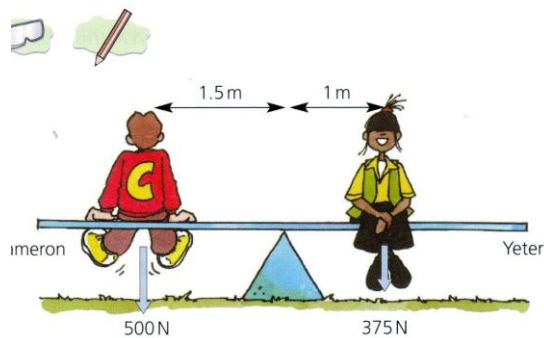
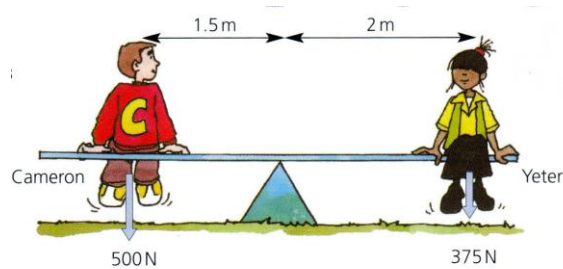
- ◁ A **pivot** is the point around which an object such as a crowbar turns.
- ◁ A **lever** turns around a pivot and pushes against a load.

- When a force tries to turn an object, the force has a **turning effect**. The turning effect of a force depends on the size of the force and the distance from the pivot to the force arrow.



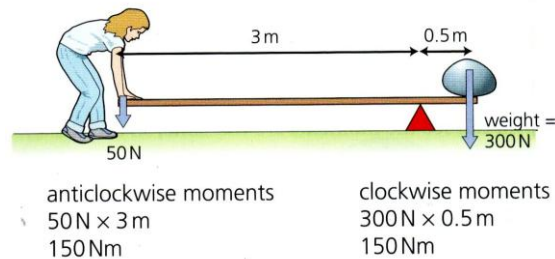
### 3.3 Just a moment:

- The turning effect of a force is called the **moment** of the force.
- Moment of a force (Nm) = force (N) x distance (m)
- When two moments are balanced, an object will not move and the **principle of moments** applies.
- This is summarised by the equation: sum of the anticlockwise moments = sum of the clockwise moments.



### 3.4 Using moments:

- ◁ The principle of moments can be used in many everyday situations.
- ◁ A **counterbalance** is a weight which stops something falling over.

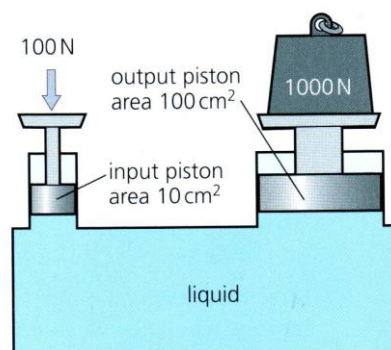


### 3.5 Forces and pressure:

- ◁ Pressure is calculated using the equation: pressure ( $\text{N/m}^2$ ) = force (N) / area ( $\text{m}^2$ ).
- ◁ For a given force, if the area gets bigger the pressure gets smaller, and if the area gets smaller the pressure gets bigger.

### 3.6 Pressure in liquids:

- ◁ Liquids cannot be squashed. The pressure in a liquid is equal in all directions at a particular depth in the liquid. A **hydraulic machine** uses this property of liquids.
- ◁ A hydraulic machine magnifies the force. If a small force is applied to a small input **piston**, a much larger force can be produced on a large piston connected to it.





- ⟨ Some metals react with acid to make hydrogen and a salt. The type of salt depends on the acid used.
- ⟨ The more reactive the metal, the more energy is released when the metal reacts.

#### 4.4 Displacement reactions:

- ⟨ More reactive metals push less reactive metals out of their compounds. These reactions are called **displacement reactions**.
- ⟨ In a displacement reaction, the more reactive metal ends up in the compound.
- ⟨ Displacement reactions can be useful.
- ⟨ Displacement reactions often release a lot of energy.

#### 4.5 Ranking reactivity:

- ⟨ The **reactivity series** is a list of metals with the most reactive at the top and the least reactive at the bottom.

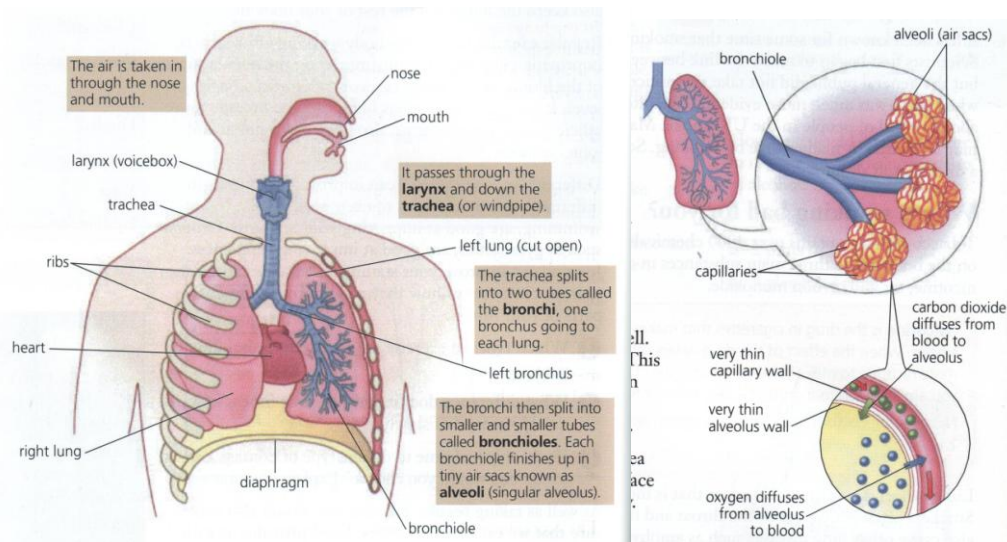
### **Being healthy**

#### 5.2 Keeping fit:

- ⟨ The **breathing rate** increases during exercise to supply the muscle cells with oxygen they need for respiration.
- ⟨ Regular exercise is good for your muscles, your lungs, your circulation, your bones and your joints.
- ⟨ A healthy lifestyle includes a good balanced diet, keeping the right weight, taking enough rest and avoiding drugs.

#### 5.3 Breathe in and out:

- ⟨ Oxygen is needed for respiration, and carbon dioxide is a waste product.
- ⟨ The air we breathe in has more oxygen and less carbon dioxide than the air we breathe out. The amount of nitrogen does not change.
- ⟨ **Gas exchange** happens when oxygen diffuses from the lungs into the blood and carbon dioxide diffuses out of the blood into the lungs. This takes place in the **alveoli**.



#### 5.4 Smoking and drinking:

- ◁ Cigarette smoke contains **nicotine**, **tar** and **carbon monoxide**. Tar harms the lungs and can cause cancer.
- ◁ Nicotine and **alcohol** are both **addictive** drugs which can have a harmful effect on the body.

#### 5.5 Going on growing:

- ◁ There are three main groups of **microbe**: bacteria, viruses and **fungi**.
- ◁ Bacteria and fungi reproduce by **cell division**.
- ◁ Cell division makes it possible for humans to grow and repair their bodies.
- ◁ When cell division goes wrong, it can cause **cancer**.
- ◁ Microorganisms can be very useful to us.

#### 5.6 Defence against disease:

- ◁ Microorganisms that cause **infection** are called **pathogens**.
- ◁ The first line of defence in the body is the skin.
- ◁ The **immune system** can fight off infection using **white blood cells** and **antibodies**.
- ◁ The immune system can be helped by **vaccinations**.

### 5.7 Medicines and drugs:

- ◁ A **drug** is any substance that is taken into the body and affects the way that you think and feel.
- ◁ **Medicines** are drugs designed to fight disease or make the body work better.
- ◁ Drugs, including alcohol and nicotine can have serious effects on the body and brain and may be addictive.

### Moving energy

#### 6.2 What temperature?:

- ◁ The **internal energy** of an object is the total kinetic energy of its particles.
- ◁ When you heat something up, you give more kinetic energy to its particles.
- ◁ Temperature is not the same as internal energy. Hot things can contain less energy than cold things. The energy depends on the number of particles present as well as the temperature.
- ◁ The **temperature** of an object depends on the average kinetic energy of its particles.

#### 6.3 Transferring thermal energy:

- ◁ Thermal energy is transferred from hotter objects to cooler objects.
- ◁ **Conduction** is one of the ways in which thermal energy is transferred.
- ◁ In conduction, energy is transferred from one particle to the particles touching it, from hotter to colder.

#### 6.4 Transferring more thermal energy:

- ◁ In convection the particles move, transferring the thermal energy.
- ◁ Convection happens in gases and liquids, but not in solids.
- ◁ A convection current happens when one part of a gas or a liquid is hotter than another part.

#### 6.5 Transferring even more thermal energy:

- ◁ Thermal energy can be transferred from a liquid by evaporation. The liquid then cools its surroundings.

- ◁ **Radiation** happens when thermal energy is transferred by **infrared radiation**, which is like light.

### 6.6 Energy is conserved:

- ◁ Energy is transferred from place to place, but conserved.
- ◁ Not all the energy is transferred to where we want it. A lot of it ends up as thermal energy.
- ◁ Once the thermal energy is **dissipated**, it becomes less useful.

