

KS3 Cellular Respiration

Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules.

There are two types:

- **Aerobic respiration:** breaks down glucose with oxygen to release energy and producing carbon dioxide and water. It occurs in the mitochondria. The word equation for this reaction is:
 $\text{glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$
- **Anaerobic respiration in animals** breaks down glucose without oxygen to release energy, producing lactic acid. It occurs in the cytoplasm. The word equation for this reaction is:
 $\text{glucose} \rightarrow \text{lactic acid}$
- **Anaerobic respiration in plants and microorganisms** (known as fermentation): breaks down glucose without oxygen to release energy, producing ethanol and carbon dioxide. Yeast and other microorganisms expire anaerobically (fermentation). The word equation for this reaction is:
 $\text{glucose} \rightarrow \text{ethanol} + \text{carbon dioxide}$

- Aerobic means with oxygen, anaerobic is without oxygen.
- Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable.
- Aerobic occurs in the mitochondria of the cell, anaerobic occurs in the cytoplasm of the cell.
- In animals, the glucose in respiration comes from the food we eat (glucose has a store of chemical energy).
- In animals, the oxygen in aerobic respiration comes from the atmosphere around us that we breathe in.
- Substances that aren't needed in the body, such as the carbon dioxide produced in aerobic respiration, are breathed out.
- 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.
- All food chains start with plants (producers) and therefore we rely on them for us to be able to carry out essential life processes.
- The ethanol and carbon dioxide produced in anaerobic respiration in plants and microorganism (fermentation) is used for brewing and baking.

Keywords

- Respiration/Respire
- Aerobic respiration
- Anaerobic respiration
- Mitochondria
- Cytoplasm
- Energy
- Molecules
- Glucose
- Oxygen
- Atmosphere
- Fermentation
- Microorganism
- Asthma
- Smoking
- Nicotine
- Tobacco
- Gas exchange
- Drug
- Recreational
- Stimulant
- Depressant

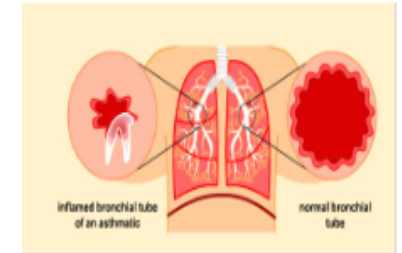
KS3 Cellular Respiration

Smoking: cigarette smoke contains over 4,000 chemicals, including approximately 69 known cancer-causing chemicals as well as over 400 other poisons.

- Smoking is very harmful to health and causes or can lead to many types of cancer including – lung, mouth, throat, voice box, bladder, bowel, cervix, kidney, liver, stomach, leukaemia, heart disease, blood pressure problems, stroke, fertility problems, serious breathing conditions and weak bones.
- The harmful substances in cigarette smoke include tar, smoke, nicotine and carbon monoxide.

- **Tar** and **smoke** causes cancer of the lungs, mouth and throat. They coat the inside of the lungs, including the alveoli, causing coughing. They damage the alveoli, making it more difficult for gas exchange to happen, which negatively impacts respiration as there is less oxygen available.
- **Nicotine** is addictive it causes a smoker to want more cigarettes. It increases the heart rate and blood pressure. It makes blood vessels narrower than normal which can lead to heart disease.
- **Carbon monoxide** takes the place of oxygen in red blood cells. This reduces the amount of oxygen that the blood can carry, again, negatively impacts respiration.
- It is illegal to smoke inside public buildings, in the workplace, on public transport such as buses, trains and planes, and in a car while carrying somebody aged 18 or under.
- An electronic, or E-cigarette is a battery-operated device that emits a vapour to inhale, which usually contains nicotine. The aim is to provide the sensation of inhaling tobacco smoke, without the smoke. When the user inhales, a small amount of liquid is heated until it becomes a vapour. People who use E-cigarettes are therefore not smoking but “Vaping”.

Asthma is a common non-infectious disease that can cause breathing difficulties. During an asthma attack, the breathing (bronchial) tubes narrow.



Symptoms of **asthma** include wheezing and shortness of breath and can be treated using medication taken using an inhaler. Risk factors for asthma include air pollution, smoking, low birth weight, having an allergy, and family history.

Drugs can be both legal and illegal.

- Medicines are drugs that people take when they are ill.
- People consume other drugs recreationally (for fun), including caffeine, nicotine and alcohol.
- Recreational drugs can be classified as depressants or stimulants.

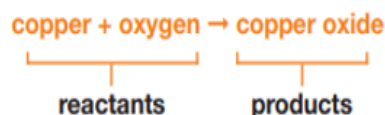
Drugs can be categorized as depressants or stimulants. Depressants slow down thinking and reaction times. Stimulants make you feel more alert and can give you quicker thinking and reaction times.

- **Alcohol** is a legal depressant, but long-term alcohol use can damage the brain and liver.
- **Caffeine** is a legal stimulant present in some foods and drinks.
- **Cocaine** and **ecstasy** are examples of illegal stimulants used as recreational drugs.

Substance abuse can cause physical and mental health issues.

KS3 Chemical reactions

- The substances you start with in a chemical reaction are called **reactants**.
- During a chemical **reaction**, the reactant atoms have their chemical bonds broken, then re-arranged into new substances called **products**
- A **word equation** is a way of representing these changes



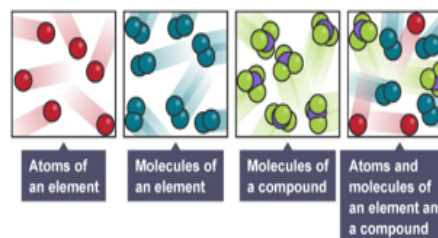
- Any reactants are to the left of the arrow and any products are to the right of the arrow.
- The arrow shows that the reaction is not reversible
- The number of atoms at the start of a chemical reaction is the same as the number of atoms at the end.
- This is called '**conservation of mass**'

- A **balanced symbol equation** uses chemical symbols to represent a reaction.



- A balanced symbol equation shows:
 - The formula of each substance in the reaction
 - How the atoms are rearranged
 - The relative number of atoms of each substance.

- Element:** A pure substance made of only one kind of atom.
- Molecule:** Two or more atoms bonded together.
- Compound:** A substance made of two or more **different** elements chemically bonded together.



There are 4 signs that a chemical reaction is occurring:

1. A gas is released (fizzing or bubbling)
2. The temperature of the reaction changes
3. The substances change colour
4. A solid appears from a solution (precipitate)

Changes of physical state are not chemical reactions, but they are reversible this is called a **physical change**. This is because no new substances are made.

Types of reaction

- A **decomposition** reaction is when a substance breaks down into simpler substances. Most decomposition reactions need extra heat to be applied to the reactants to occur – this is called thermal decomposition.
- Combustion** is a type of reaction where oxygen from the air is reacted with a **fuel**.
 - The Carbon and Hydrogen atoms in the fuel are both oxidised to form Carbon dioxide and Water molecules.
 - Burning fossil fuels causes the release of extra Carbon dioxide into the atmosphere. This contributes to global warming and climate change

Keywords

- Atom
- Chemical bond
- Chemical change
- Combustion
- Compound
- Conserved
- Decomposition
- Element
- Fuel
- Molecule
- Oxidation
- Physical change
- Product
- Reactant
- Reaction
- Reduction
- State symbol

KS3 Electromagnetism: Electricity

Charges

A charged object is either positive or negative.

Opposite charges will **attract**.

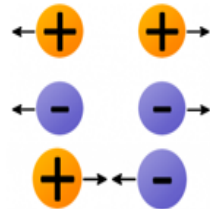
The same charges will **repel**.

Static electricity is an imbalance

between negative **electrons** and

positive **protons** where the charge cannot move

Earthing an object will mean the **electrons** can transfer to the ground by the path of least resistance.



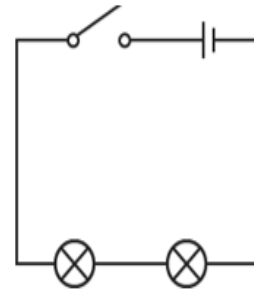
Electric Fields

An **electric field** is a region surrounding a charged object where other charged objects can experience a force.

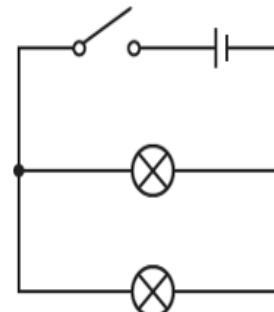
When charged objects enter the electric field, they experience a force and can repel or attract

Series and Parallel

Series circuit - A circuit where the current has only one route to flow.



Parallel circuit - A circuit with different 'branches' the current can flow through.



Circuit Symbols



Battery



Wire



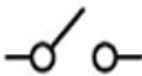
Bulb



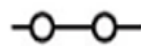
Buzzer



Motor



Switch (off)



Switch (on)


Keywords

- Static
- Electron
- Repulsion
- Attraction
- Non-contact force
- Electric field
- Current
- Ammeter
- Potential difference
- Voltmeter
- Series circuit
- Parallel circuit
- Resistance
- Conductor
- Insulator

KS3 Electromagnetism: Electricity

Current

Current is a flow of negative charge in a complete circuit.

An ammeter  is a device that is used to measure current. An ammeter measures current in Amperes (or Amps).

The ammeter is placed in series.


Current is constant throughout a series circuit.

Current across branches adds up to the current before and after the branches.

Potential Difference

Potential difference can also be called voltage.

Potential difference is the difference in the amount of energy that negative charges have between two points in a circuit.

A voltmeter  is a device that measures potential difference.

A voltmeter measures potential difference in Volts.

The voltmeter is placed in parallel to the two points it is measuring.

Resistance

Resistance is the opposition to the flow of current in a closed circuit.

Current will always flow the path of least resistance.

Resistance is measured in Ohms (Ω) and is produced by any device in the path of a current. For example, a lamp produces resistance.

The higher the resistance, the lower the current.

Resistance is a ratio between potential difference and current that can be represented by the formula:

$$\text{Resistance} = \frac{\text{Potential Difference}}{\text{Current}}$$

Resistance in objects

Electrical conductors are materials that allow electrical current to flow through easily.

Metals are good electrical conductors.

Electrical insulators are materials that do not allow electrical current to flow through easily.

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