

Electricity (Part 1)

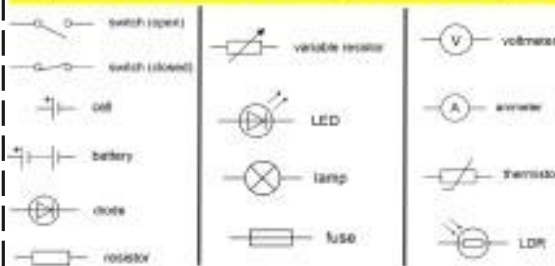
Threshold Concept

Electricity is the flow of electrons.

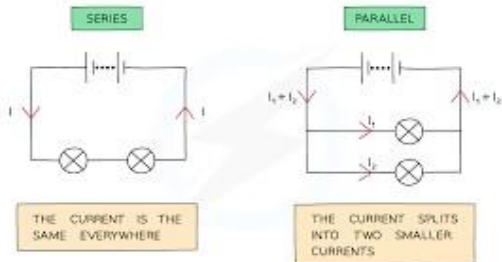
Circuit Symbols



An electronic circuit can include lots of different components. All of which can be represented with a symbol.

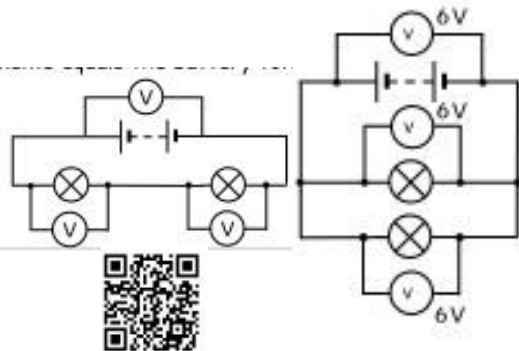


Series and Parallel circuits



In a series circuit, the potential difference/voltage supplied by the battery is **shared** by the components.

In a parallel circuit, the potential difference across each bulb is the **same** as the potential difference across the battery.



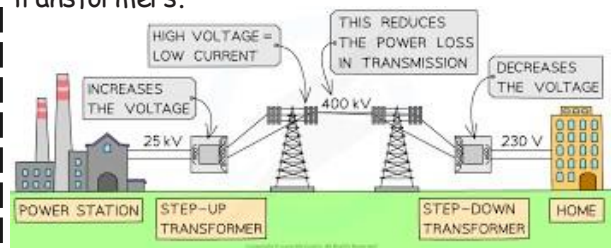
Keywords

- **Electron:** a stable subatomic particle with a charge of negative electricity, found in all atoms and acting as the primary carrier of electricity in solids.
- **Electricity:** is the presence or flow of charged particles.
- **Charge:** is a property of a body which experiences a force in an electric field. Charge is measured in coulombs (C).
- **Current:** Current is the rate of flow of electric charge around a circuit.



National Grid

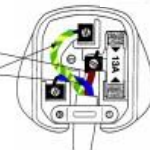
The **National Grid** distributes electricity across the country. The National Grid connects power stations to homes, workplaces and public buildings all around the country through a system of cables and transformers.



Practical

Wiring a plug

- The live wire.
- The neutral wire.
- The earth wire.



Equations for this topic

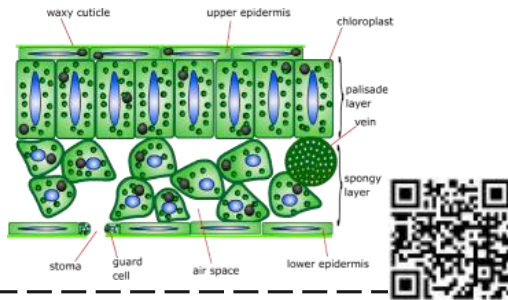


Bioenergetics

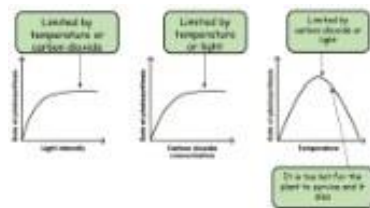
Threshold Concept

Respiration and photosynthesis are chemical processes that provide plants and animals with energy.

Structure of the leaf



Limiting factors of photosynthesis

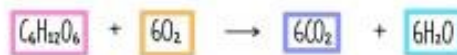
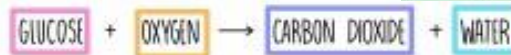


Keywords

- **Respiration:** Respiration is the body's way of producing energy from the food we eat. It involves the breakdown of glucose in the presence of oxygen into carbon dioxide and water with the release of energy-generating molecules called ATP.
- **Photosynthesis:** is a chemical reaction that takes place in the chloroplasts of green plant cells, where light energy is used to convert carbon dioxide and water into glucose and oxygen.
- **Energy:** The ability to do work
- **Limiting factors:** Limiting factors affect the rate of a reaction. A limiting factor is a condition, that when in shortage, slows down the rate of a reaction.
- **Reaction:** A chemical reaction is when one or more substances change and produce one or more new chemical substances.



Respiration



GLUCOSE



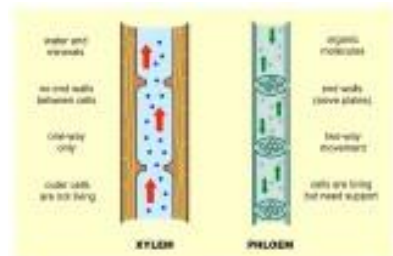
LACTIC ACID



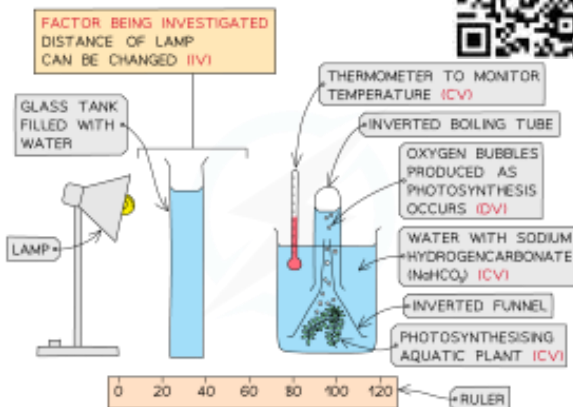
Photosynthesis



Xylem and Phloem



Required practical



Equations for this topic

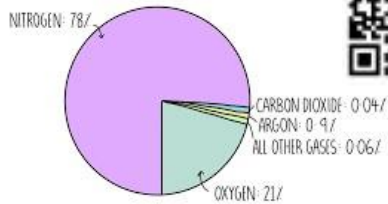
$$\text{REACTION RATE} = \frac{\text{CHANGE IN MASSES OF REACTANT OR PRODUCT}}{\text{TIME}}$$

Chemistry of the atmosphere

Threshold Concept

The Earth's atmosphere is made of different gases.

The Proportion of gases in the earths atmosphere

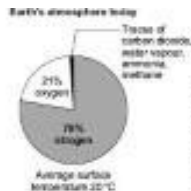


Keywords

- **Atmosphere:** An atmosphere is the layers of gases surrounding a planet.
- **Pollutants:** A pollutant is a chemical or biological substance which harms water, air, or land quality.
- **Climate change:** Climate change refers to long-term shifts in temperatures and weather patterns.
- **Combustion:** Combustion is another name for burning. In a combustion reaction, fuel is burned and reacts with oxygen to release energy.
- **Global Warming:** Global warming is the long-term warming of the planet's overall temperature.

History of the earths atmosphere

- The proportion of oxygen increased because of **photosynthesis** by plants and algae.
- The proportion of ammonia decreased as it reacted with the newly formed oxygen in the atmosphere to form nitrogen and water vapour.
- The proportion of methane decreased as it reacted with the newly formed oxygen to form carbon dioxide and water.



Greenhouse gases

Greenhouse gases present in the atmosphere include:

- water vapour
- carbon dioxide
- methane



Required practical Testing for gases

Test for Carbon dioxide CO ₂ Carbon dioxide gas Limewater (calcium hydroxide) Limewater (cloudy/milky)	Test for Chlorine Cl ₂ Chlorine bleaches damp blue litmus paper Chlorine gas Blue litmus paper White	Test for Hydrogen H ₂ Hydrogen makes a popping pop with a lighted splint POP!
Test for Water H ₂ O Water turns cobalt chloride paper from blue to pink Instant cobalt paper	Test for Oxygen O ₂ Oxygen relights a glowing splint Glowing splint	Cl₂ Gas Tests CO ₂ H ₂ H ₂ O These gas tests appear regularly on the final exam. Try to learn them.



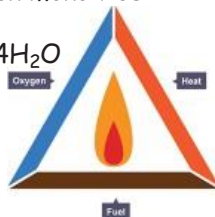
Combustion

Complete combustion:

Propane + oxygen → carbon dioxide + water
 $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Incomplete combustion:

Propane + oxygen → carbon monoxide + carbon + water
 $C_3H_8 + 3O_2 \rightarrow 2CO + C + 4H_2O$



Equations for this topic

Waves

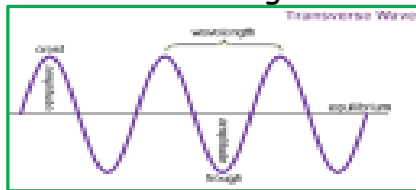
Threshold Concept

Waves transfer energy,
NOT matter.

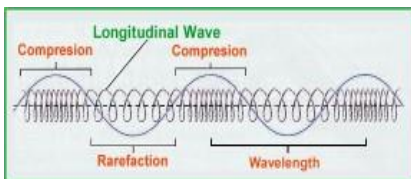


Link to information on the whole topic, consisting of slides, videos, and quizzes
Trilogy pupils ignore tasks 5,6 & 7.

Transverse vs Longitudinal



Vibrations are **perpendicular** to the direction of energy transfer



Vibrations are **parallel** to the direction of energy transfer

Equations

$$\text{Wave speed} = \text{distance} / \text{time}$$

$$v = s / t$$

$$\text{Wave speed} = \text{wavelength} \times \text{frequency}$$

$$v = \lambda \times f$$

$$\text{Time Period} = 1 / \text{frequency}$$

$$T = 1 / f$$

Keywords

Wave - a disturbance/vibration in matter, which transfers the energy through the matter.

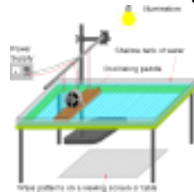
Energy - a property of a substance that is stored or transferred in order for things to be done.

Transverse - vibrations are perpendicular (at right angles) to the direction of energy transfer.

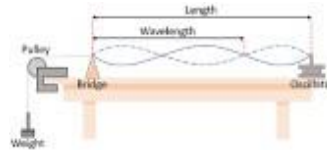
Longitudinal - vibrations are parallel (same direction) to the direction of energy transfer.

Required Practicals

Waves in a liquid



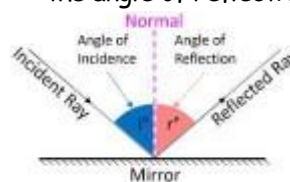
Waves in a solid



Reflection and refraction (HT only)

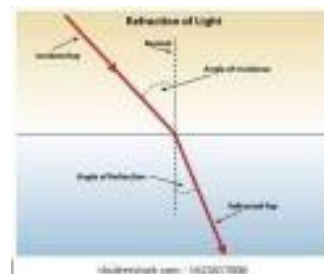
Law of reflection

The angle of incidence = the angle of reflection



Refraction

The change in direction and speed of light, due to passing from one medium into a different medium, of different densities



Bonding Part 1

Threshold Concept

How do 100 elements make up everything in the universe?

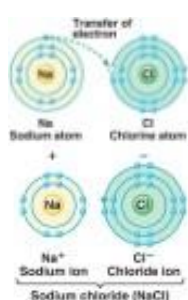
Forming ions

An ion is a charged particle.

Atoms will lose or gain electrons to get a full outer shell.

The **metal** atom **loses electrons** to become a **positive ion**

The **non-metal** atom **gains electrons** to become a **negative ion**.



Use task 3-5

Keywords

Electron - a subatomic particle with a negative charge

Electrostatic attraction - strong attraction between oppositely charged ions

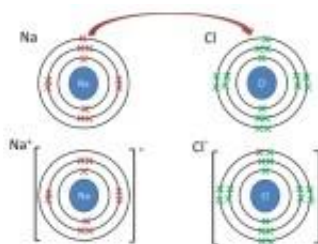
Weak intermolecular forces - force of attraction between atoms, elements and molecules

Delocalised electron - free moving electron that isn't a part of any atom

Ion - a charged particle

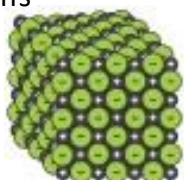
Ionic bonds

Ionic bonds are formed between metals and non-metals. Metals **lose** electrons and **non-metals** gain electrons. The oppositely charged ions attract one another forming ionic bond.



Ionic compounds and properties

Positive and negative ions join together to form a giant ionic lattice



electrostatic attraction is strong

Ionic compounds have a high M.P

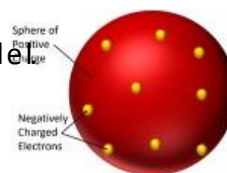
Lots of energy needed to overcome attraction



Ionic compounds don't conduct when solid because the ions are locked in position. When molten or dissolved the ions are free to move and can conduct.

History of the atom

JJ Thomson - Suggested the plum pudding model. Atoms were a ball of positive charge with negative particles scattered within.



Ernest Rutherford Alpha scattering experiment. Found that atoms have a very small, positive nucleus and the majority of atoms are empty space.

