NORMAL FORCE

The force or the component of a force which a surface exerts on an object with which it is in contact, and which is perpendicular to the surface

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FRICTIONAL FORCE

The force that opposes the motion of an object and acts parallel to the surface

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STATIC FRICTION FORCE

The force that opposes the tendency of motion of a stationary object relative to a surface.

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KINETIC FRICTION FORCE

The force that opposes the motion of a moving object relative to a surface.

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NEWTON'S FIRST LAW OF MOTION

A body will remain in its state of rest or motion at a constant velocity unless a non-zero resultant/net force acts on it.

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INERTIA

The resistance of an object to any change in its state of motion. The mass of an object is a quantitative measure of its inertia.

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NEWTONS SECOND LAW OF MOTION

When a net force acts on an object, the object will accelerate in the direction of the force and the acceleration is directly proportional to the force, and inversely proportional to the mass of the object.

Fnet=ma

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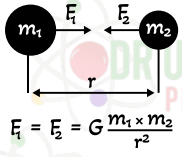
NEWTONS THIRD LAW OF MOTION

When object A exerts a force on object B, object B SIMULTANEOUSLY exerts an oppositely directed force of equal magnitude.



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WEIGHTLESSNESS

The sensation experienced when all contact forces are removed, i.e. no external objects touch one's body.

WEIGHT

The gravitational force the earth exerts on any object on or near its surface.

$$W=mg$$

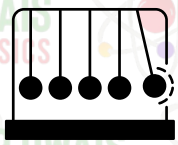
NEWTONS LAW OF UNIVERSAL GRAVITATION

Each body in the universe attracts every other body with a force that is directionally proportionate to the product of their masses and inversely proportional to the square of the distance between the centers.

MOMENTUM

The product of an object's mass and its velocity.

$$p=mv$$



NEWTON'S SECOND LAW IN TERMS OF MOMENTUM

The net (or resultant) force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force.

$$F_{net}=\frac{\Delta p}{\Delta t}$$

IMPULSE

The product of the resultant/net force acting on an object and the time the net force acts on the object.

$$\text{Impulse} = F_{net}\Delta t$$

ISOLATED SYSTEMS

A system on which the net external force is zero.

THE PRINCIPLE OF CONSERVATION OF LINEAR MOMENTUM

The total linear momentum of an isolated system remains constant (is conserved).

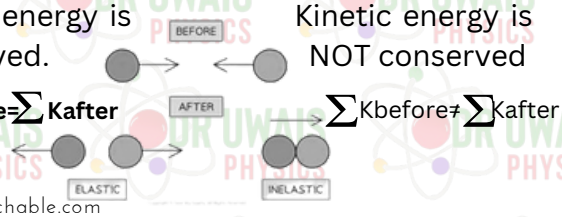
ELASTIC AND INELASTIC COLLISIONS

Elastic collisions:
Kinetic energy is conserved.

$\sum K_{before} = \sum K_{after}$

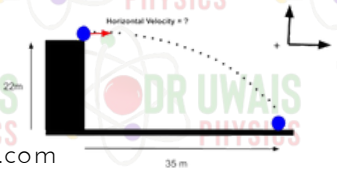
Inelastic Collisions:
Kinetic energy is NOT conserved

$\sum K_{before} \neq \sum K_{after}$



PROJECTILE

An object which has been given an initial velocity and then it moves under the influence of the gravitational force only.



FREE FALL

Motion during which the only force acting on an object is the gravitational force (Fg).

WORK

Work done by a constant force F is $W = F \triangle x \cos\theta$ where F is the magnitude of the force, $\triangle x$ is the magnitude of the displacement and θ the angle between the force and the displacement

WORK-ENERGY THEOREM

The work done on an object by a net force is equal to the change in the object's kinetic energy.

$$W_{net} = \triangle K$$

CONSERVATIVE FORCE

A force for which the work done in moving an object between two points is independent of the path taken.

NON-CONSERVATIVE FORCE

A force which the work done in moving an object between two points depends on the path taken.

Example: Friction, air resistance, tension etc.

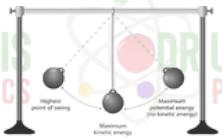
POWER

The rate at which work is done.

$$P = \frac{W}{\triangle t}$$

PRINCIPLE OF CONSERVATION OF MECHANICAL ENERGY

The total Mechanical Energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant. **$E_{mech_A} = E_{mech_B}$**



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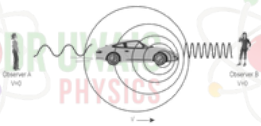
DOPPLER EFFECT

The change in frequency (or pitch) of the sound detected by the listener because the sound source and the listener have different velocities relative to the medium of sound propagation.



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COULOMB'S LAW

The magnitude of the electrostatic force exerted by one point charge(Q1) on another point charge(Q2) is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance(r) between them. $$F = \frac{kQ_1Q_2}{r^2}$$

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ELECTRIC FIELD

A region of space in which an electric charge experiences a force. The direction of the electric field at a point is the direction that a positive test charge would move if placed at that point.

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ELECTRIC FIELD AT A POINT

The electric field at a point is the electrostatic force experienced per unit positive charge placed at that point.

$$E = \frac{F}{Q}$$

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OHMS LAW

The potential difference across a conductor is directly proportional to the current in the conductor at constant temperature.

$$R = \frac{V}{I}$$

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OHMIC AND NON-OHMIC CONDUCTORS

Ohmic: obeys Ohm's law

Example: Wires and resistors

$$V \propto I$$

Non-Ohmic: Does not obey Ohms law

Example: diodes, bulb filaments.

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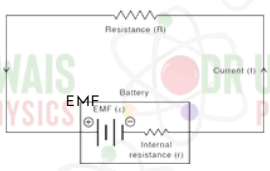
EMF

The maximum energy provided by a battery per unit charge, passing through it.



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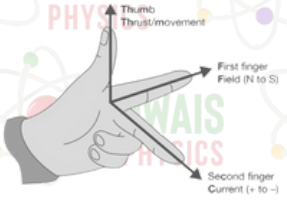
FARADAY'S LAW OF ELECTROMAGNETIC INDUCTION

The magnitude of the induced EMF across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor

$$E = -N\frac{\Delta\Phi}{\Delta t}$$

MOTOR EFFECT

A straight current carrying conductor will experience a force when placed in a magnetic field



VRMS

rms potential difference

The AC potential difference which dissipates/produces the same amount of energy as an equivalent DC potential difference

IRMS

rms Current

The alternating current which dissipates/produces the same amount of energy as an equivalent direct current (DC).

PHOTOELECTRIC EFFECT

The process whereby electrons are ejected from a metal surface when light of suitable frequency is incident on that surface.

THRESHOLD FREQUENCY

(f_0)

Minimum frequency of light needed to emit electrons from a certain metal surface.

WORK FUNCTION

(W_0)

The minimum energy that an electron in the metal needs to be emitted from the metal surface.

ATOMIC ABSORPTION SPECTRUM

Formed when certain frequencies of electromagnetic radiation passing through a substance is absorbed due to an atom making a transition from a lower energy state to a higher energy state.

ATOMIC EMISSION SPECTRUM

Formed when certain frequencies of electromagnetic radiation are emitted due to an atom making a transition from a higher energy state to a lower energy state.

ORGANIC MOLECULES

Molecules containing carbon atoms.

HYDROCARBON

Organic compounds that consist of Hydrogen and Carbon only.

HOMOLOGOUS SERIES

A series of organic compounds that can be described by the same general formula or in which one member differs from the next with a CH_2 group.

SATURATED COMPOUNDS

Compounds in which there are no multiple bonds between carbon atoms in their hydrocarbon chains

UNSATURATED COMPOUNDS

Compounds with one or more multiple bonds between C atoms in their hydrocarbon chains.

FUNCTIONAL GROUP

A bond or an atom or a group of atoms that determine the physical and chemical properties of a group of organic compounds

STRUCTURAL ISOMERS

Organic molecules with the same molecular formula, but different structural formula

CHAIN ISOMERS

Organic molecules with the same molecular formula but different types of chains.

Example: butane and 2-methylpropane

POSITIONAL ISOMER

Organic molecules with the same molecular formula, but different positions of the side chain, substituents or functional groups on the parent chain.

Example: 1-chloropropane and 2-chloropropane/ but-2-ene and but-1-ene

BOILING POINT

The temperature at which the vapour pressure of a substance equals atmospheric pressure.

MELTING POINT

The temperature at which the solid and liquid phases of a substance are at equilibrium.

VAPOUR PRESSURE

The pressure exerted by a vapour at equilibrium with its liquid in a closed system.

CRACKING

The chemical process in which longer chain hydrocarbon molecules are broken down to shorter, more useful molecules

HEAT OF REACTION/ENTHALPY

ΔH

The energy absorbed or released (per mole) in a chemical reaction.

EXOTHERMIC REACTIONS

Reactions that release energy

$\Delta H < 0$

ENDOTHERMIC REACTIONS

Reactions that absorb energy

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ACTIVATION ENERGY

The minimum energy needed for a reaction to take place.

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ACTIVATION COMPLEX

The unstable transition state from reactants to products

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REACTION RATE

The change in concentration of reactants or products per unit time

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CATALYST

A substance that increases the rate of a chemical reaction without itself undergoing a permanent change. It provides an alternative path of lower activation energy and decreases the net activation energy.

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OPEN AND CLOSED SYSTEMS

An open system continuously interacts with its environment, while a closed system is isolated from its surroundings.

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REVERSIBLE REACTION

A reaction is reversible when products can be converted back to reactants vice versa.

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CHEMICAL EQUILIBRIUM

A dynamic equilibrium when the rate of the forward reaction equals the rate of the reverse reaction.

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LE CHATELIERS PRINCIPLES

When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favoring the reaction that will oppose the disturbance.

EQUILIBRIUM CONSTANT (KC)

Kc is the ratio of product concentration to reactant concentration at equilibrium

ARRHENIUS THEORY

An acid is a substance that orifices hydrogen ions (H^+) or Hydronium ions (H_3O^+) in an aqueous solution

A base is a substance that produces hydroxide ions (OH^-) in aqueous solution.

LOWRY-BROWNSTED THEORY

An **acid** is a proton (H^+) **donor**

A *base* is a proton (H^+) *receptor*

DIPROTIC ACID

Acid that can donate 2 protons/H_3O^+ per molecule

STRONG ACIDS

Ionise completely in water to form a high concentration of H_3O^+ ions

Eg: Hydrochloric acid HCL, Sulphuric Acid H_2SO_4,and Nitric Acid HNO_3.

WEAK ACIDS

Ionise incompletely in water to form a low concentration of H_3O^+ ions.

Eg: Ethanoic Acid CH_3COOH

Oxalic Acid $C_2H_2O_4$

STRONG BASES

Dissociate completely in water to form a high concentration of OH- ions.

Eg: Sodium Hydroxide NaOH

Potassium Hydroxide KOH

WEAK BASES

Dissociate incompletely in water to form a low concentration of OH- ions.

Eg: Ammonia NH_3
Calcium Carbonate $CaCO_3$
Potassium Carbonate K_2CO_3

CONCENTRATED/DILUTE ACIDS

Concentrated acids: contain a large number of moles of acid in proportion to the volume of water
Dilute Acids: contain a small number of moles of acid in proportion to the volume of water.

CONCENTRATED/DILUTE BASES

Concentrated Bases: contain a large number of moles of base in proportion to the volume of water
Dilute Bases: contain a small number of moles of base in proportion to the volume of water.

AMPHOLYTE

A substance that can act as a either a base or an acid

HYDROLYSIS

The reaction of salt with water.

EQUIVALENCE POINT

The point in a titration at which the acid/base has **completely reacted** with the base/acid.

ENDPOINT OF A TITRATION

The point in a titration where the indicator changes colour.

PH SCALE

A scale of numbers from 0 to 14 used to express the acidity or alkalinity of a solution.

Kw

Equilibrium Constant for the ionisation of water (or the ion product of water or the ionisation of constant water)

$Kw=[H_3O^+][OH^-] = 1 \times 10^{-14}$ at 298k

(formula is on the data sheet)

Auto-ionisation of water

The reaction of water with itself to form H_3O^+ ions and OH^- ions

Galvanic cell

A cell in which chemical energy is converted to electrical energy.

Electrolytic cell

A cell in which electrical energy is converted into mechanical energy.

Oxidation

- loss of electrons
- increase in oxidation number

Reduction

- gain of electrons
- decrease in oxidation number

Oxidising agent

A substance that:
is **reduced** and **gains electrons**.

Reducing agent

A substance that:
is **oxidised** and **loses electrons**.

ANODE

The electrode where **oxidation** takes place.

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CATHODE

The electrode where *reduction* takes place.

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ELECTROLYTE

A substance that dissolves in water to give a solution that conducts electricity.

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ELECTROLYSIS

The chemical process in which electrical energy is converted to chemical energy

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