VECTORS AND SCALARS

A vector is a physical quantity with magnitude and direction.
A scalar is a physical quantity with magnitude only.

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RESULTANT VECTOR

A single vector having the same effect as two or more vectors together.

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DISTANCE

The total path length travelled. (scalar)

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DISPLACEMENT

Difference in position in space. A vector quantity that points from the initial to the final position.

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AVERAGE SPEED

The total distance travelled per total time.

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AVERAGE VELOCITY

The rate of change of position.

$$\bar{v} = \frac{x - x_0}{\Delta t}$$

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ACCELERATION

The rate of change of velocity.

$$a = \frac{\Delta v}{\Delta t} = \frac{\Delta V_f - \Delta V_i}{\Delta t_f - \Delta t_i}$$

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INSTANTANEOUS VELOCITY

The velocity at a particular time.

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INSTANTANEOUS SPEED

The magnitude of the instantaneous velocity.
(The speed at a particular time)

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UNIFORM VELOCITY

Motion at constant velocity (no acceleration)

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UNIFORM ACCELERATED MOTION

The velocity of an object changes with the same amount during each time interval.

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GRAVITATIONAL POTENTIAL ENERGY

The energy an object has because of its position in the gravitational field relative to some reference point.

$$U = mgh$$

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KINETIC ENERGY

The energy an object possesses as a result of its motion.

$$K = \frac{1}{2}mv^2$$

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MECHANICAL ENERGY

The sum of the gravitational potential energy and kinetic energy.

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LAW OF CONSERVATION OF ENERGY

The total energy of an isolated system remains constant.

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ISOLATED SYSTEM

A system that does not interact with its surroundings i.e. there is no transfer of enrgy or mass between the system and the surroundings.

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PRINCIPLE OF CONSERVATION OF MECHANICAL ENERGY

The total mechanical energy in an isolated system remains constant.

$$E_{mech\ A} = E_{mech\ B}$$

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PULSE

A single disturbance in a medium.

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TRANSVERSE PULSE

A pulse in which the particles of the medium move at right angles to the direction of the motion of the pulse.

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AMPLITUDE

The maximum disturbance of a particle from its rest (equilibirum) position.

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PRINCIPLE OF SUPERPOSITION

The algebraic sum of the amplitudes of two pulses that occupy the same space at the same time.

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CONSTRUCTIVE INTERFERENCE

The phenomenon where the crest of one pulse overlaps with the crest of another to produce a pulse of increased amplitude.

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DESTRUCTIVE INTERFERENCE

The phenomenon where the crest of one pulse overlaps with the trough of another, resulting in a pulse of reduced amplitude.

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TRANSVERSE WAVE

A wave in which the particles of the medium vibrate at right angles to the direction of motion of the wave. A transverse wave is a succession of transverse pulses.

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WAVELENGTH

The distance between two successive points in phase.

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FREQUENCY

The number of wave pulses per second.

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PERIOD

The time taken for one complete wave pulse.

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CREST

Highest point (peak) on a wave.

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TROUGH

The lowest point on a wave

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IN PHASE

Two points in phase are separated by a whole number (1,2,3...) multiple of complete wavelengths.

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OUT OF PHASE

Points that are **NOT** separated by a whole number multiple of complete wavelengths.

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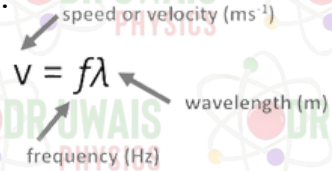
WAVE SPEED

The distance travelled by a point on a wave per unit time.



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LONGITUDINAL WAVE

A wave in which the particles of the medium vibrate parallel to the direction of motion of the wave

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COMPRESSION

Compression
A region of high pressure in a Longitudinal wave

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RAREFRACTION

A region of low pressure in a Longitudinal wave

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ECHO

An echo is a reflection of sound waves.

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PITCH

Pitch is the effect produced in the ear due to the sound of a particular frequency. Pitch is directly proportional to frequency

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LOUDNESS

Loudness describes the strength of the ears perception of a sound. Loudness is directly proportional to amplitude.

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ULTRASOUND

Sound with frequencies higher than 20 kHz up to about 100kHz

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DUAL NATURE OF ELECTROMAGNETIC RADIATION

Some aspects of the behaviour of electromagnetic radiation can be explained using a wave model and some aspects can be explained using an article model.

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ELECTROMAGNETIC WAVE

An electric field oscillating in one plane lane at right angles to it, which produces an oscillating electric field and so on.

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PHOTON

A packet of energy found in light

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TRIBO-ELECTRIC CHARGING

A type of contact electrification in which certain materials become electrically charged after they come into contact with different materials and are then separated (such as through rubbing).

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PRINCIPLE OF CONSERVATION OF CHARGE

The net charge of an isolated system remains constant during any physical process

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PRINCIPLE OF CHARGE QUANTIZATION

All charges in the univers consist of an integer multiple of the charge on one electron

$q_e = 1.6 \times 10^{-19} C$

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POLARISATION

The partial or complete polar separation of positive and negative electric charge in a system.

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POTENTIAL DIFFERENCE

The energy transferred per unit electric charge flowing through it V= W/Q

$$V = \frac{W}{Q}$$

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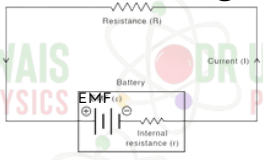
EMF

The work done per unit charge by the battery. It is equal to the potential difference/voltage measured across the terminals of a battery when no charges are flowing in the circuit



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TERMINAL POTENTIAL DIFFERENCE

The potential difference/voltage measured across the terminals of a battery when charges are flowing in the circuit

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CURRENT STRENGTH

The rate of flow of charge in Amperes (A)

$$I = \frac{Q}{\triangle t}$$

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COULOMB

The charge transferred in a conductor in one second if the current is one ampere

$$Q = I\triangle t$$

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RESISTANCE

The ratio of the potential difference across a resistor to the current in the resistor.

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

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OHM

The unit of resistance. One Ω is equal to one volt per ampere.

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

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SERIES CIRCUITS

The Series circuits are potential difference dividers because the total potential difference is equal to the sum of the potential differences across all the individual components

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PARRALEL CIRCUITS

Parallel circuits are current dividers because the total current in the circuit is equal to the sum of the branch currents.

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DENSITY

The mass per unit volume of a substance.

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HOMOGENEOUS MIXTURE

A mixture of uniform composition and in which all components are in the same phase, e.g. a solution of salt and water.

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HETEROGENEOUS MIXTURE

A mixture of non-uniform composition and of which the components can be easily identified, e.g. sand and water.

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ELEMENT

A pure substance consisting of one type of atom.

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COMPOUND

A pure substance consisting of two or more different elements.

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PURE SUBSTANCE

A substance that cannot be separated into simpler components by physical methods.

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ELECTRICAL CONDUCTOR

A material that allows the flow of charge.

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SEMICONDUCTOR

A substance that can conduct electricity under some conditions but not others, making it a good medium for the control of electrical current.

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ELECTRICAL INSULATOR

A material that prevents the flow of charge.

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THERMAL CONDUCTORS AND INSULATORS

Thermal conductor: a material that allows heat to pass through easily.
Thermal insulator: a material that does not allow heat to pass through it.

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DIFFUSION

The movement of atoms or molecules from an area of higher concentration to an area of lower concentration.

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BOILING POINT

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

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MELTING POINT

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

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MELTING

The process during which a solid changes to a liquid by the application of heat.

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FREEZING POINT

The temperature at which a liquid changes to a solid by the removal of heat.

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FREEZING

The process during which a liquid changes to a solid by the removal of heat

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EVAPORATION

The change of a liquid into a vapour at any temperature below the boiling point.
(Evaporation takes place at the surface of a liquid, where molecules with the highest kinetic energy are able to escape)

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SUBLIMATION

The process during which a solid changes directly into a gas without passing through an intermediate liquid phase.

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DIFFUSION

The movement of atoms or molecules from an area of higher concentration to an area of lower concentration.

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CONDENSATION

The process during which a gas or vapour changes to a liquid, either by cooling or being subjected to increased pressure.

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ATOMIC NUMBER

The number of protons in an atom of an element.

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ISOTOPES

Atoms of the same element having the same number of protons, but different numbers of neutrons.

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ATOMIC ORBITALS

The most probable regions in space where electrons that have the specific energy corresponding to the orbital are found.

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HUNDS RULE

No pairing in p orbitals before there is not at least one electron in each of them.

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PAULIS EXCLUSION PRINCIPLE

Maximum of two electrons per orbital provided that they spin in opposite directions

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PERIODIC TABLE

Displays the elements:

- in order of increasing atomic number and
- shows how periodicity of the physical and chemical properties of the elements relates to atomic structure

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GROUPS

Vertical columns in the periodic table

Some groups have names:
Group 1: Alkali metals
Group 2: Earth Alkaline Metals
Group 17 (VII): Halogens
Group 18 (VIII): Noble Gases

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PERIODS

Horizontal rows in the periodic table.

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ATOMIC RADIUS

Radius of an atom i.e. the mean distance from the nucleus to the border of the outer orbital.

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IONISATION ENERGY

Energy needed per mole to remove an electron(s) from an atom in the gaseous phase.

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FIRST IONISATION ENERGY

Energy needed per mole to **remove the first electron** from an atom in the gaseous phase.

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ELECTRON AFFINITY

The energy releaased when an electron is attached to an atom or molecule to form a negative ion.

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ELECTRONEGATIVITY

A measure of the tendency of an atom in a molecule to attract bonding electrons.

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CHEMICAL BOND

A mutual attraction between two atoms resulting from the simultaneous attraction between their nuclei and the outer electrons

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LEWIS DOT DIAGRAM

A structural formula in which valence electrons are represented by dots or crosses. It is also known as an electron dot formula or a lewis formula or an electron diagram.

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COVALENT BOND

The sharing of electrons between two atoms to form a molecule.

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MOLECULE

A group of two or more atoms covalently bonded and that function as a unit.

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IONIC BONDING

The transfer of electrons to form cations (positive ions) and anions (negative ions) that attract each other to form a forumla-unit.

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FORMULA-UNIT

The most simple empirical formula that represents the compound.

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ION

A charged particle made from an atom by the loss or gain of electrons.

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ANION (NEGATIVE ION)

A charged particle made from an atom by the gain of electrons.

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CATION (POSITIVE ION)

A charged particle made from an atom by the loss of electrons.

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METALLIC BONDING

The bond between positive ions and delocalised valence electrons in a metal.

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VALENCE ELECTRON

Valence electrons or outer electrons are the electrons are the electrons in the highest energy level of an atom in which there are electrons.

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ATOM

The smallest particle of which all substances are made.

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PHYSICAL CHANGE

A change in which:

- no new substances are formed
- energy changes are small in relation to chemical changes
- mass, numbers of atoms and molecules are conserved

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CHEMICAL CHANGE

A change in which:

- new chemical substances are formed
- energy changes are larger than those of the physical change.
- mass and numbers of atoms are conserved, but molecules are not.

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ENDOTHERMIC REACTIONS

Energy is **absorbed** during the reaction.

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EXOTHERMIC REACTIONS

Energy is **released** during the reaction.

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MOLE

The SI unit for amount of substance.
One mole is the amount of substance having the same number of particles as there are atoms, e.g. 12g carbon—12.

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RELATIVE ATOMIC MASS

The mass of a particle on a scale where an atom of Carbon-12 has a mass of 12.

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MOLAR MASS

The mass of one mole of a substance measured in $g.mol^{-1}$

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AVOGADROS NUMBER (N_A)

The number of particles (atoms, molecules, formula-units) present in one mole ($N_A = 6.02 \times 10^{23}$ particles per mole)

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AVOGADROS LAW

One mole of any gas occupies the same volume at the same temperature and pressure.

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CONCENTRATION

The number of moles of solute per cubic decimeter of solution.

$$c = \frac{n}{v}$$

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EMPIRICAL FORMULA

The simplest whole-number ratio of atoms in a compound.

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