

**H2 PHYSICS DEFINITIONS LIST**

| Term   | Definition   |
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| <b>SECTION I: MEASUREMENT</b>                |  |
| <b>Chapter 1: Measurement</b>                |  |
| <b>Scalar</b>                                | A scalar quantity is one which has <u>magnitude</u> but <u>no direction</u> .  |
| <b>Vector</b>                                | A vector is a quantity which has <u>direction as well as magnitude</u> .   |
| <b>SECTION II: NEWTONIAN MECHANICS</b>       |  |
| <b>Chapter 2: Kinematics</b>                 |  |
| <b>Displacement, s</b>                       | Total distance moved by an object <u>along a particular direction</u> .  |
| <b>Speed</b>                                 | The rate of change of <u>distance</u> with respect to time.  |
| <b>Velocity, v</b>                           | The rate of change of <u>displacement</u> with respect to time.  |
| <b>Acceleration, a</b>                       | The rate of change of <u>velocity</u> with respect to time.  |
| Average speed/velocity                       | The <u>average rate</u> of change of distance/displacement with respect to time.   |
| Instantaneous Velocity                       | The rate of change of displacement with respect to time <u>at a particular time</u> .  |
| <b>Chapter 3: Dynamics</b>                   |  |
| <b>Newton's First Law</b>                    | A body <u>continues in its state of rest or uniform motion in a straight line</u> unless a <u>resultant external force</u> acts on it.   |
| <b>Newton's Second Law</b>                   | The <u>rate of change of momentum</u> of a body is <u>proportional</u> to the <u>resultant force</u> acting on it and occurs <u>in the direction of the force</u> .  |
| <b>Newton's Third Law</b>                    | If body A exerts a force on body B, then body B exerts an <u>equal but opposite</u> force on body A.   |
| <b>Linear Momentum</b>                       | The <u>product</u> of the <u>mass</u> of an object and its <u>velocity</u> .   |
| <b>Impulse</b>                               | Impulse is the <u>area under the force-time graph</u> .  |
| <b>Force, F</b>                              | The <u>rate of change of momentum</u> .  |
| <b>Principle of Conservation of Momentum</b> | The total momentum of a system remains <u>constant provided no external resultant forces</u> act on the system.<br><b>OR</b><br>The total momentum of an <u>isolated system</u> of bodies is <u>constant</u> . |
| <b>Inertia</b>                               | The <u>reluctance</u> of a body to start moving or to change its motion once it has started.   |
| <b>Equilibrium</b>                           | When the <u>state</u> of an object remains <u>unchanged</u> even though two or more forces are acting on it.   |
| <b>Chapter 4: Forces</b>                     |  |
| <b>Hooke's Law</b>                           | The <u>force</u> needed to cause an extension/compression in a spring is <u>directly proportional to its extension/compression</u> .   |
| <b>Upthrust, U</b>                           | It is the <u>upward force</u> acting on an object that is <u>partially or fully immersed in a fluid</u> . (RJCPromo07)   |
| <b>Equilibrium</b>                           | A system is in equilibrium if there is <u>no resultant force</u> and   |

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|  | <u>no resultant torque</u> acting on it.  |
| <b>Centre of Gravity</b>                               | The point at which <u>all the weight</u> of an object may be <u>considered to be acting</u> as if the object were a particle.   |
| <b>Couple</b>  | A couple consists of a <u>pair of parallel forces</u> of <u>equal magnitude</u> but <u>opposite direction</u> whose lines of action do not coincide.  |
| <b>Moment of a Force</b>                               | The moment of a force about a point is the <u>product</u> of the <u>force</u> with the <u>perpendicular distance</u> of the force from that <u>point</u> .  |
| <b>Torque of a Couple, <math>\tau</math></b>           | The torque of a couple is the <u>product</u> of <u>one of the forces</u> with the <u>perpendicular separation</u> between the couple.   |
| <b>Archimedes' Principle</b>                           | An object <u>immersed fully or partially in a fluid</u> experiences a <u>buoyant force equal in magnitude to the weight of the fluid displaced</u> .  |
| <b>Centre of Mass</b>                                  | The point at which <u>all of the mass</u> of an object or system may be <u>considered to be concentrated</u> .  |
| <b>Principle of Flotation</b>                          | An object floating in a fluid always <u>displaces its own weight of fluid</u> .   |
| <b>Rotational Equilibrium</b>                          | A system is in rotational equilibrium if there is <u>no resultant torque</u> .  |
| <b>Chapter 5: Work, Energy and Power</b>               |   |
| <b>Work Done</b>                                       | The <u>product</u> of a <u>force</u> and the <u>displacement in the direction of the force</u> .  |
| <b>Power</b>   | <u>Work done per unit time</u> .  |
| <b>Chapter 6: Motion in a Circle</b>                   |   |
| <b>Angular Velocity, <math>\omega</math></b>           | The <u>rate of change of angular displacement</u> with respect to time.   |
| <b>Centripetal Acceleration</b>                        | Acceleration which is always <u>perpendicular to the velocity</u> and always <u>acts towards the centre</u> of the circular motion.   |
| <b>Uniform Circular Motion</b>                         | The motion of an object moving in circular path at <u>constant speed</u> with <u>constant angular velocity</u> .  |
| <b>Centripetal Force</b>                               | The <u>resultant perpendicular force</u> acting on an object moving in circular motion  |
| <b>Chapter 7: Gravitational Field</b>                  |   |
| <b>Gravitational Field</b>                             | A gravitational field due to a body is a <u>region in space</u> in which <u>another body</u> placed in the region <u>experiences a force of attraction by the first body</u> .  |
| <b>Newton's Law of Gravitation/Gravitational Force</b> | Newton's law of gravitation states that the <u>force of attraction</u> between <u>two point masses</u> is <u>directly proportional</u> to the <u>product of their masses</u> and <u>inversely proportional</u> to the <u>square of their distance apart</u> . |
| <b>Gravitational Field Strength, <math>g</math></b>    | The gravitational field strength at a point is the <u>gravitational force per unit mass</u> experienced by a mass placed at that point.   |
| <b>Gravitational Potential, <math>\phi</math></b>      | Gravitational potential at a point is the <u>work done per unit mass</u> by an external agent in bringing a mass <u>from infinity to</u>  |

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|   | that <u>point</u> without a change in kinetic energy. (RJCPromo07)   |
| Gravitational Potential Energy              | The Gravitational Potential Energy of a mass is defined as the <u>work done by an external agent in bringing the mass from infinity to its present location</u> (without any change in KE).      |
| <b>Chapter 8: Oscillations</b>              |  |
| <b>Amplitude</b>                            | The <u>maximum displacement from the equilibrium position</u> .  |
| <b>Period, T</b>                            | The <u>time taken to complete one cycle of oscillation</u> .   |
| <b>Frequency, <math>f</math></b>            | The <u>number of complete cycles per second</u> made by the oscillating object.  |
| <b>Simple Harmonic Motion</b>               | The motion of the body whose <u>acceleration is directly proportional to its displacement from a fixed point</u> (equilibrium position) and is <u>always directed towards that fixed point</u> . |
| <b>Resonance</b>                            | The tendency of a system to oscillate at <u>maximum amplitude</u> at its <u>natural frequency</u> .  |
| <b>Forced Oscillation</b>                   | When the system is forced to oscillate at a <u>frequency other than the natural frequency</u> by a <u>periodic external force</u> .  |
| <b>Natural Frequency</b>                    | The frequency of oscillation when a system <u>oscillates freely without any external force</u> applied.  |
| Displacement, s                             | The <u>distance</u> of the oscillating object <u>from its equilibrium position</u> at any instant.   |
| <b>SECTION III: THERMAL PHYSICS</b>         |  |
| <b>Chapter 9: Thermal Physics</b>           |  |
| <b>Internal Energy</b>                      | The <u>sum of the microscopic kinetic and potential energies</u> of the molecules that make up the system.   |
| <b>Thermal Equilibrium</b>                  | When two objects in thermal contact <u>cease to have any exchange of heat</u> .  |
| <b>Absolute Zero</b>                        | The theoretical temperature at which the molecules of a substance have the lowest energy and hence, the substance has <u>minimum internal energy</u> .   |
| <b>Kelvin, K</b>                            | The Kelvin is defined as <u><math>\frac{1}{273.16}</math> of the temperature difference between absolute zero and the triple point of water</u> .  |
| <b>Specific Heat Capacity, c</b>            | It is the <u>quantity of heat required to raise the temperature of 1kg of the body by 1K</u> .   |
| <b>Latent Heat</b>                          | It is the <u>thermal energy</u> required by matter for a <u>change in phase</u> .  |
| <b>Specific Latent Heat of Fusion</b>       | It is the <u>thermal energy</u> required for <u>1kg</u> of substance to change from the <u>solid phase to the liquid phase without a change in temperature</u> .                                 |
| <b>Specific Latent Heat of Vaporisation</b> | It is the <u>thermal energy</u> required for <u>1kg</u> of substance to change from the <u>liquid phase to the gaseous phase without a change in temperature</u> .                               |
| <b>First Law of Thermodynamics</b>          | The First Law of Thermodynamics states that the <u>internal energy</u> of a system depends only on the <u>thermodynamic</u>  |

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|   | state of the system; the <u>increase</u> in the <u>internal energy</u> of a system is <u>equal</u> to the <u>sum</u> of the <u>heat supplied</u> to the <u>system</u> and the <u>work done on the system</u> .   |
| Triple Point of Water                       | The particular temperature and pressure at which the <u>three states of water</u> can co-exist in equilibrium.   |
| Heat Capacity                               | The <u>quantity of heat</u> required to <u>raise the temperature</u> of the body by <u>1K</u> .  |
| Ideal Gas                                   | A gas in which <u>all collisions</u> between the atoms and molecules are <u>perfectly elastic</u> and which there are <u>no intermolecular attractive or repulsive forces</u> .  |
| <b>SECTION IV: WAVES</b>                    |  |
| <b>Chapter 10: Wave Motion</b>              |  |
| <b>Wavelength, <math>\lambda</math></b>     | The <u>distance between corresponding points in successive waveforms</u> , such as two successive crests or two successive troughs.  |
| <b>Intensity, <math>I</math></b>            | The <u>amount of energy incident per unit area per unit time</u> .   |
| <b>Phase</b>                                | The <u>stage of motion</u> of the particle <u>with respect to other particles</u> in the same wave or another wave.  |
| <b>Transverse Waves</b>                     | A transverse wave is one in which particles of the medium move in a direction <u>perpendicular</u> to the direction of travel of the wave.   |
| <b>Longitudinal Waves</b>                   | A longitudinal wave is one in which particles of the medium move in a direction <u>parallel</u> to the direction of travel of the wave.  |
| <b>Polarised Waves</b>                      | <u>All particles vibrate in the same plane</u> at all times  |
| Electromagnetic Radiation                   | A self-propagating <u>transverse wave</u> in space with <u>electric and magnetic</u> components.   |
| <b>Chapter 11: Superposition</b>            |  |
| <b>Principle of Superposition</b>           | The principle of superposition states that the <u>resultant displacement</u> at any point is the <u>vector sum of the individual displacement</u> due to each wave arriving at that point. (RJCCT108)  |
| <b>Diffraction</b>                          | Diffraction is the <u>bending of waves through an aperture or around an obstacle</u> .   |
| <b>Interference</b>                         | Interference is the <u>superposition</u> of two or more <u>coherent waves</u> to give a resultant wave whose resultant amplitude is given by the <u>principle of superposition</u> . (RJCNotes)<br><br><b>OR</b><br>Interference is the <u>superposition of waves</u> in the same region and time so as to form <u>regions of maxima</u> (bright) <u>and minima</u> (dark) due to waves meeting constructively and destructively respectively. (RJCPrelim07) |
| <b>Coherence</b>                            | Sources having <u>constant phase difference</u> .  |
| <b>SECTION V: ELECTRICITY AND MAGNETISM</b> |  |
| <b>Chapter 12: Electric Fields</b>          |  |

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| <b>Electric Field Strength, E</b>            | The electric field strength at a point is defined as the <u>force per unit charge</u> acting on a <u>small positive test charge</u> placed at that point.   |
| <b>Coulomb's Law</b>                         | The <u>force</u> between <u>two point charges</u> is <u>directly proportional</u> to the <u>product of the charges</u> and <u>inversely proportional</u> to the <u>square of the distance between the charges</u> .   |
| <b>Uniform Electric Field</b>                | Electric field strength is <u>equal in magnitude</u> and has the <u>same direction at all points</u> in the region.   |
| <b>Electric Potential, <math>\phi</math></b> | The electric potential at a point in an electric field is the <u>work done per unit charge</u> in bringing a <u>positive test charge from infinity to the point</u> (without a change in kinetic energy).             |
| <b>Chapter 13: Current of Electricity</b>    |   |
| <b>Electric Current, I</b>                   | The <u>net amount of charge passing through a point per unit time</u> .   |
| <b>Coulomb, C</b>                            | One coulomb is the <u>quantity of electric charge</u> that passes a given point in a circuit in <u>one second</u> when there is a <u>constant current of one ampere</u> .   |
| <b>Potential Difference, E</b>               | The potential difference between two points in a circuit is the <u>amount of electric energy</u> that is <u>converted to other forms of energy</u> when a <u>unit charge</u> passes from one point to the other.      |
| <b>Volt, V</b>                               | One volt is the <u>potential difference between two points</u> in a circuit in which <u>one joule of energy</u> is <u>converted</u> when <u>one coulomb of charge</u> passes from one point to the other.             |
| <b>Resistance, R</b>                         | The electrical resistance of a conductor is defined as the <u>ratio of the p.d. across it to the current through it</u> .   |
| <b>Ohm, <math>\Omega</math></b>              | One ohm is defined as the <u>resistance</u> of a conductor in which a <u>current of one ampere</u> passes through it when the <u>p.d. across it is one volt</u> .   |
| <b>Electromotive Force (e.m.f.)</b>          | The e.m.f. of a source is defined as the <u>amount of energy converted from other forms to electrical energy</u> when the <u>source drives a unit charge round a complete circuit</u> .                               |
| <b>Ampere, A</b>                             | <u>One coulomb per second</u> .   |
| <b>Chapter 15: Electromagnetism</b>          |   |
| <b>Magnetic Flux Density, B</b>              | The flux density of a magnetic field is the <u>force per unit length</u> on a straight conductor carrying <u>unit current</u> placed <u>perpendicularly to the field</u> . (RJCT208)                                  |
| <b>Tesla, T</b>                              | The <u>magnetic flux density</u> of a magnetic field is one tesla if the <u>force</u> acting on <u>1m length</u> of a <u>conductor carrying 1A of current</u> placed <u>perpendicular</u> to the field is <u>1N</u> . |
| <b>Electronvolt, eV</b>                      | The electronvolt is the <u>energy gained by an electron</u> when it is <u>accelerated</u> through a <u>p.d. of one volt</u> .   |
| <b>Chapter 16: Electromagnetic Induction</b> |   |
| <b>Magnetic Flux, <math>\phi</math></b>      | Magnetic flux through a plane surface is the <u>product of the</u>  |

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|   | <u>area and the magnetic flux density that passes through the area perpendicularly.</u>  |
| <b>Weber</b>  | One weber is the magnetic flux if a field of flux density one tesla exists at right angles to an area of one metre square.   |
| <b>Magnetic Flux Linkage, <math>\Phi</math></b>                                     | The magnetic flux linkage of a coil is the magnetic flux passing through each turn of the coil multiplied by the number of turns of the coil.  |
| <b>Faraday's Law</b>  | Whenever there is a change in magnetic flux linkage of a circuit or coil, an e.m.f. is induced in the circuit and the magnitude is <u>directly proportional to the rate of change of magnetic flux linkage</u> of the circuit or coil. |
| <b>Lenz's Law</b>   | Lenz's Law states that the <u>direction of the induced current</u> is such as to <u>oppose the change in flux</u> which causes it.   |
| <b>Chapter 17: Alternating Current</b>  |  |
| <b>RMS value of an alternating current</b>  | It is the <u>value of the steady direct current</u> which would dissipate <u>heat at the same rate</u> in a given resistance as the alternating current.   |
| <b>Mean Power</b>   | The mean power dissipated by a resistive load is <u>half the maximum power</u> for a <u>sinusoidal AC</u> .  |
| <b>Sinusoidal AC/Voltage</b>  | Current/voltage <u>varies periodically with time</u> in <u>magnitude and direction</u> .   |
| <b>Rectification of an AC</b>   | Conversion of <u>AC to DC</u> .  |
| <b>Half-wave Rectification</b>  | For <u>half the cycle</u> , the <u>diode allows current to flow</u> but for the <u>other half</u> of the cycle, the <u>current flow is very small</u> due to the <u>high resistance</u> of the diode being in <u>reverse bias</u> .    |
| <b>SECTION VI: MODERN PHYSICS</b>   |  |
| <b>Chapter 18: Quantum Physics</b>  |  |
| <b>Photoelectric Effect</b>   | The <u>emission of electrons from a metal</u> as a result of <u>light with sufficiently short wavelength</u> falling on it.  |
| <b>Work function, <math>\Phi</math></b>   | The work function of a material is defined as the <u>minimum amount of energy</u> required <u>to remove a free electron from the surface</u> of a material   |
| <b>Square of the absolute magnitude of the Wave Function, <math> \Psi ^2</math></b> | <u>Probability density</u> of finding the particle at a particular point, at a particular time.  |
| <b>Potential Barrier</b>  | A potential barrier is a region within which the <u>potential energy of the particle</u> is much higher than immediately <u>outside it</u> .   |
| <b>Photon</b>   | A <u>quantum of electromagnetic energy</u> .   |
| <b>Ionisation Energy</b>  | The ionization energy of an atom is the <u>minimum energy</u> required <u>to remove an electron completely from the atom</u> .   |
| <b>Ionisation</b>   | The process of <u>creating charged particles</u> .   |
| <b>Transmission Coefficient</b>   | The <u>probability</u> of the particle being <u>transmitted</u> .  |
| <b>Reflection Coefficient</b>   | The <u>probability</u> of the particle being <u>reflected</u> .  |
| <b>Chapter 19: Lasers and Semiconductors</b>  |  |
| <b>Spontaneous Emission</b>   | A <u>photon</u> is <u>emitted by an atom randomly</u> and in <u>any</u>  |

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|                                      | <u>direction without any external stimulation.</u>   |
| <b>Stimulated Emission</b>           | An <u>incoming photon, whose energy is exactly equal to the excitation energy of the atom, induces the excited atom to fall to a lower energy level and releases a photon</u> in the process. This photon released is similar to the one which induces its emission. The two photons are emitted at the same time and in the <u>same direction</u> . |
| <b>Population Inversion</b>          | When there are <u>more atoms in the excited state than in the ground state</u> .   |
| <b>Intrinsic Semiconductor</b>       | A semiconductor <u>without added impurities</u> .  |
| <b>Extrinsic Semiconductor</b>       | A semiconductor <u>with added impurities</u> .   |
| <b>P-N Junction</b>                  | A P-N Junction is a <u>single semiconductor crystal</u> that has been <u>selectively doped</u> so that one region is n-type material and the adjacent region is p-type material.   |
| <b>Stimulated Absorption</b>         | When an <u>atom at a lower energy level absorbs a photon and moves to a higher energy level</u> .  |
| <b>Chapter 20: Nuclear Physics</b>   |  |
| <b>Nucleon Number (Mass Number)</b>  | The number of <u>nucleons</u> (protons and neutrons) in the nucleus.   |
| <b>Proton Number (Atomic Number)</b> | The number of <u>protons</u> in the nucleus.   |
| <b>Mass Defect</b>                   | The <u>difference</u> between the <u>sum of the individual masses of protons and neutrons</u> and the <u>mass of a nucleus</u> .   |
| <b>Binding Energy</b>                | The <u>amount of energy</u> needed to <u>split a nucleus into its individual nucleons</u> .  |
| <b>Binding Energy per Nucleon</b>    | Binding energy divided by the mass or nucleon number of the nucleus.   |
| <b>Nuclear Fusion</b>                | Process by which nuclei with <u>mass numbers lower than 56 combine</u> to form nuclei of <u>higher mass numbers</u> which are <u>more stable</u> .   |
| <b>Nuclear Fission</b>               | Process by which nuclei of <u>mass numbers larger than 56 break up</u> to form <u>lighter nuclei</u> which are <u>more stable</u> .  |
| <b>Activity, A</b>                   | The <u>number of atoms</u> of a radioactive substance that <u>decay per unit time</u> .  |
| <b>Decay constant</b>                | The <u>probability of decay per nucleus per unit time</u> .  |
| <b>Half life</b>                     | Half life of a radioactive element is <u>the time taken</u> for a <u>sample of atoms</u> to <u>decay to half their initial number</u> .  |
| <b>Neutron Number</b>                | The number of <u>neutrons</u> in the nucleus.  |
| <b>Radioactivity</b>                 | The <u>spontaneous emission</u> of $\alpha$ , $\beta$ or $\gamma$ <u>radiation by a parent nucleus</u> which results in itself being <u>transformed</u> into a completely different <u>daughter nucleus</u> .  |