***Physics Exam Syllabus***

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| **NTU** | **NUS** |
| Measurement   * Physical quantities and SI units * Scalars and vectors * Errors and uncertainties | Physical quantities and units   * (dimensions to derive possible forms of physical equation not required) * Scalars and vectors |
| Kinematics   * Rectilinear motion * Nonlinear motion | Relative masses of atoms and molecules   * Determination of relative masses * Calculation of empirical and molecular formulae |
| Dynamics   * Newton’s laws of motion * Linear momentum and its conservation | Atomic structure   * Electrons, protons, and neutrons * The nucleus of the atom * The electronic structure of the atom |
| Forces   * Types of force * Centre of gravity * Turning effects of forces * Equilibrium of forces * Upthrust (buoyancy) | Gases, Liquids, and Solids   * Gases: derivation of deal gas equation, kinetics of gas, ideal gas behaviour (no Van de Waals’), Boltzmann distribution * Liquids: kinetic concept of the liquid state, melting, vaporisation, and vapour pressure, saturated and unsaturated vapours * Solids: lattice structure and spacing, lattice energy (qualitative) |
| Work, Energy, and Power   * Work * Energy conversion and conservation * Efficiency * Potential energy and kinetic energy * Power | Electrochemistry   * Electrolysis |
| Motion in a Circle   * Kinematics of uniform circular motion * Centripetal acceleration * Centripetal force | Mechanics   * Couples, torques, moments of forces, equilibrium * Dynamics: kinematics, Newton’s laws of motion, momentum * Energy, work, power (including force of attraction between two masses) * Motion in a circle |
| Gravitational Field   * Gravitational field * Gravitational force between point masses * Gravitational field of a point mass * Gravitational field near to the surface of the Earth * Gravitational potential * Circular orbits | Oscillations and Waves   * Simple harmonic motion, including simple treatment of damping * Waves * Longitudinal and transverse waves * Electromagnetic spectrum * Optics: reflection and refraction, critical angle, thin converging lens, ray diagrams, dispersion of light by a glass prism * Superposition |
| Temperature and Ideal Gases   * Thermal equilibrium * Temperature scales * Equation of state * Kinetic theory of gases * Kinetic energy of a molecule | Electricity and magnetism   * Electric current * Simple D.C. circuits * Inverse square law fields (derivations are not required) * Capacitors * Magnetic effects of currents * Electromagnetic induction * Alternating current |
| First Law of Thermodynamics   * Specific heat capacity and specific latent heat * Internal energy * First law of thermodynamics | Matter   * Deformation of solids * Temperature scales * Thermal expansion of matter * Heat absorbed by matter * Heat conduction |
| Oscillations   * Simple harmonic motion * Energy in simple harmonic motion * Damped and forced oscillations, resonance | * Charged particles (Milikan’s oil drop experiment) * Photons and energy levels |
| Wave Motion   * Progressive waves * Transverse and longitudinal waves * Polarisation * Determination of frequency and wavelength of sound waves |  |
| Superposition   * Principle of superposition * Stationary waves * Diffraction * Two-source interference * Single slit and multiple slit diffraction |  |
| Electric Fields   * Concept of an electric field * Electric force between point charges * Electric field of a point charge * Uniform electric fields * Electric potential |  |
| Current of Electricity   * Electric current * Potential difference * Resistance and resistivity * Electromotive force |  |
| D.C. Circuits   * Circuit symbols and diagrams * Series and parallel arrangements * Potential divider * Balanced potentials |  |
| Electromagnetism   * Concept of a magnetic field * Magnetic fields due to currents * Force on a current-carrying conductor * Force between current-carrying conductors * Force on a moving charge |  |
| Electromagnetic Induction   * Magnetic flux * Laws of electromagnetic induction |  |
| Alternating Current   * Characteristics of alternating currents * The transformer * Rectification with a diode |  |
| Quantum Physics   * Energy of a photon * The photoelectric effect * Wave-particle duality * Energy levels in atoms * Line spectra * X-ray spectra * The uncertainty principle |  |
| Nuclear Physics   * The nucleus * Isotopes * Nuclear processes * Mass defect and nuclear binding energy * Radioactive decay * Biological effects of radiation |  |