Singapore Junior Physics Olympiad (SJPO) Training

Course Syllabus

Lesson	Topic	Contents
1	Kinematics	• Instantaneous/Average Values • Constant Acceleration • Graphical Representation of 1D Motion • Projectile Motion • Relative Motion
2	Dynamics	• Newton's 1st, 2nd and 3rd Law • Free Body Diagrams • Resolving Forces into Components • Normal, Friction and Tension
3		• Hooke's Law • Application of Newton's 2nd Law on Various Systems • Applying Kinematics Principles to Analyse Systems
4	Work, Energy and Power	• Work Done • Conservation of Energy • Work Done-Kinetic Energy Theorem • Gravitational and Elastic Potential Energy • Power
5	Impulse, Momentum and Collision	• Conservation of Momentum • Momentum and N2L • Impulse-Momentum Theorem • Centre of Mass of Point Mass Systems
6		• Collisions (Elastic, Inelastic, Disintegration) • Coefficient of Restitution
7	Circular Motion	• Angular Quantities • Period, Frequency, Angular Frequency • Centripetal Force • Dynamics of Circular Motion • Gravitation
8	Rotational Mechanics	• Rotational Kinematics • Rigid Bodies • Centre of Mass • Energy in Rotation • Moment of Inertia
9		• Torque and Moments • N2L in Rotational Form • Fixed Axis Rotation • Rolling with Slipping • Power • Conservation of Angular Momentum
10	Simple Harmonic Motion	• Definition of SHM • Spring-Mass System • Simple Pendulum • Sinusoidal Description of SHM • Energy in SHM • Graphs of Mechanical Quantities Against Time
11	Fluid Mechanics	• Pressure and Pascal's Law • Buoyancy and Archimedes' Principle • Fluid Flow and Continuity Equation • Bernoulli's Principle

12	Direct Current	• Electromotive Force of a Source • Potential Difference • Current and Conventional Current • Resistance and Ohm's Law • Series and Parallel Circuits • Voltage and Current Divider Rules • Kirchhoff's Laws
13	Electric Fields	• Coulomb's Law • Electric Field • Electric Potential Energy and Electric Potential • Relation between Potential Energy and Electrical Force • Conductors
14	Capacitors	• Electric Field Between Parallel Plates • Capacitance of a Parallel-Plate Capacitor • Combinations of Capacitors • Energy Stored in Capacitor • Dielectric
15	Electromagnetism	• Magnetic Field and Magnetic Field Lines • Current-Carrying Wires and B-fields • Flat Circular Coil • Magnetic Field of Solenoid
16		• Magnetic Force on Moving Charge • Current-Carrying Wire in Magnetic Field • Current Loop in Magnetic Field • Velocity Selector
17	Electromagnetic Inductance	• Magnetic Flux • Lenz' Law and Faraday's Law • Motional EMF • Transformers
18	Thermodynamics	• Thermometers and Temperature • Zeroth Law of Thermodynamics • Specific Heat Capacity • Latent Heat • Heat Transfer • Newton's Law of Cooling
19		• Ideal Gas Law • Root Mean Square Speed • First Law of Thermodynamics • Isobaric, Isochoric, Isothermal, Adiabatic Processes • Work Done in PV Cycles
20	Waves	• Snapshot and History Graphs • Period and Frequency • Transverse and Longitudinal Waves • Phase and Phase Difference • Intensity of Waves
21		• Polarisation of Light • Polarisation by Reflection, Brewster's Law • Superposition • Standing Waves • Doppler Effect
22	Optics	• Snell's Law • Interference of Light Waves • Diffraction of Light Waves • Young's Double Slit Experiment • Diffraction Grating