Diploma Programme Course Outline

Name of the DP subject	**Physics**
Level	**Higher** ☐ **Standard** ☐

YEAR 1

UNIT	TOPIC/CONCEPT TERM 1: Aug 2022 – Dec 2022			ASSESSMENT COMPONENTS
Unit 1: Measurements and Uncertainties **5 Hours for Both SL and HL**	Measurements in physics	1.1	• Fundamental and derived SI units • Scientific notation and metric multipliers • Significant figures • Orders of magnitude • Estimation	Formative assessments: • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions
	Uncertainties and errors	1.2	• Random and systematic errors • Absolute, fractional and percentage uncertainties • Error bars • Uncertainty of gradient and intercepts	
	Vectors and scalars	1.3	• Vector and scalar quantities • Combination and resolution of vectors	

Unit 2: Mechanics **22 Hours for Both SL and HL**	Motion	2.1	• Distance and displacement • Speed and velocity • Acceleration • Graphs describing motion • Equations of motion for uniform acceleration • Projectile motion • Fluid resistance and terminal speed	Formative assessments: • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Forces	2.2	• Objects as point particles • Free-body diagrams • Translational equilibrium • Newton's laws of motion • Solid friction	
	Work, energy and power	2.3	• Kinetic energy • Gravitational potential energy • Elastic potential energy • Work done as energy transfer • Power as rate of energy transfer • Principle of conservation of energy • Efficiency	
	Momentum and impulse	2.4	• Newton's second law expressed in terms of rate of change of momentum • Impulse and force–time graphs • Conservation of linear momentum • Elastic collisions, inelastic collisions and explosions	

Unit 3: Thermal Physics **11 Hours for Both SL and HL**	Thermal concepts	3.1	• Molecular theory of solids, liquids and gases • Temperature and absolute temperature • Internal energy • Specific heat capacity • Phase change • Specific latent heat	Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers. Summative assessments: * Multiple choice and free response questions on the topic. **SL & HL: Unit 1, 2 & 3.**
	Modelling a gas	3.2	• Pressure • Equation of state for an ideal gas • Kinetic model of an ideal gas • Mole, molar mass and the Avogadro constant • Differences between real and ideal gases	

UNIT	TOPIC/CONCEPT TERM 2: Dec 2022 – May 2022			ASSESSMENT COMPONENTS
Unit 4: Waves **15 Hours for Both SL and HL**	Oscillations	4.1	• Simple harmonic oscillations • Time period, frequency, amplitude, displacement and phase difference • Conditions for simple harmonic motion	Formative assessments: • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Travelling waves	4.2	• Travelling waves • Wavelength, frequency, period and wave speed • Transverse and longitudinal waves • The nature of electromagnetic waves • The nature of sound waves	
	Wave characteristics	4.3	• Wave fronts and rays • Amplitude and intensity • Superposition • Polarization	
	Wave behavior	4.4	• Reflection and refraction • Snell's law, critical angle and total internal reflection • Diffraction through a single-slit and around objects • Interference patterns • Double-slit interference • Path difference	

	Standing waves	4.5	• The nature of standing waves • Boundary conditions • Nodes and antinodes	
Unit 9: Wave Phenomena **17 Hours for HL Only**	Simple harmonic motion (HL ONLY)	9.1	• The defining equation of SHM • Energy changes	Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Single-slit diffraction (HL ONLY)	9.2	• The nature of single-slit diffraction	
	Interference (HL ONLY)	9.3	• Young's double-slit experiment • Modulation of two-slit interference pattern by one-slit diffraction effect • Multiple slit and diffraction grating interference patterns • Thin film interference	
	Resolution (HL ONLY)	9.4	• The size of a diffracting aperture • The resolution of simple monochromatic two-source systems	
	Doppler effect (HL ONLY)	9.5	• The Doppler effect for sound waves and light waves	

Unit 5: Electricity and Magnetism **15 Hours for Both SL and HL**	Electric fields	5.1	• Charge • Electric field • Coulomb's law • Electric current • Direct current (dc) • Potential difference	Formative assessments: • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Heating effect of electric currents	5.2	• Circuit diagrams • Kirchhoff's circuit laws • Heating effect of current and its consequences • Resistance expressed as R = V/I • Ohm's law • Resistivity • Power dissipation	
	Electric cells	5.3	• Cells • Internal resistance • Secondary cells • Terminal potential difference • Electromotive force (emf)	
	Magnetic effects of electric currents	5.4	• Magnetic fields • Magnetic force	

Unit 6: Circular Motion and Gravitation **5 Hours for Both SL and HL**	Circular motion	6.1	• Period, frequency, angular displacement and velocity • Centripetal force • Centripetal acceleration	Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers. Summative assessments: * Multiple choice and free response questions on the topic. **SL : Unit 4, 5 & 6.** **HL: Unit 4, 5, 6, 9, 10 & 11**
	Newton's law of gravitation	6.2	• Newton's law of gravitation • Gravitational field strength	
Unit 10: Fields **11 Hours for HL only**	Describing fields (HL ONLY)	10.1	• Gravitational fields • Electrostatic fields • Electric potential and gravitational potential • Field lines • Equipotential surfaces	Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Fields at work (HL ONLY)	10.2	• Potential and potential energy • Potential gradient • Potential difference • Escape speed • Orbital motion, speed and orbital energy • Forces and inverse-square law behavior	

Unit 11: Electro-magnetic Induction **16 Hours for HL Only**	Electromagnetic induction (HL ONLY)	11.1	• Electromotive force (emf) • Magnetic flux and magnetic flux linkage • Faraday's law of induction • Lenz's law	Peer and self –assessment: • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers.
	Power generation and transmission (HL ONLY)	11.2	• Alternating current (ac) generators • Average power and root mean square (rms) values of current and voltage • Transformers • Diode bridges • Half-wave and full-wave rectification	
	Capacitance (HL ONLY)	11.3	• Capacitance • Dielectric materials • Capacitors in series and parallel • Resistor-capacitor (RC) series circuits • Time constant	