Alcanta International College
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Curriculum Map for Physics DP1 (Group 4)

Unit Title (Time frame)	Standards	IB Objectives	Knowledge/Content	Skills	Assessments		Key resources
	What are students expected to know and be able to do (knowledge and skills) by the end of a specific stage in their education?—General statements To be the same across all year levels	***What IB Objectives (as stated in Subject Guides) will this unit address?***	***What key knowledge will students acquire as a result of this unit? This requires a summary of key content for the unit.***	What skills will they acquire in this unit?	***Through what tasks will students demonstrate the desired understanding? What IB criteria will be used to assess the students?*** **Summative Assessments:** All assessment tasks which will be used to calculate a student's semester grade (must be entered on Engage Gradebook). Must be IB type assessment. **Formative Assessment:** All assessment tasks which are used to provide students with periodic feedback so they are aware of their progress. These could include quizzes, posters, etc. (Do not enter on Engage Gradebook).		Textbook Other texts Websites Videos Movies Community as a resource? Trip
					Formative (Quizzes, Written Questions answered in class)	Assessments for End of Unit (These go into Engage columns!) **SUMMATIVE**	**Inthinking Subscription for expert advice** **Baiyun Mountain for Group 4 project.**
Topic 1: Measurements and uncertainties (5 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts,	1a; 1b; 1c 2a; 2b; 2c 3b; 3c; 3d 4	1.1 – Measurements in physics Fundamental and derived SI units Scientific notation and metric multipliers Significant figures Orders of magnitude Estimation 1.2 – Uncertainties and errors Random and systematic errors Absolute, fractional and percentage uncertainties Error bars Uncertainty of gradient and intercepts 1.3 – Vectors and scalars Vector and scalar quantities	Using SI units in the correct format for all required measurements, final answers to calculations and presentation of raw and processed data. Using scientific notation and metric multipliers. Quoting and comparing ratios, values and approximations to the nearest order of magnitude. Estimating quantities to an appropriate number of significant figures. Explaining how random and systematic errors can be identified and reduced. Collecting data that include absolute and/or fractional uncertainties and stating these as an uncertainty range (expressed as: best estimate ±	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment Colorado pHET sims throughout whole course X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan Standard lab physics equipment throughout whole course

	concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.		Combination and resolution of vectors	uncertainty range). Propagating uncertainties through calculations involving addition, subtraction, multiplication, division and raising to a power. Determining the uncertainty in gradients and intercepts. Solving vector problems graphically and algebraically			
Topic 2: Mechanics (22 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	2.1 – Motion Distance and displacement Speed and velocity Acceleration Graphs describing motion Equations of motion for uniform acceleration Projectile motion Fluid resistance and terminal speed 2.2 – Forces Objects as point particles Free-body diagrams Translational equilibrium Newton's laws of motion Solid friction	Determining instantaneous and average values for velocity, speed and acceleration. Solving problems using equations of motion for uniform acceleration. Sketching and interpreting motion graph. Determining the acceleration of free-fall experimentally. Analysing projectile motion, including the resolution of vertical and horizontal components of acceleration, velocity and displacement. Qualitatively describing the effect of fluid resistance on falling objects or projectiles, including reaching terminal speed. Representing forces as vectors. Sketching and interpreting free-body diagrams. Describing the consequences of Newton's first law for translational	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	Students will develop an understanding of the nature of scientific inquiry.		2.3 – Work, energy and power 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 2.4 – Momentum and impulse 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	equilibrium. Using Newton's second law quantitatively and qualitatively. Identifying force pairs in the context of Newton's third law. Solving problems involving forces and determining resultant force. Describing solid friction (static and dynamic) by coefficients of friction. Discussing the conservation of total energy within energy transformations Sketching and interpreting force–distance graphs Determining work done including cases where a resistive force acts Solving problems involving power Quantitatively describing efficiency in energy transfers Applying conservation of momentum in simple isolated systems including (but not limited to) collisions, explosions, or water jets. Using Newton's second law quantitatively and qualitatively in cases where mass is not constant. Sketching and interpreting force–time graphs. Determining impulse in various contexts including (but not limited to) car safety and			

				sports. Qualitatively and quantitatively comparing situations involving elastic collisions, inelastic collisions and explosions.			
Topic 3: Thermal physics **(11 Hours)**	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	3.1 – Thermal concepts Molecular theory of solids, liquids and gases Temperature and absolute temperature Internal energy Specific heat capacity Phase change Specific latent heat 3.2 – Modelling a gas 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	Describing temperature change in terms of internal energy Using Kelvin and Celsius temperature scales and converting between them. Applying the calorimetric techniques of specific heat capacity or specific latent heat experimentally. Describing phase change in terms of molecular behaviour Sketching and interpreting phase change graphs. Calculating energy changes involving specific heat capacity and specific latent heat of fusion and vaporization. Solving problems using the equation of state for an ideal gas and gas laws. Sketching and interpreting changes of state of an ideal gas on pressure–volume, pressure–temperature and volume–temperature diagrams. Investigating at least one gas law experimentally.	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan
Option B: Engineering	Students will develop knowledge of the physical properties common to all	1a; 1b; 1c 2a; 2b; 2c	B.2 – Thermodynamics	Describing the first law of thermodynamics as a statement	Relevant activities from this range:	Mid and end of semester examinations are held on all	Physics IB Diploma – Pearson Data Logger Equipment

physics **(B1 – B3)** **(20 Hours)**	objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.	3a; 3b; 3c; 3d 4	The first law of thermodynamics The second law of thermodynamics Entropy Cyclic processes and *pV* diagrams Isovolumetric, isobaric, isothermal and adiabatic processes Carnot cycle Thermal efficiency B.1 – Rigid bodies and rotational dynamics Torque. Moment of inertia. Rotational and translational equilibrium. Angular acceleration. Equations of rotational motion for uniform angular acceleration. Newton's second law applied to angular motion. Conservation of angular momentum. B.3 – Fluids and fluid dynamics (HL only) Density and pressure.	of conservation of energy. Explaining sign convention used when stating the first law of thermodynamics a $Q = \Delta U + W$. Solving problems involving the first law of thermodynamics. Describing the second law of thermodynamics in Clausius form, Kelvin form and as a consequence of entropy. Describing examples of processes in terms of entropy change. Solving problems involving entropy changes. Sketching and interpreting cyclic processes. Solving problems for adiabatic processes for monatomic gases using pV^3 = constant. Solving problems involving thermal efficiency Calculating torque for single forces and couples. Solving problems involving moment of inertia, torque and angular acceleration. Solving problems in which objects are in both rotational and translational equilibrium. Solving problems using rotational quantities analogous to linear quantities. Sketching and interpreting graphs of rotational motion. Solving problems involving rolling without slipping.	Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	–		Buoyancy and Archimedes' principle. Pascal's principle. Hydrostatic equilibrium. The ideal fluid. Streamlines. The continuity equation. The Bernoulli equation and the Bernoulli effect. Stokes' law and viscosity. Laminar and turbulent flow and the Reynolds number.	Determining buoyancy forces using Archimedes' principle. Solving problems involving pressure, density and Pascal's principle. Solving problems using the Bernoulli equation and the continuity equation. Explaining situations involving the Bernoulli effect. Describing the frictional drag force exerted on small spherical objects in laminar fluid flow. Solving problems involving Stokes' law. Determining the Reynolds number in simple situations.			
Topic 4: Waves (4.1) (3 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts,	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	4.1 – Oscillations Simple harmonic oscillations Time period, frequency, amplitude, displacement and phase difference Conditions for simple harmonic motion	Qualitatively describing the energy changes taking place during one cycle of an oscillation Sketching and interpreting graphs of simple harmonic motion examples	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course.	X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.				pHET and other simulations	Assessed practical's Are given an IB grade	
Topic 9: Wave phenomena (9.1) (HL Only) (3 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world,	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	9.1 – Simple harmonic motion The defining equation of SHM Energy changes	Solving problems involving acceleration, velocity and displacement during simple harmonic motion, both graphically and algebraically. Describing the interchange of kinetic and potential energy during simple harmonic motion. Solving problems involving energy transfer during simple harmonic motion, both graphically and algebraically.	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.						
Option B: Engineering physics **(B4) (HL Only)** **(5 Hours)**	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d	B.4 – Forced vibrations and resonance Natural frequency of vibration *Q* factor and damping Periodic stimulus and the driving frequency Resonance	Qualitatively and quantitatively describing examples of under-, over- and critically- damped oscillations. Graphically describing the variation of the amplitude of vibration with driving frequency of an object close to its natural frequency of vibration. Describing the phase relationship between driving frequency and forced oscillations. Solving problems involving *Q* factor. Describing the useful and destructive effects of resonance.	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	scientific inquiry.						
Topic 4: Waves **(4.2 – 4.5)** **(12 Hours)**	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	4.2 – Travelling waves Travelling waves Wavelength, frequency, period and wave speed Transverse and longitudinal waves The nature of electromagnetic waves The nature of sound waves 4.3 – Wave characteristics Wavefronts and rays Amplitude and intensity Superposition Polarization 4.4 – Wave behaviour 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.	Explaining the motion of particles of a medium when a wave passes through it for both transverse and longitudinal cases. Sketching and interpreting displacement–distance graphs and displacement–time graphs for transverse and longitudinal waves. Solving problems involving wave speed, frequency and wavelength. Investigating the speed of sound experimentally. Sketching and interpreting diagrams involving wavefronts and rays. Solving problems involving amplitude, intensity and the inverse square law. Sketching and interpreting the superposition of pulses and waves. Describing methods of polarization. Sketching and interpreting diagrams illustrating polarized, reflected and transmitted beams. Solving problems involving Malus's law. Sketching and interpreting incident, reflected and transmitted waves at boundaries between media. Solving problems involving reflection at a	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

			4.5 – Standing waves The nature of standing waves Boundary conditions Nodes and antinodes	plane interface. Solving problems involving Snell's law, critical angle and total internal reflection. Determining refractive index experimentally. Qualitatively describing the diffraction pattern formed when plane waves are incident normally on a single-slit. Quantitatively describing double-slit interference intensity patterns. Describing the nature and formation of standing waves in terms of superposition. Distinguishing between standing and travelling waves. Observing, sketching and interpreting standing wave patterns in strings and pipes. Solving problems involving the frequency of a harmonic, length of the standing wave and the speed of the wave			
Topic 9: Wave phenomena (9.2 – 9.5) (HL Only) (14 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	9.2 – Single-slit diffraction The nature of single-slit diffraction 9.3 – Interference Young's double-slit experiment	Describing the effect of slit width on the diffraction pattern. Determining the position of first interference minimum. Qualitatively describing single-slit diffraction patterns produced from white light and from a range of monochromatic light frequencies. Qualitatively describing two-slit interference patterns, including	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.		Modulation of two-slit interference pattern by one-slit diffraction effect Multiple slit and diffraction grating interference patterns Thin film interference 9.4 – Resolution The size of a diffracting aperture The resolution of simple monochromatic two-source systems. 9.5 – Doppler effect The Doppler effect for sound waves and light waves	modulation by one-slit diffraction effect. Investigating Young's double-slit experimentally. Sketching and interpreting intensity graphs of double-slit interference patterns. Solving problems involving the diffraction grating equation. Describing conditions necessary for constructive and destructive interference from thin films, including phase change at interface and effect of refractive index. Solving problems involving interference from thin films. Solving problems involving the Rayleigh criterion for light emitted by two sources diffracted at a single slit. Resolvance of diffraction grating Sketching and interpreting the Doppler effect when there is relative motion between source and observer. Describing situations where the Doppler effect can be utilized. Solving problems involving the change in frequency or wavelength observed due to the Doppler effect to determine the velocity of the source/observer.	Past Paper Practice pHET and other simulations	weeks into the course. Assessed practical's Are given an IB grade	
Topic 6: Circular motion and	Students will develop knowledge of the physical properties common to all	1a; 1b; 1c 2a; 2b; 2c	6.1 – Circular motion	Identifying the forces providing the centripetal forces such as tension,	Relevant activities from this range:	Mid and end of semester examinations are held on all	Physics IB Diploma – Pearson Data Logger Equipment

gravitation (5 Hours)	objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will demonstrate an understanding of the history of science and the evolvement of scientific knowledge. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.	3a; 3b; 3c; 3d 4	Period, frequency, angular displacement and angular velocity Centripetal force Centripetal acceleration 6.2 – Newton's law of gravitation Newton's law of gravitation Gravitational field strength	friction, gravitational, electrical, or magnetic. Solving problems involving centripetal force, centripetal acceleration, period, frequency, angular displacement, linear speed and angular velocity. Qualitatively and quantitatively describing examples of circular motion including cases of vertical and horizontal circular motion. Describing the relationship between gravitational force and centripetal force. Applying Newton's law of gravitation to the motion of an object in circular orbit around a point mass. Solving problems involving gravitational force, gravitational field strength, orbital speed and orbital period. Determining the resultant gravitational field strength due to two bodies.	Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan
Topic 5: Electricity and magnetism (15 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	5.1 – Electric fields Charge; Electric field; Coulomb's law; Electric current; Direct current (dc); Potential difference	Identifying two forms of charge and the direction of the forces between them. Solving problems involving electric fields and Coulomb's law. Calculating work done in an electric field in both joules and electronvolts.	Relevant activities from this range: Daily reinforcement activities Homework Practical	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers)	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will demonstrate an understanding of the history of science and the evolvement of scientific knowledge. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will formulate designs to collect data, and formulate scientific explanations. Students will develop an understanding of the nature of scientific inquiry.		5.2 – Heating effect of electric currents 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 5.3 – Electric cells Cells Internal resistance Secondary cells Terminal potential difference Electromotive force (emf)	Identifying sign and nature of charge carriers in a metal. Identifying drift speed of charge carriers. Solving problems using the drift speed equation. Solving problems involving current, potential difference and charge. Drawing and interpreting circuit diagrams. Identifying ohmic and non-ohmic conductors through a consideration of the *V/I* characteristic graph. Solving problems involving potential difference, current, charge, Kirchhoff's circuit laws, power, resistance and resistivity. Investigating combinations of resistors in parallel and series circuits. Describing ideal and non-ideal ammeters and voltmeters. Describing practical uses of potential divider circuits, including the advantages of a potential divider over a series resistor in controlling a simple circuit. Investigating one or more of the factors that affect resistance experimentally. Investigating practical electric cells (both primary and secondary) Describing the discharge characteristic of a simple cell (variation of terminal potential difference with time) Identifying the direction of current flow required to recharge a cell	Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	

			5.4 – Magnetic effects of electric currents Magnetic fields Magnetic force	Determining internal resistance experimentally Solving problems involving emf, internal resistance and other electrical quantities Determining the direction of force on a charge moving in a magnetic field. Determining the direction of force on a current-carrying conductor in a magnetic field. Sketching and interpreting magnetic field patterns. Determining the direction of the magnetic field based on current direction. Solving problems involving magnetic forces, fields, current and charges.			

Curriculum Map for Physics DP2 (Group 4)

Unit Title (Time frame)	Standards	IB Objectives	Knowledge/Content	Skills	Assessments		Key resources
	What are students expected to know and be able to do (knowledge and skills) by the end of a specific stage in their education?—General statements To be the same across all year levels	***What IB Objectives (as stated in Subject Guides) will this unit address?***	***What key knowledge will students acquire as a result of this unit? This requires a summary of key content for the unit.***	What skills will they acquire in this unit?	***Through what tasks will students demonstrate the desired understanding? What IB criteria will be used to assess the students?*** **Summative Assessments:** All assessment tasks which will be used to calculate a student's semester grade (must be entered on Engage Gradebook). Must be IB type assessment. **Formative Assessment:** All assessment tasks which are used to provide students with periodic feedback so they are aware of their progress. These could include quizzes, posters, etc. (Do not enter on Engage Gradebook).		Textbook Other texts Websites Videos Movies Community as a resource? Trip
					Formative (Quizzes, Written Questions answered in class)	Assessments for End of Unit (These go into Engage columns!) **SUMMATIVE**	**Inthinking Subscription for expert advice** **Baiyun Mountain for Group 4 project.**

Topic 10: Fields (HL Only) (11 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the nature of scientific inquiry. Students will formulate designs to collect data, collect data, and formulate scientific explanations.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d	10.1 – Describing fields Gravitational fields Electrostatic fields Electric potential and gravitational potential Field lines Equipotential surfaces 10.2 – Fields at work Potential and potential energy Potential gradient Potential difference Escape speed Orbital motion, orbital speed and orbital energy Forces and inverse-square law behaviour	Representing sources of mass and charge, lines of electric and gravitational force, and field patterns using an appropriate symbolism. Mapping fields using potential. Describing the connection between equipotential surfaces and field lines. Determining the potential energy of a point mass and the potential energy of a point charge. Solving problems involving potential energy. Determining the potential inside a charged sphere. Solving problems involving the speed required for an object to go into orbit around a planet and for an object to escape the gravitational field of a planet. Solving problems involving orbital energy of charged particles in circular orbital motion and masses in circular orbital motion Solving problems involving forces on charges and masses in radial and uniform fields.	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan Colorado pHET sims throughout whole course Standard lab physics equipment throughout whole course

Alcanta International College
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Topic 11: Electromagnetic induction (HL Only) (16 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the nature of scientific inquiry. Students will formulate designs to collect data, collect data, and formulate	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	11.1 – Electromagnetic induction Electromotive force (emf) Magnetic flux and magnetic flux linkage Faraday's law of induction Lenz's law 11.2 – Power generation and transmission 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 11.3 – Capacitance Capacitance Dielectric materials Capacitors in series and parallel Resistor-capacitor (RC) series circuits Time constant	Describing the production of an induced emf by a changing magnetic flux and within a uniform magnetic field. Solving problems involving magnetic flux, magnetic flux linkage and Faraday's law. Explaining Lenz's law through the conservation of energy. Explaining the operation of a basic ac generator, including the effect of changing the generator frequency. Solving problems involving the average power in an ac circuit. Solving problems involving step-up and step-down transformers. Describing the use of transformers in ac electrical power distribution. Investigating a diode bridge rectification circuit experimentally. Qualitatively describing the effect of adding a capacitor to a diode bridge rectification circuit. Describing the effect of different dielectric materials on capacitance Solving problems involving parallel-plate capacitors Investigating combinations of capacitors in series or parallel circuits Determining the energy stored in a charged capacitor Describing the nature of the exponential discharge of a capacitor Solving problems involving the discharge of a capacitor through a fixed resistor Solving problems involving the time	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	scientific explanations.			constant of an RC circuit for charge, voltage and current			
Topic 7: Atomic, nuclear and particle physics (14 Hours)	Students will demonstrate an understanding of the history of science and the evolvement of scientific knowledge. Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will develop an understanding of the nature of scientific inquiry.	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d 4	7.1 – Discrete energy and radioactivity Discrete energy and discrete energy levels Transitions between energy levels Radioactive decay Fundamental forces and their properties Alpha particles, beta particles and gamma rays Half-life Absorption characteristics of decay particles Isotopes Background radiation 7.2 – Nuclear reactions The unified atomic mass unit Mass defect and nuclear binding energy Nuclear fission and nuclear fusion 7.3 – The structure of matter Quarks, leptons and their antiparticles Hadrons, baryons and mesons The conservation laws of charge, baryon number, lepton number and strangeness The nature and range of the strong nuclear force, weak nuclear force and electromagnetic force Exchange particles Feynman diagrams	Describing the emission and absorption spectrum of common gases. Solving problems involving atomic spectra, including calculating the wavelength of photons emitted during atomic transitions. Completing decay equations for alpha and beta decay. Determining the half-life of a nuclide from a decay curve. Investigating half-life experimentally (or by simulation). Solving problems involving mass defect and binding energy. Solving problems involving the energy released in radioactive decay, nuclear fission and nuclear fusion. Sketching and interpreting the general shape of the curve of average binding energy per nucleon against nucleon number. Describing the Rutherford-Geiger-Marsden experiment that led to the discovery of the nucleus. Applying conservation laws in particle reactions. Describing protons and neutrons in terms of quarks. Comparing the interaction strengths of the fundamental forces, including gravity. Describing the mediation of the fundamental forces through exchange particles. Sketching and interpreting simple Feynman diagrams. Describing why free quarks are not observed.	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	Students will formulate designs to collect data, collect data, and formulate scientific explanations.		Confinement The Higgs boson				
Topic 12: Quantum and nuclear physics (16 Hours)	Students will demonstrate an understanding of the history of science and the evolvement of scientific knowledge. Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles that explain the world,	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d	12.1 – The interaction of matter with radiation Photons The photoelectric effect Matter waves Pair production and pair annihilation Quantization of angular momentum in the Bohr model for hydrogen The wave function The uncertainty principle for energy and time and position and momentum Tunnelling, potential barrier and factors affecting tunnelling probability 12.2 – Nuclear physics Rutherford scattering and nuclear radius Nuclear energy levels The neutrino The law of radioactive decay and the decay constant	Discussing the photoelectric effect experiment and explaining which features of the experiment cannot be explained by the classical wave theory of light. Solving photoelectric problems both graphically and algebraically. Discussing experimental evidence for matter waves, including an experiment in which the wave nature of electrons is evident. Stating order of magnitude estimates from the uncertainty principle. Describing a scattering experiment including location of minimum intensity for the diffracted particles based on their de Broglie wavelength Explaining deviations from Rutherford scattering in high energy experiments Describing experimental evidence for nuclear energy levels Solving problems involving the radioactive decay law for arbitrary time intervals Explaining the methods for measuring short and long half-lives	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	through science. Students will develop an understanding of the nature of scientific inquiry. Students will formulate designs to collect data, collect data, and formulate scientific explanations.						
Topic 8: Energy production (8 Hours)	Students will develop knowledge of the physical properties common to all objects and substances, and states of matter, as well as the chemical properties, particulate nature of matter, the Periodic Table of Elements, and of the characteristics of sub-atomic particles and atomic particles. Students will develop an understanding of the facts, concepts, models, terminology and principles that explain the world, through science. Students will apply their understanding of the facts, concepts, models, terminology and principles	1a; 1b; 1c 2a; 2b; 2c 3a; 3b; 3c; 3d	8.1 – Energy sources Specific energy and energy density of fuel sources Sankey diagrams Primary energy sources Electricity as a secondary and versatile form of energy Renewable and non-renewable energy sources 8.2 – Thermal energy transfer Conduction, convection and thermal radiation Black-body radiation Albedo and emissivity The solar constant The greenhouse effect	Solving specific energy and energy density problems. Sketching and interpreting Sankey diagrams. Describing the basic features of fossil fuel power stations, nuclear power stations, wind generators, pumped storage hydroelectric systems and solar power cells. Solving problems relevant to energy transformations in the context of these generating systems. Discussing safety issues and risks associated with the production of nuclear power. Describing the differences between photovoltaic cells and solar heating panels. Sketching and interpreting graphs showing the variation of intensity with wavelength for bodies emitting thermal radiation at different temperatures. Solving problems involving the Stefan–Boltzmann law and Wien's displacement law. Describing the effects of the Earth's atmosphere on the mean surface	Relevant activities from this range: Daily reinforcement activities Homework Practical Class work Answers to Book Questions Worksheet Past Paper Practice pHET and other simulations	Mid and end of semester examinations are held on all work/topics covered to the date of the examination. Paper1 (Multiple Choice, Paper 2 and 3 (Written Answers) Assessment based on Mark Scheme, and a Grade of 1 – 7 given. Formal written paper 2 or 3 exam questions are held weekly from 6 weeks into the course. Assessed practical's Are given an IB grade	Physics IB Diploma – Pearson Data Logger Equipment X:\Acad\Science\IB Physics\Topics Multiple copies of all IB Physics texts on Library desk loan

	that explain the world, through science. Students will develop an understanding of the nature of scientific inquiry. Students will formulate designs to collect data, collect data, and formulate scientific explanations.		Energy balance in the Earth surface–atmosphere system	temperature. Solving problems involving albedo, emissivity, solar constant and the Earth's average temperature.			