

Wah Yan College Kowloon
F.5 Physics Scheme of Work (2017-2018)

Textbook	1. New Senior Secondary Physics at Work 4 - Electricity and Magnetism (for Physics, 2 nd Edition) 2. New Senior Secondary Physics at Work 5 - Radioactivity and Nuclear Energy (for Physics, 2 nd Edition) 3. New Senior Secondary Physics at Work 1 - Heat and Gases (for Physics, 2 nd Edition)
Other Resources	

◆ **Repertoire of Self-directed Learning Skills:**

1. reading to learn, 2. notes-taking, 3. looking up words in the dictionary, 4. pre-lesson preparation, 5. group discussion, 6. group presentation, 7. initiative to ask questions, 8. setting learning objectives and doing reflection, 9. eLearning platform with instant feedback, 10. flipped classroom, 11. peer assessment, 12. searching for information on the internet, 13. project learning, 14. training of higher-order thinking skills, etc.

SL: Scheduled number of lessons

AL: Actual number of lessons

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills◆	Values#	Basic Law Education ※	Consolidation and Assessment
First Term (3/9/2017- 30/12/2017, Weeks 1-17)	1-2	Electrostatics					I		
		1.1 Electric charge and electric fields	1 Two kinds of charge 2 Where do charges come from? 3 Unit of charge 4 Insulators and conductors 5 Attraction of uncharged object a Conductors b Insulators	4	<i>Simulation</i> 1.1 Attraction of uncharged objects <i>Video</i> 1.1 Attraction of uncharged objects 1.2 Charging by friction 1.3 Expt 1a -	1 and 2			The magic of charges Checkpoint 1 Checkpoint 2 Checkpoint 3 Checkpoint 4

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			6 Charging and discharging a Charging by friction b Charging by sharing c Charging by induction d Earthing 7 Van de Graaff generator 8 Electric field a Electric field lines b Electric field patterns i Electric field around point charges ii Electric field between two parallel charged		Charging and discharging 1.4 Expt 1b - Fun with electric charges 1.5 Expt 1c - Electric field patterns				Practice 1.1

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			plates						
		1.2 More about electric fields	1 Coulomb's law 2 Electric field strength a Field strength around a point charge b Field strength between parallel charged plates 3 Electric potential energy	4+1 (for problem solving and revision)	<i>Simulation</i> 1.2 Electric field	1 and 2			Lightning Checkpoint 5 Checkpoint 6 Checkpoint 7 Practice 1.2
	3-6	Electric Circuits			Lab				
		2.1 Electric current	1 Flow of electric charges 2 Electric current a Convention for direction of current b Current and its unit c Measuring current	1.5	<i>Simulation</i> 2.1 Reading an ammeter	1 and 2			Does a charged bulb light up? Checkpoint 1 Checkpoint 2 Practice 2.1

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			d Current in series and parallel circuits						
		2.2 Voltage, electromotive force and potential difference	1 Energy change in a circuit 2 Voltage, p.d. and e.m.f. a Definitions b Measuring voltage c Voltage in series and parallel circuits d Cells in series and parallel	1.5	<i>Simulation</i> 2.2 Model of a simple circuit 2.3 Energy change in a circuit 2.4 Reading a voltmeter	1 and 2			Energy conversion in a circuit Checkpoint 3 Checkpoint 4 Practice 2.2
		2.3 Resistance	1 Definition of resistance a Resistance and its unit b Measuring resistance 2 Ohm's law 3 Factors affecting resistance	4	<i>Simulation</i> 2.5 Ohm's law 2.6 Resistance of a metal wire <i>Video</i> 2.1 Using the multimeter 2.2 Expt 2a - Ohm's law	1 and 2			Checking saltiness Checkpoint 5 Checkpoint 6 Checkpoint 7

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			a Temperature b Length and thickness c Resistivity 4 Fixed and variable resistors		2.3 Expt 2b - Effect of temperature on resistance of metal wire 2.4 Expt 2c - Effect of length and thickness on resistance				Practice 2.3
		2.4 Resistors in series and in parallel	1 Resistors in series 2 Resistors in parallel 3 Potential divider 4 Short circuit	4	<i>Simulation</i> 2.7 Series circuit 2.8 Parallel circuit 2.9 Complicated circuit 2.10 Parallel and series combinations <i>Video</i> 2.5 Expt 2d - Equivalent resistance of resistors in series 2.6 Expt 2e -	1 and 2			Resistor network Checkpoint 8 Checkpoint 9 Practice 2.4

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					Equivalent resistance of resistors in parallel				
		2.5 Resistance of ammeters, voltmeters and power sources	1 Resistance of ammeters 2 Resistance of voltmeters 3 Internal resistance of power sources	2 + 2 (for problem solving and revision)	<i>Video</i> 2.7 Expt 2f - Using an ammeter to measure current 2.8 Expt 2g - Using a voltmeter to measure voltage across resistors 2.9 Expt 2h - E.m.f. of a battery	1 and 2			Battery at low temperature Checkpoint 10 Checkpoint 11 Practice 2.5 Revision Exercise 2
	6-7	Domestic Electricity					II		
		3.1 Electrical power and energy	1 The heating effect of electric current 2 Electrical power 3 Power rating	3	<i>Video</i> 3.1 Expt 3a - Measuring electrical	1 and 2			Which one is brighter? Checkpoint 1

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			4 Electrical energy a Measuring electrical energy b Electricity bill		energy with a kilowatt-hour meter				Checkpoint 2 Practice 3.1
		3.2 Mains electricity and household wiring	1 Alternating current 2 The mains circuit 3 Safety designs in domestic electricity a Fuse b Earth wire c Double insulation d Three-pin plug and socket 4 Household wiring a Ring main b Lighting circuit	3 + 1 (for problem solving and revision)	<i>Simulation</i> 3.1 The 3D model of plug and socket 3.2 Household wiring <i>Video</i> 3.2 Fuse	1 and 2			Be an electrician! Checkpoint 3 Checkpoint 4 Practice 3.2 Revision exercise 3
	7-10	Electromagnetism							Lab : SBA 1
		4.1 Magnetic forces and magnetic fields	1 Magnets 2 Magnetic fields 3 The earth's magnetic field	2	<i>Simulation</i> 4.1 Magnetic field <i>Video</i> 4.1 Expt 4a - Magnetic field patterns	1 and 2			Stacking up coins Checkpoint 1 Practice 4.1

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					4.2 3-D magnetic field pattern				
		4.2 Magnetic fields of electric currents	<p>1 Magnetic field patterns of electric currents</p> <p>a Field pattern around a long straight wire</p> <p>b Field pattern around a circular coil</p> <p>c Field pattern due to a solenoid</p> <p>2 Calculating magnetic fields of electric currents</p> <p>a Field around a long straight wire</p> <p>b Field inside a long solenoid</p> <p>3 Electromagnets</p> <p>a How an</p>	5	<p><i>Simulation</i></p> <p>4.2 Magnetic field around a long straight wire</p> <p><i>Video</i></p> <p>4.3 Expt 4b - Magnetic field patterns of electric currents</p> <p>4.4 Expt 4c – Electromagnets</p>	1 and 2			<p>Door holder</p> <p>Checkpoint 2</p> <p>Checkpoint 3</p> <p>Checkpoint 4</p> <p>Practice 4.2</p>

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			<ul style="list-style-type: none"> electromagnet works b Factors affecting the strength of an electromagnet c Applications of electromagnets <ul style="list-style-type: none"> i Cranes ii Electric bells and buzzers iii Earphone iv Magnetic levitation (Maglev) trains 						
		4.3 Force due to magnetic fields	1 Magnetic force on a current-carrying conductor <ul style="list-style-type: none"> a Fleming's left-hand rule b Factors affecting magnetic force 	6	<i>Simulation</i> 4.3 Working principle of a loudspeaker 4.4 Turning effect on a coil 4.5 Simple d.c. motor	1 and 2			'Battery car' Checkpoint 5 Checkpoint 6 Checkpoint 7

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			<ul style="list-style-type: none"> c Calculating the magnetic force on a straight current-carrying wire 2 Magnetic force between two parallel wires 3 Turning effect on a coil 4 Electric motors <ul style="list-style-type: none"> a Structure of a simple d.c. motor b How a simple d.c. motor works c Practical motors 		<i>Video</i> 4.5 Battery car 4.6 Expt 4d - The magnetic force on a current-carrying conductor 4.7 Expt 4e - Effect of current on magnetic force 4.8 Expt 4f - Effect of magnetic field on magnetic force 4.9 Expt 4g - Simple electric motor <i>DIY corner</i> A simple electric motor				Checkpoint 8 Checkpoint 9 Practice 4.3
		4.4 Magnetic forces on moving charges	<ul style="list-style-type: none"> 1 Magnetic force on a moving charge 	2 + 2 (for problem solving)		1 and 2			Mass spectrometer

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			2 Motion of a moving charge in a uniform magnetic field a Moving charges in a magnetic field b Moving charges in both electric and magnetic fields	and revision)					Checkpoint 10 Checkpoint 11 Practice 4.4 Revision exercise 4
	11-13	Electromagnetic Induction							
		5.1 Current generation in a magnetic field	1 Induced e.m.f. and current a Conductor experiencing a change in magnetic field b Conductor cutting through magnetic field lines c Faraday's law of electromagnetic	4	<i>Simulation</i> 5.1 Lenz's Law <i>Video</i> 5.1 Balls with different falling speeds 5.2 Expt 5a - Relative movement of conductor and magnet 5.3 Expt 5b - Moving a	1 and 2			Different falling speeds Checkpoint 1 Checkpoint 2 Practice 5.1

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			induction 2 Direction of induced e.m.f. and current a Lenz's Law b Fleming's right-hand rule		conductor across a steady magnetic field 5.4 Expt 5c - Investigating induced e.m.f. in a coil using data-logger				
		5.2 Faraday's law and magnetic flux	1 Magnetic flux and flux density a Magnetic flux b Magnetic flux density 2 Mathematical representation of Faraday's law and Lenz's law 3 More examples of applying Faraday's law 4 Search coil	4	<i>Video</i> 5.5 Expt 5d - Studying magnetic field using a search coil	1 and 2			Turning a conductor into a power source Checkpoint 3 Checkpoint 4 Practice 5.2
		5.3 Applications of electromagnetic	1 Generators a Induced e.m.f. and current in a	4 + 2 (for problem	<i>Simulation</i> 5.2 Induced current in a	1 and 2			Digital pen Checkpoint 5

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills♦	Values#	Basic Law Education *	Consolidation and Assessment
		induction	rotating coil b Simple a.c. generator c Simple d.c. generator d Practical generators i Bicycle dynamos ii Alternators 2 Eddy currents 3 Practical uses of eddy current a Induction cookers b Eddy current brakes c Induction furnaces 4 Other applications of electromagnetic induction a Moving-coil microphones b Digital pens	solving and revision)	rotating coil 5.3 Simple a.c. generator 5.4 Simple d.c. generator <i>Video</i> 5.6 Shake-shake torch 5.7 Expt 5e - Eddy current 5.8 The induction cooker <i>DIY corner</i> Dancing aluminium foil Floating aluminium disc				Checkpoint 6 Practice 5.3 Revision exercise 5

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			c Hard disks						
	14-16	Examination							
Second Term (31/12/2017- 18/7/2018, Weeks 18-46)	18-20	Transmission of Electrical Energy			Lab slow AC				
		6.1 Alternating currents	1 Alternating currents and e.m.f. a Sinusoidal a.c. b Other forms of a.c. 2 Direct currents and e.m.f a Steady d.c. b Varying d.c. 3 Effective values of a.c. 4 Root-mean-square values of a.c. 5 The relationship between r.m.s and peak values of a sinusoidal a.c	5	<i>Video</i> 6.1 Expt 6a - Current and e.m.f. produced by a small a.c. generator 6.2 Expt 6b - The effective values of an a.c.	1 and 2		Patterns formed by light emitting diodes Checkpoint 1 Checkpoint 2 Checkpoint 3 Practice 6.1	
		6.2 Transformers and high voltage	1 How a transformer works	4 + 1 (for	<i>Simulation</i> 6.1 Mutual	1 and 2	III		Appliance

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills♦	Values#	Basic Law Education *	Consolidation and Assessment
		transmission	2 Voltage ratio 3 Currents in a transformer 4 Practical transformers 5 High voltage transmission of electrical energy a Power loss in transmission cables b Transmission of electrical power	problem solving and revision)	inductance 6.2 Simple transformer <i>Video</i> 6.3 Expt 6c - Simple transformer 6.4 Expt 6d - The relationship between the voltage ratio and the turns ratio 6.5 Expt 6e - The model power line				using both a.c. and d.c. Checkpoint 4 Checkpoint 5 Checkpoint 6 Practice 6.2 Revision exercise 6
	20-21	Radiation and Radioactivity							
		1.1 X-rays and nuclear radiation	1 X-rays a Production of X-rays b Properties of X-rays 2 Nuclear radiation	2	<i>Video</i> 1.1 Blackening of photographic plate	1 and 2	I		What is radiation? Checkpoint 1 Practice 1.1

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		1.2 Radioactivity	1 Sources of radiation a Background radiation b Radioactive sources in school laboratory 2 Ionizing power 3 Cloud chamber tracks 4 Range and penetrating power a Range b Penetrating power 5 Deflections in an electric field 6 Deflections in a magnetic field	4 + 1 (for problem solving and revision)	<i>Simulation</i> 1.1 Penetrating power 1.2 Deflection of α , β and γ radiation in a magnetic field <i>Video</i> 1.2 Expt 1a - Ionizing power of radiation 1.3 Expt 1b - Diffusion cloud chamber 1.4 Expt 1c - Right-angled fork track 1.5 The Geiger-Müller (G-M) counter 1.6 Expt 1d - Range and penetrating power of	1 and 2	II		A radiation detector? Checkpoint 2 Checkpoint 3 Practice 1.2 Revision exercise 1

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					radiation 1.7 Expt 1e - Magnetic deflection of β radiation				
	21-23	Atomic Structure and Radioactive Decay			Simulating radioactive decay				
		2.1 The atomic model	1 Rutherford's atomic model 2 Structure of an atom 3 Atomic number and mass number 4 Nuclides and isotopes	2	<i>Simulation</i> 2.1 Rutherford -Bohr model of the atom	1 and 2			What is the structure of an atom? Checkpoint 1 Practice 2.1
		2.2 Radioactive decay	1 Three types of decay a Alpha decay b Beta decay c Gamma emission 2 Decay series 3 Characteristics of radioactive decay	3	<i>Simulation</i> 2.2 Radioactive decay 2.3 Radioactive decay and half-life <i>Video</i> 2.1 Expt 2a - Radioactive	1 and 2			Disposal of radioactive wastes Checkpoint 2 Checkpoint 3

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			<ul style="list-style-type: none"> a Random nature b Activity c Half-life d Exponential decay 		decay—a dice analogy				<p>Checkpoint 4</p> <p>Practice 2.2</p>
		2.3 Uses of radioisotopes and radiation safety	<ul style="list-style-type: none"> 1 Uses of radioisotopes <ul style="list-style-type: none"> a Archaeology <ul style="list-style-type: none"> i Carbon-14 dating ii Geological dating b Medicine <ul style="list-style-type: none"> i Tracer ii Radiotherapy iii Sterilization c Industry <ul style="list-style-type: none"> i Thickness gauge ii Smoke detector (fire alarm) iii Tracer d Agriculture <ul style="list-style-type: none"> i Tracer ii Food irradiation 2 Radiation safety <ul style="list-style-type: none"> a Biological effect 	2 + 2 (for problem solving and revision)		1 and 2			<p>Extinct species reappeared</p> <p>Checkpoint 5</p> <p>Checkpoint 6</p> <p>Practice 2.3</p> <p>Revision Exercise 2</p>

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			<ul style="list-style-type: none"> of nuclear radiation b Radiation dose c Protection against radiation 						
	24-25	Lunar New year holiday							
	26-27	Nuclear Energy							
		3.1 Nuclear fission and fusion	<ul style="list-style-type: none"> 1 Nuclear fission 2 Chain reaction and critical mass 3 Nuclear fusion 	2	<i>Simulation</i> 3.1 Nuclear fission and chain reaction 3.2 Nuclear fusion	1 and 2			A trip to Mars Checkpoint 1 Practice 3.1
		3.2 Mass-energy relationship	<ul style="list-style-type: none"> 1 Mass-energy equivalence 2 Energy released in nuclear reactions <ul style="list-style-type: none"> a Atomic mass unit b Electron-volt c Mass difference and energy 	2		1 and 2			Missing mass Checkpoint 2 Practice 3.2

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills♦	Values#	Basic Law Education *	Consolidation and Assessment
		3.3 Applications of nuclear energy	1 Nuclear power a Controlled nuclear fission i Generating electricity by nuclear power ii Nuclear waste iii Potential hazards iv Benefits and disadvantages b Controlled nuclear fusion 2 Nuclear weapons a Atomic bomb b Hydrogen bomb and neutron bomb 3 Spread of nuclear radiation a Exposure pathways b Monitoring background	2 + 2 (for problem solving and revision)		1 and 2			Mutant butterfly Checkpoint 3 Practice 3.3 Revision exercise 3

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills♦	Values#	Basic Law Education *	Consolidation and Assessment
			radiation						
	28	Problem Solving		4		1, 2 and 4			
	29	Uniform Test							
	30-31	Easter holiday							
	32-34	Gases							
		5.1 The gas laws	1 Pressure a Gas pressure i Atmospheric pressure ii Measuring gas pressure 2 Boyle's law 3 Pressure-temperature relationship a The Kelvin temperature scale b Pressure law 4 Volume-temperature relationship 5 The general gas law and ideal gases a The general	8	<i>Simulation</i> 5.1 Boyle's law 5.2 $p-T$ relationship of a gas 5.3 $V-T$ relationship of a gas <i>Video</i> 5.1 Collapsing can 5.2 Expt 5a - Boyle's law 5.3 Expt 5b - Pressure-temperature relationship of a gas 5.4 Expt 5c - Volume-tempe	1 and 2			Aerosol cans Checkpoint 1 Checkpoint 2 Checkpoint 3 Checkpoint 4 Checkpoint 5 Checkpoint 6 Practice 5.1

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			gas law b Ideal gases 6 Graphs and gas laws		rature relationship of a gas 5.5 Growing marshmallow				
	33	5.2 The kinetic theory of gases	1 Random motion of gas molecules 2 Assumptions about ideal gas 3 Pressure and molecular motion 4 Temperature and molecular motion a Molecular interpretation of temperature b Root-mean-square speed of molecules 5 Explaining gas laws using kinetic theory a Mechanical	3 + 2 (for problem solving and revision)	<i>Simulation</i> 5.4 Random motion of gas molecules 5.5 Kinetic theory and gas laws <i>Video</i> 5.6 Expt 5d - Observing the motion of smoke particles 5.7 Expt 5e - Mechanical simulator of kinetic theory	1 and 2			Gas and its molecules Checkpoint 7 Checkpoint 8 Practice 5.2 Revision exercise 5

School Term	Weeks	Topics/ Extended Parts*	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Self-directed Learning Skills♦	Values#	Basic Law Education *	Consolidation and Assessment
			simulator of kinetic theory b Qualitative explanation using kinetic theory						
	35-37	Problem Solving		8	Lab : SBA 2	1, 2 and 4			
	38-39	Revision				1 and 2			
	40-42	Final Exam							
	43-46	Post Exam							

* The extended parts should be marked with asterisks. These parts should be more challenging and can be covered when the students can master the knowledge and skills covered in the conventional topics.

* Check the appropriate box with a “√” if Basic Law Education can be promoted when covering a particular topic.

Core Values of Wah Yan College, Kowloon

I. Love and care	1. Accept & feel positive about himself 2. Appreciation & Gratitude 3. Empathy & Compassion	4. Forgiveness & Reconciliation 5. Service 6. Family as a basic unit of society; marriage is the foundation of a family
II. Strive for excellence	7. Reflective 8. Commitment 9. Perseverance	10. Curiosity & willingness to learn 11. Value imagination and creativity
III. Respect and Justice	12. Life is valuable and respectable	15. Integrity

	13. Openness to good in all things 14. Respect for himself & others	16. Faithfulness
IV. Responsibility	17. Freedom & Self-discipline 18. Care for the environment	19. Social Identities: citizen identity, national identity and global citizen identity
V. Faith	20. Experience of God 21. Explore & practise one's faith	22. Appreciate religious liturgies