

Wah Yan College Kowloon
F.6 Physics Scheme of Work (2017-2018)

Textbook	1. New Senior Secondary Physics At Work E3 - Energy and Use of Energy (for Physics, 2 nd Edition) 2. New Senior Secondary Physics At Work E2 - Atomic World (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	Electricity at Home (I)							
		1.1 Energy-consuming appliances at home	1 Main sources of energy in Hong Kong 2 Energy efficiency a Energy conversions and energy converters b End-use energy efficiency	1		1 and 2			Appliance with 100% energy efficiency Checkpoint 1 Practice 1.1

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		1.2 Cooking without fire	1 Electric hotplates 2 Induction cookers 3 Microwave ovens 4 Comparing different electric cookers a End-use energy efficiency b Choosing cookers	3	<i>Video</i> 1.1 The induction cooker	1 and 2			Electric hotplate and induction cooker Checkpoint 2 Checkpoint 3 Practice 1.2
		1.3 Air conditioning	1 How an air conditioner works 2 Choosing air conditioners a Cooling capacity b Coefficient of performance 3 Reusing heat in central air conditioning systems	3 + 1 (for problem solving and revision)	<i>Simulation</i> 1.1 Working principle of an air conditioner	1 and 2			Cooling a room Checkpoint 4 Checkpoint 5 Practice 1.3 Revision Exercise 1

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			<ul style="list-style-type: none"> a Heat recovery chillers b Geothermal heat pumps 						
	3-4	Electricity at Home (II)							
		2.1 Lighting	<ul style="list-style-type: none"> 1 Light emission and electron transition 2 Types of electric lights <ul style="list-style-type: none"> a Gas discharge lamps <ul style="list-style-type: none"> i Fluorescent tube lamps (FTL) ii Compact fluorescent lamps (CFL) ii 	6	<p><i>Simulation</i></p> <ul style="list-style-type: none"> 2.1 Fluorescent tube lamps 2.2 P-n junction in an LED <p><i>Video</i></p> <ul style="list-style-type: none"> 2.1 Expt 2a - Measuring brightness with a light meter 2.2 Expt 2b - Illuminance and the distance from a point source of light 	1 and 2			<ul style="list-style-type: none"> A brighter room Checkpoint 1 Checkpoint 2 Checkpoint 3 Checkpoint 4 Checkpoint 5 Practice 2.1

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			<p>High-intensity discharge lamps (HID lamps)</p> <p>b Incandescent lamps (filament lamps)</p> <p>i Conventional incandescent lamps</p> <p>ii Halogen lamps</p> <p>c Light emitting diodes (LED)</p> <p>3 Measuring brightness</p> <p>a Luminous flux</p> <p>b Illuminance</p>		2.3 Expt 2c - Comparing the efficacy of different types of light sources				

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			c Lambert's cosine law d Inverse square law 4 Choosing electric lights a Efficacy b Comparing different electric lights						
		2.2 Saving energy	1 Hong Kong Energy Efficiency Labelling Scheme 2 Energy-saving devices a Cookers i Pressure cookers ii Vacuum cookers b Air conditioners i Reverse	2 + 1 (for problem solving and revision)		1 and 2			Standby mode Checkpoint 6 Checkpoint 7 Practice 2.2 Revision Exercise 2

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			<ul style="list-style-type: none"> cycle air conditioners ii Inverter air conditioners c Switches <ul style="list-style-type: none"> i Timers ii Intelligent power bars d Lighting 						
	5-6	Energy Efficiency in Building and Transportation							
		3.1 Energy performance of buildings	<ul style="list-style-type: none"> 1 Factors affecting the energy performance of a building 2 Rate of conduction 3 U-values of building materials 4 Overall Thermal Transfer Value (OTTV) 5 Improving energy 	5	<i>Simulation</i> <ul style="list-style-type: none"> 3.1 Heat transfer in an air-conditioned flat 3.2 Factors affecting the rate of conduction 3.3 Reducing heat transfer through a building 	1 and 2			ZCB Checkpoint 1 Checkpoint 2 Checkpoint 3 Practice 3.1

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			efficiency of buildings a Reducing heat transfer by conduction i Walls and roofs ii Windows b Reducing heat transfer by radiation i Type of galss ii Solar control window film iii Sun-shading devices c Natural lighting d Orientation and design of buildings		envelope <i>Video</i> 3.1 Expt 3a - Estimating the thermal conductivity of glass 3.2 Expt 3b - Rates of heat transfer by conduction through windows 3.3 Expt 3c - Rates of heat transfer by radiation through windows				

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			e Renewable energy supplements f Energy management and control systems						
		3.2 Energy performance of transportation	1 Electric vehicles 2 Hybrid vehicles 3 Comparing different types of vehicles 4 Efficient use of transportation	3 + 2 (for problem solving and revision)	<i>Simulation</i> 3.4 Working principle of a hybrid vehicle <i>Video</i> 3.4 Expt 3d - A model of regenerative braking system	1 and 2			The secret of hybrid vehicles Checkpoint 4 Checkpoint 5 Practice 3.2 Revision exercise 3
	7-8	Energy Sources and Energy Consumption							
		4.1 Non-renewable energy sources	1 Fossil fuels 2 Nuclear power a Binding	3	<i>Simulation</i> 4.1 Pressurized water reactor	1 and 2			Fusion in stars Checkpoint 1

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			energy b Fission reactor						Checkpoint 2 Practice 4.1
		4.2 Renewable energy sources	1 Wind power 2 Hydroelectric power 3 Solar energy a Solar constant b Using solar energy i Solar heating devices ii Solar cells	5		1 and 2			Solar powered lamps Checkpoint 3 Checkpoint 4 Checkpoint 5 Checkpoint 6 Practice 4.2
	9	First Term Assessment							
	10	Energy Sources and Energy Consumption							
		4.3 Energy consumption	1 Impact on environment and society	2 + 1 (for proble	<i>Video</i> 4.1 Greenhouse effect and	1 and 2			Cattle and global warming

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			a Extraction b Conversion c Distribution d Consumption 2 Greenhouse gases and global warming a Greenhouse effect b Global warming 3 Energy consumption in Hong Kong	m solving and revision)	global warming				Checkpoint 7 Practice 4.3 Revision exercise 4
	10-12	Towards the Modern Atomic Model (I)							
		1.1 Rutherford's model and scattering experiments	1 Rutherford's atomic model a Geiger-Marsden scattering experiment b Rutherford's	2	<i>Simulation</i> 1.1 Limitations of Rutherford's model <i>Video</i> 1.1 How are the straws	1 and 2			How are the straws distributed? Checkpoint 1 Checkpoint 2

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			<ul style="list-style-type: none"> c atomic model Analogue of alpha scattering 2 Limitations of Rutherford's model 3 The importance of scattering experiments <ul style="list-style-type: none"> a Finding the structure of atoms and nuclei b Searching for new particles 		<ul style="list-style-type: none"> distributed? 1.2 Expt 1a - Analogue of alpha scattering 				Practice 1.1
		1.2 The puzzling photoelectric effect	<ul style="list-style-type: none"> 1 Photoelectric effect and photoelectrons 2 Some observations about the photoelectric effect <ul style="list-style-type: none"> a Threshold 	4	<i>Simulation</i> 1.2 Photoelectric effect <i>Video</i> 1.3 Light up a bulb by light of different colours 1.4 Expt 1b -	1 and 2			Lighting a bulb with visible light Checkpoint 3 Checkpoint 4 Practice 1.2

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
			<p>frequency</p> <p>b No time delay</p> <p>c Relationship between photoelectric current and potential difference</p> <p>d Rate of photoelectric emission and intensity of light</p> <p>3 Failure of wave theory in explaining certain experimental results</p>		Photoelectric effect				
		1.3 Einstein's interpretation of the photoelectric effect	<p>1 Light as particles: photons</p> <p>2 Interaction between photons and electrons</p> <p>a Work</p>	4 + 2 (for problem solving and		1 and 2			<p>The concept of 'quantum'</p> <p>Checkpoint 5</p> <p>Checkpoint 6</p>

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			function b One-to-one interaction c Threshold frequency d Einstein's photoelectric equation e Time delay in the photoelectric effect 3 Verification of Einstein's model 4 Particle nature of light	revision)					Checkpoint 7 Practice 1.3 Revision exercise 1
	13-15	Towards the Modern Atomic Model (II)							
		2.1 Atomic spectra and Bohr's model	1 Line spectrum a Emission spectrum b Absorption spectrum c Evidence of	7	<i>Simulation</i> 2.1 Emission spectrum 2.2 Absorption spectrum <i>Video</i>	1 and 2			Different colours of flame Checkpoint 1 Checkpoint 2

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			<p>the energy levels of atoms</p> <p>2 Bohr's model of the hydrogen atom</p> <p>a Bohr's postulates</p> <p>i Aspects in classical physics</p> <p>ii Aspects in quantum physics</p> <p>b Discrete energy levels of the hydrogen atom</p> <p>i Deriving the energy levels</p> <p>ii Electron transition</p> <p>3 Explaining the line</p>		<p>2.1 Expt 2a - Emission spectrum</p> <p>2.2 Expt 2b - Absorption spectrum</p> <p><i>DIY corner</i> Making a DVD spectrometer</p>				<p>Checkpoint 3</p> <p>Checkpoint 4</p> <p>Checkpoint 5</p> <p>Practice 2.1</p>

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			<ul style="list-style-type: none"> spectrum of hydrogen a Emission spectrum b Absorption spectrum 4 Limitations of Bohr's model 						
		2.2 Particles or waves?	<ul style="list-style-type: none"> 1 The wave-particle duality of light 2 Wave nature of matter <ul style="list-style-type: none"> a De Broglie wavelength b Experimental evidence of the wave nature of matter c De Broglie wavelength and quantization of angular 	2 + 2 (for problem solving and revision)	<i>Simulation</i> 2.3 Electron orbits <i>Video</i> 2.3 Stationary waves in a closed circular-wire loop	1 and 2			What is the nature of light again? Checkpoint 6 Practice 2.2 Revision exercise 2

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			so differently? a Surface area effect b Quantum effect						
		3.2 Seeing at nano scale	1 Development of microscopes 2 The optical microscope a From single lens to compound lens b Diffraction-limited resolution 3 Transmission electron microscopes a Basic structure and working principle b Atomic	7	<i>Simulation</i> 3.1 Resolution 3.2 Scanning tunnelling microscopes <i>Video</i> 3.1 Expt 3a - Resolution of the human eye	1 and 2			Colour display Checkpoint 4 Checkpoint 5 Checkpoint 6 Checkpoint 7 Practice 3.2

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			<p>resolution</p> <p>4 Scanning tunnelling microscopes</p> <p>5 Comparing TEM and STM</p>						
		3.3 Some current applications and developments in nanotechnology	<p>1 Applications in daily life</p> <p>a Water-repelling property for self-cleaning</p> <p>b Water-attractive property for self-cleaning</p> <p>c Prevention of the spread of disease</p> <p>d Antimicrobial effects</p> <p>e ‘Nanofinish</p>	3 + 2 (for problem solving and revision)	<p><i>Video</i></p> <p>3.2 Expt 3b - Lotus effect</p> <p>3.3 Water-attractive property of self-cleaning glass</p> <p>3.4 Water-repelling property of nano textiles</p>	1 and 2			<p>Inspiration from a lotus</p> <p>Checkpoint 8</p> <p>Checkpoint 9</p> <p>Practice 3.3</p> <p>Revision exercise 3</p>

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			ing' in the textile industry f Catalyst in nano scale g Data storage and computation h Nano sensors i Applications created from different mechanical properties of nano materials j Nano medicine k Clean air, water and energy 2 Potential hazards a Health risks b Environme						

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			ntal impact c Hopes and concerns						
	24-25	Holiday							

* 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 13. Openness to good in all things 14. Respect for himself & others	15. Integrity 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