The City School

O-Level Syllabus Break Up

Class: 9 Sept.14 to May 15

Note: The total number of **active teaching weeks** for AY 2014-15 is **30** (excluding revision and examination weeks):

- **First term**: **14 weeks**
- **Second term: 16 weeks**
- It is highly recommended that teachers consult the **CIE Physics (5054) Syllabus** on regular basis to avoid any problem in implementing the curriculum
- Following objectives have been prepared carefully in order to facilitate the subject teachers. It is highly recommended to read through these objectives and find out the connections. Any query is welcome.

Subject:	**Physics**	**CIE Code:**	**5054**

Section 1: General Physics				
Chapter	**Topic**		**Week**	**Learning Outcomes**
	No:			
Physical Quantities, Units and Measurements	**0.0**	**Introduction to Physics Cambridge Physics – CIE Papers – Curriculum – Topics – Brief of studying techniques**	**1**	**Candidates should be able to:** • *Define physical quantity* • *Enlist the base quantities with their base units and symbols and know that these are seven* • *Explain derived units with examples* (d) Describe how to measure a variety of lengths with appropriate accuracy using tapes,

	1.2	**Measurement Techniques**	**2**	rules, micrometers, and calipers using a Vernier as necessary. (e) Describe how to measure a variety of time intervals using clocks and stopwatches. (f) Recognize and use the conventions and symbols contained in 'Signs, Symbols and Systematics', • *Use metre rule; tape measure; vernier calipers and micrometer screw gauge to measure the length* • *use digital as well as analogue stopwatch to measure time accurately and precisely* • *use both top pan balance and electronic balance to measure mass*
	1.3	**Units and Symbols**	**3**	

Section 2: Newtonian Mechanics

Chapter	Topic No:	Topic	Week	Learning Outcomes
	1.1	**Scalar and Vectors**	**4**	(a)define the terms scalar and vector (c) List the vectors and scalars from distance, displacement, length, speed, velocity, time, acceleration, mass and force. (also classify the following into vectors and scalars, latter on Energy; work; moments; time; density; pressure etc.) (b) Determine the resultant of two vectors by a graphical method. *(learn the head to tail rule/ parallelogram method for vector addition using scale diagrams) in O-Level students are required to add 2 vectors)*
Kinematics	**2.1**	**Speed, velocity and acceleration**	**5**	*(a)* State what is meant by *speed* and *velocity*. *(b)* Calculate average speed using distance travelled/time taken. *(c)* State what is meant by *uniform acceleration* and calculate the value of an acceleration using change in velocity/time taken. *(d)* Discuss non-uniform acceleration. *(e)* *plot and *interpret speed-time and distance-time graphs. *(f)* *recognize from the shape of a speed-time graph when a body is (1) at rest, (2) moving with uniform speed, (3) moving with uniform acceleration, (4) Moving with non-uniform acceleration. *(g)* Calculate the area under a speed-time graph to determine the distance travelled for
	2.2	**Graphical analysis of motion**	**6**	

	2.3	**Free-Fall**	**7** **8**	motion with uniform speed or uniform acceleration. *(h)* State that the acceleration of free-fall for a body near to the Earth is constant and is approximately 10 m / s^2. *(i)* Describe qualitatively the motion of bodies with constant weight falling with and without air resistance (including reference to terminal velocity).

Section 2: Newtonian Mechanics

Chapter	Topic No:	Topic	Week	Learning Outcomes
Dynamics	**3.1**	**Balanced and unbalanced forces**	**9**	*(a)* State Newton's third law. *(b)* Describe the effect of balanced and unbalanced forces on a body. *(c)* Describe the ways in which a force may change the motion of a body. *(d)* Do calculations using the equation *force* = *mass* × *acceleration*. *(e)* Explain the effects of friction on the motion of a body. *(f)* Discuss the effect of friction on the motion of a vehicle in the context of tyre surface, road conditions (including skidding), braking force, braking distance, thinking distance and stopping distance. *(g)* Describe qualitatively motion in a circular path due to a constant perpendicular force, including electrostatic forces on an electron in an atom and gravitational forces on a satellite. ($F = mv^2/r$ is **not** required.) *(h)* Discuss how ideas of circular motion are related to the motion of planets in the solar system.
	3.2	**Friction**	**10**	
	3.3	**Circular motion**	**11**	

Section 2: Newtonian Mechanics

Chapter	Topic No:	Topic	Week	Learning Outcomes
Mass, Weight and Density	**4.1**	**Mass and weight**	**12**	*(a)* State that mass is a measure of the amount of substance in a body. *(b)* State that the mass of a body resists change from its state of rest or motion. *(c)* State that a gravitational field is a region in which a mass experiences a force due to gravitational attraction. *(d)* Calculate weight from the equation *weight* = *mass* × *gravitational field strength*. *(e)* Explain that weights, and therefore masses, may be compared using a balance. *(f)* Describe how to measure mass and weight by using appropriate balances.
	4.2	**Gravitational fields**	**13**	

	4.3	**Density**	**14**	*(g)* Describe how to use a measuring cylinder to measure the volume of a liquid or solid. *(h)* Describe how to determine the density of a liquid, of a regularly shaped solid and of an irregularly shaped solid which sinks in water (volume by displacement). (i) Make calculations using the formula *density = mass/volume*.
	Revision		**15, 16**	
		Mid-Year Examination		
		Winter Break		

Section 2: Newtonian Mechanics

Chapter	Topic No:		Week	Learning Outcomes
Turning Effect of Forces	**5.1**	**Moments**	**1**	*(a)* Describe the moment of a force in terms of its turning effect and relate this to everyday examples. *(b)* State the principle of moments for a body in equilibrium. *(c)* Make calculations using *moment of a force = force × perpendicular distance from the pivot* and the principle of moments. *(d)* Describe how to verify the principle of moments. *(e)* Describe how to determine the position of the centre of mass of a plane lamina. *(f)* Describe qualitatively the effect of the position of the centre of mass on the stability of simple objects.
	5.2	**Centre of Mass**	**2**	
	5.3	**Stability**	**3**	

Section 2: Newtonian Mechanics

Chapter	Topic No:		Week	Learning Outcomes

Deformation	**6.1**	**Elastic Deformation**	**4**	*(a)* State that a force may produce a change in size and shape of a body. *(b)* *plot, draw and interpret extension-load graphs for an elastic solid and describe the associated experimental procedure. *(c)* *Recognise the significance of the term "limit of proportionality" for an elastic solid. *(d)* Calculate extensions for an elastic solid using proportionality.
Section 2: Newtonian Mechanics				
Chapter	**Topic No:**		**Week**	**Learning Outcomes**
Pressure	**7.1**	**Pressure**	**5**	*(a)* Define the term *pressure* in terms of force and area, and do calculations using the equation *pressure = force/area*. *(b)* Explain how pressure varies with force and area in the context of everyday examples. *(c)* Describe how the height of a liquid column may be used to measure the atmospheric pressure. *(d)* Explain quantitatively how the pressure beneath a liquid surface changes with depth and density of the liquid in appropriate examples. *(e)* Do calculations using the equation for hydrostatic pressure $p = \rho gh$. *(f)* Describe the use of a manometer in the measurement of pressure difference. *(g)* Describe and explain the transmission of pressure in hydraulic systems with particular reference to the hydraulic press and hydraulic brakes on vehicles. *(h)* Describe how a change in volume of a fixed mass of gas at constant temperature is caused by a change in pressure applied to the gas. *(i)* Do calculations using $p_1V_1 = p_2V_2$.
	7.2	**Pressure Changes**	**6, 7**	
Section 3: Energy and Thermal Physics				
Chapter	**Topic No:**		**Week**	**Learning Outcomes**

Energy Sources and transfer of Energy	**8.1**	**Energy forms**	**8**	*(a)* List the different forms of energy with examples in which each form occurs. *(b)* State the principle of the conservation of energy and apply this principle to the conversion of energy from one form to another. *(c)* State that kinetic energy is given by $E_k = \frac{1}{2}mv^2$ and that gravitational potential energy is given by $E_P = mgh$, and use these equations in calculations. *(d)* List renewable and non-renewable energy sources. *(e)* describe the processes by which energy is converted from one form to another, including reference to (1) chemical/fuel energy (a re-grouping of atoms), (2) hydroelectric generation (emphasising the mechanical energies involved), (3) solar energy (nuclei of atoms in the Sun), (4) nuclear energy, (5) geothermal energy, (6) wind energy. *(f)* Explain nuclear fusion and fission in terms of energy-releasing processes. *(g)* Describe the process of electricity generation and draw a block diagram of the process from fuel input to electricity output. *(h)* Discuss the environmental issues associated with power generation. *(i)* Calculate work done from the formula *work = force × distance moved in the line of action of the force*. *(j)* Calculate the efficiency of an energy conversion using the formula *efficiency = energy converted to the required form/total energy input*. *(k)* Discuss the efficiency of energy conversions in common use, particularly those giving electrical output. *(l)* Discuss the usefulness of energy output from a number of energy conversions. *(m)* Calculate power from the formula *power = work done/time taken.*
	8.2	**Major sources of Energy**	**9**	
	8.3	**Work**	**10**	
	8.4	**Efficiency**	**11**	
	8.5	**Power**	**12**	

Section 4: Waves

Chapter	Topic No:		Week	Learning Outcomes

Light	**14.1**	**Reflection of light**	**13**	*(a)* Define the terms used in reflection including *normal*, *angle of incidence* and *angle of reflection*. *(b)* Describe an experiment to illustrate the law of reflection. *(c)* Describe an experiment to find the position and characteristics of an optical image formed by a plane mirror. *(d)* State that for reflection, the angle of incidence is equal to the angle of reflection and use this in constructions, measurements and calculations. *(e)* Define the terms used in refraction including *angle of incidence*, *angle of refraction* and *refractive index*. *(f)* Describe experiments to show refraction of light through glass blocks. *(g)* Do calculations using the equation sin *i* /sin *r* = constant. *(h)* Define the terms *critical angle* and *total internal reflection*. *(i)* Describe experiments to show total internal reflection. *(j)* Describe the use of optical fibres in telecommunications and state the advantages of their use. *(k)* Describe the action of thin lenses (both converging and diverging) on a beam of light. *(l)* Define the term *focal length*. *(m)* *draw ray diagrams to illustrate the formation of real and virtual images of an object by a converging lens, and the formation of a virtual image by a diverging lens. *(n)* Define the term *linear magnification* and *draw scale diagrams to determine the focal length needed for particular values of magnification (converging lens only). *(o)* Describe the use of a single lens as a magnifying glass and in a camera, projector and photographic enlarger and draw ray diagrams to show how each forms an image. *(p)* Draw ray diagrams to show the formation of images in the normal eye, a short-sighted eye and a long-sighted eye. *(q)* Describe the correction of short-sight and long-sight.
	14.2	**Refraction of light**	**14, 15**	
	14.3	**Thin converging and diverging lenses**	**16**	
Revision				