The City School

Curriculum Distribution Chart
Class 11

Class: 11 August 2018 - May 2019

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

			Section 5: Electricity and Magnetism	
Chapter	**Topic No:**		**Duration**	**Learning Outcomes**
18. Static Electricity	**18.1**	**Laws of electrostatics**	**2 Weeks**	*(a)* describe experiments to show electrostatic charging by friction. *(b)* explain that charging of solids involves a movement of electrons. *(c)* state that there are positive and negative charges and that charge is measured in coulombs. *(d)* state that unlike charges attract and like charges repel. *(e)* describe an electric field as a region in which an electric charge experiences a force. *(f)* state the direction of lines of force and describe simple field patterns. *(g)* describe the separation of charges by induction. *(h)* discuss the differences between electrical conductors and insulators and state examples of each. *(i)* state what is meant by *"earthing"* a charged object. *(j)* describe examples where charging could be a problem, e.g. lightning. *(k)* describe examples where charging is helpful, e.g. photocopier and electrostatic precipitator.
	18.2	**Principles of electrostatics**		
	18.3	**Applications of electrostatics**		

			Section 5: Electricity and Magnetism	
Chapter	**Topic No:**		**Duration**	**Learning Outcomes**
Current Electricity	**19.1**	**Current**	**2 Weeks**	*(a)* state that a current is a flow of charge and that current is measured in amperes. *(b)* recall and use the equation *charge* = *current* × *time*. *(c)* describe the use of an ammeter with different ranges. *(d)* explain that electromotive force (e.m.f.) is measured by the energy dissipated by a source in driving a unit charge around a complete circuit. *(e)* state that e.m.f. is work done/charge. *(f)* state that the volt is given by J / C. *(g)* calculate the total e.m.f. where several sources are arranged in series and discuss how this is used in the design of batteries. *(h)* discuss the advantage of making a battery from several equal voltage sources of e.m.f. arranged in parallel. *(i)* state that the potential difference (p.d.) across a circuit component is measured in volts. *(j)* state that the p.d. across a component in a circuit is given by the work done in the component/charge passed through the component. *(k)* describe the use of a voltmeter with different ranges. *(l)* state that *resistance* = *p.d./current* and use the equation *resistance* = *voltage/current* in calculations. *(m)* describe an experiment to measure the resistance of a metallic conductor using a voltmeter and an ammeter and make the necessary calculations. *(n)* state Ohm's Law and discuss the temperature limitation on Ohm's Law. *(o)* *use quantitatively the proportionality between resistance and the length and the cross-sectional area of a wire. *(p)* calculate the net effect of a number of resistors in series and in parallel. *(q)* describe the effect of temperature increase on the resistance of a resistor and a filament lamp and draw the respective sketch graphs of current/voltage. *(r)* describe the operation of a light-dependent resistor.
	19.2	**Electromotive force**		
	19.3	**Potential difference**		
	19.4	**Resistance**		

			Section 5: Electricity and Magnetism	
Chapter	**Topic No:**		**Duration**	**Learning Outcomes**
D.C. Circuits	**20.1** **20.2**	**Current and potential difference in circuits** **Series and parallel circuits**	**1 Week**	*(a)* *draw circuit diagrams with power sources (cell, battery or a.c. mains), switches (closed and open), resistors (fixed and variable), light-dependent resistors, thermistors, lamps, ammeters, voltmeters, magnetising coils, bells, fuses, relays, diodes and light-emitting diodes. *(b)* state that the current at every point in a series circuit is the same, and use this in calculations. *(c)* state that the sum of the potential differences in a series circuit is equal to the potential difference across the whole circuit and use this in calculations. *(d)* state that the current from the source is the sum of the currents in the separate branches of a parallel circuit. *(e)* do calculations on the whole circuit, recalling and using formulae including $R = V/I$ and those for potential differences in series, resistors in series and resistors in parallel.

			Section 5: Electricity and Magnetism	
Chapter	**Topic No:**		**Duration**	**Learning Outcomes**
Practical Electricity	**21.1** **21.2** **21.3**	**Uses of electricity** **Dangers of electricity** **Safe use of electricity in the home**	**1 Week**	*(a)* describe the use of electricity in heating, lighting and motors. *(b)* recall and use the equations *power* = *voltage* × *current*, and *energy* = *voltage* × *current* × *time*. *(c)* define the kilowatt-hour (kW h) and calculate the cost of using electrical appliances where the energy unit is the kW h. *(d)* state the hazards of damaged insulation, overheating of cables and damp conditions. *(e)* explain the use of fuses and circuit breakers, and fuse ratings and circuit breaker settings. *(f)* explain the need for earthing metal cases and for double insulation. *(g)* state the meaning of the terms *live*, *neutral* and *earth*. *(h)* describe how to wire a mains plug safely. (Candidates will **not** be expected to show knowledge of the colours of the wires used in a mains supply.) *(i)* explain why switches, fuses and circuit breakers are wired into the live conductor.

<table>
<tr><th colspan="3"></th><th colspan="2">Section 5: Electricity and Magnetism</th></tr>
<tr><td rowspan="4">Electromagnetism</td><td colspan="2">Topic</td><td>Duration</td><td rowspan="4">(a) describe experiments to show the force on a current-carrying conductor, and on a beam of charged
particles, in a magnetic field, including the effect of reversing (1) the current, (2) the direction of the field.
(b) state the relative directions of force, field and current.
(c) describe the field patterns between currents in parallel conductors and relate these to the forces which
exist between the conductors (excluding the Earth’s field).
(d) explain how a current-carrying coil in a magnetic field experiences a turning effect and that the effect is
increased by increasing (1) the number of turns on the coil, (2) the current.
(e) discuss how this turning effect is used in the action of an electric motor.
(f) describe the action of a split-ring commutator in a two-pole, single-coil motor and the effect of winding
the coil onto a soft-iron cylinder.</td></tr>
<tr><td>No:</td><td></td><td rowspan="3">1 Week</td></tr>
<tr><td>22.1</td><td>Forces on a current-carrying conductor</td></tr>
<tr><td>22.2</td><td>The d.c motor</td></tr>
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			Section 5: Electricity and Magnetism	
Electromagnetic Induction	**Topic No:**		**Duration**	
	23.1	**Principles of electromagnetic induction**	**1 Week**	*(a)* describe an experiment which shows that a changing magnetic field can induce an e.m.f. in a circuit. *(b)* state the factors affecting the magnitude of the induced e.m.f. *(c)* state that the direction of a current produced by an induced e.m.f. opposes the change producing it (Lenz's Law) and describe how this law may be demonstrated. *(d)* describe a simple form of a.c. generator (rotating coil or rotating magnet) and the use of slip rings where needed. *(e)* *sketch a graph of voltage output against time for a simple a.c. generator. *(f)* describe the structure and principle of operation of a simple iron-cored transformer. *(g)* recall and use the equation $(V_p / V_s) = (N_p / N_s)$ *(h)* state the advantages of high voltage transmission. *(i)* discuss the environmental and cost implications of underground power transmission compared to overhead lines.
	23.2	**The a.c. generator**		
	23.3	**The transformer**		

			Section 5: Electricity and Magnetism	
Introductory Electronics	**Topic No:**		**Duration**	*Candidates should be able to:*
	24.1	**Thermionic emission and cathode-rays**	**1 Week**	*(a)* state that electrons are emitted by a hot metal filament. *(b)* explain that to cause a continuous flow of emitted electrons requires (1) high positive potential and (2) very low gas pressure. *(c)* describe the deflection of an electron beam by electric fields and magnetic fields. *(d)* state that the flow of electrons (electron current) is from negative to positive and is in the opposite direction to conventional current. *(e)* describe the use of an oscilloscope to display waveforms and to measure p.d.s and short intervals of time (the structure of the oscilloscope is **not** required). *(f)* explain how the values of resistors are chosen according to a colour code and why widely different values are needed in different types of circuit. *(g)* discuss the need to choose components with suitable power ratings. *(h)* describe the action of thermistors and light-dependent resistors and explain their use as input sensors (thermistors will be assumed to be of the negative temperature coefficient type). *(i)* describe the action of a variable potential divider (potentiometer). *(j)* describe the action of a diode in passing current in one direction only. *(k)* describe the action of a light-emitting diode in passing current in one direction only and emitting light. *(l)* describe and explain the action of relays in switching circuits. *(m)* describe and explain circuits operating as light-sensitive switches and temperature-operated alarms (using a relay or other circuits).
	24.2	**Uses of an Oscilloscope**		
	24.3	**Action and use of circuit components**		

			Section 6: Atomic Physics	
Radioactivity	**Topic No:**		**Duration**	
	26.1	**Detection of radioactivity**	**2 Week**	*(a)* describe the detection of alpha-particles, beta-particles and gamma rays by appropriate methods. *(b)* state and explain the random emission of radioactivity in direction and time. *(c)* state, for radioactive emissions, their nature, relative ionising effects and relative penetrating powers. *(d)* describe the deflection of radioactive emissions in electric fields and magnetic fields. *(e)* explain what is meant by *radioactive decay*. *(f)* explain the processes of fusion and fission. *(g)* describe, with the aid of a block diagram, one type of fission reactor for use in a power station. *(h)* discuss theories of star formation and their energy production by fusion. *(i)* explain what is meant by the term *half-life*. *(j)* make calculations based on half-life which might involve information in tables or shown by decay curves. *(k)* describe how radioactive materials are moved, used and stored in a safe way. *(l)* discuss the way in which the type of radiation emitted and the half-life determine the use for the material. *(m)* discuss the origins and effect of background radiation. *(n)* discuss the dating of objects by the use of $_{14}C$.
	26.2	**Characteristics if the three types of emission**		
	26.3	**Nuclear reactions**		
	26.4	**Half-life**		
	26.5	**Uses of radioactive isotopes including safety precautions**		

			Section 6: Atomic Physics	
The Nuclear Atom	**Topic No:**		**Duration**	*(a)* describe the structure of the atom in terms of nucleus and electrons. *(b)* describe how the Geiger-Marsden alpha-particle scattering experiment provides evidence for the nuclear atom. *(c)* describe the composition of the nucleus in terms of protons and neutrons. *(d)* define the terms *proton number* (atomic number), Z and *nucleon number* (mass number), A. *(e)* explain the term *nuclide* and use the nuclide notation ${}_{Z}^{A}X$ to construct equations where radioactive decay leads to changes in the composition of the nucleus. *(f)* define the term *isotope*. *(g)* explain, using nuclide notation, how one element may have a number of isotopes.
	27.1	**Thermionic emission and cathode-rays**	**1 Week**	
	27.2	**Uses of an oscilloscope**		

1 Week for Revision or may be used as buffer to reinforce any given topic.

			Section 5: Electricity and Magnetism	
Electronic Systems*	**Topic No:**		**Duration**	
	25.1	**Switching and logic circuits**	**1 Week***	**Note:** *There is no compulsory question set on Section 25 of the syllabus. Questions set on topics within Section 25 are always set as an alternative within a question.* *(a)* describe the action of a bipolar npn transistor as an electrically operated switch and explain its use in switching circuits. *(b)* state in words and in truth table form, the action of the following logic gates, AND, OR, NAND, NOR and NOT (inverter). *(c)* state the symbols for the logic gates listed above (American ANSI Y 32.14 symbols will be used). *(d)* describe the use of a bistable circuit. *(e)* discuss the fact that bistable circuits exhibit the property of memory.
	25.2	**Bistable and astable circuits**		

* This is an optional topic. It is the teacher's discretion to teach this topic or if he wants to use the time to reinforce the mandatory topics instead.

Note: Break-up is in weeks is only suggestive and not prescriptive

Time available after the Mid-Year Examination will be fruitfully utilized for revision practices.