

SCHEME OF WORK GRADE X

LEARNING CONTENTS AND STUDENTS' LEARNING OUTCOMES GRADE IX

Contents:	Students' Learning Outcomes	R	U	Ap.	An.	E	C
Part-I	Students will be able to:						
Unit # 10	Simple Harmonic Motion and Waves						
	(18 Periods)						
1. Simple harmonic motion (shm)	<ul style="list-style-type: none"> Explain periodic motion with examples. 		*				
2. Motion of mass attached to a spring	<ul style="list-style-type: none"> Explain motion of a mass attached to a spring on a frictionless horizontal surface, hence define shm. State the conditions necessary for an object to oscillate with shm. 		* *				
3. Simple pendulum	<ul style="list-style-type: none"> Draw forces acting on a displaced pendulum and explain that its motion is shm. Solve problems by using the formula $T = 2\pi\sqrt{l/g}$ for simple pendulum 			* *			
4. Waves, their nature and types	<ul style="list-style-type: none"> Describe wave motion as illustrated by vibrations in rope, slinky spring and on water surface, hence identify transverse and longitudinal waves. Describe that waves are means of energy transfer without transfer of matter. 		* *				

	<ul style="list-style-type: none"> Define the terms speed (v), frequency (f), wavelength (λ), time period (t), amplitude, crest, trough, cycle, compression and rarefaction. 	*					
5. Properties of waves	<ul style="list-style-type: none"> Solve problems by applying the relations $f = \frac{1}{T}$ and $v = f\lambda$. Describe properties of waves such as reflection, refraction and diffraction with the help of wave front in the ripple tank. Distinguish between mechanical and electro-magnetic waves. 		*	*		*	
Investigation Skills:							
	<ul style="list-style-type: none"> Construct a transverse wave model. 			*			
	<ul style="list-style-type: none"> Construct a longitudinal wave model by hanging a weight with a spring. 			*			
	<ul style="list-style-type: none"> Prove that time period is independent of: <ul style="list-style-type: none"> Mass of the pendulum Amplitude of the pendulum 			*			
	<ul style="list-style-type: none"> Analyze information from the given displacement-time graph for transverse wave motion. 				*		
	<ul style="list-style-type: none"> Find the value of “g” using simple pendulum. 			*			
Science, Technology and Society Connections:							

	<ul style="list-style-type: none"> Compare the diffraction of radiowaves and tv waves (transmission can be heard in such areas where the waves cannot reach directly). 				*			
Unit # 11 Sound (18 periods)								
1. Sound waves	<ul style="list-style-type: none"> Describe the longitudinal nature of sound waves as a series of compressions and rarefactions. 		*					
2. Speed of sound	<ul style="list-style-type: none"> Define the terms pitch, loudness and quality of sound. Describe the effect of change in amplitude on loudness and the effect of change in frequency on pitch of sound. 	*		*				
3. Characteristics of sound	<ul style="list-style-type: none"> Describe what is meant by intensity and intensity level of a sound; give their units also. 		*					
4. Noise pollution	<ul style="list-style-type: none"> Explain that noise is a health hazards. Describe how reflection of sound may produce echo. 		*					
5. Ultrasound	<ul style="list-style-type: none"> Explain the importance of acoustic protection in buildings. 		*					
Investigation Skills:								
	<ul style="list-style-type: none"> Identify sources of noise in their environment and suggest how such noise can be reduced to an acceptable level. 		*					
	<ul style="list-style-type: none"> Estimate the speed of sound in air by echo method. 			*				
	<ul style="list-style-type: none"> Describe that some sounds are injurious to health. 		*					

	<ul style="list-style-type: none"> Describe how knowledge of the properties of sound waves is applied in the design of buildings with respect to acoustics. 		*				
	<ul style="list-style-type: none"> Describe how ultrasound techniques are used in medical and industry. 		*				
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> Explain the use of soft materials to reduce echo sounding in classroom studies, and other public gathering buildings. 		*				
<ul style="list-style-type: none"> Unit # 12 Geometrical Optics (23 periods) 							
1. Reflection of light from spherical mirrors	<ul style="list-style-type: none"> Describe how total internal reflection is used in light propagation through optical fibers. 		*				
2. Image location by spherical mirror formula	<ul style="list-style-type: none"> Describe the mirror formula and solve problems of image location by spherical mirrors using mirror formula Solve problems by using the equation $\frac{\sin i}{\sin r} = n$ (refractive index). 		*	*			
	<ul style="list-style-type: none"> Define the terminology for the angle of incidence 'i' and angle of refraction 'r' and refractive index $n = \sin i / \sin r$ and describe the passage of light through parallel-sided transparent material. 	*					
3. Refraction of light	<ul style="list-style-type: none"> State the conditions for total internal reflection and determine critical angle. 	*					
4. Refraction through a prism	<ul style="list-style-type: none"> Describe the passage of light through a glass prism to find angle of deviation. 	*					

5. Image location by lens formula	<ul style="list-style-type: none"> Describe the lens formula and solve problems of image location by lenses using lens formula. 	*					
6. Magnifying power	<ul style="list-style-type: none"> Define power of a lens and its unit. Define the term magnifying power. 	*					
7. Compound microscope	<ul style="list-style-type: none"> Draw ray diagram of simple microscope and mention its magnifying power. Draw ray diagram of compound microscope and mention its magnifying power. 			*			
8. Telescope	<ul style="list-style-type: none"> Draw ray diagram of a telescope and mention its magnifying power. 			*			
Investigation Skills:							
	<ul style="list-style-type: none"> Perform a first-hand investigation to calculate the refractive index of glass or perspex. 			*			
	<ul style="list-style-type: none"> Plan and perform to find the refractive index of water using a concave mirror. 			*			
	<ul style="list-style-type: none"> Plan and investigate the formation of images by a concave mirror. 			*			
	<ul style="list-style-type: none"> Plan and investigate the formation of images by a convex lens. 			*			
	<ul style="list-style-type: none"> Determine the focal length of a convex lens by parallax method. 			*			

	<ul style="list-style-type: none"> Set up a microscope and a telescope. 			*			
	<ul style="list-style-type: none"> Plan and determine critical angle using a semi-circular glass slab or by a prism. 			*			
	<ul style="list-style-type: none"> Trace the path of a ray of light through a glass prism and measure the angle of deviation. 			*			
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> Describe the use of spherical mirrors for safe driving, blind turns on hilly roads, dentist mirror. 		*				
	<ul style="list-style-type: none"> Describe the use of optical fibers in telecommunications and medical field and state the advantages of their use. 		*				
	<ul style="list-style-type: none"> 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. 		*				
	<ul style="list-style-type: none"> Describe the use of lenses / contact lenses for rectifying vision defects of the human eye. Describe the exploration of the world of micro- organism by using microscopes and of distant celestial bodies by telescopes. 		*	*			
Section 4	Electricity & Magnetism						
Unit # 13	Electrostatics	(20 periods)					

1. Electric charge	<ul style="list-style-type: none"> Describe simple experiments to show the production and detection of electric charge and state that there are two types of charges. 		*				
2. Electrostatic induction	<ul style="list-style-type: none"> Describe experiments to show electrostatic charging by induction. 		*				
3. Electroscope	<ul style="list-style-type: none"> Describe the construction and working principle of electroscope. 		*				
4. Coulomb's law	<ul style="list-style-type: none"> State and explain coulomb's law. Solve problems by using coulomb's law. 	*		*			
5. Electric field and its intensity	<ul style="list-style-type: none"> Define electric field and electric field intensity. Describe electric field of positive and negative charges as pattern of field lines. 	*	*				
6. Electrostatic potential	<ul style="list-style-type: none"> Describe the concept of electrostatic potential. 		*				
7. Applications of electrostatics	<ul style="list-style-type: none"> Describe one situation in which static electricity is dangerous and the precautions taken to ensure that static electricity is discharged safely. 		*				
8. Capacitor and its different types	<ul style="list-style-type: none"> Describe that the capacitor is a charge and energy storing device and recognize different types of capacitors. 		*				
Investigation Skills:							
	<ul style="list-style-type: none"> Demonstrate the existence of different kinds of charges. 			*			

	<ul style="list-style-type: none"> Demonstrate that like charges repel each other and unlike charges attract each other using an electroscope. 			*			
	<ul style="list-style-type: none"> Detect the type of charge on a body using an electroscope. 				*		
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> Describe the use of electrostatic charging e.g. Spraying of paint and dust extraction. List the use of capacitors in various electrical appliances. 		*				
Unit # 14 current electricity (23 periods)							
1. Electric current	<ul style="list-style-type: none"> Define electric current and describe the concept of conventional current. 	*					
2. Potential difference and emf	<ul style="list-style-type: none"> Understand the potential difference across a circuit component and name its unit. 		*				
3. Ohm's law	<ul style="list-style-type: none"> Describe ohm's law and its limitations, hence define resistance and its unit (ω). 		*				
4. Resistance	<ul style="list-style-type: none"> Describe the factors affecting the resistances of a metallic conductor. Sketch and interpret the v-i characteristics graph for a metallic conductor, a filament lamp and a thermister. 		*				*
5. Series and parallel combinations	<ul style="list-style-type: none"> Construct simple series (single path) and parallel circuits (multiple paths) and calculate the effective resistance of a number of resistances connected in series and also in parallel. 			*			

6. The v-i characteristics for ohmic and non-ohmic conductors	<ul style="list-style-type: none"> Apply the equation $e = i.vt = i^2rt = v^2t/r$ to solve numerical problems. 			*			
7. Electrical power and joule's law	<ul style="list-style-type: none"> Describe how energy is dissipated in a resistance and explain joule's law. 		*				
8. Use of circuit components	<ul style="list-style-type: none"> Calculate the cost of energy when given the cost per kwh. State reason why domestic appliances are connected in parallel. 	*		*			
9. Measuring instruments: a. Voltmeter b. Galvanometer c. Ammeter	<ul style="list-style-type: none"> Describe the use of electrical measuring devices like galvanometer, ammeter and voltmeter (construction and working principles is not required). 		*				
Investigation Skills:							
	<ul style="list-style-type: none"> Measure the electric current through a bulb using battery or cell in a given circuit with the help of an ammeter. 			*			
	<ul style="list-style-type: none"> Measure the potential difference across a Bulb Battery or cell in a given circuit using voltmeter. 			*			
	<ul style="list-style-type: none"> Investigate that voltage across all the components remains same in parallel circuit. 						
	<ul style="list-style-type: none"> Verify ohms' law by devising an experiment. 			*			

	<ul style="list-style-type: none"> Determine the resistance of a resistor using a voltmeter and an ammeter. 			*			
	<ul style="list-style-type: none"> Plan, choose equipments or resources and perform a firsthand investigation to construct a model household circuit using electrical components. 			*			
	<ul style="list-style-type: none"> Determine the resistance of a galvanometer by half deflection method. 			*			
Science, Technology, and Society Connections:							
	<ul style="list-style-type: none"> Write a paragraph by imagining what life would be like without electricity. 						*
	<ul style="list-style-type: none"> Identify ways to reduce electricity consumption in everyday life. 			*			
	<ul style="list-style-type: none"> Calculate the total cost of electrical energy used in one month (30 days) at home. 			*			
	<ul style="list-style-type: none"> Predict the behaviour of light bulbs in series and parallel circuits such as for festive lights. 						*
	<ul style="list-style-type: none"> Suggest ways how it can be reduced without compromising the comforts and benefits of electricity. 						*
	<ul style="list-style-type: none"> Describe the damages of an electric shock from appliances on the human body. 		*				
	<ul style="list-style-type: none"> Explain the underlying principles in the working of volume controls of radio and TV. 		*				

	<ul style="list-style-type: none"> Identify the use of fuses, circuit breakers, earthing, double insulation and other safety measures in relation to household electricity. 		*				
Unit # 15 Electromagnetism (23 periods)							
1. Magnetic effect of a steady current	<ul style="list-style-type: none"> Explain by describing an experiment that an electric current in a conductor produces a magnetic field around it. 		*				
2. Force on a current carrying conductor in a magnetic field	<ul style="list-style-type: none"> Describe that a force acts on a current carrying conductor placed in a magnetic field as long as the conductor is not parallel to the magnetic field. 		*				
3. Turning effect on a current carrying coil in a magnetic field	<ul style="list-style-type: none"> State that a current carrying coil in a magnetic field experiences a torque. 	*					
4. D.c motor	<ul style="list-style-type: none"> Relate the turning effect on a coil to the action of a D.C. motor. 			*			
5. Electromagnetic induction	<ul style="list-style-type: none"> Describe an experiment to show that a changing magnetic field can induce emf in a circuit. List factors affecting the magnitude of an induced emf. 		*				
6. Alternating current and A.C generator	<ul style="list-style-type: none"> Describe a simple form of A.C generator and hence explain alternating current. Distinguish between D.C and A.C. 		*			*	
7. Mutual induction and transformer	<ul style="list-style-type: none"> Describe mutual induction. Identify that a transformer works on the principle of mutual induction between two coils. Describe the uses of transformers in A.C circuits. 	*	*				

Investigation Skills:							
	<ul style="list-style-type: none"> • Conduct an experiment to identify the pattern of magnetic field of • Bar magnet • Circular coil carrying current, using iron filings • Magnetic compass 			*			
	<ul style="list-style-type: none"> • Investigate to generate electric current by moving a magnet in a coil or a coil near a magnet. 			*			
	<ul style="list-style-type: none"> • Investigate to identify the factors that affect the magnitude and direction of the electric current induced by a changing magnetic field. 			*			
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> • Describe the application of the magnetic effects of an electric current in relay, door-latch, loudspeaker and circuit breaker. 		*				
	<ul style="list-style-type: none"> • Analyze and describe the operation of industrial and domestic technological system based on principles related to magnetic field e.g. Electric motors, electric generators, and components in home entertainment system, computers, doorbells, telephones. 				*		
	<ul style="list-style-type: none"> • Describe the historical development of technologies related to magnetic fields e.g. Electric motors and generators, medical 		*				

	equipment, loudspeakers, magnetic information storage devices (audio-video cassettes).						
	<ul style="list-style-type: none"> Identify the role of transformers in power transmission from power station to your house. List the use of transformer (step-up and step-down) for various purposes at your home. 		*				
Unit # 16 Introductory Electronics (23 periods)							
1. Thermionic emission	<ul style="list-style-type: none"> Explain the process of thermionic emission from a filament. 		*				
2. Electron gun and cathode rays	<ul style="list-style-type: none"> Describe the simple construction and use of an electron gun as a source of electron beam. 		*				
3. Deflection of electron by electric field	<ul style="list-style-type: none"> Explain the production of electron beam by the process of thermionic emission from a filament. 		*				
4. Deflection of electron by magnetic field	<ul style="list-style-type: none"> Describe the effect of electric field and magnetic field on an electron beam. 		*				
5. Cathode rays oscilloscope (cro)	<ul style="list-style-type: none"> Describe the basic principle of cro and make a list of its uses. State the basic operations of digital electronics. 		*				
6. Introduction to electronics	<ul style="list-style-type: none"> Differentiate between analogue and digital systems. 					*	
7. Analogue and digital electronics	<ul style="list-style-type: none"> Identify and draw the symbols and truth tables for the logic gates i.e. Not, or, and, nor and nand. 		*				

8. Logic gates	<ul style="list-style-type: none"> Describe the simple uses of logic gates. 		*				
Investigation Skills:							
	<ul style="list-style-type: none"> Verify truth tables of not, or, and, nor and nand gates. 			*			
	<ul style="list-style-type: none"> Make burglar alarm / fire alarm using an appropriate gate 			*			
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> Compare an analogue wrist watch with a digital wrist watch with reference to energy conversions and time display on dials. 				*		
	<ul style="list-style-type: none"> Identify the use of logic gates for security purposes e.g. Burglar alarm, fire extinguisher etc. 		*				
	<ul style="list-style-type: none"> Recognize that a computer is a systematic arrangement of a very large number of gates. 			*			
	<ul style="list-style-type: none"> Identify that the computers are the forefront of electronic technology. 		*				
	<ul style="list-style-type: none"> Realize that digital electronics is shifting from low-tech electrical appliances to high-tech electronic appliances. 			*			
Unit # 17 Information and Communication Technology (16 periods)							
1. Transducers	<ul style="list-style-type: none"> Explain the working of microphone, loudspeaker, photocell and light emitting diode (led). 		*				

2. Flow of information	<ul style="list-style-type: none"> • Explain briefly the transmission of: <ul style="list-style-type: none"> • electric signals through wires • Radio waves through air • light signals through optical fibers 		*				
3. Storing information	<ul style="list-style-type: none"> • Describe functions and use of cell phone and computer. 		*				
4. Handling information	<ul style="list-style-type: none"> • Describe the use of information storage devices such as hard discs, compact discs and flash drive. • Identify that information is basically stored and transferred in two forms i.e. Text and graphic. • Identify the functions of word processing, data managing, monitoring and controlling. 		*				
Investigation Skills:							
	<ul style="list-style-type: none"> • Analyze and describe the energy transformations that occur in cell phone. 				*		
	<ul style="list-style-type: none"> • Design and construct a simple communication system (intercom). 					*	
	<ul style="list-style-type: none"> • Identify various information storage devices and compare their advantages. 		*				
	<ul style="list-style-type: none"> • Use e-mail and explore internet to search the latest information and communication devices. 			*			
Science, Technology and Society Connections:							

	<ul style="list-style-type: none"> Compare the advantages of high-tech communication devices with the traditional system through library or internet search. 				*		
	<ul style="list-style-type: none"> Assess the risks and benefits to society and the environment of introducing ict e.g. Effects on personal privacy, criminal activities, health and transfer of information. 					*	
	<ul style="list-style-type: none"> Make a list of the use of computer technology in various fields of daily life. 			*			
Unit # 18 Radioactivity (16 periods)							
1. Atom and atomic nucleus	<ul style="list-style-type: none"> Describe the structure of an atom in terms of a nucleus and electrons. Describe the composition of the nucleus in terms of protons and neutrons. 		*				
2. Natural radioactivity	<ul style="list-style-type: none"> Explain that number of protons in a nucleus distinguishes one element from the other. Represent various nuclides by using the symbol of proton number z, nucleon number a and the nuclide notation x. 		*		*		
3. Natural transmutations	<ul style="list-style-type: none"> Explain that some nuclei are unstable, give out radiation to get rid of excess energy and are said to be radioactive. Describe that the three types of radiation are α, β and γ. 		*		*		
4. Background radiation	<ul style="list-style-type: none"> Show an awareness of the existence of background radiation and its sources. 				*		

	<ul style="list-style-type: none"> • State mass-energy equation $e = mc^2$ and solve problems related to it. • Describe that radioactive emissions occur randomly over space and time. • Explain that an element may change into another element when radioactivity occurs. • State, for radioactive emissions: <ul style="list-style-type: none"> ▪ Their nature ▪ Their relative ionizing effects ▪ Their relative penetrating abilities. 	*		*				
5. Half life	<ul style="list-style-type: none"> • Explain the meaning of half -life of a radioactive material and apply it for radioactive dating e.g. Carbon dating. 		*					
6. Radioisotopes	<ul style="list-style-type: none"> • Describe what radioisotopes are and what makes them useful for various applications? • Represent changes in the composition of the nucleus by symbolic equations when alpha or beta particles are emitted. 		*	*				
7. Fission and fusion	<ul style="list-style-type: none"> • Describe briefly the processes of fission and fusion. 		*					
8. Hazards and safety measures	<ul style="list-style-type: none"> • Describe hazards of radioactive materials. 		*					
Investigation Skills:								
	<ul style="list-style-type: none"> • Make calculations based on half-life which might involve information in tables or shown by decay curves. 			*				

	<ul style="list-style-type: none"> Determine the half-life of a sample of radioactive material by using a graph of number of radioactive nuclei or activity versus time. 			*			
Science, Technology and Society Connections:							
	<ul style="list-style-type: none"> Describe how radioactive materials are handled, used, stored and disposed of, in a safe way. 		*				
	<ul style="list-style-type: none"> Make a list of some applications of radioisotopes in medical, agriculture and industrial fields. 			*			

