MOST ESSENTIAL LEARNING COMPETENCIES (MELC)

GRADE LEVEL : GRADE 12 **SUBJECT: GENERAL PHYSICS 2**

Quarter	**Content Standard** *The learners demonstrate understanding of...*	**Performance Standard** *The learners should be able to...*	**Most Essential Learning Competencies**	**Duration**	**Code**
3rd	1. Electric charge 2. Insulators and conductors 3. Coulomb's Law 4. Electric forces and fields 5. Electric field calculations 6. Charges on conductors 7. Electric flux and Gauss's Law 8. Electric charge, dipoles, force, field, and flux problems	Use theoretical and experimental approaches to solve multi-concept and rich-context problems involving electricity and magnetism	Describe using a diagram charging by rubbing and charging by induction	Week 1	STEM_GP12EM-IIIa-1
			Explain the role of electron transfer in electrostatic charging by rubbing	Week 1	STEM_GP12EM-IIIa-2
			Describe experiments to show electrostatic charging by induction	Week 1	STEM_GP12EM-IIIa-3
			Calculate the net electric force on a point charge exerted by a system of point charges	Week 1	STEM_GP12EM-IIIa-6
			Describe an electric field as a region in which an electric charge experiences a force	Week 1	STEM_GP12EM-IIIa-7
			Calculate the electric field due to a system of point charges using Coulomb's law and the superposition principle	Week 1	STEM_GP12EM-IIIa-10
			Calculate electric flux	Week 1	STEM_GP12EM-IIIb-12
			Use Gauss's law to infer electric field due to uniformly distributed charges on long wires, spheres, and large plates	Week 2	STEM_GP12EM-IIIb-13
			Solve problems involving electric charges, dipoles, forces, fields, and flux in contexts such as, but not	Week 2	STEM_GP12EM-IIIb-14

			limited to, systems of point charges, electrical breakdown of air, charged pendulums, electrostatic ink-jet printers		
	1. Electric potential energy 2. Electric potential 3. Equipotential surfaces 4. Electric field as a potential gradient 5. Electric potential		Relate the electric potential with work, potential energy, and electric field	Week 2	STEM_GP12EM-IIIb-15
			Determine the electric potential function at any point due to highly symmetric continuous- charge distributions	Week 2	STEM_GP12EM-IIIc-17
			infer the direction and strength of electric field vector, nature of the electric field sources, and electrostatic potential surfaces given the equipotential lines	Week 3	STEM_GP12EM-IIIc-18
			Calculate the electric field in the region given a mathematical function describing its potential in a region of space	Week 3	STEM_GP12EM-IIIc-20
			Solve problems involving electric potential energy and electric potentials in contexts such as, but not limited to, electron guns in CRT TV picture tubes and Van de Graaff generators	Week 3	STEM_GP12EM-IIIc-22
	1. Capacitance and capacitors a. Capacitors in series and parallel b. Energy stored and electric-field energy in capacitors 2. Dielectrics		Deduce the effects of simple capacitors (e.g., parallel-plate, spherical, cylindrical) on the capacitance, charge, and potential difference when the size, potential difference, or charge is changed	Week 3	STEM_GP12EM-IIId-23
			Calculate the equivalent capacitance of a network of capacitors connected in series/parallel	Week 3	STEM_GP12EM-IIId-24
			Determine the total charge, the charge on, and the potential difference across each capacitor in the network given the capacitors connected in series/parallel	Week 4	STEM_GP12EM-IIId-25
			Determine the potential energy stored inside the capacitor given the geometry and the potential difference across the capacitor	Week 4	STEM_GP12EM-IIId-26

			Describe the effects of inserting dielectric materials on the capacitance, charge, and electric field of a capacitor	Week 4	STEM_GP12EM-IIId-29
			Solve problems involving capacitors and dielectrics in contexts such as, but not limited to, charged plates, batteries, and camera flashlamps.	Week 5	STEM_GP12EM-IIId-30
	1. Current, resistivity, and resistance 2. Ohm's law 3. Energy and power in electric circuits 4. Electrical safety		Distinguish between conventional current and electron flow	Week 5	STEM_GP12EM-IIId-32
			Apply the relationship charge = current x time to new situations or to solve related problems	Week 5	STEM_GP12EM-IIIe-33
			Describe the effect of temperature increase on the resistance of a metallic conductor	Week 5	STEM_GP12EM-IIIe-35
			Describe the ability of a material to conduct current in terms of resistivity and conductivity	Week 5	STEM_GP12EM-IIIe-36
			Apply the relationship of the proportionality between resistance and the length and cross-sectional area of a wire to solve problems	Week 5	STEM_GP12EM-IIIe-37
			Differentiate ohmic and non-ohmic materials in terms of their I-V curves	Week 5	STEM_GP12EM-IIIe-38
			Differentiate emf of a source and potential difference (PD) across a circuit	Week 5	STEM_GP12EM-IIIe-40
			Given an emf source connected to a resistor, determine the power supplied or dissipated by each element in a circuit	Week 5	STEM_GP12EM-IIIe-42
			Solve problems involving current, resistivity, resistance, and Ohm's law in contexts such as, but not limited to, batteries and bulbs, household wiring, and selection of fuses.	Week 5	STEM_GP12EM-IIIe-44
	Devices for measuring currents and voltages		Operate devices for measuring currents and voltages	Week 5	STEM_GP12EM-IIIe-45
			Draw circuit diagrams with power sources (cell or battery), switches, lamps, resistors (fixed and variable) fuses, ammeters and voltmeters	Week 5	STEM_GP12EM-IIIf-47

	1. Resistors in series and parallel 2. Kirchhoff's rules 3. R-C circuits		Evaluate the equivalent resistance, current, and voltage in a given network of resistors connected in series and/or parallel	Week 6	STEM_GP12EM-IIIg-48
			Calculate the current and voltage through and across circuit elements using Kirchhoff's loop and junction rules (at most 2 loops only)	Week 6	STEM_GP12EM-IIIg-49
			Solve problems involving the calculation of currents and potential difference in circuits consisting of batteries, resistors and capacitors.	Week 6	STEM_GP12EM-IIIg-51
	1. Magnetic fields 2. Lorentz Force 3. Motion of charge particles in electric and magnetic fields 4. Magnetic forces on current-carrying wires		Differentiate electric interactions from magnetic interactions	Week 6	STEM_GP12EM-IIIh-54
			Evaluate the total magnetic flux through an open surface	Week 6	STEM_GP12EM-IIIh-55
			Describe the motion of a charged particle in a magnetic field in terms of its speed, acceleration, cyclotron radius, cyclotron frequency, and kinetic energy	Week 6	STEM_GP12EM-IIIh-58
			Evaluate the magnetic force on an arbitrary wire segment placed in a uniform magnetic field	Week 6	STEM_GP12EM-IIIh-59
	1. Biot-Savart Law 2. Ampere's Law		Evaluate the magnetic field vector at a given point in space due to a moving point charge, an infinitesimal current element, or a straight current-carrying conductor	Week 7	STEM_GP12EM-IIIh-60
			Calculate the magnetic field due to one or more straight wire conductors using the superposition principle	Week 7	STEM_GP12EM-IIIi-62
			Calculate the force per unit length on a current carrying wire due to the magnetic field produced by other current-carrying wires	Week 7	STEM_GP12EM-IIIi-63
			Evaluate the magnetic field vector at any point along the axis of a circular current loop	Week 7	STEM_GP12EM-IIIi-64
			Solve problems involving magnetic fields, forces due to magnetic fields and the motion of charges and current-carrying wires in contexts such as, but not limited to, determining the strength of	Week 7	STEM_GP12EM-IIIi-66

			Earth's magnetic field, mass spectrometers, and solenoids.		
4th	1. Magnetic induction 2. Faraday's Law 3. Alternating current, LC circuits, and other applications of magnetic induction	1. Use theoretical and, when feasible, experimental approaches to solve multiconcept, rich-context problems using concepts from electromagnetic waves, optics, relativity, and atomic and nuclear theory 2. Apply ideas from atomic and nuclear physics in contexts such as, but not limited to, radiation shielding and inferring the composition of stars	Identify the factors that affect the magnitude of the induced emf and the magnitude and direction of the induced current (Faraday's Law)	Week 7	STEM_GP12EM-IVa-1
			Compare and contrast electrostatic electric field and non-electrostatic/induced electric field	Week 7	STEM_GP12EM-IVa-3
			Calculate the induced emf in a closed loop due to a time-varying magnetic flux using Faraday's Law	Week 7	STEM_GP12EM-IVa-4
			Describe the direction of the induced electric field, magnetic field, and current on a conducting/nonconducting loop using Lenz's Law	Week 8	STEM_GP12EM-IVa-5
			Compare and contrast alternating current (AC) and direct current (DC)	Week 8	STEM_GP12EM-IVb-6
			Characterize the properties (stored energy and time-dependence of charges, currents, and voltages) of an LC circuit	Week 8	STEM_GP12EM-IVb-8
	1. Maxwell's synthesis of electricity, magnetism, and optics 2. EM waves and light 3. Law of Reflection 4. Law of Refraction (Snell's Law) 5. Polarization (Malus's Law) 7. Applications of reflection, refraction, dispersion, and polarization		Relate the properties of EM wave (wavelength, frequency, speed) and the properties of vacuum and optical medium (permittivity, permeability, and index of refraction)	Week 8	STEM_GP12OPT-IVb-12
			Explain the conditions for total internal reflection	Week 8	STEM_GP12OPT-IVb-14
			Explain the phenomenon of dispersion by relating to Snell's Law	Week 8	STEM_GP12OPT-IVb-16
			Calculate the intensity of the transmitted light after passing through a series of polarizers applying Malus's Law	Week 8	STEM_GP12OPT-IVc-18
			Solve problems involving reflection, refraction, dispersion, and polarization in contexts such as, but not limited to, (polarizing) sunglasses, atmospheric haloes, and rainbows	Week 8	STEM_GP12OPT-IVc-21

	1. Reflection and refraction at plane and spherical surfaces 2. Mirrors 3. Thin lens 4. Geometric optics		Explain image formation as an application of reflection, refraction, and paraxial approximation	Week 8	STEM_GP12OPT-IVd-22
			Relate properties of mirrors and lenses (radii of curvature, focal length, index of refraction [for lenses]) to image and object distance and sizes	Week 8	STEM_GP12OPT-IVd-23
			Determine graphically and mathematically the type (virtual/real), magnification, location, and orientation of image of a point and extended object produced by a plane or spherical mirror	Week 8	STEM_GP12OPT-IVd-24
			Determine graphically and mathematically the type (virtual/real), magnification, location/ apparent depth, and orientation of image of a point and extended object produced by a lens or series of lenses	Week 8	STEM_GP12OPT-IVd-27
			Apply the principles of geometric optics to discuss image formation by the eye, and correction of common vision defects	Week 8	STEM_GP12OPT-IVd-28
	1. Huygens' Principle 2. Two-source interference of light 3. Intensity in interference patterns 4. Interference in thin films 5. Diffraction from single-slits		Determine the conditions (superposition, path and phase difference, polarization, amplitude) for interference to occur emphasizing the properties of a laser as a monochromatic and coherent light source	Week 9	STEM_GP12OPT-IVf-32
			Relate the geometry of the two-slit experiment set up (slit separation, and screen-to-slit distance) and properties of light (wavelength) to the properties of the interference pattern (width, location, and intensity)	Week 9	STEM_GP12OPT-IVf-33
			Relate the geometry of the diffraction experiment setup (slit size, and screen- to-slit distance) and properties of light (wavelength) to the properties of the diffraction pattern (width, location, and intensity of the fringes)	Week 9	STEM_GP12OPT-IVf-35
	1. Postulates of Special Relativity		State the postulates of Special Relativity and their consequences	Week 9	STEM_GP12MP-IVg-39

	2. Relativity of times and lengths 3. Relativistic velocity addition 4. Relativistic dynamics 5. Relativistic Doppler effect		Apply the time dilation, length contraction and relativistic velocity addition to worded problems	Week 9	
			Calculate kinetic energy, rest energy, momentum, and speed of objects moving with speeds comparable to the speed of light	Week 9	STEM_GP12MP-IVg-42
	1. Photoelectric effect 2. Atomic spectra 3. Radioactive decay		Explain the photoelectric effect using the idea of light quanta or photons	Week 9	STEM_GP12MP-IVh-45
			Explain qualitatively the properties of atomic emission and absorption spectra using the concept of energy levels	Week 9	STEM_GP12MP-IVh-46
			Calculating radioisotope activity using the concept of half-life	Week 9	STEM_GP12MP-IVh-i-47