MOST ESSENTIAL LEARNING COMPETENCIES (MELC)

GRADE LEVEL : GRADE 12 **SUBJECT: GENERAL PHYSICS 1**

Quarter	**Content Standard** *The learners demonstrate understanding of...*	**Performance Standard** *The learners should be able to...*	**Most Essential Learning Competencies**	**Duration**	**Code**
1st	1. The effect of instruments on measurements 2. Uncertainties and deviations in measurement 3. Sources and types of error	Solve, using experimental and theoretical approaches, multi-concept, rich-content problems involving measurement, vectors, motion in 1D and 2D, Newton's Laws, Work, Energy, Center of Mass, momentum, impulse and collisions	Solve measurement problems involving conversion of units, expression of measurements in scientific notation	Week 1	STEM_GP12EU-Ia-1
			Differentiate accuracy from precision	Week 1	STEM_GP12EU-Ia-2
			Differentiate random errors from systematic errors	Week 1	STEM_GP12EU-Ia-3
			Estimate errors from multiple measurements of a physical quantity using variance	Week 1	STEM_GP12EU-Ia-5
	Vectors and vector addition		Differentiate vector and scalar quantities	Week 1	STEM_GP12V-Ia-8
			Perform addition of vectors	Week 1	STEM_GP12V-Ia-9
			Rewrite a vector in component form	Week 1	STEM_GP12V-Ia-10
	1. Position, time, distance, displacement, speed, average velocity, instantaneous velocity 2. Average acceleration, and instantaneous acceleration		Convert a verbal description of a physical situation involving uniform acceleration in one dimension into a mathematical description	Week 2	STEM_GP12Kin-Ib-12
			Interpret displacement and velocity, respectively, as areas under velocity vs. time and acceleration vs. time curves	Week 2	STEM_GP12KIN- Ib-14

	3. Uniformly accelerated linear motion 3. Free-fall motion 4. 1D Uniform Acceleration Problems		Interpret velocity and acceleration, respectively, as slopes of position vs. time and velocity vs. time curves	Week 2	STEM_GP12KIN-Ib-15
			Construct velocity vs. time and acceleration vs. time graphs, respectively, corresponding to a given position vs. time-graph and velocity vs. time graph and vice versa	Week 2	STEM_GP12KIN-Ib-16
			Solve for unknown quantities in equations involving one-dimensional uniformly accelerated motion , including free fall motion	Week 2	STEM_GP12KIN-Ib-17
			Solve problems involving one-dimensional motion with constant acceleration in contexts such as, but not limited to, the “tail-gating phenomenon”, pursuit, rocket launch, and free-fall problems	Week 2	STEM_GP12KIN-Ib-19
	Relative motion 1. Position, distance, displacement, speed, average velocity, instantaneous velocity, average acceleration, and instantaneous acceleration in 2- and 3- dimensions 2. Projectile Motion 3. Circular Motion		Describe motion using the concept of relative velocities in 1D and 2D	Week 3	STEM_GP12KIN-Ic-20
			Deduce the consequences of the independence of vertical and horizontal components of projectile motion	Week 3	STEM_GP12KIN-Ic-22
			Calculate range, time of flight, and maximum heights of projectiles	Week 3	STEM_GP12KIN-Ic-23
			Infer quantities associated with circular motion such as tangential velocity, centripetal acceleration, tangential acceleration, radius of curvature	Week 3	STEM_GP12KIN-Ic-25
			Solve problems involving two dimensional motion in contexts such as, but not limited to ledge jumping, movie stunts, basketball, safe locations during firework displays, and Ferris wheels	Week 3	STEM_GP12KIN-Ic-26
	1. Newton’s Law’s of Motion		Define inertial frames of reference	Week 4	STEM_GP12N-Id-28

	2. Inertial Reference Frames 3. Action at a distance forces 4. Types of contact forces: tension, normal force, kinetic and static friction, fluid resistance 5. Action-Reaction Pairs 6. Free-Body Diagrams 7. Applications of Newton's Laws to single-body and multibody dynamics 8. Problem solving using Newton's Laws		Identify action-reaction pairs	Week 4	STEM_GP12N-Id-31
			Draw free-body diagrams	Week 4	STEM_GP12N-Id-32
			Apply Newton's 1st law to obtain quantitative and qualitative conclusions about the contact and noncontact forces acting on a body in equilibrium	Week 4	STEM_GP12N-Ie-33
			Differentiate the properties of static friction and kinetic friction	Week 4	STEM_GP12N-Ie-34
			Apply Newton's 2nd law and kinematics to obtain quantitative and qualitative conclusions about the velocity and acceleration of one or more bodies, and the contact and noncontact forces acting on one or more bodies	Week 5	STEM_GP12N-Ie-36
			Solve problems using Newton's Laws of motion in contexts such as, but not limited to, ropes and pulleys, the design of mobile sculptures, transport of loads on conveyor belts, force needed to move stalled vehicles, determination of safe driving speeds on banked curved roads	Week 5	STEM_GP12N-Ie-38
	1. Dot or Scalar Product 2. Work done by a force 3. Work-energy relation 4. Kinetic energy 5. Power 6. Conservative and nonconservative forces 7. Gravitational potential energy 8. Elastic potential energy 9. Equilibria and potential energy diagrams 10. Energy Conservation, Work, and Power Problems		Calculate the dot or scalar product of vectors	Week 5	STEM_GP12WE-If-40
			Determine the work done by a force acting on a system	Week 5	STEM_GP12WE-If-41
			Define work as a scalar or dot product of force and displacement	Week 6	STEM_GP12WE-If-42
			Interpret the work done by a force in one-dimension as an area under a Force vs. Position curve	Week 6	STEM_GP12WE-If-43
			Relate the gravitational potential energy of a system or object to the configuration of the system	Week 6	STEM_GP12WE-Ig-48
			Relate the elastic potential energy of a system or object to the configuration of the system	Week 6	STEM_GP12WE-Ig-49

			Explain the properties and the effects of conservative forces	Week 6	STEM_GP12WE-Ig-50
			Use potential energy diagrams to infer force; stable, unstable, and neutral equilibria; and turning points	Week 7	STEM_GP12WE-Ig-53
			Solve problems involving work, energy, and power in contexts such as, but not limited to, bungee jumping, design of roller-coasters, number of people required to build structures such as the Great Pyramids and the rice terraces; power and energy requirements of human activities such as sleeping vs. sitting vs. standing, running vs. walking.	Week 7	STEM_GP12WE-Ih-i- 55
	1. Center of mass 2. Momentum 3. Impulse 4. Impulse-momentum relation 5. Law of conservation of momentum 6. Collisions 7. Center of Mass, Impulse, Momentum, and Collision Problems		Differentiate center of mass and geometric center	Week 7	STEM_GP12WE-Ih-i- 56
			Relate the motion of center of mass of a system to the momentum and net external force acting on the system	Week 7	STEM_GP12MMIC-Ih- 57
			Relate the momentum, impulse, force, and time of contact in a system	Week 8	STEM_GP12MMIC-Ih- 58
			Compare and contrast elastic and inelastic collisions	Week 8	STEM_GP12MMIC-Ii- 60
			Apply the concept of restitution coefficient in collisions	Week 8	STEM_GP12MMIC-Ii- 61
			Solve problems involving center of mass, impulse, and momentum in contexts such as, but not limited to, rocket motion, vehicle collisions, and ping-pong.	Week 8	STEM_GP12MMIC-Ii- 63
2nd	1. Moment of inertia 2. Angular position, angular velocity, angular acceleration 3. Torque 4. Static equilibrium 5. Rotational kinematics		Calculate the moment of inertia about a given axis of single-object and multiple-object systems	Week 1	STEM_GP12RED-IIa-1
			Calculate magnitude and direction of torque using the definition of torque as a cross product	Week 1	STEM_GP12RED-IIa-3
			Describe rotational quantities using vectors	Week 1	STEM_GP12RED-IIa-4

	6. Work done by a torque		Determine whether a system is in static equilibrium or not	Week 1	STEM_GP12RED-IIa-5
			Apply the rotational kinematic relations for systems with constant angular accelerations	Week 1	STEM_GP12RED-IIa-6
			Determine angular momentum of different systems	Week 1	STEM_GP12RED-IIa-9
			Apply the torque-angular momentum relation	Week 1	STEM_GP12RED-IIa- 10
			Solve static equilibrium problems in contexts but not limited to see-saws, cable-hinge-strut-system, leaning ladders, and weighing a heavy suitcase using a small bathroom scale	Week 1	STEM_GP12RED-IIa-8
	1. Newton's Law of Universal Gravitation 2. Gravitational field 3. Gravitational potential energy 4. Orbits 5. Kepler's laws of planetary motion		Use Newton's law of gravitation to infer gravitational force, weight, and acceleration due to gravity	Week 2	STEM_GP12G-IIb-16
			Discuss the physical significance of gravitational field	Week 2	STEM_GP12Red-IIb- 18
			Apply the concept of gravitational potential energy in physics problems	Week 2	STEM_GP12Red-IIb- 19
			Calculate quantities related to planetary or satellite motion	Week 2	STEM_GP12Red-IIb- 20
			For circular orbits, relate Kepler's third law of planetary motion to Newton's law of gravitation and centripetal acceleration	Week 3	STEM_GP12G-IIc-22
	1. Periodic Motion 2. Simple harmonic motion: spring-mass system, simple pendulum 3. Damped and Driven oscillation 4. Periodic Motion experiment 5. Mechanical waves		Relate the amplitude, frequency, angular frequency, period, displacement, velocity, and acceleration of oscillating systems	Week 3	STEM_GP12PM-IIc-24
			Recognize the necessary conditions for an object to undergo simple harmonic motion	Week 3	STEM_GP12PM-IIc-25
			Calculate the period and the frequency of spring mass, simple pendulum, and physical pendulum	Week 3	STEM_GP12PM-IIc-27
			Differentiate underdamped, overdamped, and critically damped motion	Week 4	STEM_GP12PM-IId-28

			Define mechanical wave, longitudinal wave, transverse wave, periodic wave, and sinusoidal wave	Week 4	STEM_GP12PM-IId-31
			From a given sinusoidal wave function infer the speed, wavelength, frequency, period, direction, and wave number	Week 4	STEM_GP12PM-IId-32
	1. Sound 2. Wave Intensity 3. Interference and beats 4. Standing waves 5. Doppler effect		Apply the inverse-square relation between the intensity of waves and the distance from the source	Week 4	STEM_GP12MWS-IIe- 34
			Describe qualitatively and quantitatively the superposition of waves	Week 5	STEM_GP12MWS-IIe- 35
			Apply the condition for standing waves on a string	Week 5	STEM_GP12MWS-IIe- 36
			Relate the frequency (source dependent) and wavelength of sound with the motion of the source and the listener	Week 5	TEM_GP12MWS-IIe- 37
	1. Specific gravity 2. Pressure 3. Pressure vs. Depth Relation 4. Pascal's principle 5. Buoyancy and Archimedes' Principle 6. Bernoulli's principle		Relate density, specific gravity, mass, and volume to each other	Week 5	STEM_GP12FM-IIf-40
			Relate pressure to area and force	Week 6	STEM_GP12FM-IIf-41
			Relate pressure to fluid density and depth	Week 6	STEM_GP12FM-IIf-42
			Apply Pascal's principle in analyzing fluids in various systems	Week 6	STEM_GP12FM-IIf-43
			Apply the concept of buoyancy and Archimedes' principle	Week 6	STEM_GP12FM-IIf-44
			Apply Bernoulli's principle and continuity equation, whenever appropriate, to infer relations involving pressure, elevation, speed, and flux	Week 7	STEM_GP12FM-IIf-46
	1. Zeroth law of thermodynamics and Temperature measurement		Explain the connection between the Zeroth Law of Thermodynamics, temperature, thermal equilibrium, and temperature scales	Week 7	STEM_GP12TH-IIg-49

	2. Thermal expansion 3. Heat and heat capacity		Convert temperatures and temperature differences in the following scales: Fahrenheit, Celsius, Kelvin	Week 7	STEM_GP12TH-IIg-50
			Define coefficient of thermal expansion and coefficient of volume expansion	Week 7	STEM_GP12TH-IIg-51
			Calculate volume or length changes of solids due to changes in temperature	Week 7	STEM_GP12TH-IIg-52
			Solve problems involving temperature, thermal expansion, heat capacity, heat transfer, and thermal equilibrium in contexts such as, but not limited to, the design of bridges and train rails using steel, relative severity of steam burns and water burns, thermal insulation, sizes of stars, and surface temperatures of planets	Week 7	STEM_GP12TH-IIg-53
	1. Ideal gas law 2. Internal energy of an ideal gas 3. Heat capacity of an ideal gas 4. Thermodynamic systems 5. Work done during volume changes 6. 1st law of thermodynamics 7. Thermodynamic processes: adiabatic, isothermal, isobaric, isochoric 8. Heat engines 9. Engine cycles 10. Entropy 11. 2nd law of Thermodynamics		Enumerate the properties of an ideal gas	Week 8	STEM_GP12GLT-IIh- 57
			Solve problems involving ideal gas equations in contexts such as, but not limited to, the design of metal containers for compressed gases	Week 8	STEM_GP12GLT-IIh- 58
			Interpret PV diagrams of a thermodynamic process	Week 8	STEM_GP12GLT-IIh- 60
			Compute the work done by a gas using dW=PdV	Week 8	STEM_GP12GLT-IIh- 61
			State the relationship between changes internal energy, work done, and thermal energy supplied through the First Law of Thermodynamics	Week 8	STEM_GP12GLT-IIh- 62
			Differentiate the following thermodynamic processes and show them on a PV diagram: isochoric, isobaric, isothermal, adiabatic, and cyclic	Week 8	STEM_GP12GLT-IIh- 63
			Calculate the efficiency of a heat engine	Week 8	STEM_GP12GLT-IIi-67
			Describe reversible and irreversible processes	Week 8	STEM_GP12GLT-IIi-68

	12. Reversible and irreversible processes		Explain how entropy is a measure of disorder	Week 8	STEM_GP12GLT-IIi-69
			State the 2nd Law of Thermodynamics	Week 8	STEM_GP12GLT-IIi-70
			Calculate entropy changes for various processes e.g., isothermal process, free expansion, constant pressure process, etc.	Week 8	STEM_GP12GLT-IIi-71