K to 12 BASIC EDUCATION CURRICULUM
SENIOR HIGH SCHOOL – SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) SPECIALIZED SUBJECT

Grade: 12
Subject Title: General Physics 1

Quarters: General Physics 1 (Q1&Q2)
No. of Hours/ Quarters: 40 hours/ quarter
Prerequisite: Basic Calculus

Subject Description: Mechanics of particles, rigid bodies, and fluids; waves; and heat and thermodynamics using the methods and concepts of algebra, geometry, trigonometry, graphical analysis, and basic calculus

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
1. **Units** 2. **Physical Quantities** 3. **Measurement** 4. **Graphical Presentation** 5. **Linear Fitting of Data**	*The learners demonstrate an understanding of...* 1. The effect of instruments on measurements 2. Uncertainties and deviations in measurement 3. Sources and types of error 4. Accuracy versus precision 5. Uncertainty of derived quantities 6. Error bars 7. Graphical analysis: linear fitting and transformation of functional dependence to linear form	*The learners are able to...* Solve, using experimental and theoretical approaches, multiconcept, rich-context problems involving measurement, vectors, motions in 1D, 2D, and 3D, Newton's Laws, work, energy, center of mass, momentum, impulse, and collisions	*The learners...* 1. Solve measurement problems involving conversion of units, expression of measurements in scientific notation	**STEM_GP12EU-Ia-1**	
			2. Differentiate accuracy from precision	**STEM_GP12EU-Ia-2**	
			3. Differentiate random errors from systematic errors	**STEM_GP12EU-Ia-3**	
			4. Use the least count concept to estimate errors associated with single measurements	**STEM_GP12EU-Ia-4**	
			5. Estimate errors from multiple measurements of a physical quantity using variance	**STEM_GP12EU-Ia-5**	
			6. Estimate the uncertainty of a derived quantity from the estimated values and uncertainties of directly measured quantities	**STEM_GP12EU-Ia-6**	
			7. Estimate intercepts and slopes—and and their uncertainties—in experimental data with linear dependence using the "eyeball method" and/or linear regression formulae	**STEM_GP12EU-Ia-7**	
Vectors	1. Vectors and vector addition 2. Components of vectors 3. Unit vectors		1. Differentiate vector and scalar quantities	**STEM_GP12V-Ia-8**	
			2. Perform addition of vectors	**STEM_GP12V-Ia-9**	
			3. Rewrite a vector in component form	**STEM_GP12V-Ia-10**	
			4. Calculate directions and magnitudes of	**STEM_GP12V-Ia-**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			vectors	**11**	
Kinematics: Motion Along a Straight Line	1. Position, time, distance, displacement, speed, average velocity, instantaneous velocity 2. Average acceleration, and instantaneous acceleration 3. Uniformly accelerated linear motion 4. Free-fall motion 5. 1D Uniform Acceleration Problems		1. Convert a verbal description of a physical situation involving uniform acceleration in one dimension into a mathematical description	**STEM_GP12Kin-Ib-12**	
			2. Recognize whether or not a physical situation involves constant velocity or constant acceleration	**STEM_GP12KIN-Ib-13**	
			3. Interpret displacement and velocity, respectively, as areas under velocity vs. time and acceleration vs. time curves	**STEM_GP12KIN-Ib-14**	
			4. Interpret velocity and acceleration, respectively, as slopes of position vs. time and velocity vs. time curves	**STEM_GP12KIN-Ib-15**	
			5. 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	**STEM_GP12KIN-Ib-16**	NSTIC Free-FALL Set
			6. Solve for unknown quantities in equations involving one-dimensional uniformly accelerated motion	**STEM_GP12KIN-Ib-17**	
			7. Use the fact that the magnitude of acceleration due to gravity on the Earth's surface is nearly constant and approximately 9.8 m/s^2 in free-fall problems	**STEM_GP12KIN-Ib-18**	NSTIC Free-FALL Set
			8. 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	**STEM_GP12KIN-Ib-19**	
Kinematics: Motion in 2-Dimensions and 3-	Relative motion 1. Position, distance,		1. Describe motion using the concept of relative velocities in 1D and 2D	**STEM_GP12KIN-Ic-20**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
Dimensions	displacement, speed, average velocity, instantaneous velocity, average acceleration, and instantaneous acceleration in 2- and 3- dimensions 2. Projectile motion 3. Circular motion 4. Relative motion		2. Extend the definition of position, velocity, and acceleration to 2D and 3D using vector representation	**STEM_GP12KIN-Ic-21**	
			3. Deduce the consequences of the independence of vertical and horizontal components of projectile motion	**STEM_GP12KIN-Ic-22**	
			4. Calculate range, time of flight, and maximum heights of projectiles	**STEM_GP12KIN-Ic-23**	
			5. Differentiate uniform and non-uniform circular motion	**STEM_GP12KIN-Ic-24**	
			6. Infer quantities associated with circular motion such as tangential velocity, centripetal acceleration, tangential acceleration, radius of curvature	**STEM_GP12KIN-Ic-25**	
			7. 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	**STEM_GP12KIN-Ic-26**	
			8. Plan and execute an experiment involving projectile motion: Identifying error sources, minimizing their influence, and estimating the influence of the identified error sources on final results	**STEM_GP12KIN-Id-27**	
Newton's Laws of Motion and Applications	1. Newton's Law's of Motion 2. Inertial Reference Frames 3. Action at a distance forces 4. Mass and Weight 5. Types of contact forces: tension, normal force, kinetic and static friction, fluid		1. Define inertial frames of reference	**STEM_GP12N-Id-28**	
			2. Differentiate contact and noncontact forces	**STEM_GP12N-Id-29**	
			3. Distinguish mass and weight	**STEM_GP12N-Id-30**	
			4. Identify action-reaction pairs	**STEM_GP12N-Id-31**	NSTIC Cart-Rail System
			5. Draw free-body diagrams	**STEM_GP12N-Id-32**	
			6. Apply Newton's 1st law to obtain quantitative and qualitative conclusions about the contact and noncontact forces	**STEM_GP12N-Ie-33**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
	resistance 6. Action-Reaction Pairs 7. Free-Body Diagrams 8. Applications of Newton's Laws to single-body and multibody dynamics 9. Fluid resistance 10. Experiment on forces 11. Problem solving using Newton's Laws		acting on a body in equilibrium (1 lecture)		
			7. Differentiate the properties of static friction and kinetic friction	**STEM_GP12N-Ie-34**	NSTIC Friction Set
			8. Compare the magnitude of sought quantities such as frictional force, normal force, threshold angles for sliding, acceleration, etc.	**STEM_GP12N-Ie-35**	
			9. 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	**STEM_GP12N-Ie-36**	
			10. Analyze the effect of fluid resistance on moving object	**STEM_GP12N-Ie-37**	
			11. 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	**STEM_GP12N-Ie-38**	
			12. Plan and execute an experiment involving forces (e.g., force table, friction board, terminal velocity) and identifying discrepancies between theoretical expectations and experimental results when appropriate	**STEM_GP12N-If-39**	1. Force Table 2. NSTIC Friction Set
Work, Energy, and Energy Conservation	1. Dot or Scalar Product 2. Work done by a force 3. Work-energy relation 4. Kinetic energy		1. Calculate the dot or scalar product of vectors	**STEM_GP12WE-If-40**	
			2. Determine the work done by a force (not necessarily constant) acting on a system	**STEM_GP12WE-If-41**	
			3. Define work as a scalar or dot product of force and displacement	**STEM_GP12WE-If-42**	
			4. Interpret the work done by a force in	**STEM_GP12WE-If-**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
	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		one-dimension as an area under a Force vs. Position curve	**43**	
			5. Relate the work done by a constant force to the change in kinetic energy of a system	**STEM_GP12WE-Ig-44**	
			6. Apply the work-energy theorem to obtain quantitative and qualitative conclusions regarding the work done, initial and final velocities, mass and kinetic energy of a system.	**STEM_GP12WE-Ig-45**	
			7. Represent the work-energy theorem graphically	**STEM_GP12WE-Ig-46**	
			8. Relate power to work, energy, force, and velocity	**STEM_GP12WE-Ig-47**	
			9. Relate the gravitational potential energy of a system or object to the configuration of the system	**STEM_GP12WE-Ig-48**	
			10. Relate the elastic potential energy of a system or object to the configuration of the system	**STEM_GP12WE-Ig-49**	
			11. Explain the properties and the effects of conservative forces	**STEM_GP12WE-Ig-50**	
			12. Identify conservative and nonconservative forces	**STEM_GP12WE-Ig-51**	
			13. Express the conservation of energy verbally and mathematically	**STEM_GP12WE-Ig-52**	
			14. Use potential energy diagrams to infer force; stable, unstable, and neutral equilibria; and turning points	**STEM_GP12WE-Ig-53**	
			15. Determine whether or not energy conservation is applicable in a given example before and after description of a physical system	**STEM_GP12WE-Ig-54**	

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			16. 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. (Conversion of joules to calories should be emphasized at this point.)	**STEM_GP12WE-Ih-i-55**	
Center of Mass, Momentum, Impulse, and Collisions	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 8. Energy and momentum experiments		1. Differentiate center of mass and geometric center	**STEM_GP12MMIC-Ih-56**	
			2. Relate the motion of center of mass of a system to the momentum and net external force acting on the system	**STEM_GP12MMIC-Ih-57**	
			3. Relate the momentum, impulse, force, and time of contact in a system	**STEM_GP12MMIC-Ih-58**	
			4. Explain the necessary conditions for conservation of linear momentum to be valid.	**STEM_GP12MMIC-Ih-59**	
			5. Compare and contrast elastic and inelastic collisions	**STEM_GP12MMIC-Ii-60**	
			6. Apply the concept of restitution coefficient in collisions	**STEM_GP12MMIC-Ii-61**	
			7. Predict motion of constituent particles for different types of collisions (e.g., elastic, inelastic)	**STEM_GP12MMIC-Ii-62**	
			8. Solve problems involving center of mass, impulse, and momentum in contexts such as, but not limited to, rocket motion, vehicle collisions, and ping-pong. (*Emphasize also the concept of whiplash and the sliding, rolling, and mechanical deformations in vehicle collisions.*)	**STEM_GP12MMIC-Ii-63**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			9. Perform an experiment involving energy and momentum conservation and analyze the data identifying discrepancies between theoretical expectations and experimental results when appropriate	**STEM_GP12MMIC-Ii-64**	
Integration of Data Analysis and Point Mechanics Concepts	Refer to weeks 1 to 9		(Assessment of the performance standard)	(1 week)	
Rotational equilibrium and rotational dynamics	1. Moment of inertia 2. Angular position, angular velocity, angular acceleration 3. Torque 4. Torque-angular acceleration relation 5. Static equilibrium 6. Rotational kinematics 7. Work done by a torque 8. Rotational kinetic energy 9. Angular momentum 10. Static equilibrium experiments 11. Rotational motion problems	Solve multi-concept, rich context problems using concepts from rotational motion, fluids, oscillations, gravity, and thermodynamics	1. Calculate the moment of inertia about a given axis of single-object and multiple-object systems *(1 lecture with exercises)*	**STEM_GP12RED-IIa-1**	
			2. Exploit analogies between pure translational motion and pure rotational motion to infer rotational motion equations (e.g., rotational kinematic equations, rotational kinetic energy, torque-angular acceleration relation)	**STEM_GP12RED-IIa-2**	
			3. Calculate magnitude and direction of torque using the definition of torque as a cross product	**STEM_GP12RED-IIa-3**	
			4. Describe rotational quantities using vectors	**STEM_GP12RED-IIa-4**	
			5. Determine whether a system is in static equilibrium or not	**STEM_GP12RED-IIa-5**	
			6. Apply the rotational kinematic relations for systems with constant angular accelerations	**STEM_GP12RED-IIa-6**	
			7. Apply rotational kinetic energy formulae	**STEM_GP12RED-IIa-7**	
			8. Solve static equilibrium problems in contexts such as, but not limited to, see-saws, mobiles, cable-hinge-strut system, leaning ladders, and weighing a heavy suitcase using a small bathroom scale	**STEM_GP12RED-IIa-8**	
			9. Determine angular momentum of different systems	**STEM_GP12RED-IIa-9**	

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			10. Apply the torque-angular momentum relation	STEM_GP12RED-IIa-10	
			11. Recognize whether angular momentum is conserved or not over various time intervals in a given system	STEM_GP12RED-IIa-11	
			12. Perform an experiment involving static equilibrium and analyze the data—identifying discrepancies between theoretical expectations and experimental results when appropriate	STEM_GP12RED-IIa-12	
			13. Solve rotational kinematics and dynamics problems, in contexts such as, but not limited to, flywheels as energy storage devices, and spinning hard drives	STEM_GP12RED-IIa-13	
Gravity	1. Newton's Law of Universal Gravitation 2. Gravitational field 3. Gravitational potential energy 4. Escape velocity 5. Orbits		1. Use Newton's law of gravitation to infer gravitational force, weight, and acceleration due to gravity	STEM_GP12G-IIb-16	
			2. Determine the net gravitational force on a mass given a system of point masses	STEM_GP12Red-IIb-17	
			3. Discuss the physical significance of gravitational field	STEM_GP12Red-IIb-18	
			4. Apply the concept of gravitational potential energy in physics problems	STEM_GP12Red-IIb-19	
			5. Calculate quantities related to planetary or satellite motion	STEM_GP12Red-IIb-20	
	6. Kepler's laws of planetary motion		6. Apply Kepler's 3rd Law of planetary motion	STEM_GP12G-IIc-21	
			7. For circular orbits, relate Kepler's third law of planetary motion to Newton's law of gravitation and centripetal acceleration	STEM_GP12G-IIc-22	
			8. Solve gravity-related problems in contexts such as, but not limited to, inferring the mass of the Earth, inferring the mass of Jupiter from the motion of its moons, and calculating escape speeds from the Earth and from the solar system	STEM_GP12G-IIc-23	
Periodic Motion	1. Periodic Motion		1. Relate the amplitude, frequency, angular	STEM_GP12PM-	

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	2. Simple harmonic motion: spring-mass system, simple pendulum, physical pendulum		frequency, period, displacement, velocity, and acceleration of oscillating systems	**IIc-24**	
			2. Recognize the necessary conditions for an object to undergo simple harmonic motion	**STEM_GP12PM-IIc-25**	
			3. Analyze the motion of an oscillating system using energy and Newton's 2nd law approaches	**STEM_GP12PM-IIc-26**	
			4. Calculate the period and the frequency of spring mass, simple pendulum, and physical pendulum	**STEM_GP12PM-IIc-27**	
	3. Damped and Driven oscillation 4. Periodic Motion experiment		5. Differentiate underdamped, overdamped, and critically damped motion	**STEM_GP12PM-IId-28**	
			6. Describe the conditions for resonance	**STEM_GP12PM-IId-29**	
			7. Perform an experiment involving periodic motion and analyze the data—identifying discrepancies between theoretical expectations and experimental results when appropriate	**STEM_GP12PM-IId-30**	
	5. Mechanical waves		8. Define mechanical wave, longitudinal wave, transverse wave, periodic wave, and sinusoidal wave	**STEM_GP12PM-IId-31**	Slinky Coil
			9. From a given sinusoidal wave function infer the (speed, wavelength, frequency, period, direction, and wave number	**STEM_GP12PM-IId-32**	
			10. Calculate the propagation speed, power transmitted by waves on a string with given tension, mass, and length (*1 lecture*)	**STEM_GP12PM-IId-33**	
Mechanical Waves and Sound	1. Sound 2. Wave Intensity 3. Interference and beats 4. Standing waves 5. Doppler effect		1. Apply the inverse-square relation between the intensity of waves and the distance from the source	**STEM_GP12MWS-IIe-34**	
			2. Describe qualitatively and quantitatively the superposition of waves	**STEM_GP12MWS-IIe-35**	
			3. Apply the condition for standing waves	**STEM_GP12MWS-**	1. DC String Vibrator

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			on a string	IIe-36	2. Musical Instrument, Miniature Guitar
			4. Relate the frequency (source dependent) and wavelength of sound with the motion of the source and the listener	STEM_GP12MWS-IIe-37	Resistance Board
			5. Solve problems involving sound and mechanical waves in contexts such as, but not limited to, echolocation, musical instruments, ambulance sounds	STEM_GP12MWS-IIe-38	Musical Instrument, Miniature Guitar
			6. Perform an experiment investigating the properties of sound waves and analyze the data appropriately—identifying deviations from theoretical expectations when appropriate	STEM_GP12MWS-IIe-39	1. Loudspeaker 2. Resonance Tube 3. Sound Signal Generator 4. Tuning Fork Set
Fluid Mechanics	1. Specific gravity 2. Pressure 3. Pressure vs. Depth Relation 4. Pascal's principle 5. Buoyancy and Archimedes' Principle 6. Continuity equation 7. Bernoulli's principle		1. Relate density, specific gravity, mass, and volume to each other	STEM_GP12FM-IIf-40	
			2. Relate pressure to area and force	STEM_GP12FM-IIf-41	
			3. Relate pressure to fluid density and depth	STEM_GP12FM-IIf-42	Open U-Tube Manometer with Pressure Sensor
			4. Apply Pascal's principle in analyzing fluids in various systems	STEM_GP12FM-IIf-43	
			5. Apply the concept of buoyancy and Archimedes' principle	STEM_GP12FM-IIf-44	1. Archimedes Principle 2. Beaker, Plastic
			6. Explain the limitations of and the assumptions underlying Bernoulli's principle and the continuity equation	STEM_GP12FM-IIf-45	Air Blower

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			7. Apply Bernoulli's principle and continuity equation, whenever appropriate, to infer relations involving pressure, elevation, speed, and flux	**STEM_GP12FM-IIf-46**	1. Air Blower 2. Archimedes Principle
			8. Solve problems involving fluids in contexts such as, but not limited to, floating and sinking, swimming, Magdeburg hemispheres, boat design, hydraulic devices, and balloon flight	**STEM_GP12FM-IIf-47**	Beaker, Plastic
			9. Perform an experiment involving either Continuity and Bernoulli's equation or buoyancy, and analyze the data appropriately—identifying discrepancies between theoretical expectations and experimental results when appropriate	**STEM_GP12FM-IIf-48**	1. Archimedes Principle 2. Air Blower 3. Beaker, Plastic
Temperature and Heat	1. Zeroth law of thermodynamics and Temperature measurement 2. Thermal expansion 3. Heat and heat capacity 4. Calorimetry		1. Explain the connection between the Zeroth Law of Thermodynamics, temperature, thermal equilibrium, and temperature scales	**STEM_GP12TH-IIg-49**	
			2. Convert temperatures and temperature differences in the following scales: Fahrenheit, Celsius, Kelvin	**STEM_GP12TH-IIg-50**	
			3. Define coefficient of thermal expansion and coefficient of volume expansion	**STEM_GP12TH-IIg-51**	Coefficient of Linear Expansion
			4. Calculate volume or length changes of solids due to changes in temperature	**STEM_GP12TH-IIg-52**	
			5. 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	**STEM_GP12TH-IIg-53**	Coefficient of Linear Expansion

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			6. Perform an experiment investigating factors affecting thermal energy transfer and analyze the data—identifying deviations from theoretical expectations when appropriate (such as thermal expansion and modes of heat transfer)	**STEM_GP12TH-IIg-54**	
			7. Carry out measurements using thermometers	**STEM_GP12TH-IIg-55**	
	5. Mechanisms of heat transfer		8. Solve problems using the Stefan-Boltzmann law and the heat current formula for radiation and conduction (1 lecture)	**STEM_GP12TH-IIh-56**	
Ideal Gases and the Laws of Thermodynamics	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 Thermodynamic processes: adiabatic, isothermal, isobaric, isochoric		1. Enumerate the properties of an ideal gas	**STEM_GP12GLT-IIh-57**	
			2. Solve problems involving ideal gas equations in contexts such as, but not limited to, the design of metal containers for compressed gases	**STEM_GP12GLT-IIh-58**	
			3. Distinguish among system, wall, and surroundings	**STEM_GP12GLT-IIh-59**	
			4. Interpret PV diagrams of a thermodynamic process	**STEM_GP12GLT-IIh-60**	
			5. Compute the work done by a gas using dW=PdV (1 lecture)	**STEM_GP12GLT-IIh-61**	
			6. State the relationship between changes internal energy, work done, and thermal energy supplied through the First Law of Thermodynamics	**STEM_GP12GLT-IIh-62**	
			7. Differentiate the following thermodynamic processes and show them on a PV diagram: isochoric, isobaric, isothermal, adiabatic, and cyclic	**STEM_GP12GLT-IIh-63**	
			8. Use the First Law of Thermodynamics in combination with the known properties of adiabatic, isothermal, isobaric, and	**STEM_GP12GLT-IIh-64**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			isochoric processes		
			9. Solve problems involving the application of the First Law of Thermodynamics in contexts such as, but not limited to, the boiling of water, cooling a room with an air conditioner, diesel engines, and gases in containers with pistons	**STEM_GP12GLT-IIh-65**	
	7. Heat engines 8. Engine cycles 9. Entropy 10. 2nd law of Thermodynamics 11. Reversible and irreversible processes 12. Carnot cycle 13. Entropy		10. Calculate the efficiency of a heat engine	**STEM_GP12GLT-IIi-67**	
			11. Describe reversible and irreversible processes	**STEM_GP12GLT-IIi-68**	
			12. Explain how entropy is a measure of disorder	**STEM_GP12GLT-IIi-69**	
			13. State the 2nd Law of Thermodynamics	**STEM_GP12GLT-IIi-70**	
			14. Calculate entropy changes for various processes e.g., isothermal process, free expansion, constant pressure process, etc.	**STEM_GP12GLT-IIi-71**	
			15. Describe the Carnot cycle (enumerate the processes involved in the cycle and illustrate the cycle on a PV diagram)	**STEM_GP12GLT-IIi-72**	
			16. State Carnot's theorem and use it to calculate the maximum possible efficiency of a heat engine	**STEM_GP12GLT-IIi-73**	
			17. Solve problems involving the application of the Second Law of Thermodynamics in context such as, but not limited to, heat engines, heat pumps, internal combustion engines, refrigerators, and fuel economy	**STEM_GP12GLT-IIi-74**	Engine Model
Integration of Rotational motion, Fluids, Oscillations, Gravity and Thermodynamic Concepts	Refer to weeks 1 to 9		(Assessment of the performance standard)	(1 week)	

Code Book Legend

Sample: STEM_GP12GLT-IIi-73

LEGEND		SAMPLE	
First Entry	Learning Area and Strand/ Subject or Specialization	Science, Technology, Engineering and Mathematics General Physics	**STEM_GP12GLT**
	Grade Level	Grade 12	
Uppercase Letter/s	Domain/Content/ Component/ Topic	Ideal Gases and Laws of Thermodynamics	
			-
Roman Numeral **Zero if no specific quarter*	Quarter	Second Quarter	**II**
Lowercase Letter/s **Put a hyphen (-) in between letters to indicate more than a specific week*	Week	Week 9	**i**
			-
Arabic Number	Competency	State Carnot's theorem and use it to calculate the maximum possible efficiency of a heat engine	**73**

DOMAIN/ COMPONENT	CODE
Units and Measurement	EU
Vectors	V
Kinematics	KIN
Newton's Laws	N
Work and Energy	WE
Center of Mass, Momentum, Impulse and Collisions	MMIC
Rotational Equilibrium and Rotational Dynamics	RED
Gravity	G
Periodic Motion	PM
Mechanical Waves and Sounds	MWS
Fluid Mechanics	FM
Temperature and Heat	TH
Ideal Gases and Laws of Thermodynamics	GLT

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