Republic of the Philippines
Department of Education
REGION I
SCHOOLS DIVISION OF DEPED TAMBAYAN
_____ NATIONAL HIGH SCHOOL

GENERAL SCIENCE
School Year 2026-2027, Term 1
1ST Summative Test

Name: _____ Grade & Section: _____
Date: _____ Score: _____

General Instructions: Read each scenario carefully. Choose the best answer from the options provided. These questions are designed to test your literacy, numeracy, and scientific reasoning in physics contexts.

Scenario 1: The Modern Filipino Home

Maria lives in a smart home where various technologies enhance her family's quality of life. From the induction cooker that prepares meals quickly to the MRI scan her grandfather recently underwent, physics is at the heart of their daily experiences. Safety features like circuit breakers and car airbags also ensure their well-being.

1. Which of the following household appliances primarily utilizes the principles of electromagnetism to provide a safer and more efficient way of cooking?
   A. Electric Fan
   B. Induction Cooker
   C. Traditional Charcoal Grill
   D. Manual Whisk
2. In terms of health and safety, what physics-based technology is used to create detailed images of the body's internal organs without using harmful ionizing radiation?
   A. X-ray Imaging
   B. CT Scan
   C. Magnetic Resonance Imaging (MRI)
   D. Stethoscope
3. How does the application of physics in the design of LED (Light Emitting Diode) bulbs enhance the quality of life regarding work productivity and economy?
   A. By producing more heat to keep the workplace warm.
   B. By converting more electrical energy into light rather than heat, reducing electricity costs.
   C. By requiring more frequent replacements to boost the manufacturing industry.
   D. By emitting ultraviolet rays that help in sanitizing the office.
4. In the context of transportation safety, how do crumple zones in modern vehicles protect passengers during a collision?
   A. They increase the time of impact, thereby reducing the impulsive force acting on the passengers.
   B. They make the car stronger so it does not deform at all during a crash.
   C. They decrease the time of impact to get the crash over with quickly.
   D. They eliminate the need for seatbelts by absorbing all the kinetic energy.
5. If a household wants to reduce its carbon footprint while maintaining leisure activities like watching TV, which physics-based solution is most applicable?
   A. Using a CRT (Cathode Ray Tube) television for better color depth.
   B. Connecting the television to a high-capacity lead-acid battery.
   C. Installing photovoltaic (solar) panels to harness energy from sunlight.
   D. Increasing the volume of the TV to use more sound energy.

Scenario 2: The Amusement Park

At a local theme park, Juan observes two different rides. Ride A is a "Drop Tower" where the seats move straight down. Ride B is a "Carousel" where the wooden horses move in a circular path around a central axis. Juan notices that while both involve movement, the quantities used to describe them differ.

1. Which term refers to the motion of the "Drop Tower" where all parts of the object move the same distance in the same direction?
   A. Rotational Motion
   B. Translational Motion
   C. Oscillatory Motion
   D. Vibrational Motion
2. In the Carousel ride, what is the standard unit used to measure the "angular displacement" of the horses as they go around the center?
   A. Meters

B. Kilograms
C. Radians
D. Newtons

3. How does translational velocity differ from angular velocity in the context of these rides?
   A. Translational velocity is measured in m/s, while angular velocity is measured in rad/s.
   B. Translational velocity only applies to objects at rest.
   C. Angular velocity measures the change in linear distance over time.
   D. There is no difference; they are two names for the same quantity.
4. When comparing mass in translational motion to its counterpart in rotational motion (moment of inertia), which statement is true?
   A. Mass depends on the axis of rotation, while moment of inertia does not.
   B. Moment of inertia depends on both the mass and the distribution of that mass relative to the axis.
   C. Moment of inertia is always less than the total mass.
   D. Mass and moment of inertia are both measured in Joules.
5. If the Carousel (Ride B) completes one full revolution in 10 seconds, what is its average angular velocity?
   A. 0.10 rad/s
   B. 0.314 rad/s
   C. 0.628 rad/s
   D. 6.28 rad/s

Scenario 3: The Gymnastics Meet

A gymnast performs a routine. When she tucks her body tightly while spinning in the air, she rotates faster. This relationship between her body's shape (ergonomics) and her movement involves both linear and angular quantities. Similarly, the design of her training equipment must consider these physics principles for safety and performance.

1. What is the linear distance covered by a point on the gymnast's waist if she performs one full rotation (2π radians) and the radius from her spine to her waist is 0.15 meters?
   A. 0.15 meters
   B. 0.30 meters
   C. 0.94 meters
   D. 1.50 meters
2. In human movement, what is the rotational equivalent of "force" that allows a gymnast to begin spinning?
   A. Momentum
   B. Torque
   C. Acceleration
   D. Inertia
3. Why does an athlete's "linear velocity" at the tip of their foot increase when they kick with a straight leg compared to a bent leg, assuming the angular velocity is the same?
   A. Because linear velocity is inversely proportional to the radius.
   B. Because linear velocity is equal to angular velocity multiplied by the radius ($v = r\omega$).
   C. Because a straight leg has less mass than a bent leg.
   D. Because the straight leg experiences less air resistance.
4. How does ergonomic furniture design, such as an adjustable office chair, apply the relationship between linear and angular quantities to improve health?
   A. By keeping the joints at fixed 180-degree angles at all times.
   B. By allowing the user to adjust the pivot points (axis) to match their natural limb lengths, reducing strain.
   C. By making the chair rotate as fast as possible.
   D. By using heavy materials to increase the moment of inertia.
5. A toy designer wants to create a spinning top that stays upright for a long time. Based on physics, what should they do?
   A. Make the top very tall and thin.
   B. Distribute the mass further from the center of rotation to increase the moment of inertia.
   C. Ensure the top is made of soft, flexible rubber.
   D. Decrease the rotational speed.

Scenario 4: The Car Service Center

At a car service center, a mechanic uses a hydraulic lift to raise a heavy SUV. By pushing down on a small piston with a small force, the system generates enough force on a large piston to lift the vehicle. This system relies on the properties of incompressible fluids.

1. Which fundamental principle states that pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and to the walls of the container?
   A. Archimedes' Principle
   B. Bernoulli's Principle
   C. Pascal's Principle
   D. Newton's Third Law
2. In a hydraulic system, what remains constant between the input piston and the output piston?
   A. The Force
   B. The Area
   C. The Pressure

D. The Distance Moved

3. How does a hydraulic system "enhance" a simple machine like a lever?
    A. By multiplying the force applied through the ratio of the piston areas.
    B. By creating energy out of nothing within the fluid.
    C. By eliminating the need for any movement.
    D. By cooling down the machine during operation.
4. Why is oil usually used in hydraulic systems instead of air?
    A. Oil is cheaper and easier to find than air.
    B. Oil is incompressible, whereas air is compressible, leading to inefficient force transmission.
    C. Oil makes the machine look cleaner.
    D. Air is too heavy for the pistons to move.
5. If the area of the output piston is 10 times larger than the input piston, how much force is generated at the output if 50 N is applied to the input?
    A. 5 N
    B. 50 N
    C. 500 N
    D. 5000 N

Scenario 5: Heavy Construction Machinery
Excavators and backhoes are compound machines that combine levers and hydraulic cylinders. The hydraulic fluid allows these machines to perform heavy-duty tasks like digging through solid rock or lifting massive concrete pipes with precision.

1. What component in an excavator acts as the "enclosed container" for the fluid to transmit pressure?
    A. The Metal Bucket
    B. The Hydraulic Cylinder
    C. The Rubber Tires
    D. The Operator's Seat
2. Which of the following describes the energy transformation in a hydraulic excavator?
    A. Electrical energy to Chemical energy
    B. Mechanical energy to Thermal energy only
    C. Fluid pressure (Potential/Kinetic) to Mechanical work
    D. Nuclear energy to Sound energy
3. How does the use of hydraulics in a compound machine like a crane improve work productivity?
    A. It allows the operator to lift loads that exceed human strength by many magnitudes.
    B. It makes the crane move at the speed of light.
    C. It reduces the weight of the crane itself to zero.
    D. It prevents the crane from ever needing maintenance.
4. In a compound machine, if the hydraulic system fails, what happens to the mechanical advantage of the overall system?
    A. It increases significantly.
    B. It remains the same because the levers are still there.
    C. It is effectively lost because the force-transmitting medium is gone.
    D. It turns into electrical advantage.
5. An engineer is designing a small robotic arm. To double the lifting force without changing the input force, what adjustment should be made to the hydraulic pistons?
    A. Double the area of the input piston.
    B. Double the area of the output piston.
    C. Reduce the area of the output piston by half.
    D. Keep both pistons the same size.

Scenario 6: The Braking System
Most modern cars use hydraulic brakes. When the driver taps the brake pedal, the force is transmitted through fluid-filled lines to the brake calipers, which then squeeze the brake pads against the rotors to stop the car.

1. In the hydraulic braking system, what acts as the "input force"?
    A. The friction between tires and road.
    B. The driver's foot pressing the pedal.
    C. The heat generated by the brakes.
    D. The rotation of the wheels.
2. What happens if a bubble of air gets trapped in the hydraulic brake line?
    A. The brakes become more responsive.
    B. The brake pedal feels "spongy" because the air compresses, failing to transmit pressure effectively.
    C. The car will go faster.
    D. The air will help cool the brake fluid.
3. How does the hydraulic brake system demonstrate the concept of "fluid principles enhancing a machine"?
    A. By allowing a small foot force to generate enough friction to stop a 2-ton moving vehicle.
    B. By using the fluid to lubricate the tires.
    C. By replacing the need for a steering wheel.
    D. By converting the car's fuel directly into stopping power.
4. Which part of the braking system corresponds to the "Large Piston" in a basic hydraulic diagram?
    A. The Brake Pedal

B. The Master Cylinder (at the pedal)
C. The Wheel Cylinder or Caliper Piston
D. The Rear-view Mirror

5. If a driver applies 100 N of force to a master cylinder with an area of 0.001 m^2, what is the pressure (in Pascals) transmitted through the brake lines?
   A. 100 Pa
   B. 1,000 Pa
   C. 10,000 Pa
   D. 100,000 Pa

Answer Key

Part 1: PISA-Type Assessment

1. Induction Cooker
2. Magnetic Resonance Imaging (MRI)
3. By converting more electrical energy into light rather than heat, reducing electricity costs.
4. They increase the time of impact, thereby reducing the impulsive force acting on the passengers.
5. Installing photovoltaic (solar) panels to harness energy from sunlight.
6. Translational Motion
7. Radians
8. Translational velocity is measured in m/s, while angular velocity is measured in rad/s.
9. Moment of inertia depends on both the mass and the distribution of that mass relative to the axis.
10. 0.628 rad/s
11. 0.94 meters (Calculation: $s = r\theta = 0.15 * 2\pi \approx 0.94m$)
12. Torque
13. Because linear velocity is equal to angular velocity multiplied by the radius ($v = r\omega$).
14. By allowing the user to adjust the pivot points (axis) to match their natural limb lengths, reducing strain.
15. Distribute the mass further from the center of rotation to increase the moment of inertia.
16. Pascal's Principle
17. The Pressure
18. By multiplying the force applied through the ratio of the piston areas.
19. Oil is incompressible, whereas air is compressible, leading to inefficient force transmission.
20. 500 N
21. The Hydraulic Cylinder
22. Fluid pressure (Potential/Kinetic) to Mechanical work
23. It allows the operator to lift loads that exceed human strength by many magnitudes.
24. It is effectively lost because the force-transmitting medium is gone.
25. Double the area of the output piston.
26. The driver's foot pressing the pedal.
27. The brake pedal feels "spongy" because the air compresses, failing to transmit pressure effectively.
28. By allowing a small foot force to generate enough friction to stop a 2-ton moving vehicle.
29. The Wheel Cylinder or Caliper Piston
30. 100,000 Pa (Calculation: $P = F/A = 100 / 0.001 = 100,000$)