HOPE HAVEN
SCHOOL

SECONDARY 1
PHYSICS

TERM TWO WORKBOOK

Student Name:

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Academic Year: _____

Unit 4: Newton's Laws of Motion (I)

Lesson 1: Relationship between mass and inertia. And Newton's laws of motion

1. Explain the term inertia.

2. State three practical applications of inertia law.

3. Explain the following experiences:

(a) When one alights from a moving bus, he/she is more likely to fall unlike when alighting from a stationary one.

(b) When a car suddenly stops, the passengers are jerked forward.

4. (a) State Newton's second law of motion.

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(b) Use Newton's second law of motion to derive to the equation F = ma.

(c) Define the unit of force; 'the newton' using F = ma.

Lesson 2: Applications of Newton's law of motion on frictionless horizontal surface

1. For each of the following forces, describe the reaction, giving its direction and stating where it acts.

(a) The push of a boot on a football.

b) The pushback of a swimmer on water.

(c) The pull of gravity on a mango resting on a table.

2. State Newton's third law of motion. Explain how this law is applied in the propulsion of rockets.

Lesson 3: Determination of acceleration due to gravity on bodies using usual formula

1. A mini bus accelerates uniformly from rest to 30 m/s in 10 s. Find:

(a) acceleration

(b) force the back of a passenger of mass 60 kg would exert on the seat

Unit 5: Centre of gravity

Lesson 1: Definition of Centre of mass and center of gravity

1. Define the term center of gravity.

2. Differentiate between center of mass and center of gravity.

Lesson 2: Effect of position of the center of gravity to the stability of simple objects

1. Explain why a three-legged stool design is less stable than a four legged one.

2. Explain the following:

(a) The passengers of a double-decker bus are not allowed to stand on the upper deck.

(b) A racing car is made of a heavy chassis in its lower parts.

(c) When one is alighting from a moving vehicle, it is advisable to spread out his/her legs.

Unit 6: Work, Power and Energy (i)

Lesson 1: Forms of energy

1. Define the term energy.

2. State and explain briefly six forms of energy.

3. Differentiate between:

(a) Potential energy and kinetic energy.

(b) Gravitational potential energy and elastic potential energy.

Lesson 2: Transformation of kinetic energy to potential energy and vice-versa

1. (a) State the law of conservation of energy.

(b) Differentiate between renewable and non-renewable sources of energy. Give two examples of each.

(c) Explain the energy transformation in a hydroelectric power station.

2. A device which converts one form of energy to another is called a *transducer*. Name one transducer in each of the cases of energy transformation given below.

(a) Heat to kinetic energy

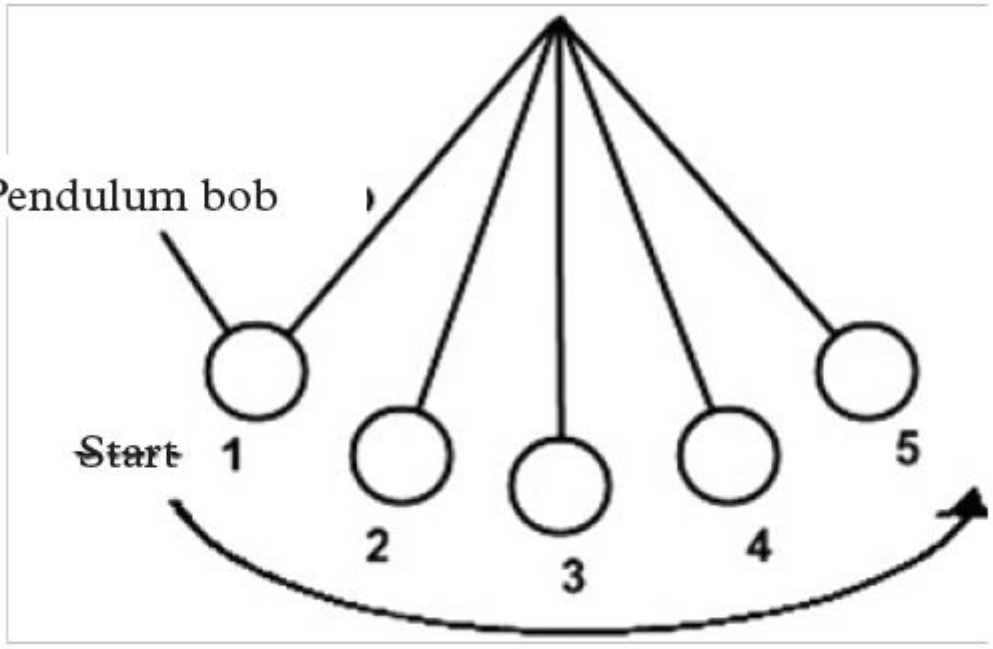
(b) Electrical to light

(c) Sound to electrical

(d) Potential energy to kinetic energy

(e) Chemical to electrical

3. Pendulum bob swings as shown in the diagram.



At which position (s) is:

(a) the kinetic energy of the pendulum bob least.
(b) the potential energy of the pendulum bob most.
(c) the kinetic energy of the pendulum bob the most.
(d) the potential energy of the pendulum bob the least.

Lesson 4: Power

1. A stone falls vertically through a distance of 20 m. If the mass of the stone is 3.0 kg,

   (a) Sketch a graph of work done by the gravity against distance.

   (b) Find the power of the gravitational pull.

2. Mugisha climps 16 m rope in 20 s. If his mass is 60 kg, find the average power he developed.

3. A car is doing work at a rate of 8.0 × 104 W. Calculate the thrust of the wheels on the ground if the car moves with a constant velocity of 30 m/s.

4. A machine is able to do 30 joules of work in 6.0 seconds. What is the power developed by the machine?

5. Mitaako is 42 kg. She takes 10 seconds to run up two flights of stairs to a landing, a total of 5.0 metres vertically above her starting point. What power does the girl develop during her run?

6. Student A lifts a 50 newton box from the floor to a height of 0.40 metres in 2.0 seconds. Student B lifts a 40 newton box from the floor to a height of 0.50 metres in 1.0 second. Which student has more power than the other?

Lesson 5: Different ways to conserve energy, Law of conservation of mechanical energy

1. A fork-lift truck raises a 400 kg box through a height of 2.3 m. The case is then moved horizontally by the truck at 3.0 m/s onto the loading platform of a lorry.

   (a) What minimum upward force should the truck exert on the box?

   (b) How much P.E. is gained by the box?

   (c) Calculate the K.E of the box while being moved horizontally.

   (d) What happens to the K.E once the truck stops?

2. A machine is able to do 30 joules of work in 6.0 seconds. What is the power developed by the machine?

3. Mitaako is 42 kg. She takes 10 seconds to run up two flights of stairs to a landing, a total of 5.0 metres vertically above her starting point. What power does the girl develop during her run?

Unit 7: Simple Machines (I)

Lesson 1: Definition of simple machines and the working principle

1. A machine whose velocity ratio is 8 is used to lift a load of 300 N. The effort required is 60 N.

   (a) What is the mechanical advantage of the machine?

   (b) Calculate the efficiency of the machine.

Lesson 2: Machine work out and friction in the machine

1. An effort of 250 N raises a load of 900 N through 5 m in a machine. If the effort moves through 25 m, find:

(a) The useful work done in raising the load

(b) The work done by the effort

(c) The efficiency of the machine

Lesson 3: Determination of output of simple machine (Efficiency)

1. Describe an experiment to determine the velocity ratio of a lever whose pivot is between the load and the effort.

2. An effort of 50 N is applied to drive a screw whose handle moves through a circle of radius 14 cm. The pitch of the screw thread is 2 mm. Calculate the:
   (a) Velocity ratio of the screw.

   (b) Load raised if the efficiency is 30%.

3. Draw a diagram of a single string block and tackle system with a velocity ratio of 6. Calculate its efficiency if an effort of 1 500 N is required to raise a load of 5 000 N.

4. A pulley system has a velocity ratio of 3. Calculate the effort required to lift a load of 600 N, if the system is 75% efficient.

5. A pulley system has a velocity ratio of 4. In this system, an effort of 68 N would just raise a load of 217 N. Find the efficiency of this system.

6. (a) Draw a system of pulleys with two pulleys in the lower and upper block.

(b) Describe how you would find experimentally its mechanical advantage.

2. A block and tackle pulley system has a velocity ratio of 4. If its efficiency is 75%. Find the:

(a) Mechanical advantage.

(b) Load that can be lifted with an effort of 500 N.

(c) Work done if the load is lifted through a vertical distance of 4.0 m.

(d) Average rate of working if the work is done in 2 minutes.