Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_ Hour:\_\_\_\_\_\_\_ Assignment #\_\_\_\_

**REINFORCEMENT – POTENTIAL AND KINETIC ENERGY**

**POTENTIAL ENERGY**

Potential energy (PE) is energy of position. Potential energy may also be described as gravitational potential energy (GPE). An object gets PE from height, mass, and gravity. An object with potential energy has the **potential to do work**. This potential is only released if the object falls. The energy is then transformed into energy of motion or transformed into work.

Look at the diagrams below that show the relationship between mass and PE and height and PE. The formula for PE is on the right.

**Potential**

**Energy**

**(in Joules**)

PE = mgh

**m** = mass (in kilograms)

**g** = acceleration due to gravity (9.8 m/s2)

**h** = height (in meters)

**Potential energy equals mass times gravity times height.**

**More mass = more PE More height = more PE**

More PE

Less PE More PE Less PE

**10 kg**

**10 kg**

**20 kg**

**10 kg**

**5 m 5 m**

**3 m**

**Ex:** How much PE does a 4kg object have that is 5m off the ground?

**PE = mgh**

= (4kg) (9.8m/s2) (5m)

= 200 J

**KINETIC ENERGY**

Kinetic energy (KE) is energy of motion. An object gets its kinetic energy from its mass and velocity. An object with kinetic energy has energy stored in motion. When the object slows down, the energy is converted to potential energy (if going up) or some other kind of energy (like heat in the brakes of a car).

Look at the diagrams below that show the relationship between mass and KE and velocity and KE. The formula for KE is on the right.

**Kinetic**

**Energy**

**(in Joules**)

KE = (**1/2)**mv2

**m** = mass (in kilograms)

**v** = velocity (in m/s)

**Kinetic energy equals one-half times mass times velocity squared.**

**More mass = more KE More velocity = more KE**

Less KE More KE 10m/s 10m/s

**10 kg**

**10 kg**

More KE

Less KE

**20 kg**

10m/s 5m/s

**10 kg**

Ex: How much kinetic energy does a 10kg object have traveling 3m/s?

**KE = (1/2)mv2**

= 1/2 (10kg)(3m/s)2

= (5kg) (9m/s2)

= 45 J USE THE INFORMATION ON THIS SHEET TO COMPLETE THE BACK!

**POTENTIAL AND KINETIC ENERGY QUESTIONS AND CALCULATIONS**

**Matching – Match each term on the left to its definition on the right. Some terms will have more than one answer.**

\_\_\_\_\_\_\_\_\_\_ kinetic energy A. the product of force and distance

\_\_\_\_\_\_\_\_\_\_ potential energy B. how far above the ground an object is.

\_\_\_\_\_\_\_\_\_\_ work C. energy of position

\_\_\_\_\_\_\_\_\_\_ joules D. calculated using the formula: **1/2mv2**

**\_\_\_\_\_\_\_\_\_\_** 9.8 m/s2 E. energy in motion

\_\_\_\_\_\_\_\_\_\_ height F. mass

\_\_\_\_\_\_\_\_\_\_ kilograms G. Calculated using the formula: **mgh**

\_\_\_\_\_\_\_\_\_\_ meters/second H. velocity

I. units for energy and work

J. acceleration due to gravity

**Tell whether each is describing PE or KE.**

\_\_\_\_\_ A car is traveling at 45mph \_\_\_\_\_ A rock is on a ledge 5 meters high

\_\_\_\_\_ A car is stopped at the top of a hill \_\_\_\_\_ A ball rolling on the ground

**Circle the one with MORE potential or kinetic energy.**

A) 10kg mass 5m high OR 20 kg mass 5m high B) 10kg mass 5m high OR 10kg mass 3m high

C) 20kg mass at 10m/s OR 10kg mass at 10m/s D) 10kg mass at 10m/s OR 10kg mass at 5m/s

**Calculate**

1. Calculate the PE of a 5kg object sitting on a 3m ledge.

2. A rock is at the top of a 20m tall hill. The rock has a mass of 10kg. How much PE does it have?

3. How high up is a 3kg object that has 300 joules of energy? (**h = PE ÷ mg**)

4. A 4kg rock is rolling at 10m/s. Find its KE.

5. An 8kg cat is running at 4m/s. How much KE does it have?

6. A rolling ball has 18 joules of KE and is rolling at 3m/s. Find its mass. ( **½ m = KE ÷ v2**) (double the mass for the answer)

7. A 4kg bird has 8 joules of KE. How fast is it flying? (**v2 = KE ÷ ½ m**) (take the square root of **v** for the answer)