**Kinetic and Potential Energy Worksheet**

Classify the following as a type of potential energy or kinetic energy (use the letters K or P)

1. A bicyclist pedaling up a hill \_\_K\_\_\_

3. A volleyball player spiking a ball \_\_K\_\_\_

5. The chemical bonds in sugar \_\_P\_\_\_ \_\_\_

7. Walking down the street \_\_K\_\_\_ \_\_\_

9. A bowling ball rolling down the alley \_\_K\_\_\_

2. An archer with his bow drawn \_P\_\_\_\_

4. A baseball thrown to second base \_\_K

6. The wind blowing through your hair \_\_K\_\_\_

8. Sitting in the top of a tree \_\_P\_\_\_

10. A bowling ball sitting on the rack \_\_\_P\_\_

What examples can you find in your home that are examples of kinetic and potential energy? (name two for each type of energy)

11. Kinetic: \_\_\_\_\_\_\_Washing Machine\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. Kinetic: \_\_\_\_\_\_\_\_Ceiling Fan\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. Potential: \_\_\_\_\_\_\_Snow sitting on my roof\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. Potential: \_\_\_\_\_\_\_All the junk on my top shelf in my office\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **Kinetic Energy – what does it depend on?**

The \_\_more\_\_\_\_\_\_\_\_\_\_\_\_\_\_ an object moves, the more \_\_\_\_kinetic energy\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_it has.

The greater the \_\_\_velocity\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a moving object, the more \_\_kinetic energy\_\_\_\_\_\_\_\_\_\_it has.

Kinetic energy depends on both \_\_\_mass\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_velocity\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Solve the following word problems using the kinetic and potential energy formulas (Be sure to show your work!)

**Formulas:**

**KE = 0.5 x m x v2 OR PE = m x g x h**

*v = velocity or speed m = mass in kg g = 9.81m/s2  h = height in meters*

1. You serve a volleyball with a mass of 2.1 kg. The ball leaves your hand with a speed of 30 m/s. The ball has \_\_\_\_KINETIC\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy. Calculate it and show your work.

KE = 0.5 x 2.1 x 302 KE = 945J

1. A baby carriage is sitting at the top of a hill that is 21 m high. The carriage with the baby has a mass of 1.5 kg. The carriage has \_POTENTIAL\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy. Calculate it and show your work.

PE = 1.5 x 9.81 x 21 PE = 309.015J

1. A car is traveling with a velocity of 40 m/s and has a mass of 1120 kg. The car has \_KINETIC\_\_\_\_\_\_\_\_\_\_\_ energy. Calculate it and show your work.

KE = 0.5 x 1120 x 402 KE = 896 000J

1. A cinder block is sitting on a platform 20 m high. It weighs 7.9 kg. The block has \_\_\_\_\_POTENTIAL\_\_\_\_\_ energy. Calculate it and show your work.

PE = 7.9 x 9.81 x 20 PE = 1549.98J

1. A roller coaster is sitting at the top of a 72 m hill and has 94646J. The coaster (at this moment) has \_\_POTENTIAL\_\_\_\_\_\_\_\_\_\_ energy. What is its mass? Calculate it and show your work.

M = PE / G x H M = 94646 / (9.81 x 72) M = 134kg

1. There is a 19kg bell at the top of a tower that is storing 15745J of energy. The bell has \_\_POTENTIAL\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy. What is the height of the tower? Calculate it and show your work.

H = PE / G x M H = 15745J / (9.81 x 19) H = 84.47m

(not the same question as worksheet; skip)

1. Determine the **kinetic** energy of a 1000-kg roller coaster car that is moving with a speed of 20.0 m/s.

KE = 0.5 x 1000 x 202 KE = 200 000J

1. If the roller coaster car in the above problem were moving with **twice the speed**, then what would be its new **kinetic** energy?

KE = 0.5 x 1000 x 402 KE = 3 200 000J

1. A cart is loaded with a brick and pulled at constant speed along an inclined plane to the height of a seat-top. If the mass of the loaded cart is 3.0 kg and the height of the seat top is 0.45 meters, then what is the **potential** energy of the loaded cart at the height of the seat-top?

PE = 3.0 x 9.81 x 0.45 PE = 13.24J

1. A 75-kg refrigerator is located on the 70th floor of a skyscraper (300 meters above the ground) What is the **potential** energy of the refrigerator?

PE = 75 x 9.81 x 300 PE = 220 725J

1. The potential energy of a 40-kg cannon ball is 14000 J. How high was the cannon ball to have this much **potential** energy?

H = PE / (G x M) H = 14000 / (9.81 x 40) H = 35.68M

The Law of Conservation of Energy states that:

* Energy can be neither \_\_CREATED\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nor \_\_\_DESTROYED\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Energy can be \_\_TRANSFORMED\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from one form to another.
* The total amount of \_\_\_\_\_ENERGY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the \_\_SAME\_\_\_\_\_\_\_\_\_\_\_ before and after any energy transformation.

Energy Transfer

* Energy TRANSFER is the passing of energy from one object to another object.
Example: A cup of hot tea has thermal energy. Some of this thermal energy is transferred to the particles in the cold milk, in which you put to make the coffee cooler.

Energy Transformation

* A change from one form of energy to another.
* Single Transformations
	+ Occur when one form of energy needs to be transformed into another to get work done.
* Multiple Transformations
* Occur when a series of energy transformations are needed to do work
* An objects energy can be:
* As velocity increases kinetic energy increases and potential energy increases
* As velocity decreases kinetic energy decreases and potential energy increases

WHAT IS THE TYPE OF RELATIONSHIP KE AND PE HAVE? Inverse

Roller Coasters

Does energy get transferred or transformed?

* As you move up to the first hill on a roller coaster the distance between the coaster and the Earth increases, resulting in an increase of Gravitational Potential Energy
* At the top of the first hill you have the most Gravitational Potential Energy
* As you begin your trip down the hill you your speed resulting in a transformation from GPE to KE.
* At the bottom of the hill right before it goes back upward the GPE is small, but the KE is large
* As it starts to move up the next hill or loop KE is transformed back into GPE