Kinetic and Potential Energy Worksheet

Name KEY

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
2. An archer with his bow drawn P
3. A volleyball player spiking a ball K
4. A baseball thrown to second base K
5. The chemical bonds in sugar P
6. The wind blowing through your hair K
7. Walking down the street K
8. Sitting in the top of a tree P
9. A bowling ball rolling down the alley K
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: radio, lamp, dishwasher
12. Kinetic: bicycle, T.V. piano
13. Potential: food, batteries, magnets
14. Potential: gasoline, propane, running shoes

Kinetic Energy – what does it depend on?

- The faster an object moves, the greater the KE it has.
- The greater the mass of a moving object, the greater the KE 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:

$KE = 0.5 \cdot m \cdot v^2$ **OR** $PE = m \cdot g \cdot h$

v = velocity or speed *m = mass in kg* *g = 10 m/s/s* *h = height in meters*

15. 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 _____ energy. Calculate it.

945 J

16. 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 _____ energy. Calculate it.

308.7 J

17. A car is traveling with a velocity of 40 m/s and has a mass of 1120 kg. The car has _____ energy. Calculate it.

8.96 x 10^5 J

18. A cinder block is sitting on a platform 20 m high. It weighs 7.9 kg. The block has _____ energy. Calculate it.

1548.4 J

19. A roller coaster is at the top of a 72 m hill and weighs 134 kg. The coaster (at this moment) has _____ energy. Calculate it.

9.4550 x 10^4 J

20. There is a bell at the top of a tower that is 45 m high. The bell weighs 19 kg. The bell has _____ energy. Calculate it.

8 379 J

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

200 000 J

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

800 000 J

23. 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?

13.23 J

24. 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?

2.205 x 10^5 J

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

35.71 m

- IF most of the energy we use on earth comes from the sun – how does that energy (light and thermal) end up
  - As ___chemical___ energy in our food
  - As ___mechanical___ energy of wind or moving water
  - As ___electrical___ energy that powers our lights
  - As ___mechanical___ energy when we move around

Law of Conservation of Energy

- Energy can be neither created nor destroyed by ordinary means.
- 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 transfer 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 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 decreases
  - 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 GPE
- At the top of the first hill you have the maximum Gravitational Potential Energy
- As you begin your trip down the hill you increase your speed resulting in a transformation from GPE to KE.
- At the bottom of the hill right before it goes back upward the KE is maximum, but the GPE is zero
- As it starts to move up the next hill or loop KE is transformed back into GPE