Kinetic and Potential Energy Worksheet Name _____

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 P+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

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*

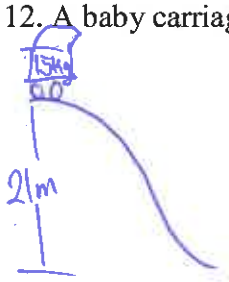
For Questions 11-16, state the type of energy that is described as either kinetic or potential, then calculate its value.

11. 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 KE energy. Calculate it.

$E_K = \frac{1}{2} mv^2 = \frac{1}{2}(2.1)(30)^2$

$= 945 J$

12. 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 PE energy. Calculate it.



$E_p = mgh$

$= 1.5(9.81)21m$

$= 308.7 J$ or $310 J$

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

$E_K = \frac{1}{2} mv^2$

$= \frac{1}{2}(1120)(40)^2 = 896000 J$

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

$E_p = mgh$

$= 7.9(9.81)(20)$

$= 1548.4 J$ or $1500 J$

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

$E_p = mgh$

$= 134 kg (9.81 m/s^2)(72 m)$

$= 94675.2 J$ or $95000 J$

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

$E_p = 19(9.81)(45)$

$= 8382 J$ or $8400 J$

17. Determine the **kinetic** energy of a 100-kg roller coaster car that is moving with a speed of 20.0 m/s.

$E_K = \frac{1}{2}mv^2$

$= \frac{1}{2}(100)(20.0)^2$

$= 20000\text{J}$

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

Since $E_K \propto$ to v^2, if v doubles then E_K quadruples

$(2v)^2 = 4v$ or $E_K = \frac{1}{2}mv^2$ → $E_K = \frac{1}{2}m4v^2$ (4X increase)

$E_K = \frac{1}{2}m(2v)^2$

19. 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?

$E_p = mgh$

$= 3.0(9.81)(0.45)$

$= 13.23\text{J}$ or 13J

20. 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?

~~$E_p = 75mgh$~~

~~$E_p = 75(300)$~~

$E_p = mgh$

$= 75(9.81)(300)$

$= 220500\text{J}$ or 22000J

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

$E_p = mgh$

$14000 = 40(9.81)h$

$\frac{14000}{392.4} = \frac{392.4h}{392.4}$ $h = 35.7\text{m}$

or

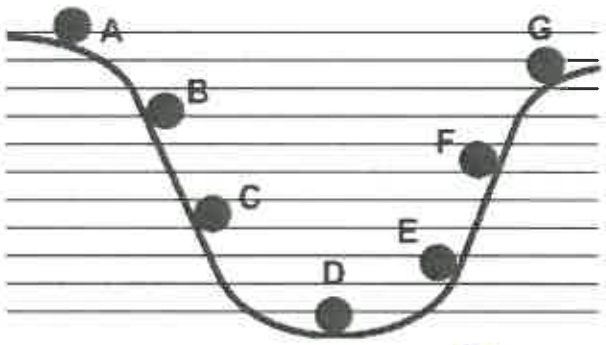
$\frac{E_p}{mg} = \frac{mgh}{mg}$ $h = \frac{E_p}{mg}$

$= \frac{14000}{40(9.81)}$

$= 35.7\text{m}$

or 36m

22. This graph shows a ball rolling from A to G. The ball starts at point A and rolls to point G. Use the graph to answer the following questions.



a. At what letter does the ball have the greatest kinetic energy? D

b. Which letter shows the ball when it has the maximum potential energy? A

c. Which letter shows the ball when it has the least potential energy? D

d. Why is point G slightly lower than point A? In other words, why couldn't the ball go back to the same height at which it started?

Some Energy lost to friction (thermal) and sound.