KINETIC AND POTENTIAL ENERGY WORKSHEET **Name:** KEY

Determine whether the objects in the following problems have kinetic or potential energy. Remember, kinetic energy is the energy of motion and potential energy is stored energy due to an object's shape or position. Then, choose the correct formula to use:

Kinetic Energy = $\frac{1}{2}$ x mass x velocity^2 (mass in Kg, velocity in m/s)

Potential Energy = Mass x gravity x Height (mass in Kg, gravity 9.8 m/s^2, height in meters)

For each problem, write the formula used, show your work, & write your answer with correct units.

Example: An 80kg man is jogging at a rate of 4m/s. He has kinetic energy. Calculate it:

Kinetic Energy = $\frac{1}{2}$ x mass x velocity^2

Kinetic Energy = $\frac{1}{2}$ x 80kg x (4m/s)^2

Kinetic Energy = $\frac{1}{2}$ x 80 x 16

Kinetic Energy = 40 x 16

Kinetic Energy = 640 J

1. You serve a volleyball with a mass of 2.1 Kg. The ball leaves your hand with a speed of 30m/s. The ball has _____ K _____ energy. Calculate it.

945 J

2. A baby carriage is sitting at the top of a hill that is 21 m high. The carriage with the baby weighs 12 Kg. The carriage has _____ P _____ energy. Calculate it.

2469.6 J

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

896,000 J

896 kJ

4. A cinder block is sitting on a platform 20 m high. It weighs 79 Kg. The block has _____ P _____ energy. Calculate it.

15484 J

15.48 kJ

5. There is a bell at the top of a tower that is 45 m high. The bell weighs 190 Kg. The bell has _____ energy. Calculate it.

83,790 J

6. A roller coaster is at the top of a 72 m hill and weighs 966 Kg. The coaster (at this moment) has _____ energy. Calculate it.

681,609.6 J

or 681.6 kJ

7. Determine the amount of potential energy of a 5.0Kg book that is moved to three different shelves on a bookcase. The height of each shelf is 1.0 m, 1.5 m, and 2.0 m.

1 = 49 J 2 = 98 J

1.5 = 73.5 J

8. You are on in-line skates at the top of a small hill. Your potential energy is equal to 1,000. J. The last time you checked, your mass was 60.0 kg.

a. What is the height of the hill? $h = \frac{1000}{60 \times 9.8} = \frac{1000}{588}$ 1.7 m

b. If you start rolling down this hill, your potential energy will be converted to kinetic energy. At the bottom of the hill, your kinetic energy will be equal to your potential energy at the top. Calculate your speed at the bottom of the hill.

$v^2 = \frac{1000}{\frac{1}{2}\,60} = \frac{1000}{30} = v^2 = 33.3$ $v = 5.7$ m/s

9. (**BONUS!!**) A 1.0-Kg ball is thrown into the air with an initial velocity of 30. m/s.

a. How much kinetic energy does the ball have?

$E_K = \frac{1}{2} m v^2 = \frac{1}{2}\,900 = 450$ J

b. How much potential energy does the ball have when it reaches the top of its ascent?

450 J

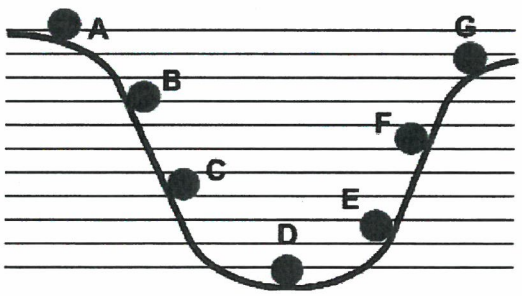
c. How high into the air did the ball travel?

$h = \frac{450}{9.8}$ 45.9 m

10. What is the kinetic energy of a 2,000.-Kg boat moving at 5.0 m/s?

25 000 J

This graph shows a ball rolling from A to G. The ball starts at point A and rolls to point G.



11. At what letter does the ball have the greatest kinetic energy? D
12. Which letter shows the ball when it has the maximum potential energy? A
13. Which letter shows the ball when it has the least potential energy? D
14. 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?

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