Kinetic and Potential Energy Practice

1. A 20 kg rock is lifted 5 m.
   a. What work was done against gravity?

   b. What is its gravitational potential energy?

2. A flower pot weighing 10 N is lifted and given 20 J of gravitational potential energy. How high was it lifted?

3. A 4000 kg roller coaster car is pulled to the top of the first hill, which is 30 m above the starting position.
   a. What is the gravitational potential energy of the car at the top of the hill?

   b. How much work was done on the car to get it to the top of the hill?

   c. What happens to this stored PE as the car travels down the hill?

4. A 10 kg object is moving along at a constant speed of 5 m/s. What is its kinetic energy?

5. If the speed of the object in question 4 doubles, by how much does the KE change?

6. A 5 kg ball is dropped out a window and hits the ground with 500 J of KE. With what speed does the ball hit the ground?

7. If the 5 kg ball hits the ground with 250 J of KE, what is the speed of the ball as it hits the ground?

8. A 0.5 kg lab cart is released on an inclined track. The cart is released from a height of 0.3 m and has a speed of 2.45 m/s at the bottom of the track.
   a. What is the PE of the cart at the top of the track?

   b. What is the KE of the cart at the top of the track?

   c. What is the KE of the car at the bottom of the track?

   d. Why are your answers to *a* and *c* the same?

9. A 1.5 kg cart is placed on a 0.35m high inclined track.
   a. What is the PE of the cart at the top of the track?

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b. What happens to the PE as the cart rolls down the track?

c. What is the KE of the cart at the bottom of the track?

d. What is the speed of the cart at the bottom of the track?

e. If you replaced the cart with a wooden block, would you expect the PE at the top to equal the KE at the bottom? Explain.

10. After graduation, an enthusiastic A-B graduate tosses her 150 g cap into the air with a speed of 6 m/s.
    a. What is the KE of the cap when it is released?

    b. What happens to the KE as the cap travels up?

    c. How high does the cap go?

11. A happy physics student decides to go sledding. He carries his sled (total mass 60 kg) up the hill and does 3300 J of work against gravity.
    a. How high is the hill?

    b. Assuming the snow is frictionless, how fast will the student and sled be moving at the bottom of the hill?

    c. Taking friction into account, would you expect the speed of the student to be more, less or the same as in part c? Explain in terms of energy.

12. Three physics teachers decided to slide down an icy hill. The first teacher has a mass of 60 kg, the second teacher has a mass of 68 kg and the third teacher has a mass of 80 kg. If the hill is 4 m high, which teacher has the greatest speed at the bottom of the hill?

Answers:
1. a) 1000 J b) 1000 J 2) 2 m 3. a) 1,200,000 J b) 1,200,000 J c) turns into KE (& sound & heat) 4) 125 J 5) quadruples! (500 J) 6) 14.1 m/s 7) 10 m/s
8. a) 1.5 J b) 0 J c) 1.5 J d) conservation of energy 9. a) 5.25 J b) KE c) 5.25 J
d) 2.6 m/s e) PE>KE, Friction 10. a) 2.7 J b) PE c) 1.8 m 11. a) 5.5 m
b) 10.4 m/s c) less 12) they all will have the same speed at the bottom