Example Problems – conservation of mechanical energy

1. A 10-kg object is dropped from rest from a height of 20 meters above the ground.

 (a) What is the KE, GPE, and ME of the object when the object is released?

 (b) What is the KE, GPE, and ME of the object when the object reaches the ground?

 (c) What is the KE, GPE, and ME of the object when the object has fallen 10 meters?

 (d) What is the speed of the object when the object reaches the ground?

 (e) What is the speed of the object when the object has fallen 10 meters?

2. An object slides up a frictionless ramp. The speed of the object is 6 m/s at the bottom of the ramp. At what vertical height above the bottom of the ramp will the object have a speed of 5 m/s?

3. A 4-kg object is sliding at 3 m/s when the object comes in contact with a 250 N/m spring.

 How far will the spring compress in stopping the object?

4. A roller coaster car is at the top of a 4 m tall hill.

 The coaster has a speed of 3 m/s at the top of the hill.

 What is the speed of the coaster at the bottom of the hill if

 (a) the track is a straight line?

 (b) the track path is an arc of a circle?

 5. A 2-kg ball is dropped from 2 meters above the floor. The ball hits the floor and rebounds to a height of 1.6 meters above the floor. **Use *g* = 10 m/s2.**

 (a) What was the speed of the ball when it reached the floor?

 (b) At what speed did the ball rebound from the floor?

 (c) How much kinetic energy was lost by the ball during the collision with the floor?

 (d) Was the collision between the ball and the floor elastic or inelastic?

A

B

A

B

0.3 m

6. The two objects, A & B, are held at rest in the

 START position shown. The mass of A is

 4 kg and the mass of B is 2 kg. Assign the

 starting height of B as zero GPE.

 (a) What is KE, GPE, and ME for A at the

 start point?

 (b) What is KE, GPE, and ME for B at the

 start point?

 (c) What is the total system ME at the start point?

 ***The questions now refer to when A has moved***

 ***0.3 m downward.***

START

 (d) What is the total system ME at this point?

 (e) What is the GPE of A and of B at this point?

 (f) What is the total KE of A and B at this point?

 (g) What is the speed of A and the speed of B at this point?

7. A child is on a swing. The child is moving at 2 m/s when the swing in 1.8 m above the lowest point of the swing. What is the speed of the child when she passes through the lowest point of the swing arc?

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