Energy Problems

1. Which of the following has the most kinetic energy?
a) A boulder
b) A racecar
c) An airplane
d) A satellite orbiting Earth
e) The Hover dam


2. Which of the following has the most potential energy?
a) A leaf falling
b) A boy running
c) An airplane at 30,000 ft
d) A parked semi-truck
e) A man standing on a ladder


3. A 78 kg jogger is running at 3.0 m/s. What is her kinetic energy?
a) 350 J
b) 430 J
c) 700 J
d) 780 J
e) 1050 J


4. A 5.0 kg cat sits 4.0 m up in a tree. What is its potential energy?
a) 20 J
b) 48 J
c) 170 J
d) 200 J
e) 390 J


5. A block initially at rest is allowed to slide down a frictionless ramp and attains a speed $v$ at the bottom. To achieve a speed $2v$ at the bottom, how many times as high must a new ramp be?
a) $\sqrt{2}$
b) 2
c) 4
d) 6
e) 8


6. A 3.0 kg bird is flying 12 m in the air with a speed of 9.0 m/s. What is the total mechanical energy of the bird?
a) 120 J
b) 350 J
c) 470 J
d) 960 J
e) 1200 J

7. Mars Pathfinder entered the atmosphere of Mars with a velocity of 7.65 km/s with a mass of 800 kg at an altitude of 8500 km.

    a) What is the potential energy of Pathfinder at this time? (Don't forget to use the appropriate units)

    b) What is the kinetic energy of Pathfinder at this time? (Don't forget to use the appropriate units)

8. A 3.0 kg box is sitting at rest on the top of a 12.0 m tall building

a) What is the potential energy of the box?

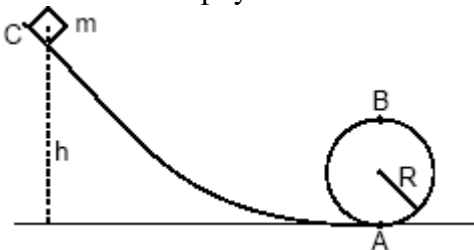b) What is the kinetic energy of the box?

c) What is the total mechanical energy of the box at the top of the building?

Now the box falls toward the ground.

d) Assuming zero air resistance, just before the box hits the ground, what is its kinetic energy?

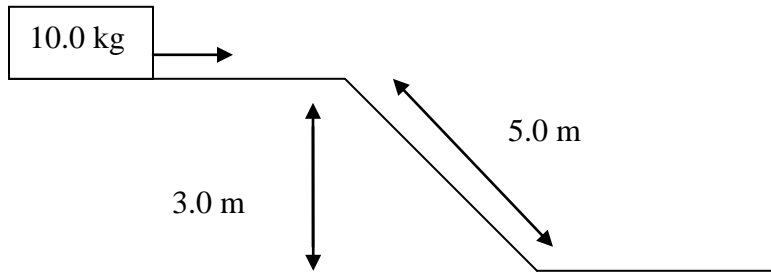e) What is the speed of the box just before it hits the ground?

9. Roller coaster physics



The initial height of a mass m is 32 m and the radius of the loop R is 8.0 m. The mass m, starting at rest at point C, slides down the ramp without friction.

What is the speed of the mass at point A?

What is the speed of the mass at point B?

10.0 kg

5.0 m

3.0 m

10.
A crate initially moves to the right at 6.0 m/s.

a) How much kinetic energy does the crate initially have?

b) How much potential energy does the crate initially have?

c) After the crate slides down the ramp, what is its kinetic energy?

d) After the crate slides down the ramp, what is its speed?

Answers

1. D
2. C
3. A
4. D
5. C
6. C
7a) $800 * 9.8 * 8500000 = 6.7 \times 10^{10}$ J
 b) $.5 * 800 * (7650)^2 = 2.3 \times 10^{10}$ J

8a) $3 * 9.8 * 12 = 350$ J
 b) 0
 c) 350 J
 d) 350 J
 e) $350 = .5 * 3 * v^2$

9. a) $mgh = .5m\ v^2$
    $9.8 * 32 = .5 * v^2$
     $v = 25$ m/s

b) $9.8 * 16 = .5 * v^2$
    $v = 17.7 = 18$ m/s

10a) $.5 * 10.0 * 6^2 = 180$ J
  b) $10.0 * 9.8 * 3.0 = 290$ J
  c) $180 + 290 = 470$
  d) $470 = .5 * 10 * v^2$
     $v = 9.7$ m/s