Conservation of Energy Worksheet

Name _____

1) State the law of conservation of energy.

the total energy of an isolated system cannot change.

2) A 200-kg boulder is 1000-m above the ground.

a) What is its potential energy when it is 1000-m above the ground?

$mgh = (200\ kg)(9.8 m/s^2)(1000 m) = 1.96 \times 10^6\ J$

b) What is its kinetic energy when it is 1000-m above the ground?

0

c) The boulder begins to fall. What is its potential energy when it is 500-m above the ground? Where did the "lost" potential energy go?

$9.8 \times 10^5\ J$; it was transformed into kinetic energy

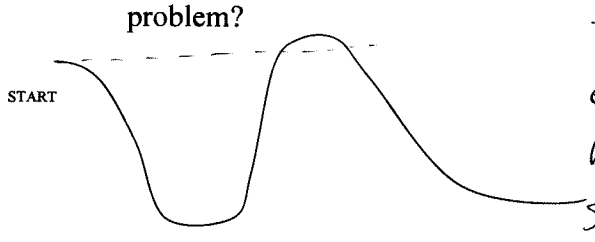
d) What is the kinetic energy of the boulder when it has fallen 500-m?

$9.8 \times 10^5\ J$

e) What is the kinetic energy of the boulder just before it hits the ground?

$1.96 \times 10^6\ J$

3) A rollercoaster is designed as shown below. If the roller coaster starts at the top of the first hill from rest, describe what will happen to the rollercoaster. How could you fix this problem?



The roller coaster only has enough energy to return to its original height which is less than the second hill. If there is friction then energy will be "lost" and the it will stop even lower. The roller coaster needs more energy at the beginning. Either it should have a velocity or a higher hill.

4) When you use a slingshot to fire a rock you stretch the rubber band storing potential energy. If you stretched the rubber band so that it had 100-J of potential energy,

a) with how much kinetic energy will the rock leave the slingshot?

100 J

b) with how much kinetic energy will the rock leave the slingshot if it loses 10-J to heat & sound?

90 J

5) A pendulum has 15-J of potential energy at the top of its swing.

a) What is its kinetic energy at the bottom of its swing?

15 J

b) At another time the pendulum has 8-J of potential energy. What is its kinetic energy?

7 J

c) For the pendulum in "b", what will its kinetic energy be if it loses 2-J to heat?

5 J

6) A 1-kg ball is 10-m above a table when it is dropped. It bounces to a height of 7-m.

a) How much energy is transferred to heat & sound during the bounce?

before: $mgh = 1(9.8)10 = 98$

after $mgh = 1(9.8)7 = 68.6$

29.4 J is transferred to heat + sound.

b) Explain why this ball cannot bounce to a height of 12-m if it is dropped.

it can only return to its initial height since energy must be conserved.

c) What could you do to make the ball bounce to a height of 12-m?

- add kinetic energy (throw the ball down)