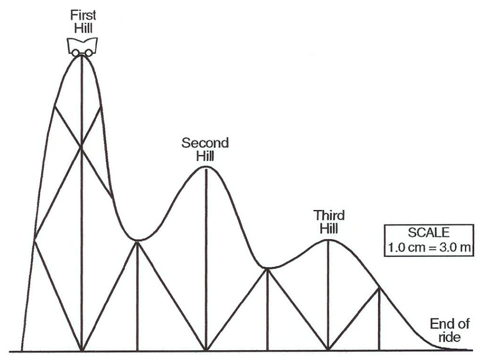
Name Answer Key
Honors Physics
Period ____________

Date ________________________
Energy WS #5H
Mrs. Nadworny

Conservation of Energy

Directions: Read online textbook pages 181 – 186. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work. Answer in complete sentences where appropriate.

1. In the diagram, a 650 kg roller coaster car starts from rest at the top of the first hill of its track, which is 24 meters high, and glides freely to the end of the ride. [Neglect friction.]



   a. Where will the car have the most gravitational potential energy? Explain.

   At the top of the first hill because it is not moving yet and it's the highest point.

   b. Where will the car have the most kinetic energy? Explain.

   At the end of the ride because all of the PE will be converted into KE

   c. Using one or more complete sentences, describe how energy is transformed as the car travels from the top of the first hill to the end of the ride.

   It is all PE at the top of the hill, it changes to KE as it goes down the first dip. At the second hill it has a medium amount of PE and small KE. At the third hill it has a small amount of PE and a larger amount of KE. At the end of the ride the entire PE is now KE.

   d. Using one or more complete sentences, compare the kinetic energy of the car at the top of the second the hill to its kinetic energy at the top of the third hill. Give a reason for your answer.

   The KE at the top of the hill 2 is less that the KE at the top of hill 3. There is more PE because the coaster is higher on the top of hill 2.

   e. Calculate how fast the car will be going when it gets to the end of the ride.

$E_i = E_f$

$PE_{g\ top} = KE_{bottom}$

$mgh = \frac{1}{2} mv^2$

$v = \sqrt{2gh} = \sqrt{2(9.81\,\frac{m}{s^2})(24\ m)} = 22\,\frac{m}{s}$

$E_i = PE_{top} = mgh = (650kg)(9.81\,\frac{m}{s^2})(24m) = 1.5\times10^5 J$

$E_i = E_f = KE_{bottom}$

$v = \sqrt{\frac{2KE}{m}} = \sqrt{\frac{2(1.5\times10^5 J)}{650kg}} = 21\,\frac{m}{s}$

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2. A 0.740 kilogram water balloon is held out of a window 4.9 meters high. When it is dropped, it hits the ground below traveling at a speed of 8.1 meters per second.

   a. Calculate the potential energy of the water balloon as it was held out the window.

$$PE = mgh = (0.740kg)(9.81\tfrac{m}{s^2})(4.9m) = 36J$$

   b. Calculate the kinetic energy of the water balloon as it was impacting the ground.

$$KE = \tfrac{1}{2}mv^2 = \tfrac{1}{2}(0.740kg)(8.1\tfrac{m}{s})^2 = 24J$$

   c. Calculate how much energy was “lost” as it fell.

$$\Delta E_{T\ \text{lost}} = E_f - E_i = KE_{bottom} - PE_{top} = 24J - 36J = -12J$$

   d. Where did that “lost” energy go?

      - Overcoming air resistance
      - It is transformed into internal energy due to friction with the air

Answers in size order: 12, 21 or 22, 24, 36