PHYS 102    Energy        Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Visit this [energy website](http://zebu.uoregon.edu/1998/ph101/l5.html) and read about energy.

2. List all the forms of energy. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. State the law of conservation of energy.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Define the following:

a. Potential energy:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Kinetic energy:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Energy can be transformed from one form to another form. Write down the  
initial and final forms of energy for the following:

|  |  |  |
| --- | --- | --- |
| **Process/Device** | **Initial form of energy** | **Final form of energy** |
| Photosynthesis |  |  |
| Light bulb |  |  |
| Electric motor |  |  |
| Electric generator |  |  |
| Solar still |  |  |
| Photovoltaic cell (solar cell) |  |  |
| During friction |  |  |
| Using a battery |  |  |
| Charging a battery |  |  |
| In a microphone |  |  |
| In a loudspeaker |  |  |
| In a nuclear reactor |  |  |

**Purpose:** To investigate what happens to the energy of a cart as it slides down an inclined air-track.

**Apparatus:** Air-track, cart, electronic balance, metal can, photogate sensor, meter stick, lab stand, Pasco 750-interface, and PC.

**Theory:**

Potential Energy =  Kinetic Energy = 

    Mechanical Energy = *ME = PE + KE.*   
 **UNITS:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Time** | **Mass** | **Force** | **Distance** | **Velocity** | **Acceleration** | **Energy** |
| Cgs | S | g | dyne | Cm | Cm/s | cm/s2 | erg |
| SI | S | kg | newton, N | M | m/s | m/s2 | joule, J |
| BE/USC | S | slug | pound, lb | foot, ft | ft/s | ft/s2 | ft.lb |

cgs- centimeter, gram, second;     SI-International System;      
BE/USC- British Engineering/US customary.

**PROCEDURE**:

1. Incline the air-track using a metal can.

2. Measure the mass (M) of the cart and the Flag-Length of the card on the cart (Δx).

3. Pick a position close to the top, 155 cm or 1.55 m, and measure the Height from the table-top.

4. Repeat the height measurements for other positions: 1.45,1.35,1.25……0.25.

5. Keep the cart at the far-end of the track.

6. Set up the photo-gate head at the first position, 1.55 m, so that the card will flag the photogate as it moves across the head.

7. Connect the photogate to Digital Channel 1.

8. Open Data Studio, Click Create Experiment, Click Add Sensor, Select Digital Sensors, and Click Photogate.

9. Click the Constants tab, enter the Flag Length, and click Digits display.

10. Click Start and turn on the air in the air-track.

11. Stop the Data collection after the cart passes through the head and enter the velocity data.

12. Repeat the velocity measurements for other positions and complete the data table.

**DATA** (Use SI units)

Mass of the cart = *M* = \_\_\_\_\_\_\_    Flag-Length of the card on the cart = \_\_\_\_\_\_\_\_\_\_

Acceleration due to gravity = *g* = 9.8 m/s2

|  |  |  |
| --- | --- | --- |
| Timer Position (m) | Height, *h* (m) | Velocity, *v* (m/s) |
| 1.55 |  |  |
| 1.45 |  |  |
| 1.35 |  |  |
| 1.25 |  |  |
| 1.15 |  |  |
| 1.05 |  |  |
| 0.95 |  |  |
| 0.85 |  |  |
| 0.75 |  |  |
| 0.65 |  |  |
| 0.55 |  |  |
| 0.45 |  |  |
| 0.35 |  |  |
| 0.25 |  |  |

**DATA ANALYSIS**

Enter the above data in a spread sheet program and create three more columns for *PE*, *KE*, and *ME.* Plot *PE, KE,* and *ME* VERSUS Height on the same graph. Attach your hard copies of the data table and graph and write a [conclusion.](file:///G:\Before%20Aug%202010\PHYS%20102\2009%20Web\conclusion.doc)