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

1. Review Chap-6 Power Point notes for 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 (to incline the air-track), photogate sensor w/cable, meter stick, lab stand, Pasco 850-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-Width of the card on the cart.  
3. Pick a position close to the top of the track, 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, and record the starting position. (Use the middle of the Flag-Width as the reference)   
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 cable to Digital Input 1, of the PASCO 850 interface, which is turned on.  
8. Open PASCO Capstone software from the desktop.   
9. Click Hardware Setup under Tools on the left, click on the interface input where the sensor is connected, and select Photogate.   
10. Click Timer Setup under Tools, click Next (with Pre-Configured Timer), click Next (with Photogate Ch1), click the drop-down-menu for Select a Timer, and select One Photogate (Single Flag). Click Next (with Speed checked), enter the Flag-Width, click Next, and click Finish. Click Timer Setup again to close it.  
11. Double-Click Digits under Displays, click Select Measurement, and select speed.   
12. Click Record and turn on the air in the air-track.   
13. Stop the Data collection after the cart passes through the photogate-head and enter the velocity data.  
12. Repeat the velocity measurements for other timer positions and complete the data table and data analysis.

**DATA** (Use SI units)

Mass of the cart = M = \_\_\_\_\_\_\_ Flag-Width of the card on the cart = \_\_\_\_\_\_\_\_\_\_  
 (This will be entered during Timer Set up with Capstone)

Starting position = \_\_\_\_\_\_\_\_\_\_ Acceleration due to gravity = g = 9.8 m/s2

|  |  |  |
| --- | --- | --- |
| Timer Position (m) | Height, h (m) | Velocity (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 four more columns for Displacement, PE, KE, and ME. Plot PE, KE, and ME VS. Displacement, on the same graph. Attach your data table and graph. Write a conclusion.