

# LAB #9

- Roller Coaster  
Energy Audit
  - Conservation of Energy

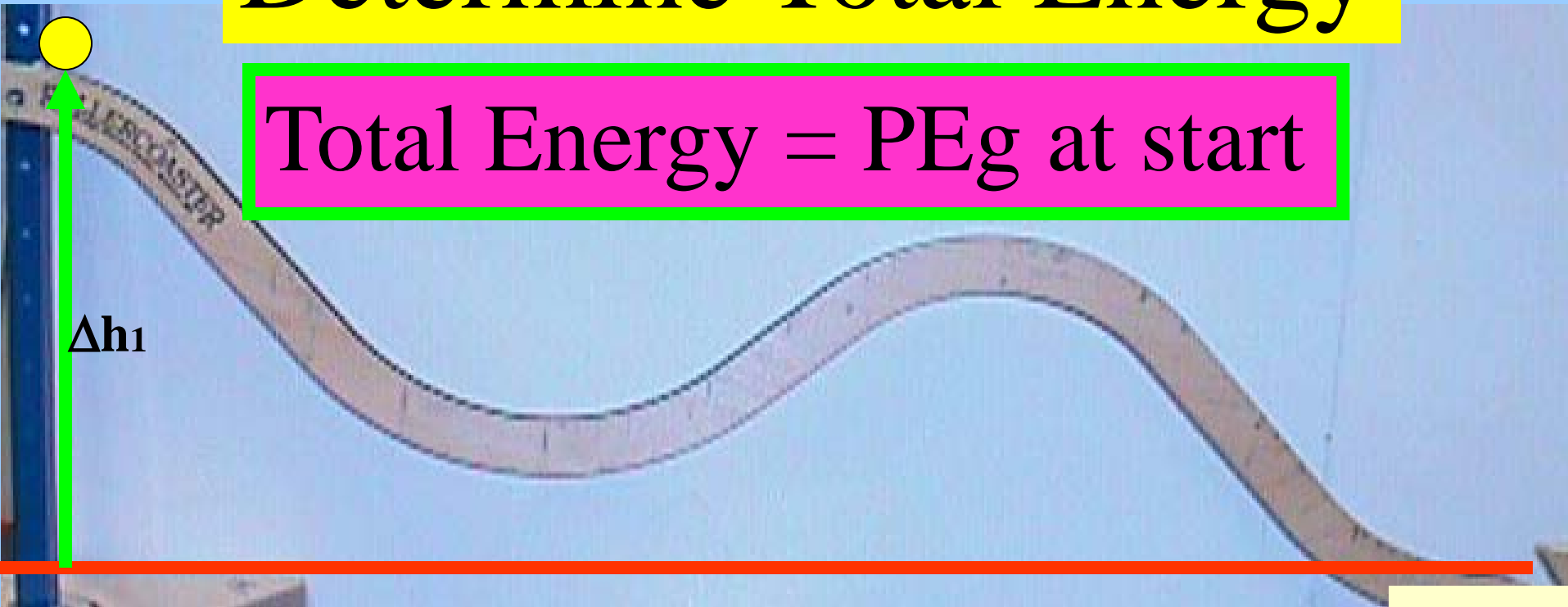
# GOALS

- **TO ACCOUNT FOR THE MECHANICAL ENERGY OF A BALL ROLLING ON THE COASTER**
  - **POTENTIAL ENERGY (GRAVITATIONAL)**
  - **KINETIC ENERGY**
  - **ENERGY LOST TO FRICTION**

# Lab #9: Roller Coaster Energy Audit

## Determine Total Energy

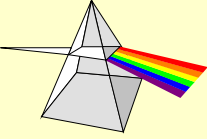
Total Energy = PE<sub>g</sub> at start



$$PE_g = mg\Delta h$$

$$h = 0$$

$$PE_g = 0$$



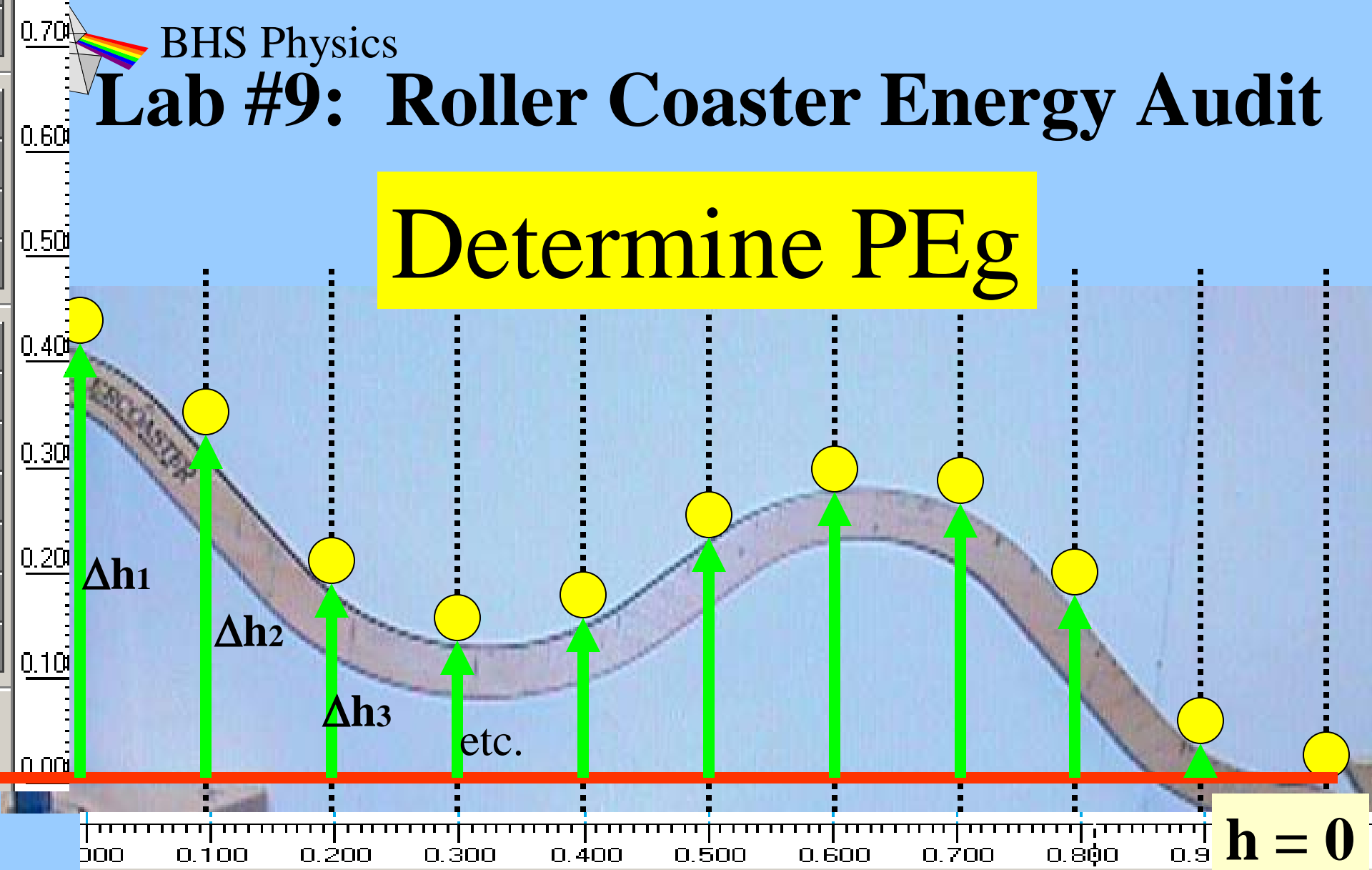
# PROCEDURE

## DETERMINE $PE_g$

- MEASURE THE HEIGHT OF THE TRACK ( **$h$** ) ABOVE THE BASELINE ( $H = 0$ ) AT .1m INTERVALS IN THE HORIZONTAL
- CALCULATE  **$PE_g$**  OF MARBLE FOR EACH HORIZONTAL POSITION

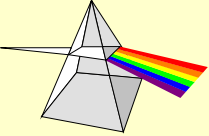
# Lab #9: Roller Coaster Energy Audit

Determine PEG



$$PE_g = mg\Delta h$$

$$PE_g = 0$$



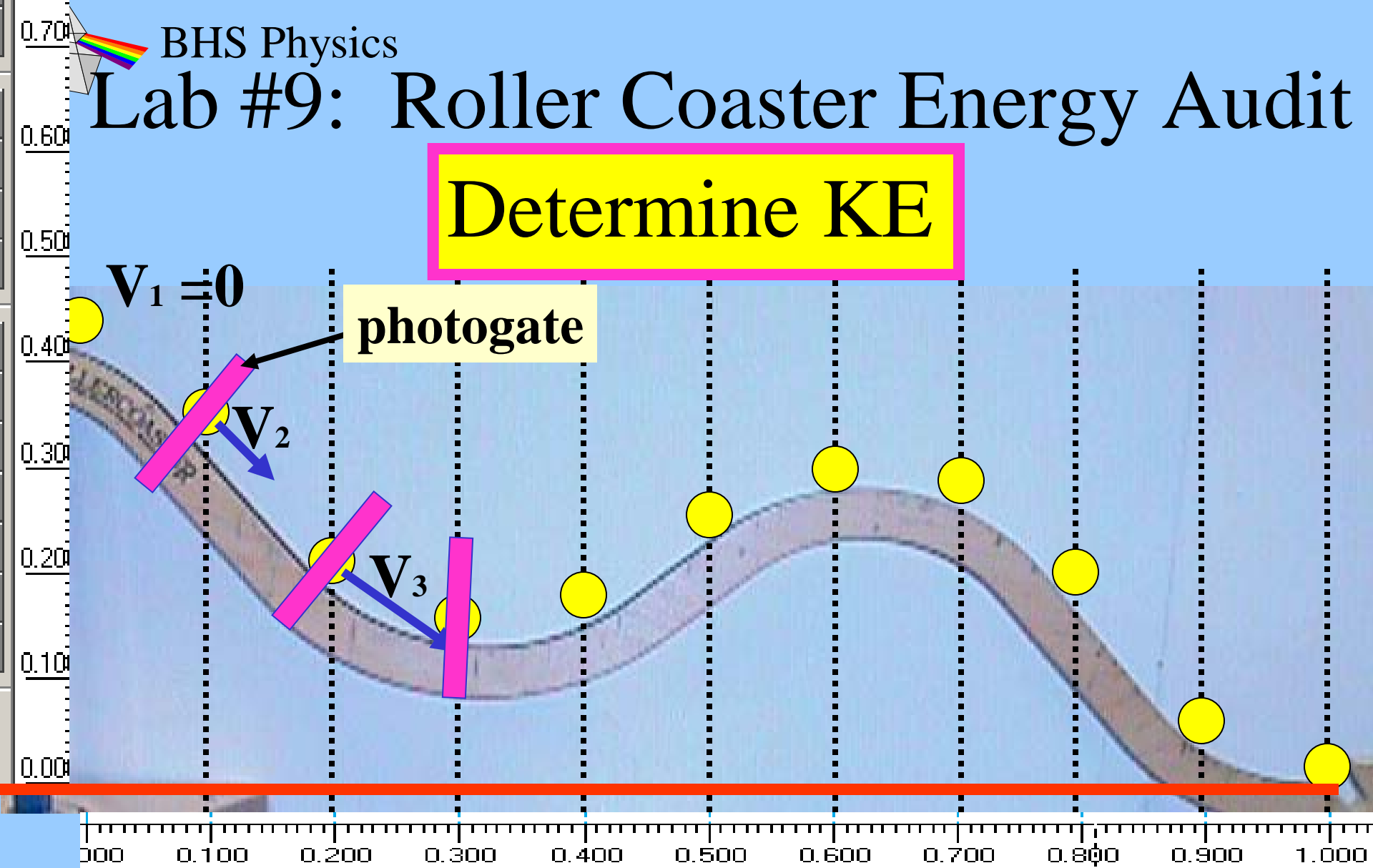
# PROCEDURE

## DETERMINE KE

- **POSITION THE PHOTOGATE TIMER AT EACH SUCCESSIVE .1 m MARKS FOR EACH TRIAL**
- **RELEASE THE MARBLE FROM THE TOP OF THE TRACK, RECORD TIME OF BEAM INTERRUPTION**
- **REPEAT TRIALS UNTIL PHOTOGATE HAS REACHED THE END OF THE TRACK**

# Lab #9: Roller Coaster Energy Audit

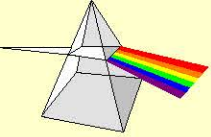
Determine KE



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

$$V = d/t$$

$$V = \text{diameter}/t_{\text{photo}}$$

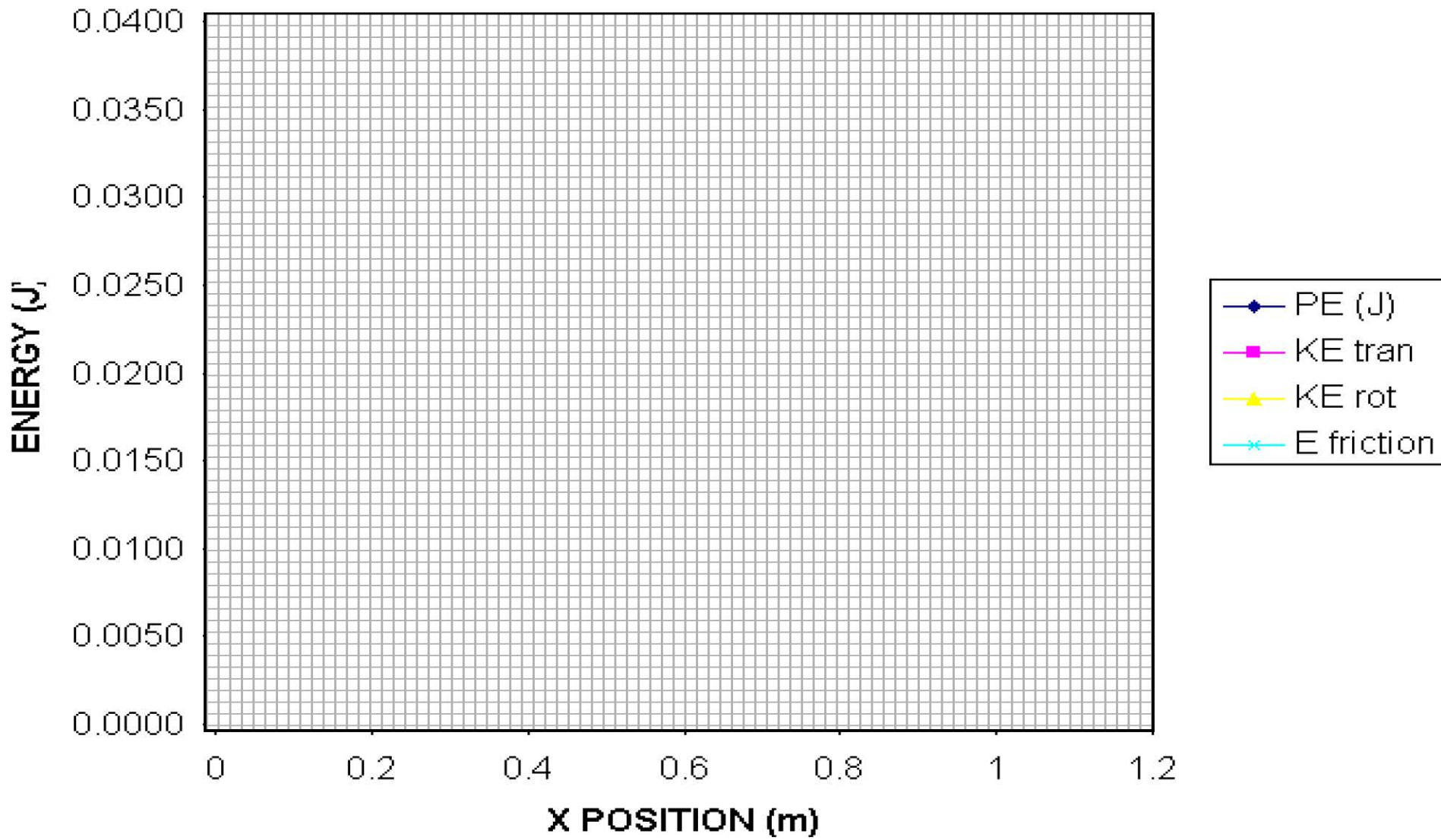


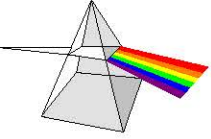
# DATA TABLE: Part 1

<b>SAMPLE DATA TABLE:</b>			MASS kg	0.0082	DIA (m) =	0.019	
<u>X (m)</u>	<u>h (m)</u>	<u>Peg (J)</u>	<u>t<sub>photo</sub>(s)</u>	<u>V (m/s)</u>	<u>KE (J)</u>	<u>E<sub>total</sub></u>	<u>E friction</u>
0							
0.1							
0.2							
0.3							
0.4							
0.5							
0.6							
0.7							
0.8							
0.9							
1							
1.1							



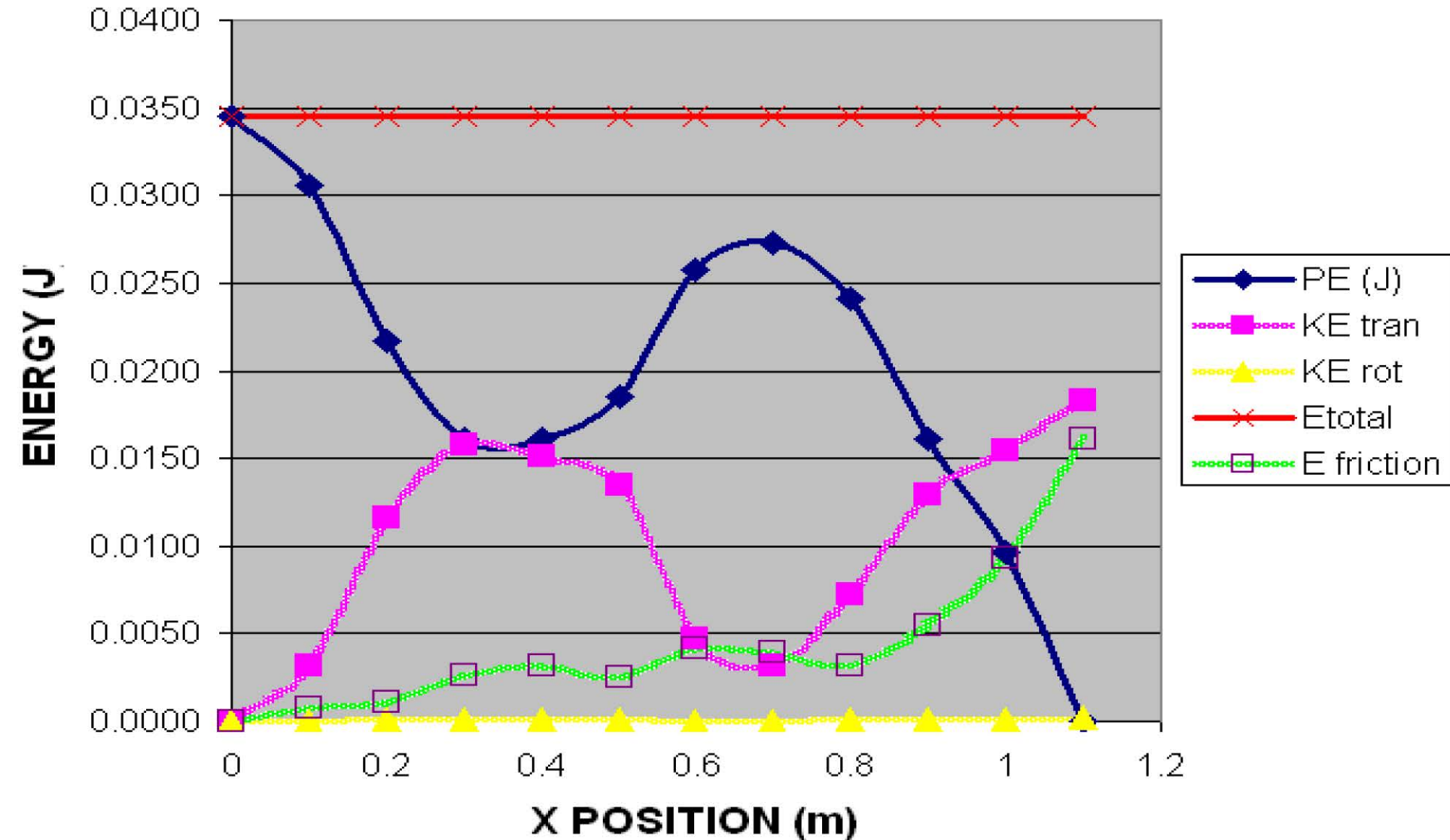
## MECHANICAL ENERGY AUDIT





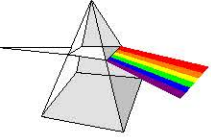
# GRAPH: PART 1

## MECHANICAL ENERGY AUDIT



# LAB #9 Part 2

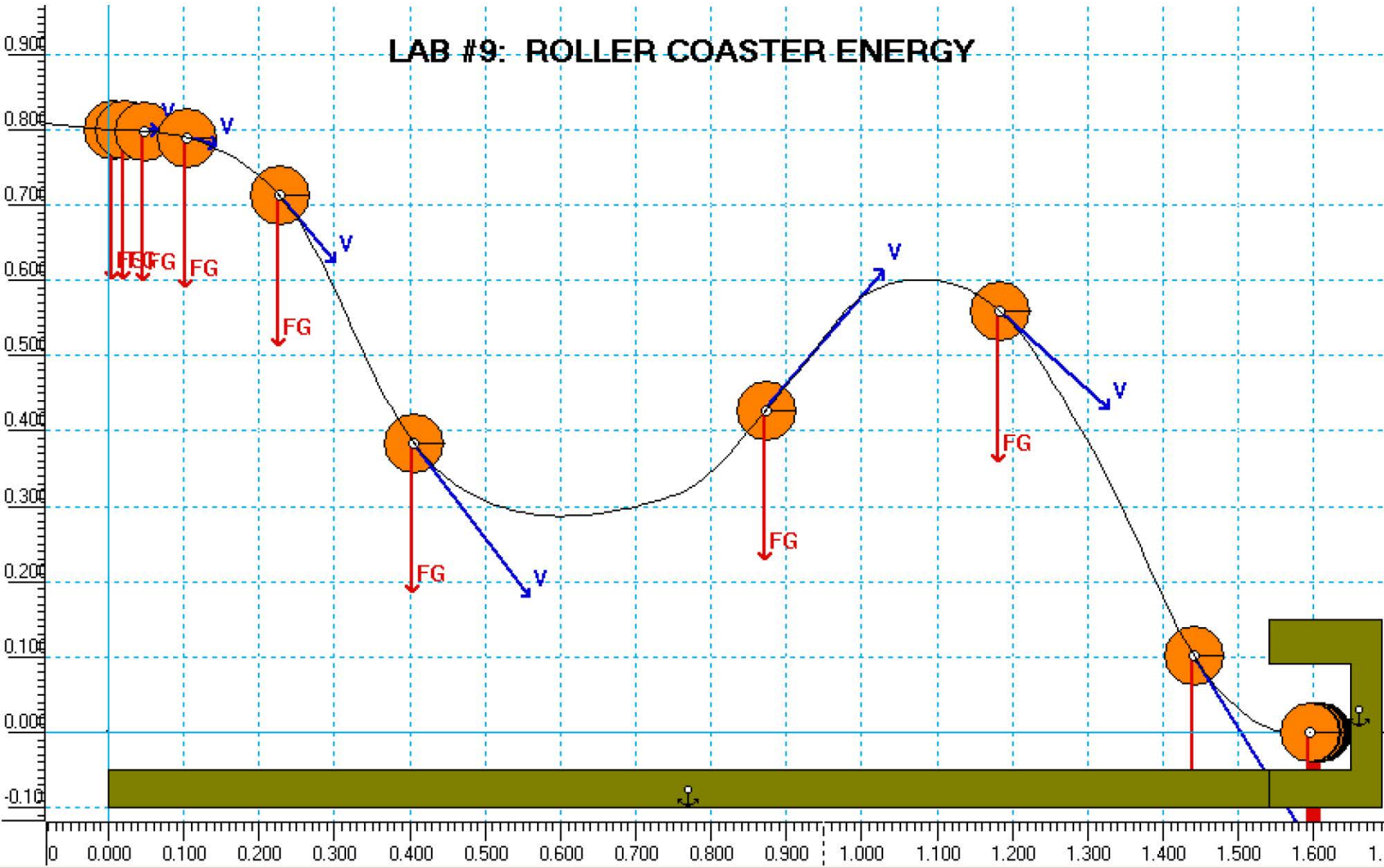
- Create an IP Sim of Rollercoaster & Repeat

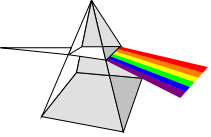


# BHS Physics Lab #9: Roller Coaster Energy Audit

## Part 2: IP Sim

LAB #9: ROLLER COASTER ENERGY

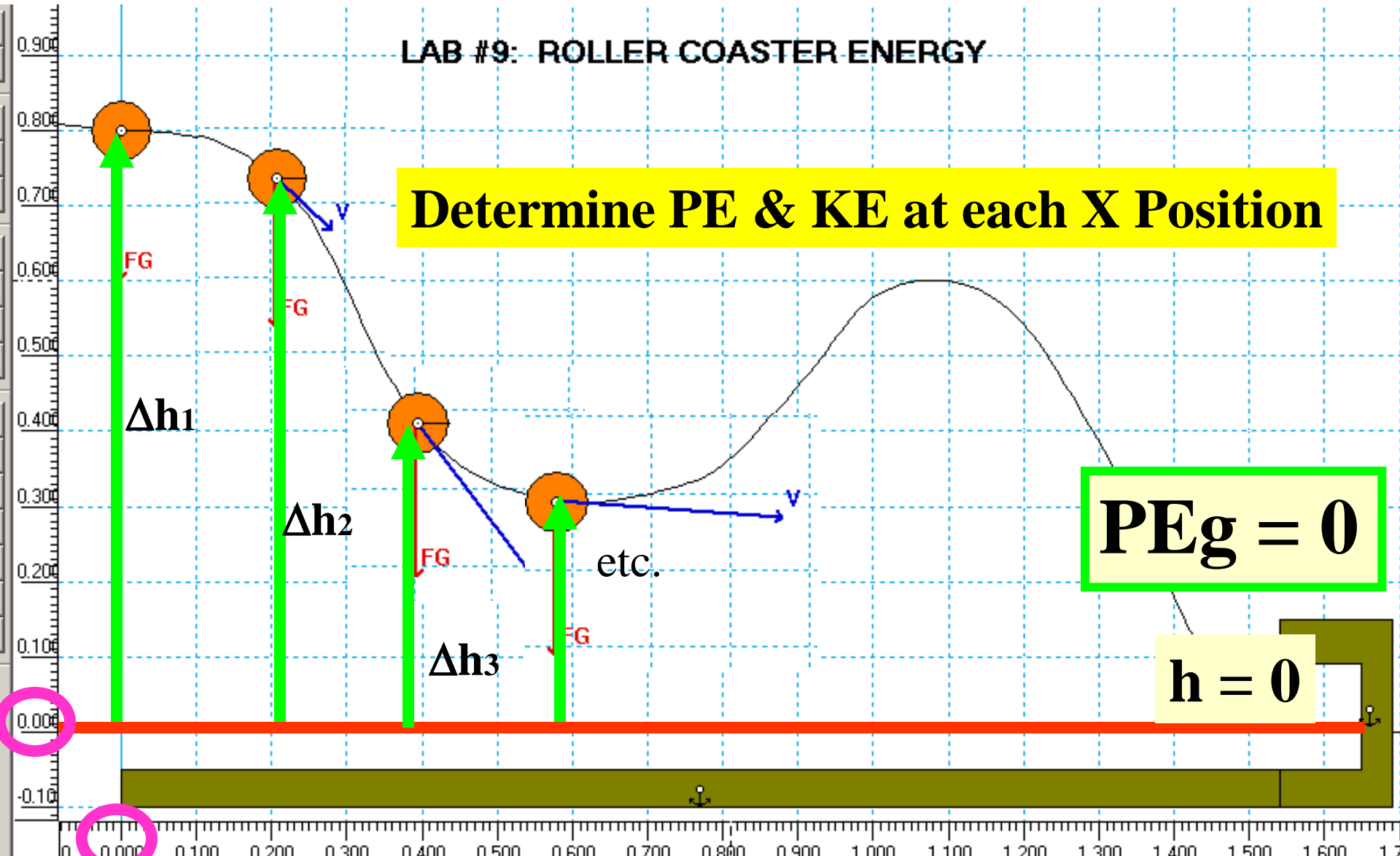


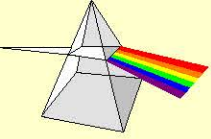


# Lab #9: Roller Coaster Energy Audit

LAB #9: ROLLER COASTER ENERGY

Determine PE & KE at each X Position



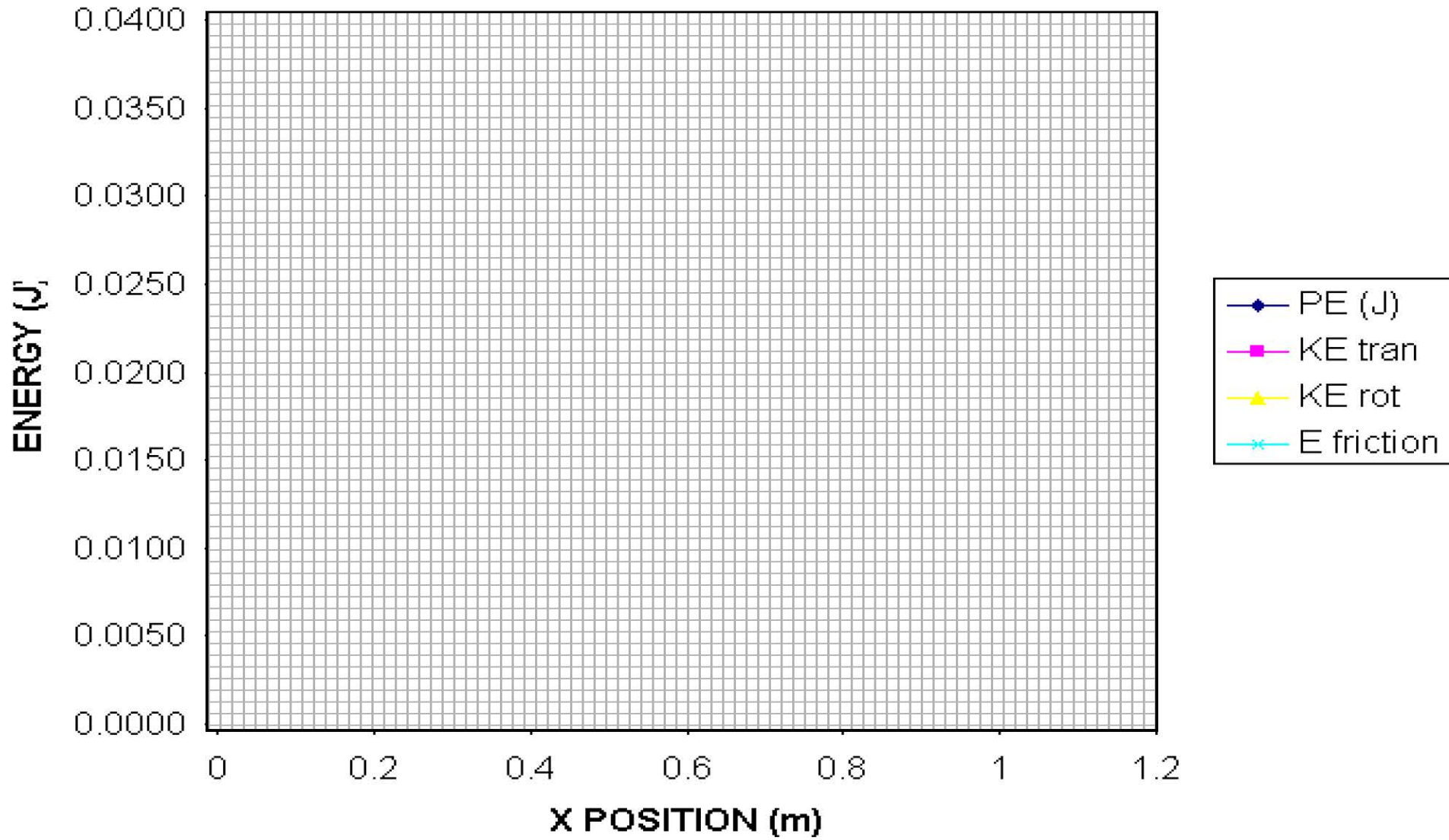


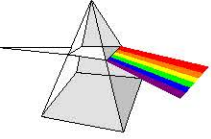
# DATA TABLE: Part 2

<u>SAMPLE DATA TABLE: PART 2:IP</u>				MASS kg		g =	
POSITION	<u>X (m)</u>	<u>h (m)</u>	<u>PE (J)</u>	<u>V (m/s)</u>	<u>KE (J)</u>	<u>Etotal</u>	<u>ME lost</u>
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

# GRAPH: PART 2

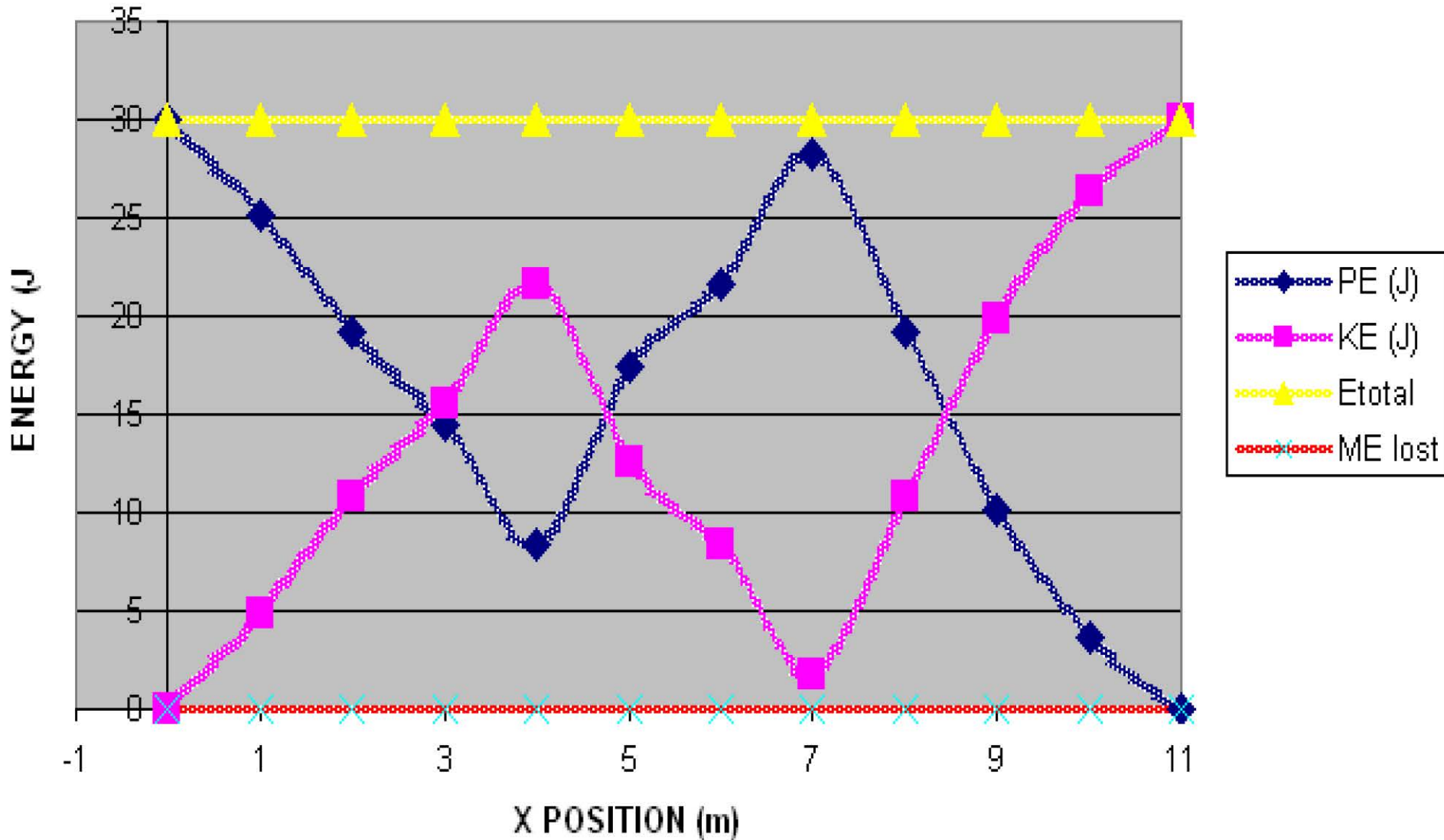
## MECHANICAL ENERGY AUDIT





# GRAPH: PART 2: I.P.

## COASTER ENERGY AUDIT

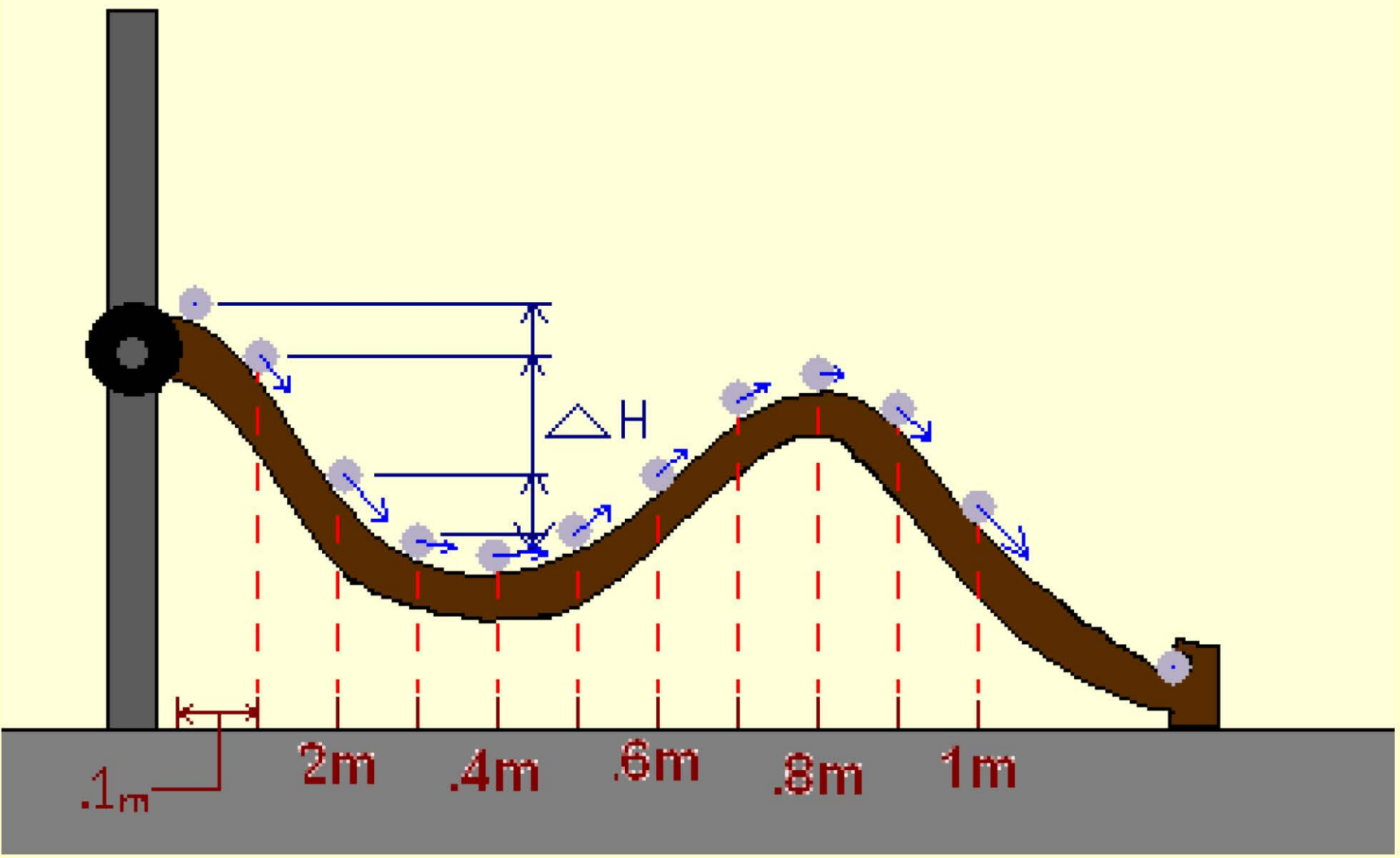




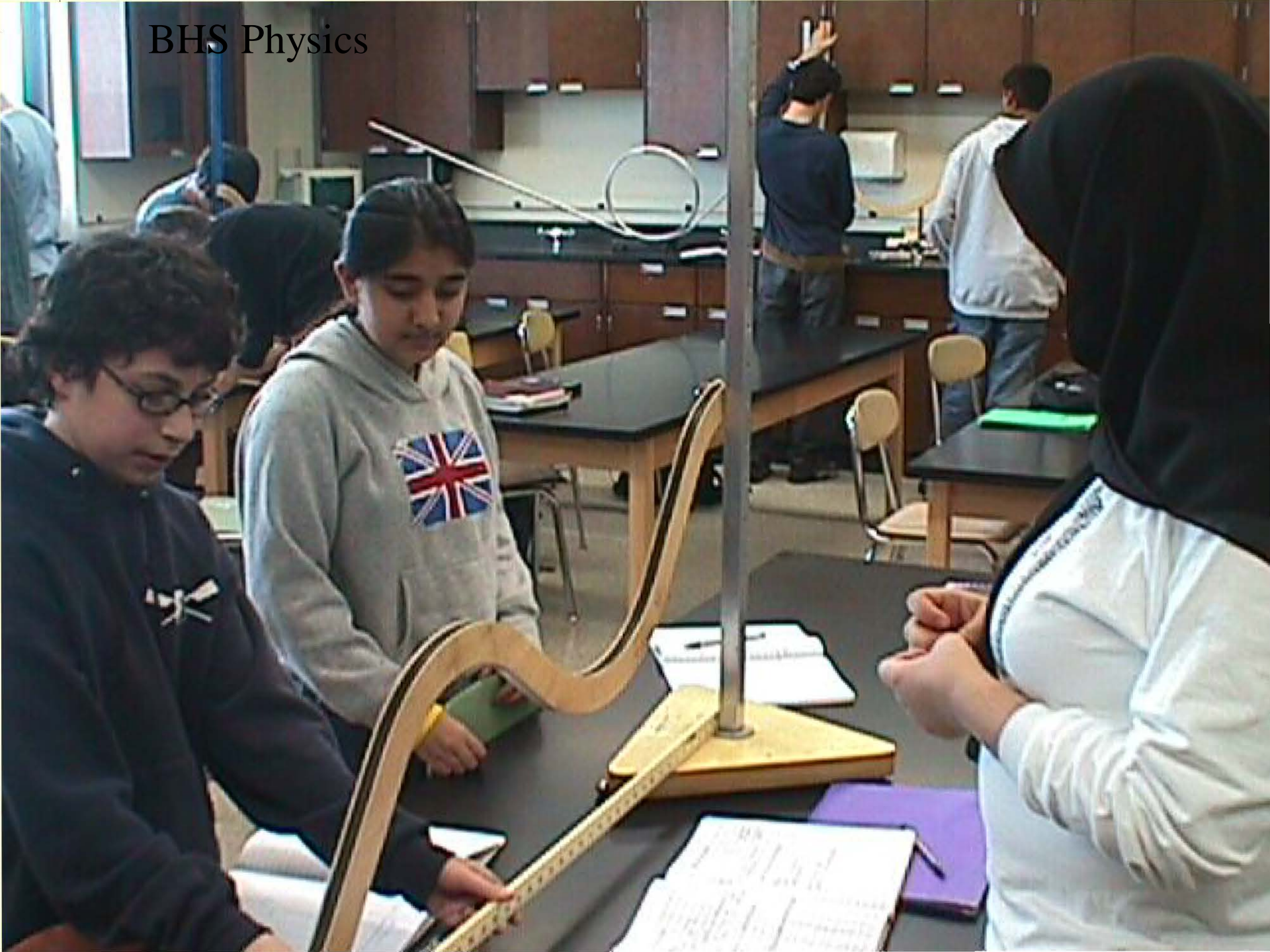
# WRITE-UP

- **ABSTRACT:**
  - BACKGROUND
  - METHOD
- **IP SIM SCREEN DUMP: EMBELLISHED**
  - SHOW VECTORS
- **SAMPLE CALCULATIONS**
  - $PE_g$
  - VELOCITY
  - KE
- **DATA TABLES**
- **GRAPHS**
  - SCATTER GRAPH, CONNECT DATA POINTS
  - GRAPH ANALYSIS
- **CONCLUSION**

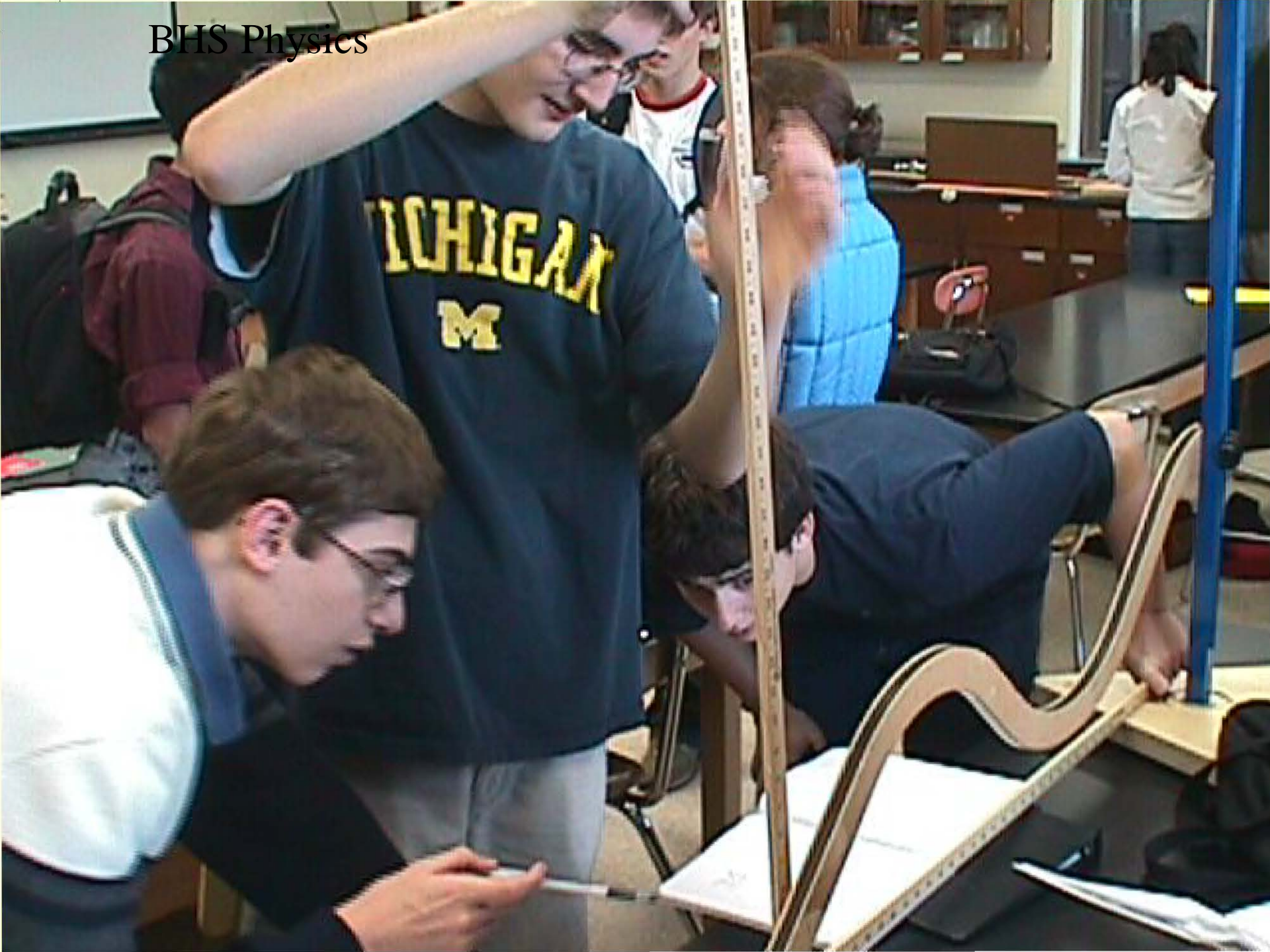
# SKETCH













# BHS Physics





# Lab #9: Roller Coaster Energy

