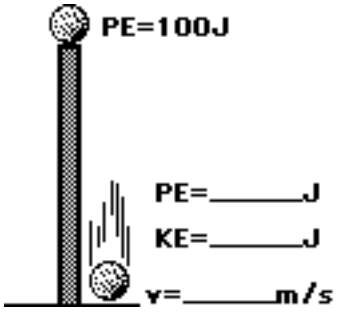
Energy Conservation

Read from **Lesson 2** of the **Work, Energy and Power** chapter at **The Physics Classroom:**

http://www.physicsclassroom.com/Class/energy/u5l2b.html
http://www.physicsclassroom.com/Class/energy/u5l2bb.html

MOP Connection: Work and Energy: Assignments WE7 and WE8

1. Consider the following two <u>frictionless</u> situations. For each situation, indicate the forces doing work upon the ball. Indicate whether the energy of the ball is conserved and explain why. Finally, simplify the work-energy equation and use it to find the kinetic energy and the velocity of the 2-kg ball just prior to striking the ground.

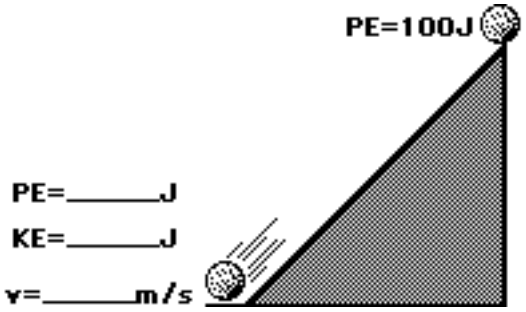


Forces doing work?

_____

TME Conserved: Yes or No?

$KE_i + PE_i + W_{ext} = KE_f + PE_f$



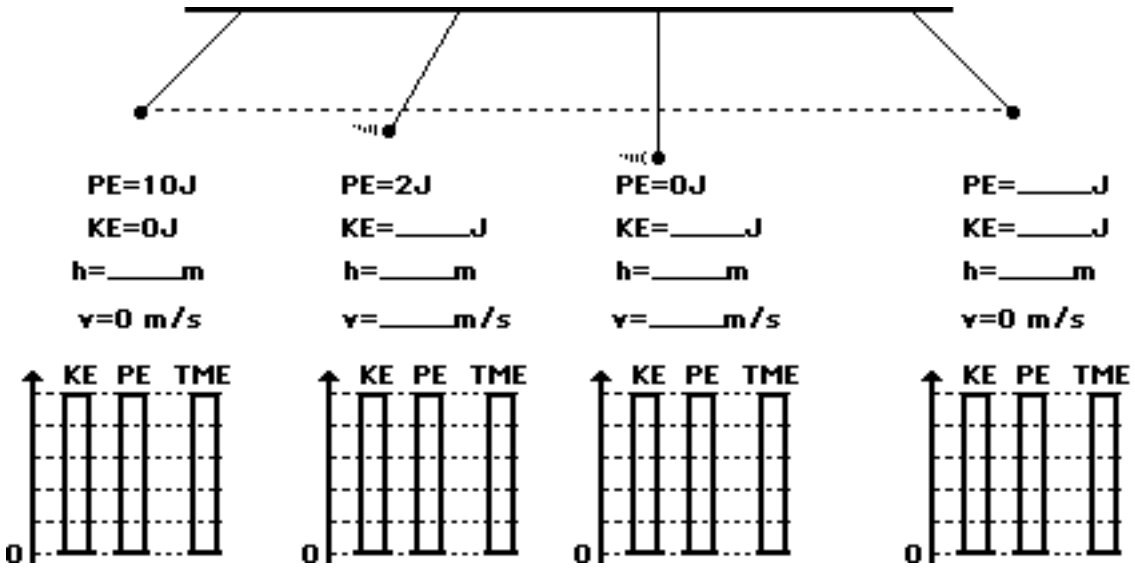
Forces doing work?

_____

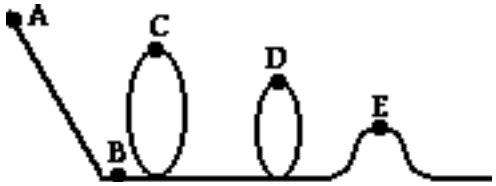
TME Conserved: Yes or No?

$KE_i + PE_i + W_{ext} = KE_f + PE_f$

2. Use the work-energy relationship to fill in the blanks for the following system (m=2 kg). Neglect frictional forces. Finally, darken in the bars of the bar chart in order to demonstrate the amount of kinetic energy (KE), potential energy (PE) and total mechanical energy (TME).



Five locations along a roller coaster track are shown. Assume negligible friction and air resistance forces. Answer the following questions by putting a letter in each blank with a comparison operator in between.



3. Rank the five locations in order of increasing TME. Place a < or = signs between the blanks.

Least ____ ____ ____ ____ ____ Greatest

4. Rank the five locations in order of increasing PE. Place a < or = signs between the blanks..

Least ____ ____ ____ ____ ____ Greatest

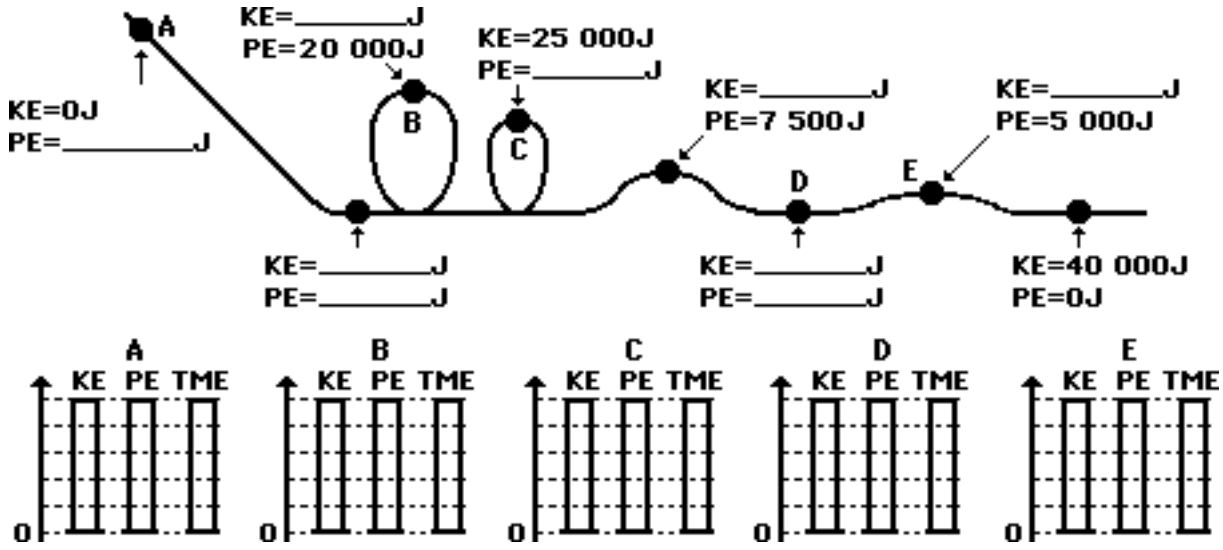
5. Rank the five locations in order of increasing KE. Place a < or = signs between the blanks.

Least ____ ____ ____ ____ ____ Greatest

6. Rank the five locations in order of increasing speed. Place a < or = signs between the blanks.

Least ____ ____ ____ ____ ____ Greatest

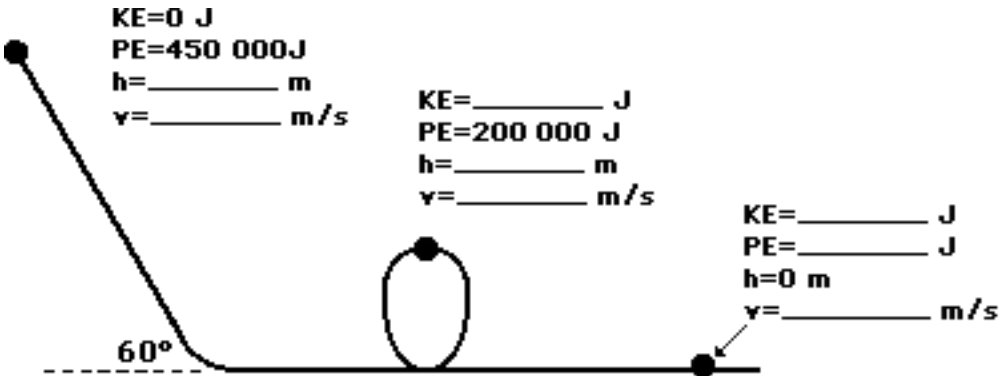
7. Use the law of conservation of energy (assume no friction nor air resistance) to determine the kinetic and potential energy at the various marked positions along the roller coaster track below. Finally, fill in the bars of the bar charts for positions A, B, C, D, and E.



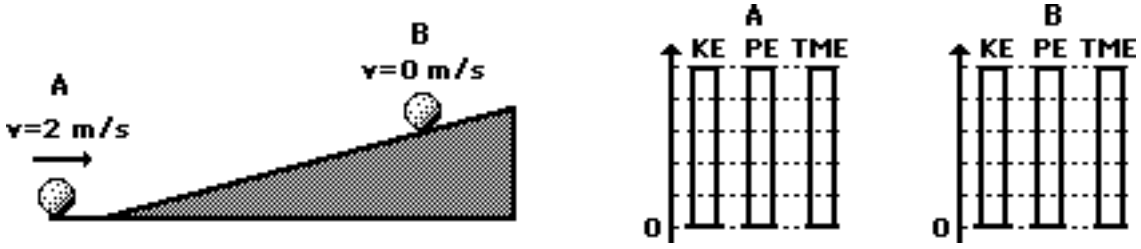
8. Fill in the blanks in the following sentence:

An object starts from rest with a PE of 600 J and free-falls towards the ground. After it has fallen to a height of one-fourth of its original height, its TME is _____ J, its PE is _____ J, and its KE is _____ J.

9. Use the law of conservation of energy (assume no friction) to fill in the blanks at the various marked positions for a 1000-kg roller coaster car.



10. A 2-kg ball moving at 2 m/s rolls towards an inclined plane. It rolls up the hill to a position near the top where it momentarily stops prior to rolling back down he incline. Assume negligible friction and air resistance. Construct a energy bar chart for the ball.



Simplify the equation below by canceling terms that are either zero or constant. Then use the equation to determine the height to which the ball rises along the incline before stopping.

$$\frac{1}{2} \bullet m \bullet v_i^2 + m \bullet g \bullet h_i + F \bullet d \bullet \cos\square = \frac{1}{2} \bullet m \bullet v_f^2 + m \bullet g \bullet h_f$$

11. Three identical balls approach three different "frictionless" hills with a speed of 2 m/s. In which case - A, B, or C, (or a tie) - will the ball roll the highest? _____ Explain your answer.