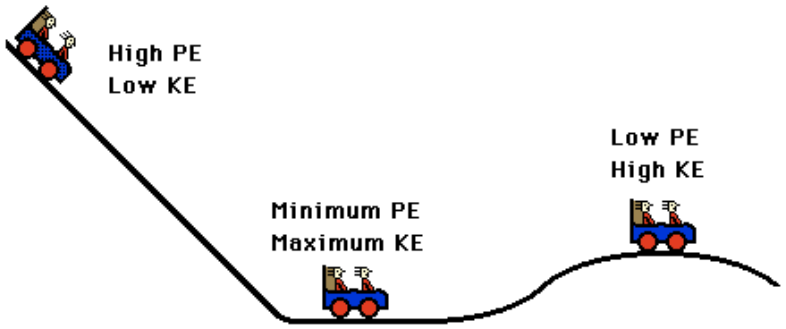
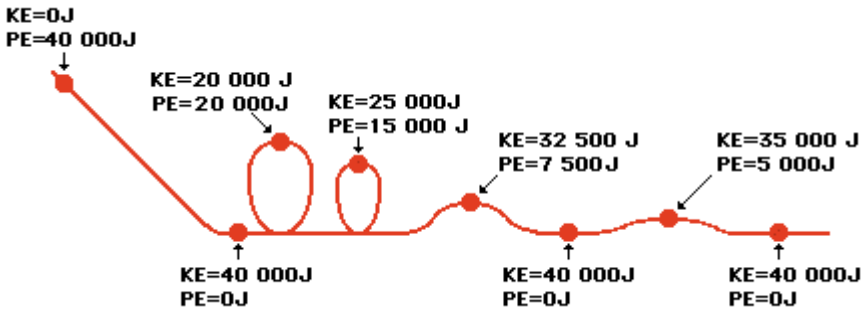
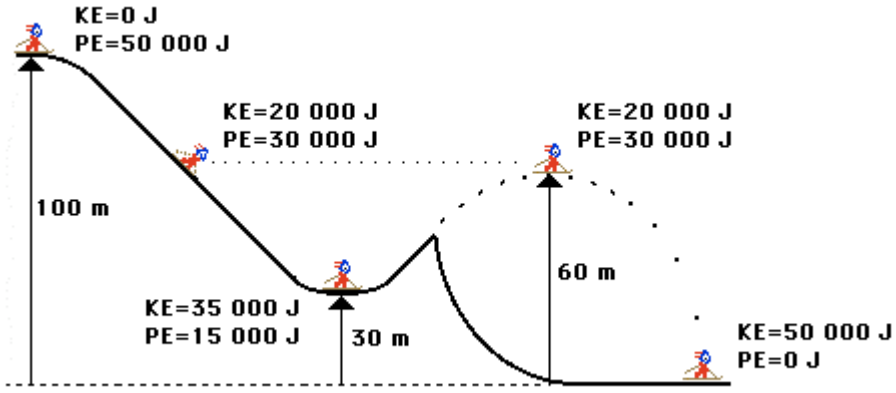
Analysis of Situations in Which Mechanical Energy is Conserved

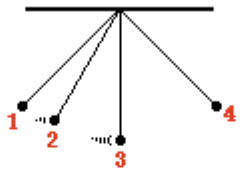


As a coaster car loses height, it gains speed; PE is transformed into KE. As a coaster car gains height it loses speed; KE is transformed into PE. The sum of the KE and PE is a constant.





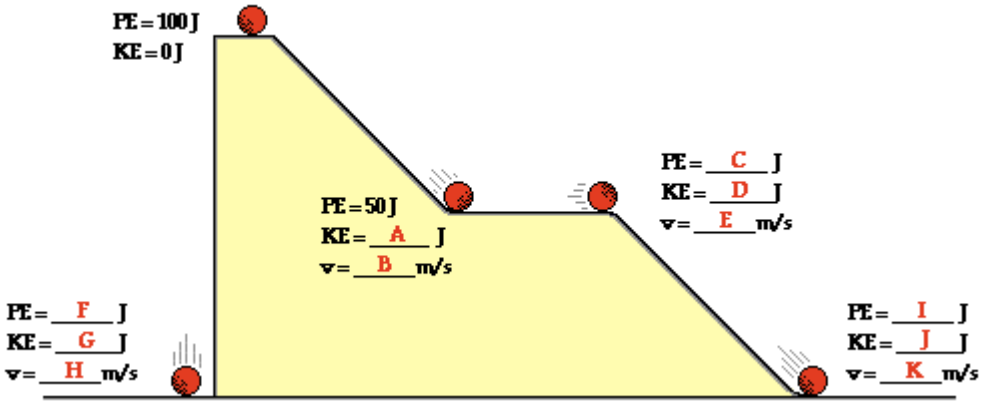
As the 2.0-kg pendulum bob in the diagram below swings to and fro, its height and speed change. Use energy equations and the above data to determine the blanks in the above diagram.



Position 1	Position 2	Position 3	Position 4
PE=6J	PE=3J	PE=0J	PE=6J
KE=0J	KE=3J	KE=6J	KE=0J
h=__A__m	h=__B__m	h=__D__m	h=__F__m
v=0m/s	v=__C__m/s	v=__E__m/s	v=0m/s

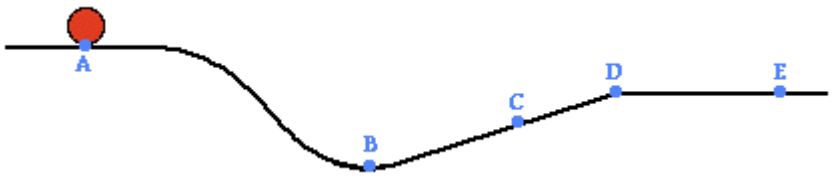
Check Your Understanding

1. Consider the falling and rolling motion of the ball in the following two resistance-free situations. In one situation, the ball falls off the top of the platform to the floor. In the other situation, the ball rolls from the top of the platform along the staircase-like pathway to the floor. For each situation, indicate what type of forces are doing work upon the ball. Indicate whether the energy of the ball is conserved and explain why. Finally, fill in the blanks for the 2-kg ball.



2. If frictional forces and air resistance were acting upon the falling ball in #1 would the kinetic energy of the ball just prior to striking the ground be more, less, or equal to the value predicted in #1?

Use the following diagram to answer questions #3 - #5. Neglect the affect of resistance forces.



3. As the object moves from point A to point D across the surface, the sum of its gravitational potential and kinetic energies ____.

a. decreases, only
b. decreases and then increases
c. increases and then decreases
d. remains the same

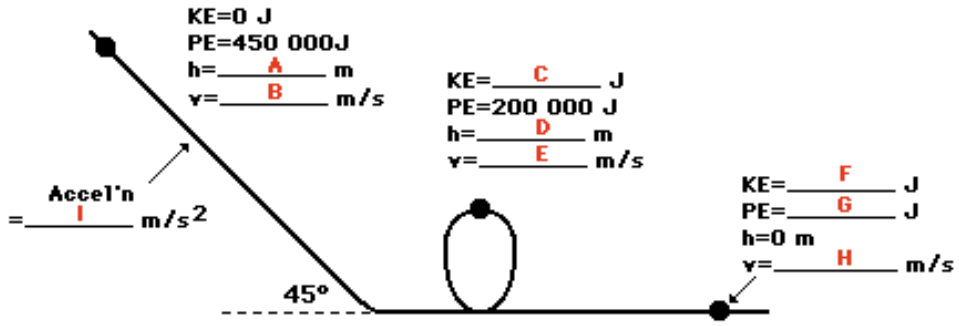
4. The object will have a minimum gravitational potential energy at point ____.

a. A
b. B
c. C
d. D
e. E

5. The object's kinetic energy at point C is less than its kinetic energy at point ____.

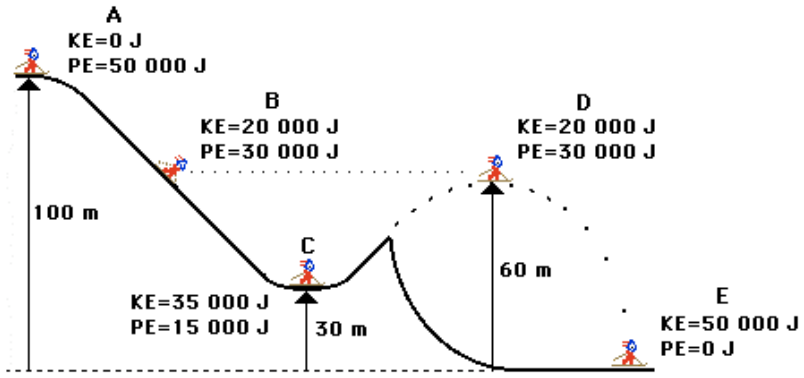
a. A only
b. A, D, and E
c. B only
d. D and E

6. 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.



7. If the angle of the initial drop in the roller coaster diagram above were 60 degrees (and all other factors were kept constant), would the speed at the bottom of the hill be any different? Explain.

8. Determine Li Ping Phar's (a mass of approximately 50 kg) speed at locations B, C, D and E.



9. An object which weighs 10 N is dropped from rest from a height of 4 meters above the ground. When it has free-fallen 1 meter its total mechanical energy with respect to the ground is ___.

a. 2.5 J b. 10 J c. 30 J d. 40J

10. During a certain time interval, a 20-N object free-falls 10 meters. The object gains ____ Joules of kinetic energy during this interval.

a. 10 b. 20 c. 200 d. 2000