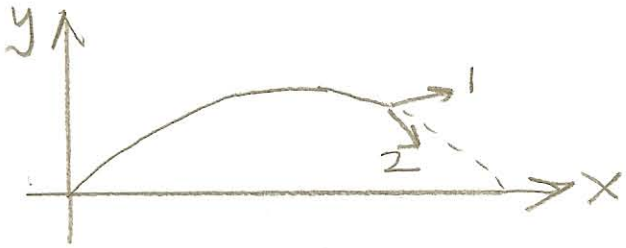
Wednesday March 1, 2006
In Lecture quiz #5, Physics 131
Name:_____

Our "system" is a projectile which has been launched. We neglect air friction, and the trajectory is the parabolic path plotted below. The projectile consists of two half shells 1 and 2, with masses m_1 and m_2, held together, with an ideal compressed spring in between. At a certain point (marked on the trajectory) the spring is released and the two parts go on separate trajectories. Which of the following are "conserved"? [You should allow the normal idealizations of simple physics, nothing tricky.]

1. $p_{1x} + p_{2x}$
2. $p_{1y} + p_{2y}$
3. $K_1 + K_2 + U_{spring} + U_{grav}$



Answers

1 and 3 are conserved, 2 not.

Momentum is conserved whenever the "system" experiences no external forces. In this case, the system (the two half-shells) experiences the external force of gravity in the –y direction. Therefore, y-momentum (equation 2) is **not** conserved, but since there is no external force in the x direction, x-momentum (equation 1) **is** conserved.

Energy is conserved whenever non-conservative forces like friction can be neglected. Air friction was ruled out explicitly. Internal friction inside the projectile will cause some of the mechanical energy to be lost, but since the spring was designated as ideal, one should assume that this also is negligible.