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General Physics I, Quiz 2
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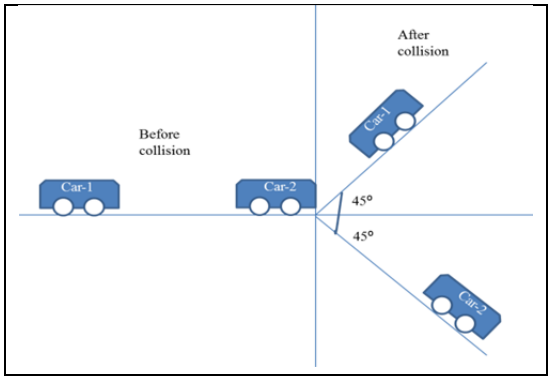
Quiz-2 Solution

1. **Solution :**
   a) Since the displacement of you is zero, so the work done will be zero in principally.
   b) We know the potential energy V= mgh = 2kg X 9.8m/s^{2}X 3m
   = 58.8 J
   c) The kinetic energy K= ½ mv^2 =1/2 [2 kg X (1 m/s)^2] = 1J
   d) Since it has uniform velocity (Every second it cross the same distance, here 1m/s) so after 3 s the book will touch the ground. The kinetic energy will be transformed to sound, potential and other energy.

2. **Solution:**
   a) The initial compression of the spring : ½ kx^2 = ½ mv^2
   Or, ½(500 N/m) (Δx^2) = ½ (1kg) (12 m/s) ^{2}
   So, Δx = 0.536 m
   b) Speed of the block at the top of track :
   Total energy, ΔE = -FΔx
   (mgh$_T$+ 1/2mv$_T^2$)- (mgh$_B$+1/2mv$_B^2$) = -F (д R)
   (1 kg X 9.8 m/s^{2}X 10 m + ½ 1 kg X v$_T^2$)- [(1 kg X 9.8 m/s X 0) +1/2 (1 kg X 12 m/s) ^{2}] = - (7 N) (д X 5m)
   So, v$_T$ = 16.48 m/s [Neglect the -negative sign, it just mean the direction)

3. **Solution:**

   a) Since the cars make angle with original line of motion (Let X –axis) after collision so by using conservation of momentum we can write for the motion in X -direction is
   M V$_{1ix}$+M V$_{2ix}$ = M V$_{1fx}$+M V$_{2fx}$
   80 km/hr + 0 = 40 km/hr cos45^o+ V$_{2fx}$ [since both cars have same mass]
   V$_{2fx}$= 51.7 km/hr
   Now for motion in Y-axis direction
   M V$_{1iy}$+M V$_{2iy}$ = M V$_{1fy}$+M V$_{2fy}$
   0+0 = 40 km/hr sin45^o+ V$_{2fy}$
   V$_{2fy}$ = -28.2 km/hr
   Resultant V$_{2f}$ = $\sqrt{(V2fx)^2 + (V_{2fy})^2}$ = 58.9 km/hr at 45^0 direction



   b) Yes, it is possible.