Name: _____   DISC: _____   Score: _____ / 20

Instructions:
- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers

Q1	Q2	Q3	Q4
10	5	5	5

1. You drop a ball from the roof of the John Hancock Center (height at the roof: 344 m). The ball is of mass 10 kg.
    a. Which kind of energy does the ball have just before you drop it:

Selection:

      i. Potential Energy ($U = mgh$).

      ii. Kinetic Energy ($K = \frac{1}{2}mv^2$)

      iii. Neither

    b. Calculate the potential energy of the ball at the roof of the building.

Potential Energy (3 pts):

    c. Find the velocity of the ball just as it hits the ground (ignore air resistance).

Velocity (3 pts):

    d. Does the force of gravity do work ($W = F\,d\cos\theta$) on the ball? Explain your answer.

Answer (3 pts):

2. Impulse changes momentum ($I = \Delta p = F\Delta t$). So momentum and force are related. You throw a ball of mass $m = 0.05\ kg$ straight at the wall of your dorm room. The ball travels with $\vec{v}_i = 6\ m/s$. Change in momentum is $\Delta\vec{p} = m(\vec{v}_f - \vec{v}_i)$.

   a. The ball bounces straight off the wall ($\vec{v}_f = -\vec{v}_i$). Calculate $\Delta\vec{p}$:

Answer (3 pts):

   b. If the ball interacts with the wall for 0.3 s, how large is the force experienced by the ball in the collision?

Answer (2 pts):

3. A block of mass $15\ kg$ rests on a frictionless floor. It suddenly explodes breaking into two pieces: piece 1, $m_1 = 6\ kg$ and piece 2, $m_2 = 9\ kg$. The pieces travel in opposite directions along the floor.

   a. Which of the following is conserved:

Selection:

      i. Momentum: $p = mv$

      ii. Kinetic energy: $K = \frac{1}{2}mv^2$

   b. Using conservation of momentum ($\Delta p = 0\ kg\ m/s$) and $\vec{v}_1 = 5\ m/s$, find v_2, the *speed* of part 2.

Answer (2 pts):

   c. Which part has the *larger* kinetic energy:

Solution (2 pts):

      i. Part 1

      ii. Part 2