Name: _____

1. State the *Law of Conservation of Linear Momentum.* (10 pts)

2. State the *Principle of Conservation of Mechanical Energy.* (10 pts)

3. Solve the following equations (2 equations with 2 unknowns) for x in terms of: m, g, h. Refer to *Appendix A: Math Review* if necessary. (10 pts)

   $6x = 9y$

   $5y^2 = mgh$

4. Solve the following equations (2 equations with 2 unknowns) for x in terms of: m, M, g, h. (20 pts)

   $mx = (m + M)y$

   $\frac{1}{2}(m + M)y^2 = (m + M)gh$

(continued on next page)

5. Solve Eq. 7.5 and Eq. 7.6 (2 equations with 2 unknowns) for v_1 in terms of: m, M, g, h. (20 pts)

   $mv_1 = (m + M)V_2$ (Eq. 7.5)

   $\frac{1}{2}(m + M)V_2^2 = (m + M)gh$ (Eq. 7.6)

6. You shoot a ball, $m = 50.0$ g, into a catcher, $M = 200.0$ g; the center of mass rises 15.0 cm. Calculate v_1. Refer to your answer for *Question 5*. (20 pts)

7. You will fire the spring gun 3 times from the first detent and measure the change in height of the (pendulum + ball) for each shot. Write the equation for the change in height of the first shot. (10 pts)