Assignment – Physics 1

1. Two carts, one twice the mass of the other, experience the same force for the same time. What is their difference in momentum? What is their difference in kinetic energy?

2. A 12 g bullet is fired horizontally into a 96 g wooden block initially at rest on a horizontal surface. After impact, the block slides 7.5 m before coming to rest. If the coefficient of kinetic friction between block and surface is 0.60, what was the speed of the bullet immediately before impact?

3. A ball bounces upward from the ground with a speed of 14 m/s and hits a wall with a speed of 12 m/s. How high above the ground does the ball hit the wall? Ignore air resistance.

4. A 200 g mass is attached to a spring of spring constant k. The spring is compressed 15 cm from its equilibrium value. When released the mass reaches a speed of 5 m/s. What is the spring constant (in N/m)?

5. A 34-g bullet traveling at 120m/s embeds itself in a wooden block on a smooth surface. The block then slides toward a spring and collides with it. The block compresses the spring (k=100 N/m) a maximum of 1.25 cm. Calculate the mass of the block of wood.

6. If a force of 300N is exerted upon a 60 kg mass for 3 seconds, how much impulse does the mass experience?

7. An 80-kg man and his car are suddenly accelerated from rest to a speed of 5 m/s as a result of a rear-end collision. Assuming the time taken to be 0.3s, find:
   a) the impulse on the man and
   b) the average force exerted on him by the back seat of his car.

8. An airplane propeller is rotating at 1900 rev/min.
   a. Compute the propeller's angular velocity in rad/s.
   b. How long in seconds does it take for the propeller to turn through 30.0 degrees?

9. A disk with a 1.0-m radius reaches a maximum angular speed of 18 rad/s before it stops 30 revolutions after attaining the maximum speed. How long did it take the disk to stop?

10. A net torque of 36 N.m acts on a wheel rotating about a fixed axis for 6 s. During this time the angular speed of the wheel increases from 0 to 12 rad/s. The applied force is then removed, and the wheel comes to rest in 75 s.
    a. What is the moment of inertia of the wheel?
    b. What is the magnitude of the frictional torque?
    c. How many revolutions does the wheel make?