PHYSICS 215

Test #1

30 September 1999

Name: _____ Section: _____

Part A. Choose the best answer from those given. (5 points each)

1. 1.0 m is equivalent to 3.281 ft. A cube with an edge of 1.5 ft has a volume of:

   ☐ a) $1.2 \times 10^2\ m^3$.
   ☐ b) $9.6 \times 10^{-2}\ m^3$.
   ☐ c) $10.5\ m^3$.
   ☐ d) $9.5 \times 10^{-2}\ m^3$.
   ☐ e) $0.21\ m^3$.

2. A physics textbook is suspended on a spring scale in an elevator. Of the following, the scale shows the highest reading when the elevator:

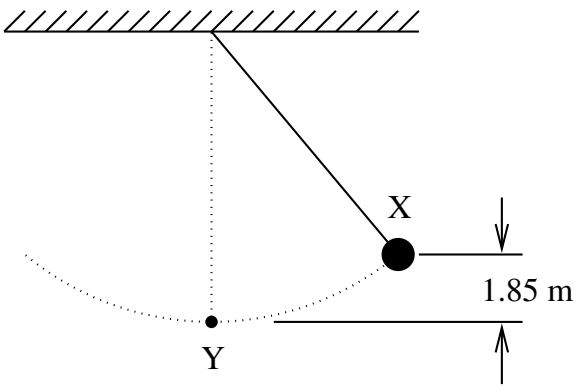
   ☐ a) moves downward with increasing speed.
   ☐ b) moves downward with decreasing speed.
   ☐ c) remains stationary.
   ☐ d) moves upward with decreasing speed.
   ☐ e) moves upward at constant speed.

3. A 5.0 kg crate is resting on a plank which is held at an angle of 25° above the horiaontal. If the coefficient of static friction is 0.50 and the coefficient of kinetic friction is 0.40, the force of friction is:

   ☐ a) 0.
   ☐ b) 18 N.
   ☐ c) 21 N.
   ☐ d) 22 N
   ☐ e) 44 N.

4. A simple pendulum consists of a 2.0 kg mass attached to a string. It is released from rest at X as shown. Its speed at the lowest point Y is:

   ☐ a) 0.90 m/s.
   ☐ b) $\sqrt{3.6}\ m/s$.
   ☐ c) 3.6 m/s.
   ☐ d) 6.0 m/s.
   ☐ e) 36 m/s.



Part B. Answer 4 of the following 5 questions. Show all work! Where appropriate, show the free body diagram. (20 points each)

1. At a stoplight, a truck traveling at 15 m/s passes a car as it starts from rest. From that point, the truck continues on with constant velocity, while the care begins to accelerate at 2.0 m/s^2.

   a) At what time will the car pass the truck?

   b) How far will the car have gone when it passes the truck.

2. Suppose you fire a projectile 35.0° above the horizontal with an initial velocity of 200 m/s. It lands in a valley 300 m below the launch point. What is:

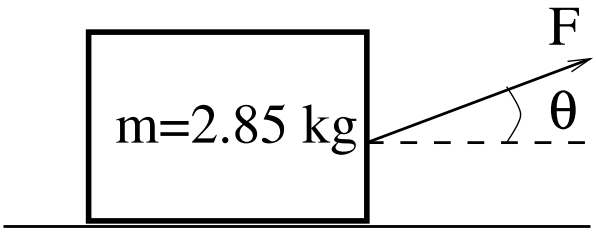
   a) the range of the projectile?

   b) the projectile's time of flight?

3. Two unrelated problems with friction:

   a) The coefficient of static friction, μ_k, between a carton of eggs and your car seat is 0.60. Assuming you don't want to clean egg off the carpet in your car, what is the maximum acceleration you can use to stop the car?

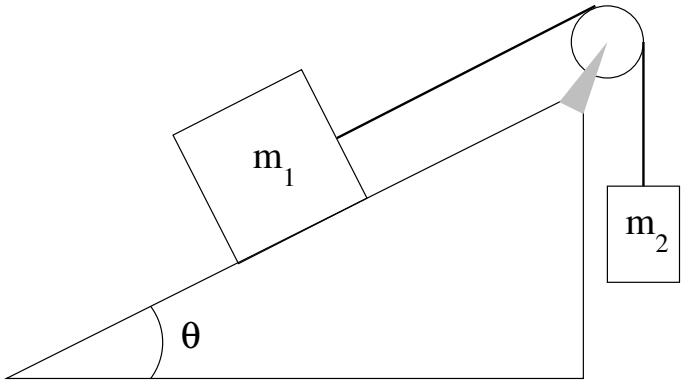
   b) Find the acceleration on the 2.85 kg block in the figure, if the coefficient of friction is 0.770, the angle $\theta = 22.5°$, and the applied force F is 50.0 N.



4. A block on an inclined plane is connected to a second block (as shown in the figure) with a massless string over a massless, frictionless pulley. The surface of the inclined plane is also frictionless. The system is in equilibrium! If $\theta = 30.0°$ and $m_2 = 10.0\ kg$, find:

   a) the tension in the string.

   b) the other mass, m_1.



5. A 400 kg roller coaster car has a speed of 1.5 m/s at the point labeled A in the diagram.

   a) If there is no friction between the car and the track, what should the speed of the car be at points B and C?

   b) The car is observed to have a speed of 7.0 m/s at point B, and the length of track from A to B is measured to be 20 m. What is the average force of friction between the car and the track?