PHYS121 - Homework Problems 1

Please return your solutions to me in the lecture on Wednesday November 7th.

Problem 1

A wooden block is placed on an inclined plane sheet of aluminium. It is observed to slide down the plane at a constant speed. If the angle the plane makes with the horizontal is 36º, what is the coefficient of kinetic friction between the wood and the aluminium?

Problem 2

A spherical helium filled balloon exerts an upward force of 0.2 N on the hand of the child that is holding it. The child accidentally lets go of the balloon. What is the maximum upward speed the balloon will reach if its radius is 15 cm, the drag coefficient is 0.35 and the density of air is 1.3 kg/m^3?

Problem 3

A lead block of mass 3 kg is released from a height of 1.5 m and falls onto a vertical spring with spring constant 400 N m^{-1}. What distance is the spring compressed at the point that the lead block comes to rest?

Problem 4

A wheel is constructed of 8 spokes that run radially from the central axis of the wheel to the rim. If each of the spokes is of length L = 20 cm and mass M = 200 g, and the mass of the rim is 500 g, determine the moment of inertia of the wheel. (You might want to use the fact that the moment of inertia of one of the spokes when rotating about an axis through its centre and perpendicular to its length is $\frac{1}{12}ML^2$.) What is the rotational kinetic energy of the wheel if it is spinning at 5 revolutions per second?