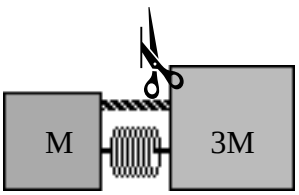
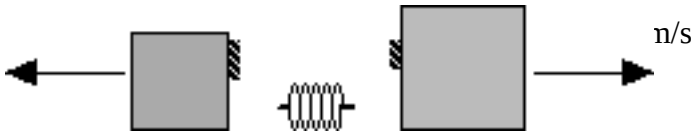
Name:_____

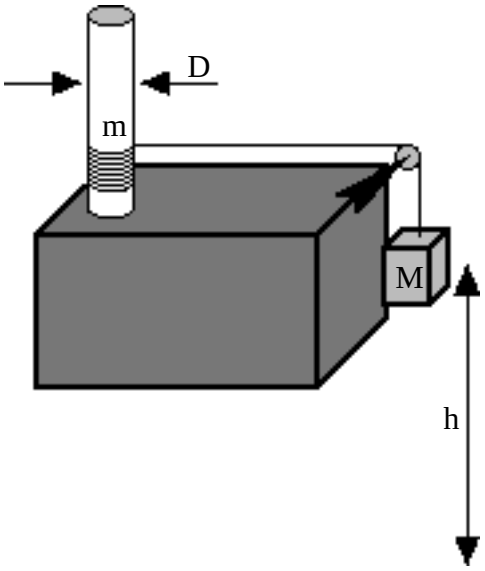
Physics 4A THIRD EXAM Chapters 1 - 12 Fall 1993

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. Two blocks of masses M and 3M are placed on a frictionless tabletop. They are tied together with a compressed spring between them as shown on the left. When the string is cut, the 3M mass moves to the right with a speed of 2.00m/s as shown below. Find the speed of the block of mass M.



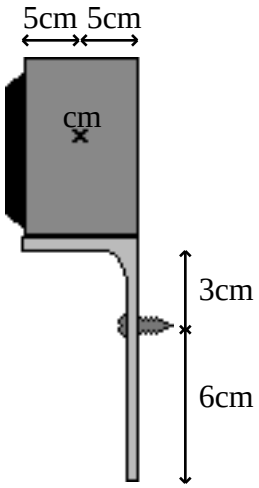




2. A device for measuring the rotational inertia I of an object is shown. The object (not shown but assume it is there) should be placed on top of a shaft of diameter D and mass m that has a string wrapped around it. The string is connected to a hanging mass M which falls a distance h in a time t. Find the equation for the rotational inertia of the object in terms of D, m, M, h, and t.

3. A CD player consists of a rotating palate with a rotational inertia of $1800 g \cdot cm^2$ which spins at 100rpm. A CD which can be treated as a 50.0g disk of radius 5.00cm is dropped on to this palate. Find the rotation rate of the palate and CD just after it lands.

4. An 8.00kg speaker rests on a bracket that is mounted on a vertical wall with a single screw as shown. Find the magnitude and direction of the force exerted on the bracket by the screw. Neglect the weight of the bracket. (*Hint: imagine that the bracket is slightly loose.*)



5. Three equally massive and equally strong astronauts are outside their ship in outer space. Two of them get the bright idea to play a game of catch by using the third one to throw back and forth. Suppose the game begins with the first astronaut throwing the third astronaut at a speed v_o toward the second astronaut. Describe the rest of the game. This means that you must find the velocity of each astronaut after each catch and after each throw. Sketches of the game at each stage might be the best way to explain your answer. Be sure to state the principle or principles you use.