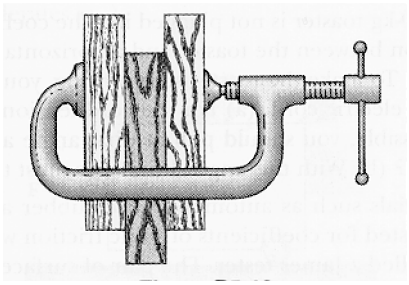
Name:_____ Posting Code _____ _____ _____

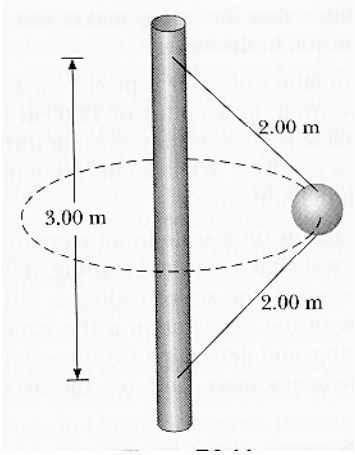
Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 10 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. A firefighter 9.00m from a building directs a stream of water from a hose moving at 10.0m/s at an angle of 53.0° above the horizontal. Find (a)the time between when the water leaves the hose and it reaches the building and (b)the height at which the water strikes the building.

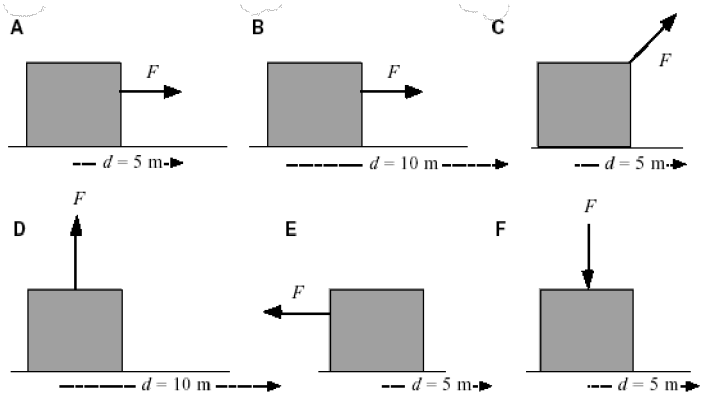
2. A 95.5N board is sandwiched between to other boards as shown. The coefficient of friction between the boards is 0.663. (a)Draw the forces that act on the 95.5N board. (b)Find the magnitude of each force.



3. A 400g ball is attached to a vertical rod by two strings as shown. The ball rotates in a horizontal circle at 6.00m/s. Find the tension in each string.

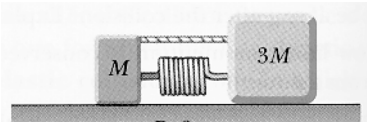


4. In the figures, identical boxes of mass 10 kg are moving at the same initial velocity to the right on a flat surface. The same magnitude force, F, is applied to each box for the distance, d, indicated in the figures. Rank these situations in order of the work done on the box by F while the box moves the indicated distance to the right. Explain your reasoning.

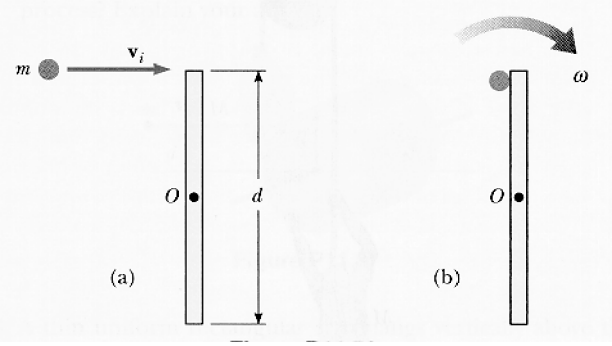


5. A 0.145kg baseball starts near rest and rolls without slipping down a 55.0cm high pitchers mound. Find the speed of the ball at the bottom.

6. Two blocks of masses 100g and 300g are placed on a horizontal, frictionless surface. A light spring of spring constant 8.00N/m is attached to one of them and the blocks as pushed together compressing the spring 5.00cm. A cord initially holding the blocks together is burned. Find the speed of the blocks assuming the energy stored in the spring is completely transferred to the blocks motion.



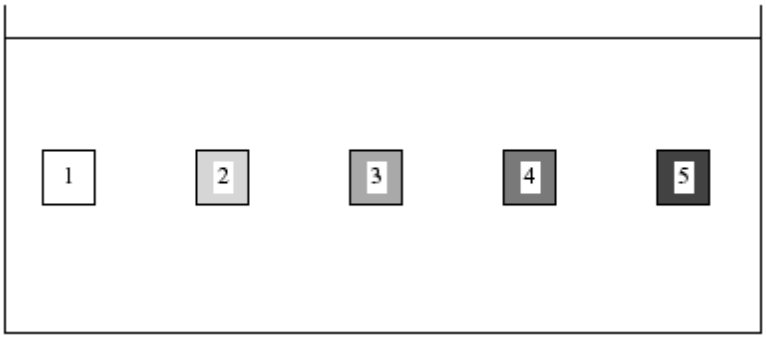
7. A 50.0g ball of clay moves to the right with a speed of 10.0m/s. It strikes and sticks to the end of a 150g meterstick pivoted about its center. Find the angular speed of the system just after the collision.

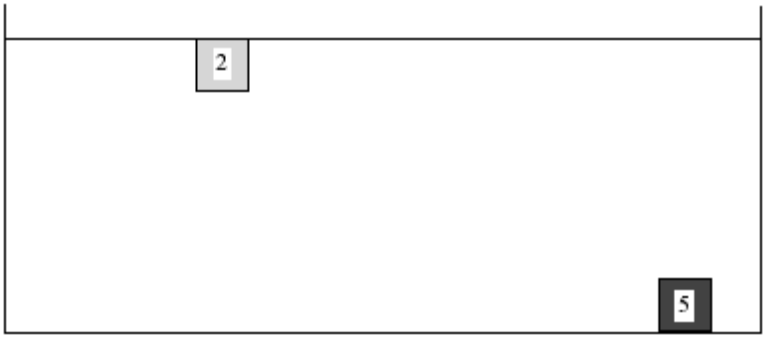


8. A 1.00kg mass attached to a spring with a spring constant of 25.0N/m oscillates on a horizontal frictionless track. At t = 0s, the mass is released from rest at x - -3.00cm. (That is, the spring is compressed by 3.00cm.) Find (a)the period of its motion, (b)the maximum speed and (c)the maximum acceleration.

9. A volcano on Jupiter's moon Io spews liquid sulfur to a height of 70.0km above the surface. The mass of Io is 8.90×10^{22}kg and the radius is 1820km. Find the speed the liquid leaves the surface.

10. Five blocks identical in size and shape are made of different materials with different densities. In order of mass, (1) is the lightest and (5) is heaviest. All five blocks are released from positions halfway to the bottom of a tank of water as shown in the upper picture. When block 2 comes to rest, its top surface is level with the surface of the water, as shown in the lower picture. (a)Draw free-body diagrams for each block at the moment of their release in the upper drawing. Draw the force vectors to scale. (b)The equilibrium positions of blocks 2 and 5 are shown in the lower picture. Sketch the equilibrium positions of blocks 1, 3, and 4 in the lower drawing. Explain your reasoning.

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