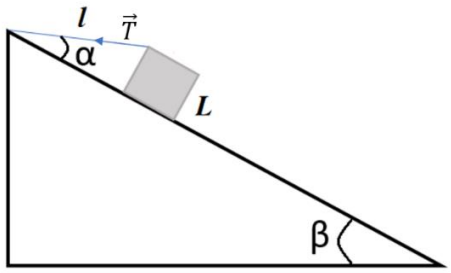
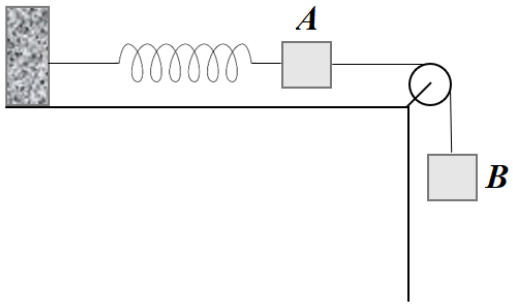
1. A marble block of mass m = 64 kg is held in place by a rope of negligible mass and length l = 1.6 m as shown in the figure. The block is located on a frictionless ramp that is inclined by an angle β = 26° above the horizontal, which has 40 cm length. The rope is attached to the surface of the ramp and to the upper edge of the marble block, a distance L above the surface of the ramp. Find the tension in the rope. Take g = 10 m/s^2.

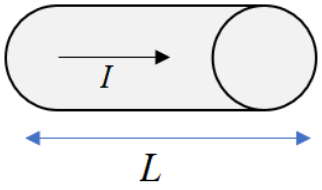


2. Two blocks of masses 6 kg and 12 kg are connected by a massless string over a massless pulley as shown in the figure. The block A is attached by the spring which has a force constant of 250 N/m. Friction is absent everywhere. System is released from rest with the spring unstretched. Use energy method to find: a) x_m – maximum extension of spring; b) the speed of block A when the extension in the spring is $x = x_m/2$. Take g = 10 m/s^2.



3. You are playing on your video game console in the room temperature of 27° C. Your game controller operates at 12 V and is connected to the main box with a copper wire of length 2.5 m. Assuming that it is completely insulated from its environment, how long after the connection is made will the copper start to melt? The resistivity of copper is

1.72×10^{-8} Ω·m, specific heat capacity of copper is 386 J/kg K, density is 8690 kg/m^3, melting temperature of copper is 1359 K.



4. Two hockey players move as shown in figure below (the top view). The hockey player A having a mass *m* moves with speed 2*v*. He is hit by opposing hockey player B, having a mass 2*m*, moving with speed *v*. If the collision is perfectly inelastic, find percentage loss in the energy during the collision. Assume a frictionless, horizontal surface of an ice rink.