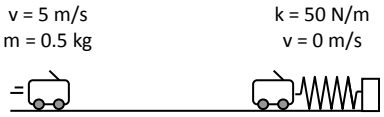
Energy Homework 3

Name: _____

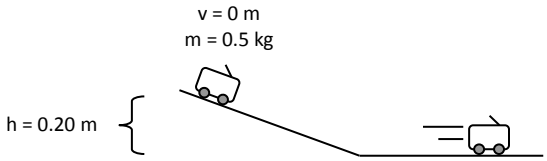
Hour: _____ Date: _____

For each problem below: Draw bar charts and an energy flow diagram; answer all questions – show all work.

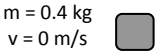
1. A 0.5 kg cart is traveling at 5 m/s when it slams into a spring. The spring compresses and brings the cart to a stop. Assuming no friction what is the maximum compression distance of the spring?

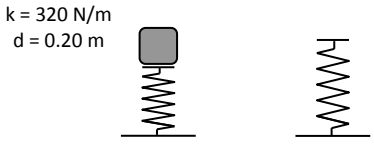


2. Determine the final velocity of the cart assuming that there is no friction. Now, find the final velocity of the cart assuming that 10% of the energy is lost to HEAT.

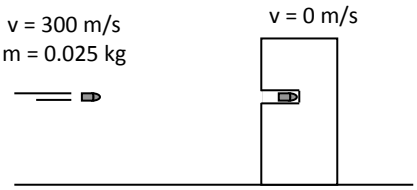


3. A 0.4 kg block is placed on a spring and compressed 0.20 meters. After it is released, to what maximum height does the block reach? How fast was the block moving when it was at half its max height?

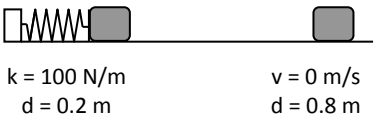




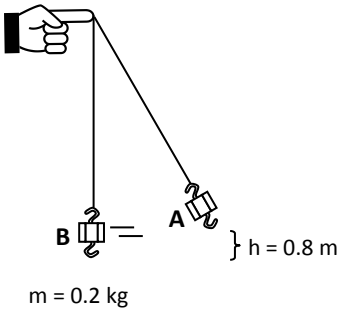
4. A bullet of mass 25 grams (0.025 kg) strikes a block of wood and comes to rest. The wood exerts an average constant force of 50,000 N on the bullet opposing its motion and bringing it to a stop. How much energy is lost to heat? How far into the wood does the bullet penetrate?



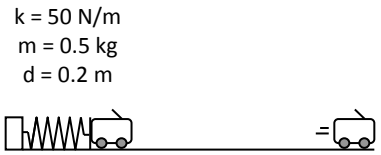
5. A 0.4 kg block is propelled along a rough surface by a compressed spring and slides to a stop. What is the force of friction between the block and the table? What is the coefficient of friction between the block and the table?



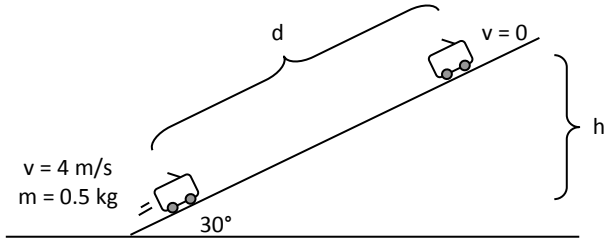
6. A pendulum swings from point A to point B as shown. Without accounting for friction, how fast would the pendulum bob swing through point B? If the pendulum loses 5% of its energy to heat from A to B how fast would it swing through point B? If the pendulum lost another 5% of its energy swinging back to A, how high would it swing?



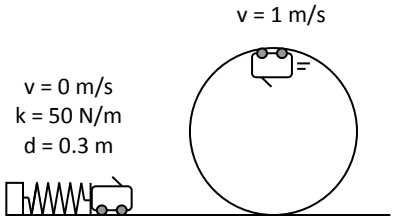
7. A 0.5 kg cart is pushed against a spring and released. The spring propels the cart along the surface as shown. Assuming no friction, how fast is the cart moving? If the cart has rusty bearings and loses 40% of its energy how fast will it be moving?



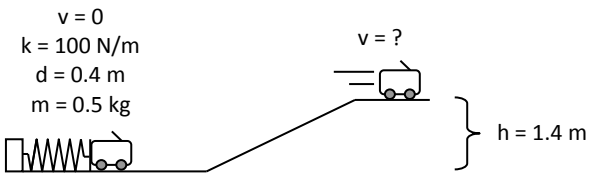
8. A 0.5 kg cart moving at 4 m/s rolls to a stop while moving up a hill. What is the change in vertical height (h) of the cart? How far along the ramp does the cart roll?



9. A 0.5 kg cart is propelled through a loop by a compressed spring as shown. If at the top of the loop the cart is moving at 1 m/s how high is the loop?

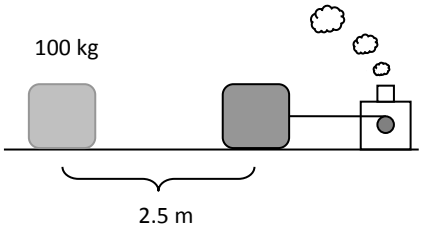


10. A cart is propelled up a hill by a compressed spring as shown. It rises vertically 1.4 meters. How fast is the cart moving at the top of the hill? If the cart loses 25% of its energy before it gets to the top of the hill, will it still make it all the way up?



11. A 100 kg crate is pulled along a rough surface by a motor at a constant speed as pictured below. The coefficient of friction between the crate and the floor is 0.20 and the crate moves a distance of 2.5 meters. How much work was done on the crate by the motor? How much energy was lost to heat?

Remember – the work done = Force (distance)



12. A 5000 kg elevator car, initially at rest, is raised upward by a motor 80 meters and ends at rest. What is the change in gravitational energy of the car? How much work was done by the motor?