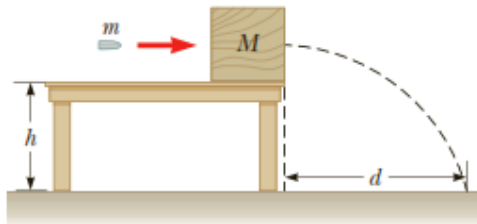


Addis Ababa University
College of Natural and Computational Sciences
Department of Physics, Phys 1011 Worksheet II

1. Two objects of masses $m_1 = 0.56$ kg and $m_2 = 0.88$ kg are placed on a horizontal frictionless surface and a compressed spring of force constant $k = 280$ N/m is placed between them as in Fig. a. Neglect the mass of the spring. The spring is not attached to either object and is compressed a distance of 9.8 cm. If the objects are released from rest, find the final velocity of each object as shown in Fig. b.

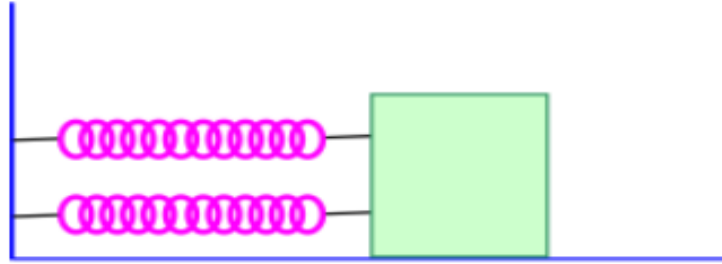


2. A bullet of mass $m = 8.00$ g is fired into a block of mass $M = 250$ g that is initially at rest at the edge of a table of height $h = 1.00$ m (See Fig. below). The bullet remains in the block, and after the impact the block lands $d = 2.00$ m from the bottom of the table. Determine the initial speed of the bullet.

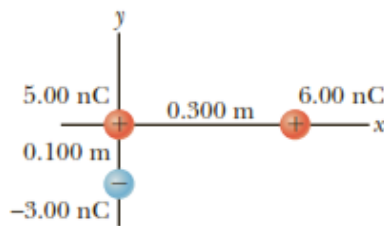


3. A 2.75 kg particle moves as function of time as follows: $x(t) = 5\cos(1.25t + \pi/4)$; where distance is measured in meter and time in seconds. (a) What is the amplitude, frequency, angular frequency, and period of this motion? (b) What is the equation of the velocity of this particle? (c) What is the equation of the acceleration of this particle? (d) What is the spring constant? (e) What are the equations for the potential and kinetic energies of the particle? (f) What is the total energy?
4. A block of mass M is on a frictionless surface as shown below. It is attached to a wall by two springs with the same constant K . Initially the block is at rest and the springs

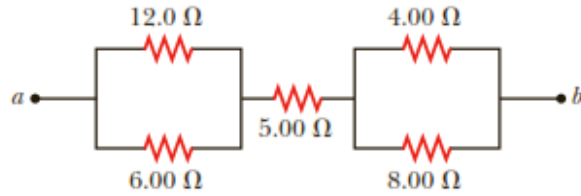
unstretched. The block is pulled a distance A and then released. (a) What is the speed of the block as it passes through equilibrium? (b) What is the angular frequency ω of the motion? (c) If the two springs were replaced by one spring so that ω remains the same, what would its spring constant have to be? (d) If the two springs were kept, what would the mass have to be so that it has the same ω as a system comprised of a single block of mass M and spring with stiffness K ?



5. The temperature difference between the inside and the outside of a home on a cold winter day is 57°F . Express this difference on (a) the Celsius scale and (b) the Kelvin scale.
6. A gas is compressed at a constant pressure of 0.800 atm from 9.00 L to 2.00 L . In the process, $400.\text{ J}$ of energy leaves the gas by heat. (a) What is the work done *on* the gas? (b) What is the change in its internal energy?
7. Three charges are arranged as shown in figure below (a) Find the magnitude and direction of the electrostatic force on the charge at the origin. (b) Determine the electric field and electric potential at a point P (-0.30 m , -0.10 m). (c) How much work is required to bring a point charge 2 nC from infinity to point P ?



8. Consider the combination of resistors shown in figure below (a) Find the equivalent resistance between point a and b . (b) If a voltage of 35.0 V is applied between points a and b , find the current in each resistor.



9. A circular coil enclosing an area of 100 cm^2 is made of 200 turns of copper wire. The wire making up the coil has resistance of $5.0\ \Omega$, and the ends of the wire are connected to form a closed circuit. Initially, a 1.1 T uniform magnetic field points perpendicularly upward through the plane of the coil. The direction of the field then reverses so that the final magnetic field has a magnitude of 1.1 T and points downward through the coil. If the time required for the field to reverse directions is 0.10 s , what is the average current in the coil during that time?