

# PHYSICS 1030

## Homework #4

(Due Oct. 9, 2018, 11:59 pm)

1. A body of mass 15 kg, initially at rest on a frictionless horizontal plane, is acted on by a horizontal force of 30 newtons. (a) What acceleration is produced? (b) How far will the body travel in 10 sec? (c) What will be its velocity at the end of 10 sec?
2. (Serway 5-18) A force  $\mathbf{F}$  applied to an object of mass  $m_1$  produces an acceleration of  $3.00 \text{ m/s}^2$ . The same force applied to a second object of mass  $m_2$  produces an acceleration of  $1.00 \text{ m/s}^2$ . (a) What is the value of the ratio  $m_1/m_2$ ? (b) If  $m_1$  and  $m_2$  are combined into one object, find its acceleration under the action of the force  $\mathbf{F}$ .
3. (Serway 5-30) A block slides down a frictionless plane having an inclination of  $\theta = 15.0^\circ$ . The block starts from rest at the top, and the length of the incline is 2.00 m. (a) Draw a free-body diagram of the block. Find (b) the acceleration of the block and (c) its speed when it reaches the bottom of the incline.
4. A .22 rifle bullet, traveling at 36,000 cm/sec, strikes a tree which it penetrates to a depth of 10 cm. The mass of the bullet is 1.8 grams. Assume a constant retarding force. (a) How long a time was required for the bullet to stop? (b) What was the decelerating force, in dynes? In pounds (lbf)?
5. If the coefficient of friction between tires and road is 0.5, what is the shortest distance in which an automobile can be stopped when traveling at 60 mi/hr?
6. A balloon is descending with a constant acceleration  $a$ , less than the acceleration due to gravity  $g$ . The weight of the balloon, with its basket and contents, is  $w$ . What weight,  $W$ , of ballast should be released so that the balloon will begin to be accelerated upward with constant acceleration  $a$ ? Neglect air resistance.
7. A hockey puck leaves a player's stick with a velocity of 30 ft/sec and slides 120 ft before coming to rest. Find the coefficient of friction between the puck and the ice.
8. A body of mass 5 kg starts from rest at the foot of a smooth inclined plane of angle  $30^\circ$  and length 4.9 meters, and reaches the top of the plane in 10 sec. What external force parallel to the plane was exerted on the body?