W - GP Week 23

1.) Define net force.

2.) Describe the motion experienced by an object with a net force equal to zero.

3.) Define equilibrium.

4.) Compare and contrast field and contact forces. What are examples of field forces?

5.) What are the fundamental forces?

6.) Newton’s First Law of Motion:

7.) What is the formal definition of mass?

8.) Newton’s Second Law:

9.) What is a Newton (unit of force)?

10.) A hockey puck having a mass of 0.30 kg slides on the horizontal, frictionless surface of an ice rink. Two hockey sticks strike the puck simultaneously, exerting the forces on the puck shown in Figure 5.4. The force **F**1 has a magnitude of 5.0 N, and the force **F**2 has a magnitude of 8.0 N. Determine both the magnitude and the direction of the puck's acceleration.

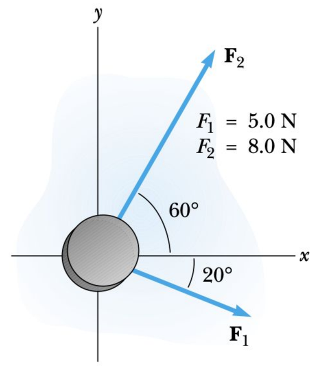


Figure 5.4 (Example 5.1) A hockey puck moving on a frictionless surface accelerates in the direction of the resultant force $\mathbf{F}_1 + \mathbf{F}_2$.

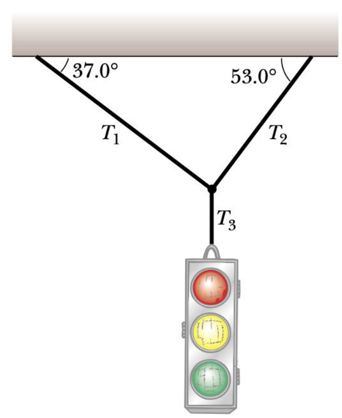
11.) Describe weight within the context of the gravitational force equation.

12.) Newton's Third Law:

13.) Draw the free body diagram for a block on a flat table. Identify the normal force.

14.) Draw the free body diagram of a lamp suspended from a ceiling. Identify tension.

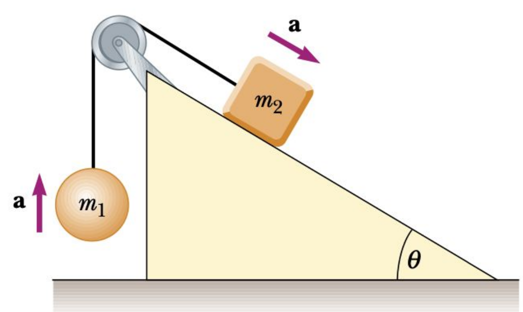
15.) A traffic light weighing 122 N hangs from a cable tied to two other cables fastened to a support, as in Figure a. The upper cables make angles of 37.0° and 53.0° with the horizontal. These upper cables are not as strong as the vertical cable, and will break if the tension in them exceeds 100 N. Will the traffic light remain hanging in this situation, or will one of the cables break?



(a)

16.) Draw the free body diagram of a car on a sloped surface.

17.) Draw the force vectors observed in the following diagram :



18.) Compare and contrast static and kinetic friction.

19.) A force F applied to an object of mass $m1$ produces an acceleration of 3.00 m/s . The same force applied to a second object of mass $m2$ produces an acceleration of 1.00 m/s . (a) What is the value of the ratio $m1/m2$? (b) If $m1$ and $m2$ are combined, find their acceleration under the action of the force F.

20.) The largest-caliber antiaircraft gun operated by the Ger- man air force during World War II was the 12.8-cm Flak 40. This weapon fired a 25.8-kg shell with a muzzle speed of 880 m/s. What propulsive force was necessary to attain the muzzle speed within the 6.00-m barrel? (Assume the shell moves horizontally with constant acceleration and neglect friction.)

21.) A 3.00-kg object undergoes an acceleration given by a □ (2.00i □+ 5.00j) m/s . Find the resultant force acting on it and the magnitude of the resultant force

22.) The average speed of a nitrogen molecule in air is about 6.70 *□ 10^{2} m/s, and its mass is 4.68 □* $10^{\square 26}$ kg. (a) If it takes 3.00 □* $10^{\square 13}$ s for a nitrogen molecule to hit a wall and rebound with the same speed but moving in the opposite direction, what is the average acceleration of the molecule during this time interval? (b) What average force does the molecule exert on the wall?

23.) An electron of mass 9.11 □* $10^{\square 31}$ kg has an initial speed of 3.00 □* 10^{5} m/s. It travels in a straight line, and its speed increases to 7.00 *□ 10^{5} m/s in a distance of 5.00 cm. Assuming its acceleration is constant, (a) determine the force exerted on the electron and (b) compare this force with the weight of the electron, which we neglected.

24.) A 1.00-kg object is observed to have an acceleration of 10.0 m/s^{2} in a direction 30.0° north of east (Fig. P5.23). The force **F**2 acting on the object has a magni- tude of 5.00 N and is directed north. Determine the magnitude and direction of the force **F**1 acting on the object

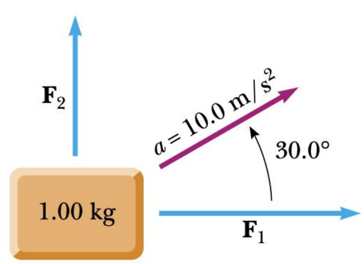


Figure P5.23

25.) A block is given an initial velocity of 5.00 m/s up a frictionless 20.0° incline (Fig. P5.22). How far up the incline does the block slide before coming to rest?

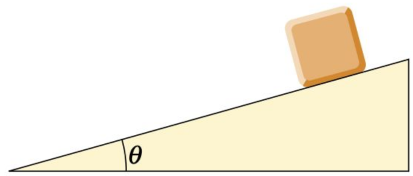


Figure P5.22 Problems 22 and 25.

26.) A 25.0-kg block is initially at rest on a horizontal surface. A horizontal force of 75.0 N is required to set the block in motion. After it is in motion, a horizontal force of 60.0 N is required to keep the block moving with constant speed. Find the coefficients of static and kinetic friction from this θ information.

27.) A 3.00-kg block starts from rest at the top of a 30.0° incline and slides a distance of 2.00 m down the incline in 1.50 s. Find (a) the magnitude of the acceleration of the block, (b) the coefficient of kinetic friction between block and plane, (c) the friction force acting on the block, and (d) the speed of the block after it has slid 2.00 m.

28.) A Chevrolet Corvette convertible can brake to a stop from a speed of 60.0 mi/h in a distance of 123 ft on a level road- way. What is its stopping distance on a roadway sloping downward at an angle of 10.0°?

29.) A block of mass 3.00 kg is pushed up against a wall by a force P that makes a 50.0° angle with the horizontal as shown in Figure P5.46. The coefficient of static friction between the block and the wall is 0.250. Determine the possi- ble values for the magnitude of P that allow the block to remain stationary.

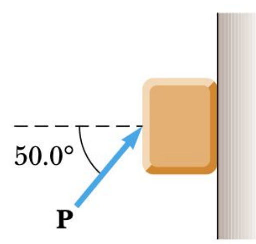


Figure P5.46

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