

Name:

Period:

Friction Problems 1

Show all work. $a_g = 10\text{m/s}^2$

1. A sled is pulled horizontally across the snow at constant velocity. The pulling force is 40N. (Remember: Constant velocity means zero net force.)

a. What is the Force of Kinetic Friction on the sled?

b. If the weight of the sled is 200N, what is the coefficient of Kinetic Friction (μ_k) between the sled and snow?

c. If wood, weighing 300N is placed in the sled, what pulling force is needed to move the sled at constant velocity?

2. The tires on a 500kg race car have a coefficient of Static Friction (μ_s) of 1.8. (We can use static friction while tires are rolling, i.e. not moving relative to the ground. If the car skids, then we would use kinetic friction.)

a. What is the maximum braking force (Static Friction) that can be applied to the car?

b. What is the acceleration of the car during braking? ($a = F_{\text{NET}}/m$)

c. If the race car has a spoiler (wing on the trunk) which increases the Normal Force (down force) by an additional 4000N. what is the maximum braking force? (Normal force will be weight + down force.) What is the acceleration of the car during braking?

3. A large box is being dragged across the floor at constant velocity. If the box has a mass of 60kg and it takes a 50N force, acting horizontally, to drag the box with a constant speed of 6m/s, what is the coefficient of kinetic friction?

4. A bolder of mass 45kg is pushed on a surface with a coefficient of kinetic friction of 0.85. What force has to be applied to produce an acceleration of 2m/s^2 ?

5. A 10kg box rests on the ground.

a. What is the weight of the box?

b. What is the normal force of the ground on the box?

c. The box is pushed to the left with 20N of force, but does not move. What is the Static Friction Force?

d. When the pushing force is increased to 40N, the box just begins to move. What is the Maximum Static Friction Force?

e. What is the coefficient of Static Friction (μ_s) between the ground and box?

6. A force of 143N is applied to the handle of a lawnmower. The handle makes an angle of 63.9° with respect to the horizontal. The lawnmower has a mass of 20.0kg. What is the horizontal acceleration in m/s^2 of the mower if the frictional force is 16.6N?