

An Introduction to Friction

SPH4C

Recall that the gravitational force acting on an object is also called the _____.

Its magnitude is equal to: _____

where m is _____, measured in kg, and $g =$ _____.

Weight is therefore measured in _____.

Recall that the normal force is the force acting to _____.

For an object on a horizontal surface with no vertical applied force, the normal force will be equal to the _____ (since the vertical forces must _____).

If there is a vertical applied force, the normal force will _____ equal the weight.

Example: A 5 kg book is resting on the table. If Ms. Rosebery is pushing down on the book with a force of 20 N, what is the normal force the table is exerting on the book?

Note that the normal force is always _____ to the surface.

(If the surface is vertical (e.g., a magnetic board to which a magnet is attached) the normal force must be horizontal.)

Recall that friction is the force acting to oppose any _____

and is therefore always _____ to the attempted motion.

The magnitude of the force of friction will depend on the _____

in contact and on the _____ acting on the object attempting to move .

The magnitude of the frictional force is given by: _____

where μ (_____) is the _____,
determined by the properties of the surfaces in contact.

μ is dimensionless (_____) and is _____ (approx.).

E.g. For steel on wood, μ_k (kinetic) = _____

μ_s (static) = _____

Note that _____ :

it's harder to _____ than _____.

For steel on ice, μ_k (kinetic) = _____

μ_s (static) = _____

For rubber on dry concrete, μ_k (kinetic) = _____

μ_s (static) = _____

Example: A 1200-kg car without ABS brakes is skidding on dry concrete. What is the magnitude of the force of friction acting on the car?

If the car does have ABS brakes, the car's tires will continue to _____ and _____

the road while stopping and the relevant coefficient will be that of _____ friction:



More Practice

1. Match each of the following terms on the left to the most appropriate definition on the right.

- | | |
|------------------|--|
| ___ friction | A. amount of matter in an object |
| ___ mass | B. gravitational force on an object |
| ___ μ | C. ratio of the frictional force to the normal force |
| ___ normal force | D. force that acts opposite to motion or attempted motion of an object |
| ___ weight | E. perpendicular force exerted by a surface |

2. A box is being pushed westward across a surface. What is the direction of the frictional force?

- A. West B. East C. up D. down

3. A magnet is sliding down a fridge door. What is the direction of the frictional force acting on the magnet?

- A. up B. down
C. into the fridge door D. out of the fridge door

4. A box of mass 12 kg is sliding across a floor. The coefficient of kinetic friction between the box and the floor is 0.30.

(a) What is the normal force the floor is exerting on the box?

(b) What is the frictional force acting on the box?

(c) What is the acceleration of the box?