

20.2: Static Friction

You know from everyday experience that if an object is sitting on the floor and you give it a very light push, it will not move. That's because a frictional force is at work: you have to give the object some minimum force in order to get it to move at all. This is the static frictional force. It is found experimentally to be proportional to the normal force:

$$f_s \leq \mu_s n \quad (20.2.1)$$

where f_s is the static frictional force, n is the normal force, and μ_s is the coefficient of static friction.

Notice the "less than or equal to" sign in Eq. 20.2.1. The static frictional force f_s is equal in magnitude to the applied force, whatever the applied force may be — up until the point just before the object starts moving. The equality sign holds when the object is just on the verge of moving. Once it begins to move, the kinetic frictional force is in play.

It is notoriously difficult to reliably reproduce measurements of the coefficient of static friction, which suggests that it is due to nicks or bumps or other imperfections in the surfaces, or to bits of dust or other gunk that hinder the initial movement of the object.

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