# Sliding Lab

**Purpose:** To find the coefficient of friction between a sled and the snow.

**Hypothesis:** Google this or use the *Handbook of Chemistry & Physics* to come up with a reasonable value. What factors will affect the coefficient of friction? Make sure you cite your sources.

**Background & Prelab:**

The **friction force** is the force exerted by a surface as an object moves across it or makes an effort to move across it. The friction force opposes the motion of the object. For example, if a book moves across the surface of a desk, the desk exerts a friction force in the direction opposite to the motion of the book.

Friction results when two surfaces are pressed together closely, causing attractive intermolecular forces between the molecules of the two different surfaces. As such, friction depends upon the nature of the two surfaces and upon the degree to which they are pressed together. The friction force can be calculated using the equation:

**friction = coeefficient of friction X normal force**          $f = \mu N$

You need to work out your own method to solve this problem. Organize your group so you make sure you have the equipment you need and know what measurements you will need to take next class. I may have some of the equipment, but you may need to bring some (like a sled). Check with me today!

You may choose to do your experiment on flat ground or a hill.


**On Flat Ground**
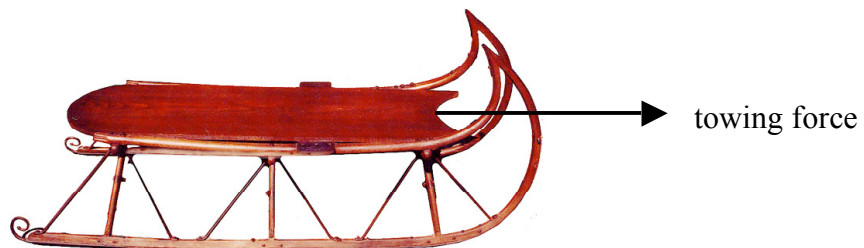

towing force


Draw a free body diagram for the sled above on level ground. Write an equation for net force in the direction the sled is moving.

How would you pull the sled so that the towing force equaled the force of friction?  How could you measure the normal force?

If you changed the total weight of the sled and passenger for several different trials, how could a graph of friction vs normal force give you the coefficient of friction?

**On a hill:**

Draw a freebody diagram for the sled on a hill. Write an equation for net force in the direction the sled is moving.

If  W = mg, how can you write $W_x$ and $W_y$ in terms of m, g and θ (the inclination of the hill with respect to the horizontal)? Use trig functions!

What does the normal force equal in this case?

Use what you did above to substitute into your equation for net force.
Don't forget $F_{net}$ = ma.

What things can you measure experimentally to find the acceleration of the sled?

What else will you need to know/measure to find the coeefficient of friction?