

## PHYSICS 190: MECHANICS and HEAT; Lab 4: Friction

### Kinetic Friction

#### 1. set up

- a. materials needed: wooden block, pulley board, mass hanger, slotted mass set and string
- b. place the pulley board so that the pulley end extends over the edge of the table
- c. attach a piece of string (approximately 1 meter in length) to the wooden block and to a mass hanger
- d. place the wooden block on the pulley board with the string passing over the pulley

#### 2. measurements

- a. measure the mass of the wooden block
- b. add enough mass to the mass hanger to cause the block to move
- c. observe the block's velocity
- d. if the velocity is not constant adjust the amount of hanging mass until it is
- e. record the mass of the block and the hanging mass
- f. place a 0.100 kg mass on the block and repeat steps "2 b" through "2 e"
- g. repeat step "2 f" adding an additional 0.100 kg mass each time up to a maximum of 0.500 kg

#### 3. analysis

- a. use a spreadsheet to make a data table labeled correctly (the data table should include the hanging mass and the block plus load mass)
- b. use a spreadsheet to graph the hanging mass as a function of the block plus load mass
- c. use a spreadsheet to display the equation of the line on the graph

### Static Friction

#### 1. set up

- a. materials needed: wooden block, pulley board, and protractor
- b. place the wooden block on the pulley board

#### 2. measurements

- a. raise the pulley end of the board until the block just starts to slip
- b. measure the incline angle when this happens

#### 3. analysis

- a. use Newton's Second Law to determine the relationship between the incline angle and the coefficient of friction (show all the steps)
- b. use your data to determine the coefficient of friction

#### 4. Questions

- a. What value did you obtain for the static and kinetic coefficient of friction?

- b. If the pulley is placed too high, the string is not parallel to the surface of the board. Would your value of the coefficient of kinetic friction be too high, too low or not effected? Why?
- c. Why is giving the block a little nudge to get it moving a good idea for the kinetic measurements?
- d. A 12 kg mass rests on a rough horizontal surface. If the coefficient of static friction is 0.6, what is the maximum static friction force that can act on the mass?
- e. What are the units for the coefficient of friction?