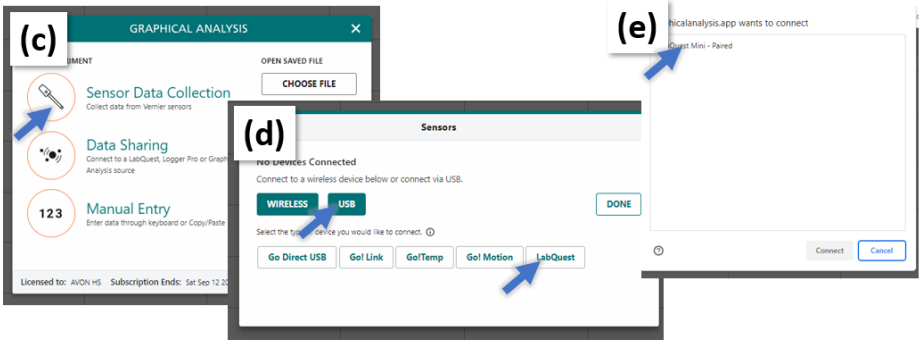
Name: Number: Date:

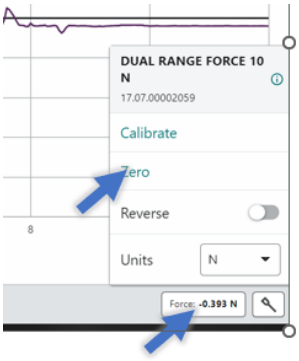
Friction Lab

1 Set Up

1. Set up your computer
   (a) Using **Google Chrome** (not Firefox or Safari), click the link on Schoology to launch Graphical Analysis on your computer.
   (b) Connect the sensor to your computer.
   (c) Click **Sensor Data Collection**.
   (d) Click **USB** and then **LabQuest**.
   (e) Make sure to Pair the LabQuest Mini, then click **Done**.



2. Make sure your Force Sensor is set to ±10 N.
3. Before you collect data, practice pulling the block and masses with the force sensor using a straight-line motion. Slowly and gently pull horizontally with a small force. *Very gradually,* taking one full second, increase the force until the block starts to slide, and then keep the block moving at a constant speed for another second.
4. Zero the force sensor before collecting data.
   (a) Place the force sensor on a flat surface so the working axis is horizontal.
   (b) With the force sensor axis held horizontally and no force applied, click or tap the Force meter at the bottom right of the screen and choose Zero.



5. Take your first set of data
   (a) Stack 600 g (three 200-g weights) on top of the block. Spread the weights evenly on the block.
   (b) Hold the force sensor in position, ready to pull the block, but with tension in the spring.
   (c) Click **Collect** to start data collection. Wait a moment, then pull the block, taking care to increase the force gradually.
   (d) Inspect your graph. It should reflect the desired motion, including pulling the block at constant speed once it begins moving. If it does not, start data collection and repeat the pulling process. Sketch the graph below for reference

6. Explain what your graph shows. Is static friction greater or less than kinetic friction? Why might this make sense at the microscopic level?

.....

.....

.....

.....

.....

.....

.....

.....

2 Static Friction and Kinetic Friction

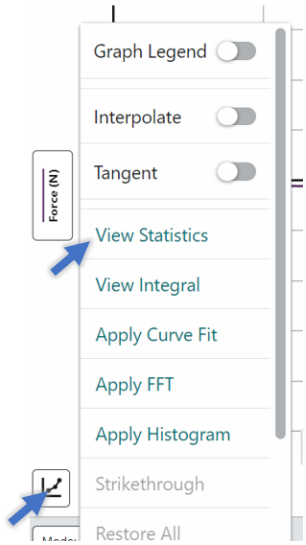
In this part, you will measure the peak static friction force and the kinetic friction force as a function of the normal force on the block. In each run, you will pull the block as before, but by changing the masses on the block, you will vary the normal force on the block.

7. Remove all masses from the block.

8. Using the same procedure as before, collect force vs. time data.

9. Click the graph to examine the data. The maximum value of the force occurs when the block started to slide. Click or tap the peak static friction force and record the value in your data table. *Note: You can also adjust the Examine line by dragging the line.*

10. Next you need to determine the average friction force while the block was moving at constant velocity.



(a) Select the data in the approximately constant-force region of the graph.

(b) Find the 'Graph Tools' Icon at the bottom left of the screen then click **View Statistics**.

(c) Record the mean force value in your data table.

11. Repeat Steps 10-12 for two more measurements and average the results to determine the reliability of your measurements. Record the values in the data table.

12. Repeat steps 10-13 for the block with 200 g, 400 g, and 600 g added on top.

	Maximum Static Friction (N)			
	Trial 1	Trial 2	Trial 3	Average
block				
block + 200 g				
block + 400 g				
block + 600 g				

	Average Kinetic Friction (N)			
	Trial 1	Trial 2	Trial 3	Average
block				
block + 200 g				
block + 400 g				
block + 600 g				

13. How does the weight added to the block affect its friction? Why does this make sense at a microscopic level?

14. What do you think would happen if we turned the block on its side so that the surface area that was touching the table was smaller?

15. What do you think would happen if we turned the block over and did the same experiment with the rubber side down?

3 Conclusions

16. What factors affect the amount of friction that act on an object?