PHYSICS LAB "EXPERIMENT" – 1

INTRODUCTION TO PHYSICS LAB AND THE POCKETLAB

OBJECTIVE: To learn a few general 'rules of thumb' about the physics lab, and to learn a little bit about the Pocketlab, which is a new instrument to the physics lab this semester.

APPARATUS:

1. An Android or iOS smartphone or Bluetooth-equipped Chromebook or Mac.
2. An internet connection.
3. A PocketLab Voyager:

PROCEDURE:

1. After your instructor has reviewed the syllabus and the expectations he or she has for your physics lab class, find yourself a lab partner.

2. You and your lab partner should grab one of the PocketLabs and one of the silicone cases that should protect the PocketLab from wear and tear.

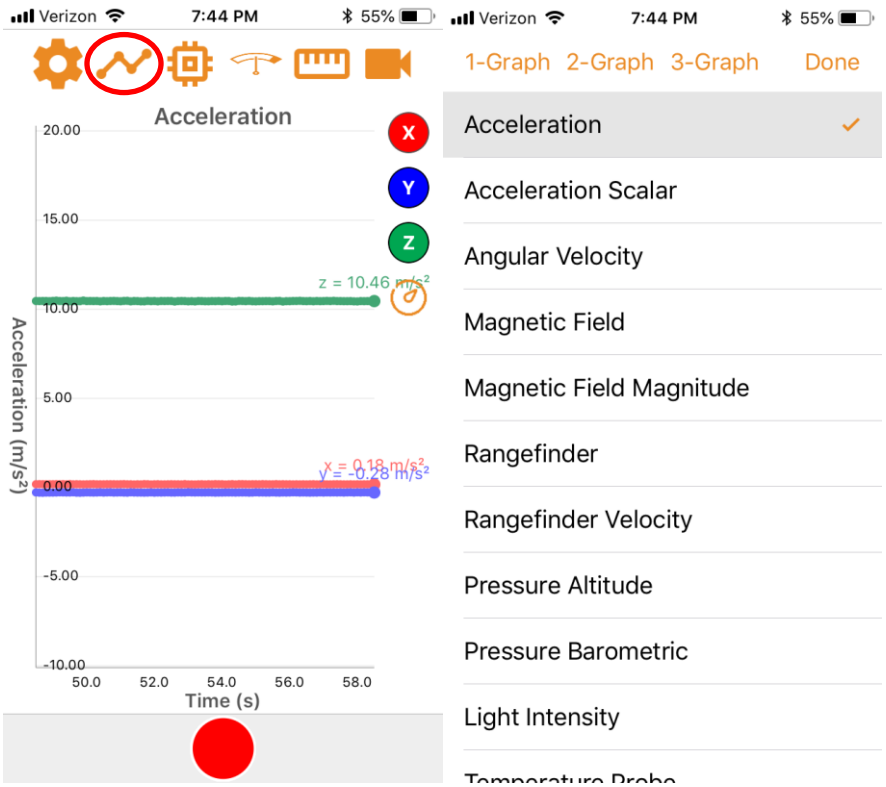
3. Install the case around the PocketLab, aligned the power button on the side with the corresponding bump on the case.

4. You will need a device with Bluetooth LE to pair with the PocketLab. Any smartphone (Android or iOS) should have this. Chromebooks, Macs, iPod Touches, and iPads all have the appropriate hardware. As of this writing (8/16/2018), Windows laptops are not compatible.

5. If the software is not already present on your device, you will need to visit the App Store (Apple devices) or Google Play (Android) to download the PocketLab app. It is not a huge download, so it should install quickly.

6. Run the app on your device, turn on your Pocketlab by pressing the power button on its side, and place the Pocketlab within several centimeters of your device. They should pair automatically. Congratulations, your PocketLab is set up.

7. Today, we'll look at the accelerometer and rangefinder sensor outputs, which will be the primary sensors we will using during the semester. First, the accelerometer: Tap the button that looks like a graph in the upper left of the screen. Tap the "Acceleration" option on the list that appears. (It may be that your PocketLab is already set to this option.) This is where you can change what sensor information is being displayed.



8. When you return to the graph, the PocketLab should be displaying three different accelerations – one for the Pocketlab's x-axis, one for its y-axis, and one for its z-axis. If you have one of the axes aligned vertically, the acceleration measured along that axis should be close to the 9.80 m/s^2, otherwise known as the acceleration due to gravity on Earth's surface. Note the approximate value that your PocketLab measures here: _____

9. By observation, figure out what the coordinate system of the PocketLab is. In other words, what are the PocketLab's x, y, and z axes? *Sketch* a diagram of the PocketLab and its axes below. Please label them appropriately.

10. Now, let's take a look at the rangefinder tool. Tap the graph button again and select "Rangefinder" from the list of measurements. Return to the home screen, and you should now see a real-time graph of position vs. time.

11. The rangefinder works via beam of infrared light emitted from a hole on one of the PocketLab's faces. The light bounces back to a detector very near the emitter. The time it takes for the infrared pulses to bounce back to the detector can be connected to a distance, because the speed of light is known. Find the emitter/detector and aim the PocketLab at any object.

12. Move the object (or the PocketLab) until your app is measuring 10 cm of distance between them.

13. Slowly move the object (or the PocketLab) away. You should see the measured distance grow. By observation, what appears to be the maximum distance that the PocketLab can detect reliably? Identify the object you used here _____ and the maximum reliable distance here _____ .

14. Try a couple other objects that are distinct from the first. Again, note the object and the maximum distance you were able to detect. You are free to improvise here, but you might consider objects of a different color, shape, size, etc. Can the PocketLab track very small objects? Does it track dark or light objects more effectively?
    Object: _____ Max distance: _____
    Object: _____ Max distance: _____

15. Ok, that's it for this brief lab orientation "experiment". Please hold in the button on your PocketLab for about 5 seconds. Its LED should show a steady red briefly and then turn off. That indicates the PocketLab has been shut down successfully. Please return the PocketLab and any other materials to the front lab bench, and thanks! It should be a fun semester.