Friction on Oscillatory Motion

Purpose

To use the "AP-Sensor" app to investigate effect of friction on an oscillatory motion.

Theory

- An oscillatory motion is a periodic motion in which an object moves back and forth about the equilibrium position.
- According to Newton's first law, if an object is not disturbed by any external force from the surroundings, its motion persists. In reality, every motion in our daily life is affected by certain types of resistive forces which bring the motion to a stop. The most commonly seen are friction and air resistance.
- The observation of the effect of resistive forces on linear motion is rather trivial. In this experiment, the effect of resistive forces on an oscillating object can be observed with "AP-Sensor" accelerometer.

Apparatus

- Mobile device with "AP-Sensor" app
- A string and a spring
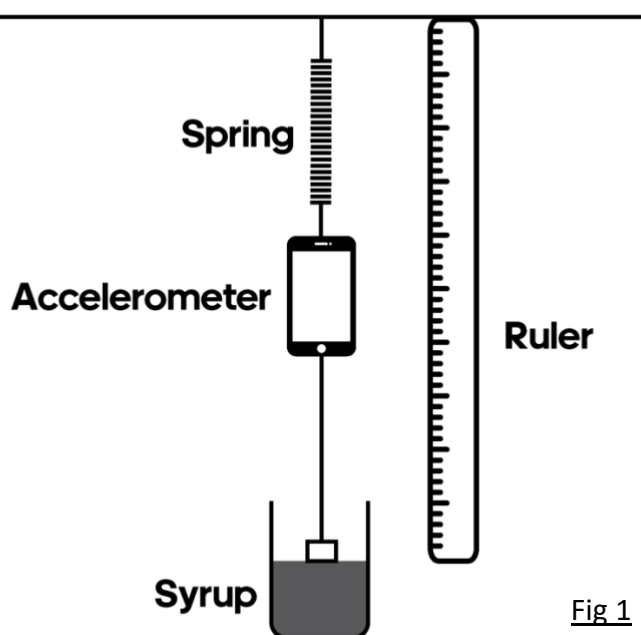- A mass
- A bottle of syrup

Fig 1

Procedure:

Set up the experiment

1. Run the app "AP-Sensor". In the "Basic Function" tab, press "Accelerometer" to enter into the monitor page (Fig 2).

2. Hang the mobile device from a ceiling with a spring, and further hang a mass with a string under the mobile device, as shown in Fig 1.
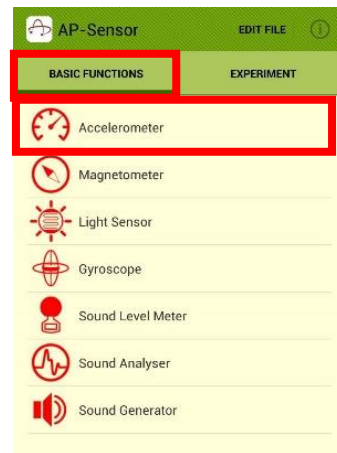

Fig 2

Control experiment

3. In order to compare result, press "Start" in the accelerometer and slightly lift up the mass and release it without any syrup.

4. Let the mass and the mobile device oscillate about the its equilibrium until it becomes stationary.

5. Stop the measurement. Export the data to .csv file and send it to computer by email.

Start experiment

6. Prepare a bottle of syrup. Adjust the length of the hanging mass such that it immerses into the syrup. Measure the equilibrium position of the mass.

7. Press "Start" in the accelerometer to begin measurement.

8. Slightly lift up the mass until the mass just touch the surface of the syrup. Release the mass and let it oscillate until it becomes stationary.

9. Stop the measurement. Export the data to .csv file and send it to computer by email.

10. Repeat the measurements with different viscosity of syrup by dilution with water.

Data Analysis

11. Open the .csv file with Excel. Change the file format to .csv if necessary.

12. Highlight the needed data columns and plot a "scatter" chart with Excel. Connect the data points as line. Then display the desired axis by filtering out the others.

13. Put the graphs side by side. Compare the time taken for the mass to come stationary in each case.
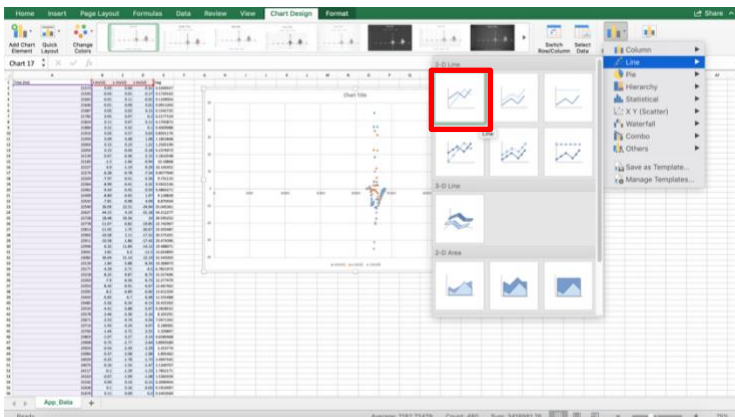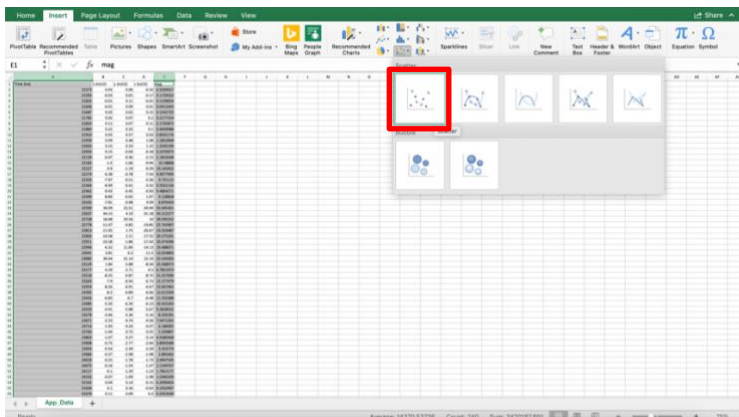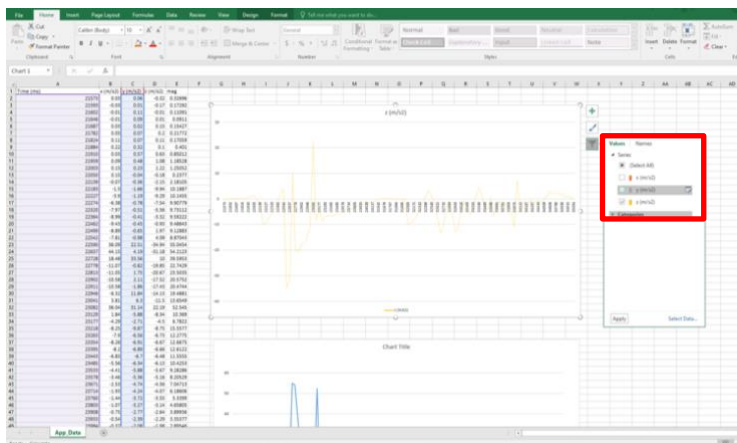
Data

Record the data in the following tables and make analysis.

Case	Time taken to stationary (s)
Control (No syrup)	

Discussion

1. What is the relation between the time taken for the mass to come to stationary and the viscosity of the syrup? Why?

2. What are the possible errors of the experiment?