Experiments

Activity 1: Purpose and Variables
Question Group 1
Question 1
A student lab group is conducting an experiment with the following purpose:

Lab #5:	Pendulum Lab
Purpose:	To determine the effect of the length of a pendulum upon the period of its back-and-forth vibrations.

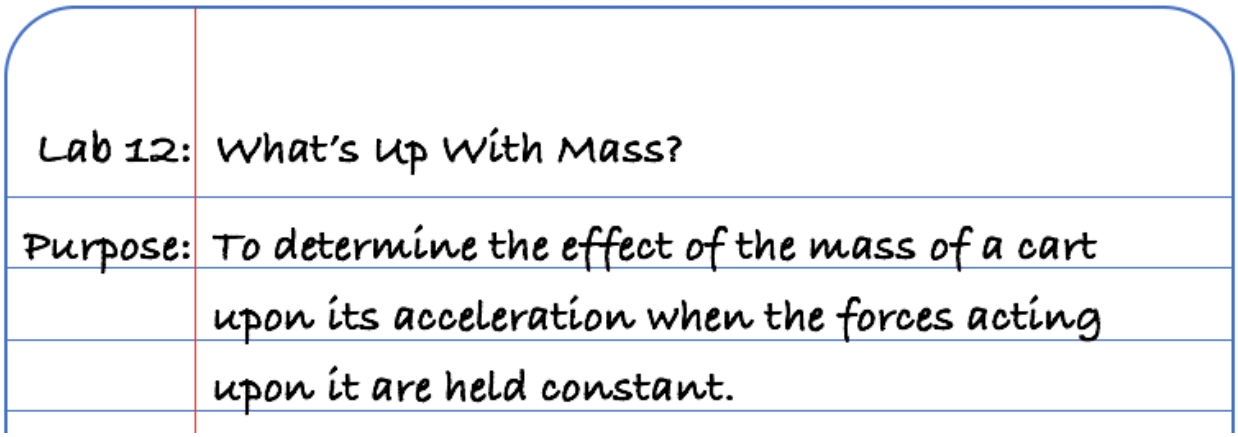
What are the independent and dependent variables in this experiment?

Question 2
Two students are conducting an experiment. Here is their notebook entry:

Lab #5:	Pendulum Lab
Purpose:	To determine the effect of the length of a pendulum upon the period of its back-and-forth vibrations.

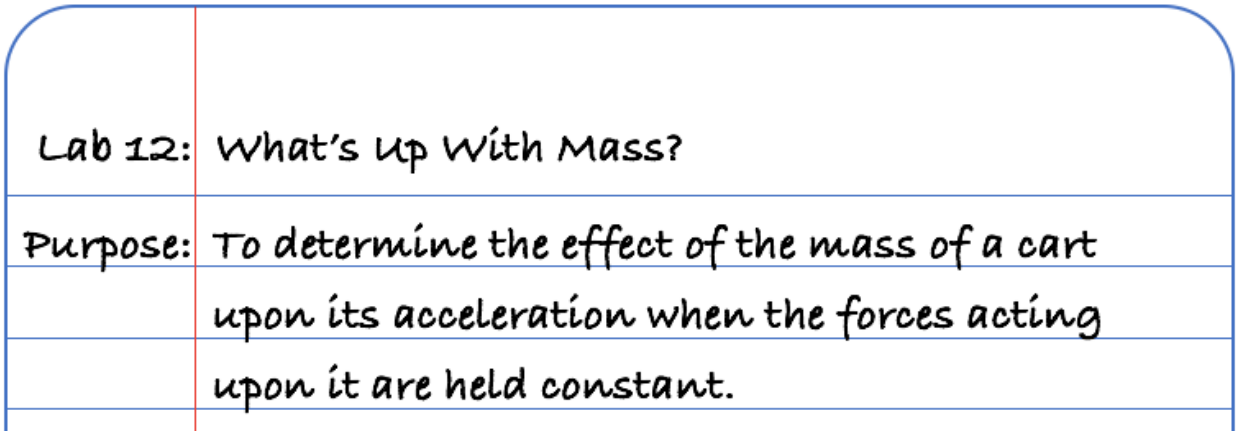
What are the independent and dependent variables in this experiment?

Question Group 2
Question 3
An experiment is being conducted with the following purpose:



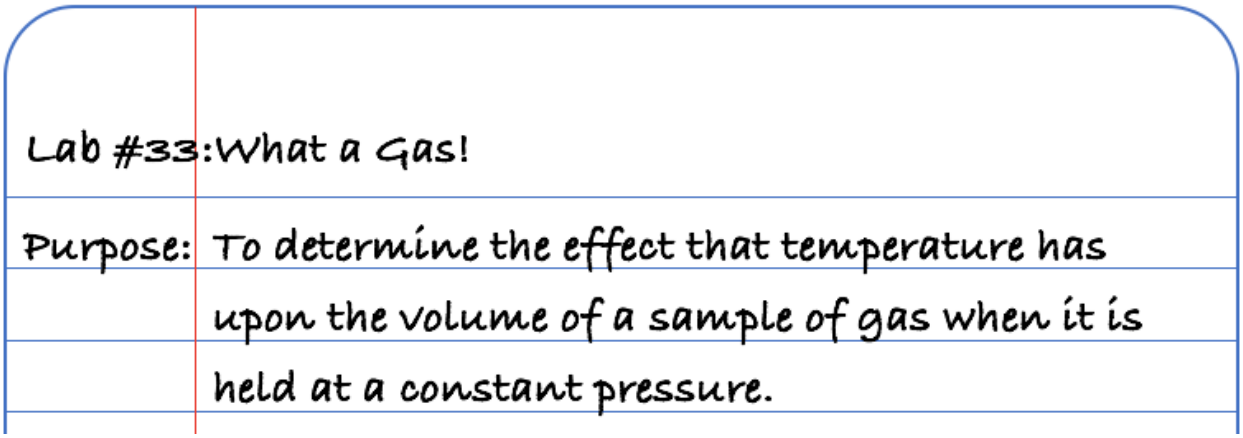
What are the independent and dependent variables in this experiment?

Question 4
Here's the noetbook entry for Nellie Newton's most recent experiment:



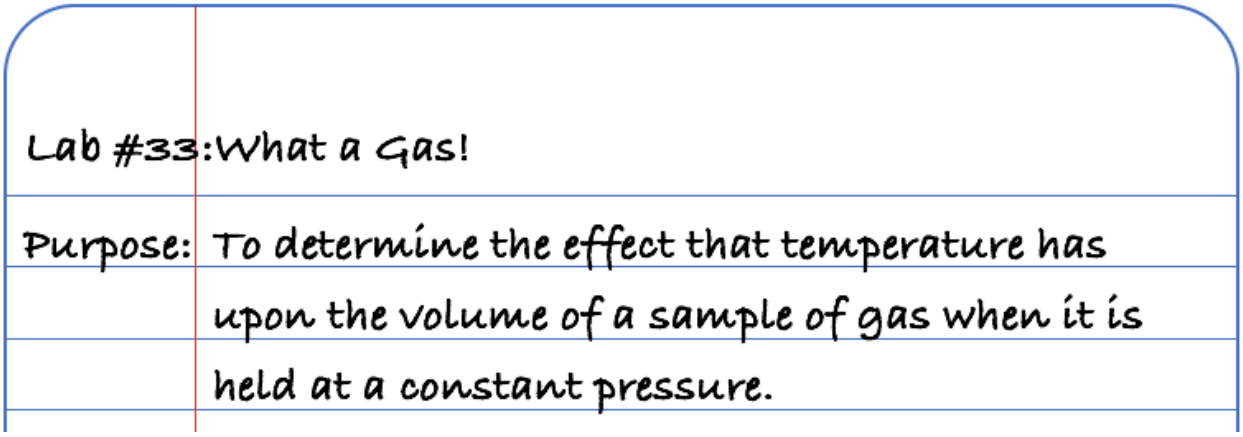
What are the independent and dependent variables in this experiment?

Question Group 3
Question 5
Charlie Izlaw is conducting an experiment with a sample of gas. Here's the notebook entry:



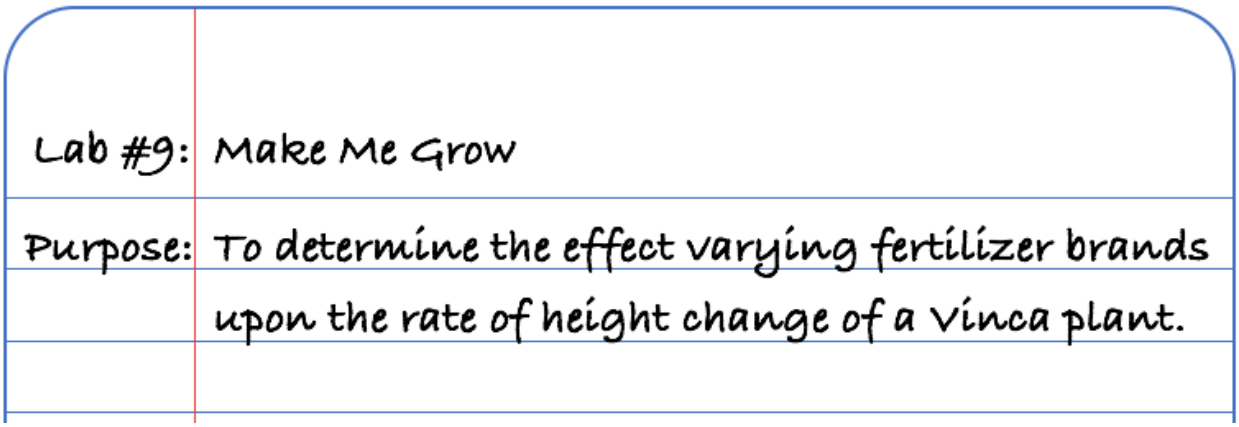
What are the independent and dependent variables in this experiment?

Question 6
Noah Formula is conducting an experiment with the following purpose:



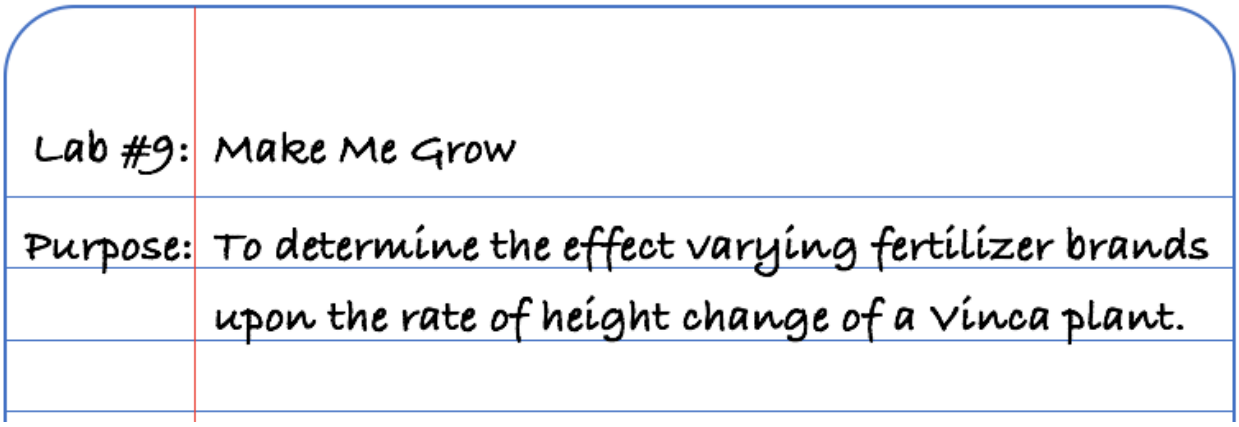
What are the dependent and independent variables in this experiment?

Question Group 4
Question 7
A student lab group is conducting the following experiment:



What are the dependent and independent variables in this experiment?

Question 8
An experiment is being designed with fertilizers. Here's the notebook entry.



What are the independent and dependent variables in this experiment?

Activity 2: Experimental Design
Question Group 5
Question 9
A student lab group is brainstorming the design of an experiment in which they wish to determine how the frequency at which you shake a Slinky would affect the wavelength. Which Post-it note describes the most effective design?

A: Shake Slinky with frequency of 1.0 Hz. Measure the wavelength and the speed. Record data in notebook. Use a different speed and shake once more at 1.0 Hz. Measure and record the wavelength. Continue changing the wave speed while keeping frequency constant. Measure and record the wavelength for each trial.

B: Shake Slinky with frequency of 1.0 Hz. Measure and record the wavelength. Get a new Slinky and repeat the trial with a frequency of 1.0 Hz. Repeat for several different Slinkies, being careful to keep the frequency controlled at 1.0 Hz and measuring the wavelength in each trial.

C: Shake Slinky with frequency of 1.0 Hz. Then shake the Slinky with frequency of 2.0 Hz. Then shake with a frequencies of 3.0 Hz, 4.0 Hz, and 5.0 Hz. Record data for each frequency.

D: Shake Slinky with frequency of 1.0 Hz. Measure and record the wavelength. Shake Slinky at 2.0 Hz. Measure the wavelength. Repeat this procedure for 3.0 Hz, 4.0 Hz, and 5.0 Hz. Measure and record wavelength for each frequency.

Question Group 6
Question 10
A student lab group is brainstorming the design of an experiment that uses a gas-filled balloon to determine how the temperature affects the volume of the gas. Which Post-it note describes the most effective design?

A: Inflate three different balloons to three different volumes. Get three different beakers and fill them with water having three different temperatures. Put the biggest balloon in the beaker with the hottest water and the smallest balloon in the beaker with the coldest water. Measure the volume of each balloon and the temperature of the water.

B: Inflate a balloon. Put it in a beaker of room temperature water. Measure the balloon's volume and the temperature of the water. Place the same balloon in a beaker of very cold water. Wait 3 minutes. Measure the new volume of the balloon and the temperature of the water. Place the same balloon in a beaker of heated water. Wait 3 minutes. Measure the new volume of the balloon and the temperature of the water.

C: Inflate a balloon. Put it in a beaker of water. Measure the volume of the balloon and the temperature of the water. Inflate a different balloon. Put the balloon in the same beaker and measure volume and temperature. Repeat the procedure for a third balloon. Make sure that each balloon is inflated to a different volume each time you blow into it.

D: Inflate three different balloons so that they have different volumes. Prepare three beakers with water having a different temperature. Place the balloons in the water. Measure the volume of the water in the beaker and the temperature of the water in each beaker.

Question Group 7

Question 11

A student lab group is brainstorming the design of an experiment that uses a mini light bulb and a light meter to determine how light intensity varies with the distance from the source. Which Post-it note describes the most effective design?

A: Turn off the room lights and turn on the light bulb. Place the light meter 25.0 cm from the bulb. Measure the light intensity. Add a second light bulb and measure the new intensity. Repeat trials for three and four light bulbs, being careful to keep the light meter the same distance away from the bulbs.

B: Turn off the room lights and turn on the light bulb. Place the light meter 10.0 cm from the bulb. Measure the light intensity. Add a second light bulb and move the light meter 20.0 cm away from the bulb. Measure light intensity. Repeat trials for different number of bulbs. Each time you add a bulb be sure to add another 10.0 cm to the distance. Record light intensities for each distance.

C: Turn off the room lights and turn on the light bulb. Place the light meter 10.0 cm from the bulb. Measure the light intensity. Repeat the measurement of intensity with the light meter 20.0 cm away. Repeat trials with distances of 30.0 cm and 40.0 cm.

D: Turn off the room lights and turn on the light bulb. Place the light meter 10.0 cm from the bulb. Measure the light intensity. Obtain a new bulb that has a different brightness. Place the light meter at 10.0 cm and measure the new light intensity. Repeat these measurements for different bulbs but be careful to control the distance from trial to trial.

Question Group 8

Question 12

A student lab group is brainstorming the design of an experiment that uses an ammeter (measures current) and different resistors to determine the effect of the resistance of a resistor upon the current in a simple circuit. Which Post-it note describes the most effective design?

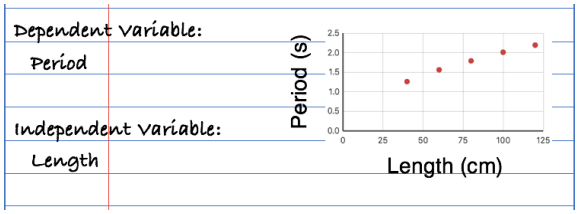
A: Put a 10.0-ohm resistor in the circuit. Measure the current in the circuit. Replace the 10.0-ohm resistor with a 20.0-ohm resistor. Measure the new current. Continue replacing the resistor with a different resistor of known resistance. Measure the current for each resistor. Record all data.

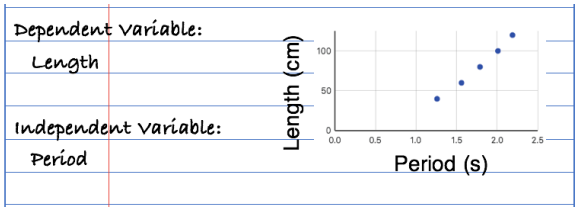
B: Put a 10.0-ohm resistor in the circuit. Measure the current in the circuit. Move the ammeter to a different location in the circuit. Measure the current at this new location. Continue moving the ammeter to different locations within the circuit but be careful to keep the resistor in a fixed location. Measure and record all current values.

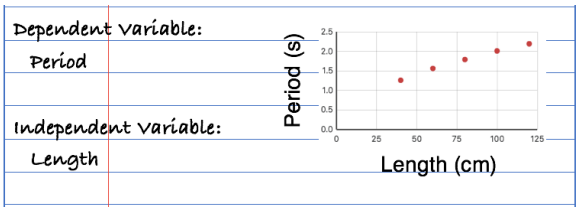
C: Obtain a variety of batteries and build several circuits. Make sure that each circuit has at least one resistor and make sure that the resistance values are different in the different circuits. Place various ammeters in each circuit. Measure the number of batteries and the current for each of the circuits. Record the resistance values used in each of these circuits.

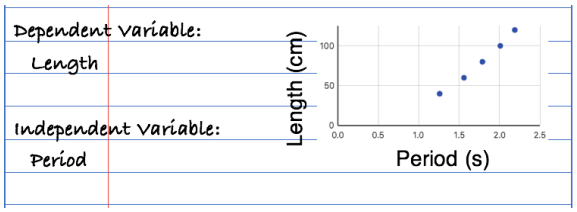
D: Put a 10.0-ohm resistor in a circuit with a single D-cell. Measure the current in the circuit. Add a second D-cell and measure the current with two D-cells. Repeat trials for three, four, and five D-cells, being careful to get accurate current measurements for a fixed amount of resistance in each trial.

Activity 3: Data Presentations
Question Group 9
Question 13
Anna Litical and Perry Id vary the length of a simple pendulum and measure the period of its back-and-forth vibrations. Which notebook entry accurately identifies the variables and displays the best choice for a plot?

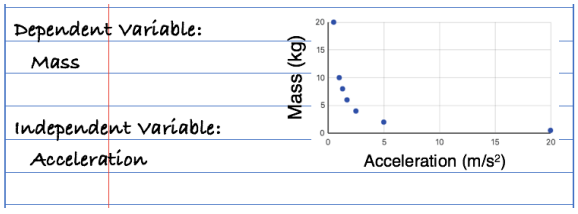


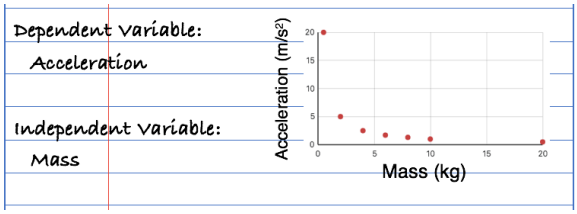


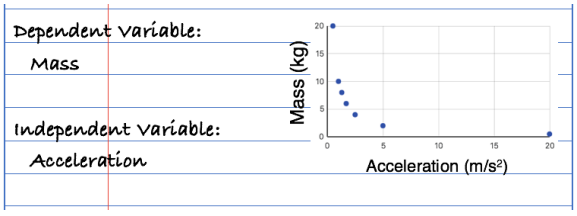


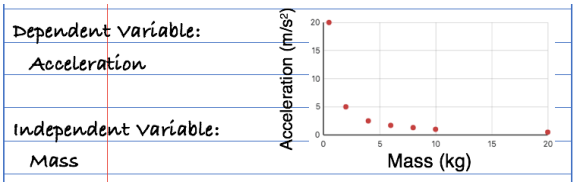


Question Group 10
Question 14
Anna Litical and Nellie Newton conduct several trials in which they study the effect of varying the mass of a cart upon the acceleration of the cart when pulled with a constant force. Which notebook entry accurately identifies the variables and displays the best choice for a plot?

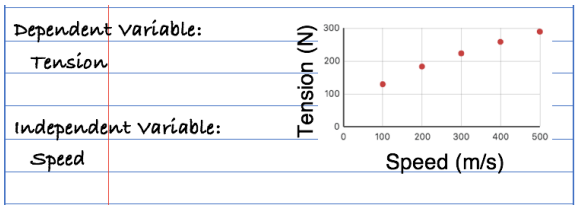


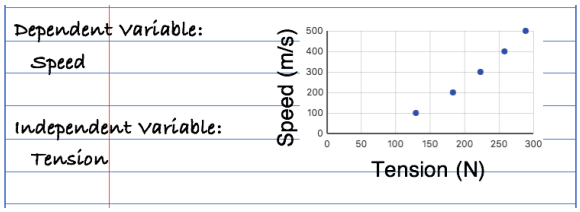


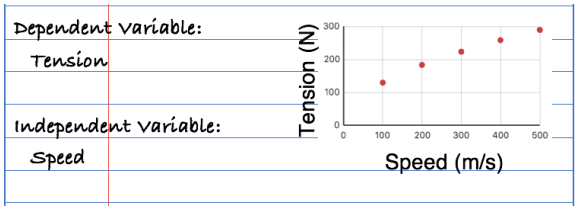


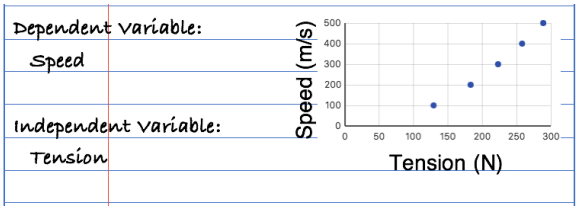


Question Group 11
Question 15
Stan Dingwaives and Anna Conda are conducting a study of the effect of varying tension in a wire upon the speed of wave traveling through the wire. Which notebook entry accurately identifies the variables and displays the best choice for a plot?









Question Group 12
Question 16
Jack and Jill are conducting an experiment to determine the effect that the angle of an inclined plane has upon the acceleration of a Hot Wheels car that rolls along it. Which notebook entry accurately identifies the variables and displays the best choice for a plot?