Name: _____ **Period:** _____

13A Boyles Law

Essential Question: How are pressure and volume of a gas related?

1. When you blow up a balloon, what happens to the volume of air inside the balloon? _____
2. When you blow up a balloon, what happens to the pressure inside the balloon? _____
3. Are pressure and volume inversely or directly proportional? _____

- Connect the 4cm piece of tubing to the pressure sensor connector and the other end of the tubing to the syringe. Adjust the syringe until the volume of air is 12mL. Screw the pressure sensor connector onto the pressure sensor.
- Start the data collector. Record the pressure at 12mL (in kPa). Put your reading in Table 1.
- Pull the syringe out until it measures 16mL. Hold it until the pressure stabilizes. Again, record the pressure in Table 1.
- Repeat step 2 for volumes of 18m and 10mL.
- Repeat step 2 with a volume of 6mL, but take the measurement quickly to prevent air from escaping.
- Stop the data collection. Do not disconnect the syringe from the sensor yet!

4. Fill in Table 1: Pressure and volume data

Volume (mL)	Pressure (kPa)	P * V (kPa * mL)	P/V (kPa/mL)
6.0 mL			
10.0 mL			
12.0mL			
16.0mL			
18.0mL			

5. Graph your pressure (y-axis) vs. volume (x-axis) to the right. **Don't forget to write numbers in even increments, label the axis with the variables and write a title**.

6. Is the relationship shown on the graph direct of inverse?
_____
7. Fill in the P*V and P/V columns in the table.
8. Based on your values, do you think the P*V or the P/V is the right mathematical relationship for pressure and volume?
_____
9. According to your data, what is the constant value?
_____
10. Use three different methods to predict the pressure if the volume is **14.0mL**:
    a. Using your constant (#9) _____ Show your work here: _____
    b. Using your graph _____
    c. Actually doing it _____

13B Pressure and Temperature Relationship

Essential Question: How are temperature and pressure of a gas related?

1. Car manuals tell you to inflate the tires to a certain pressure when the tires are cold. Why do you think this is important?

   _____
   _____

2. Make a hypothesis about the relationship between pressure and temperature.

   _____
   _____

- The cold water should be up to the 600mL make on the displacement tank. Place the temperature probe in the water and turn the data collector on. Place the rubber stopper/tube assembly into the 125mL flask and attach the pressure sensor to the tube. Connect the pressure sensor to the data collector.
- Place the flask into the cold water back and allow it to sit for 2 minutes. Record the temperature and pressure in Table 1 after 2 minutes have passed.
- Take the flask out of the water. Remove 200mL water from the tank.
- Fill it back up with 200mL of hot water.
- Place the flask into this warmer water and after 2 minutes, record the temperature and pressure. Repeat this with 2 other temperatures and record in the table.

3. Fill in Table 1: Pressure and temperature data

Pressure (kPa)	Temperature (C)	Temperature (K)	P/T (kPa/K)	P*T (kPa*K)

4. Graph your pressure (y-axis) vs. temperature (x-axis). Don't forget your numbers in even increments, your labeled axes and your title.

5. Does the graphical model support your hypothesis? Explain your answer. _____
   _____
   _____
6. What happens to the pressure of an enclosed gas when the temperature increases?_____
   _____
7. Fill in the last two columns in the table. Do you think the P/T column or the P*T column is the right mathematical relationship for pressure and temperature? _____
   _____
8. According to your data, what is the constant value? _____
9. Use two different methods to find the pressure when the temperature is 333K:
   a. Using the constant value: _____ Show your work here: _____
   b. Using your graph: _____