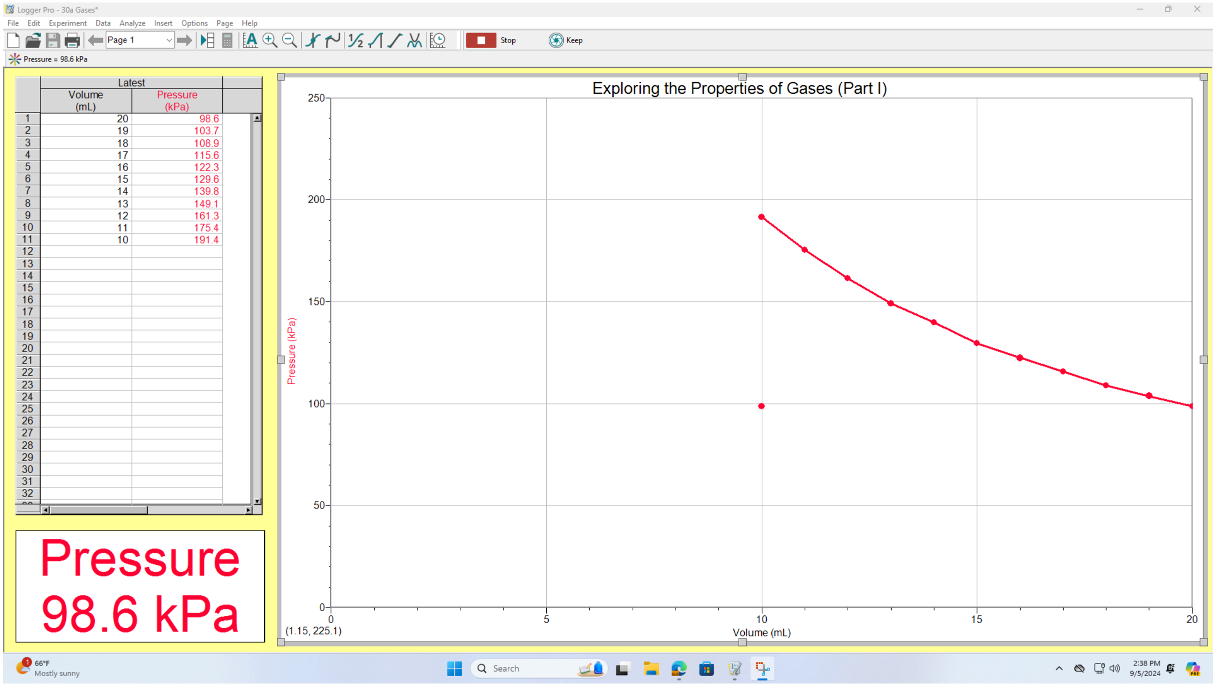
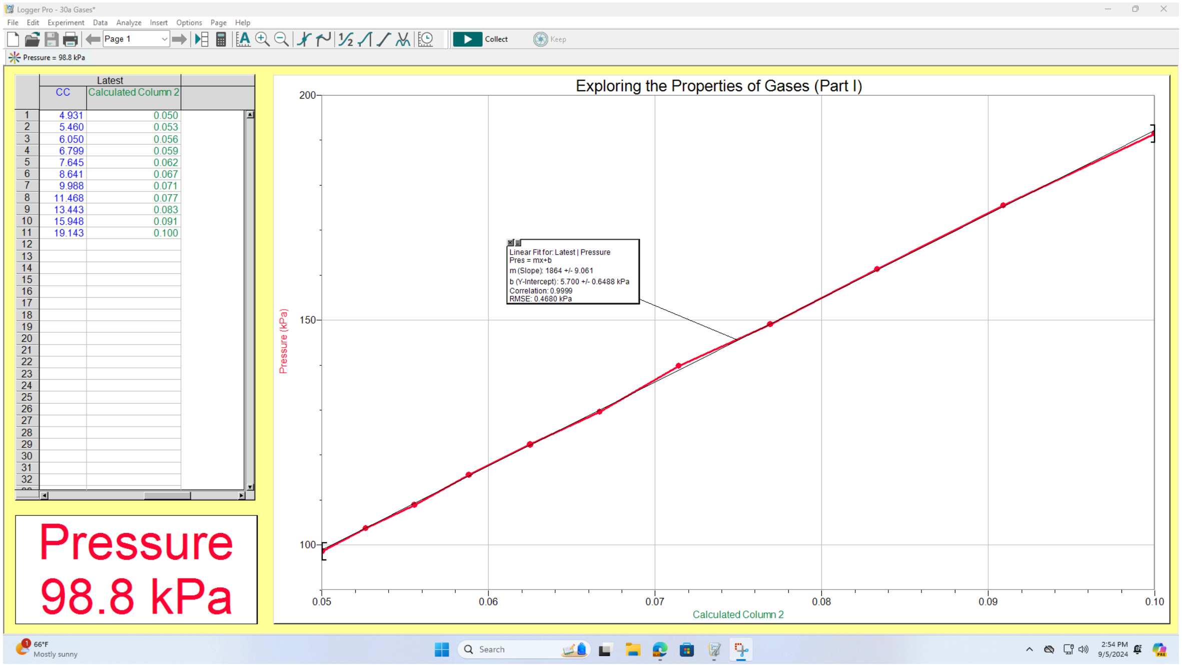
Lab 01 - The Ideal Gas Law

1. a) If the temperature and moles are constant, the pressure is inversely proportional to the volume.
   b) If the volume and moles are constant, the pressure is directly proportional to the temperature.
   c) If the volume and temperature are constant, the pressure is directly proportional to the moles.
2. The pressure of the gas will increase proportional to the amount of volume lost.
3. There was no significant gas loss. We know this because our pressure was the same as we started when we brought the syringe back to its original volume.



	Latest	
	Molecules (#)	Pressure (kPa)
1	0	99.3
2	2	99.7
3	4	100.0
4	6	100.3
5	8	100.9
6	12	101.0
7	14	101.2
8	16	101.4
9	18	101.6
10	20	101.9

4. The graph is not linear; this is due to the fact that pressure and gas are inversely proportional, thus reducing one has an exponential effect on increasing the other.

5. 

6.
$$P = \left(\frac{1}{V}\right) nRT$$

Temperature and moles are constant. If there are no leaks or major changes in outside temperature, they are almost exactly constant.

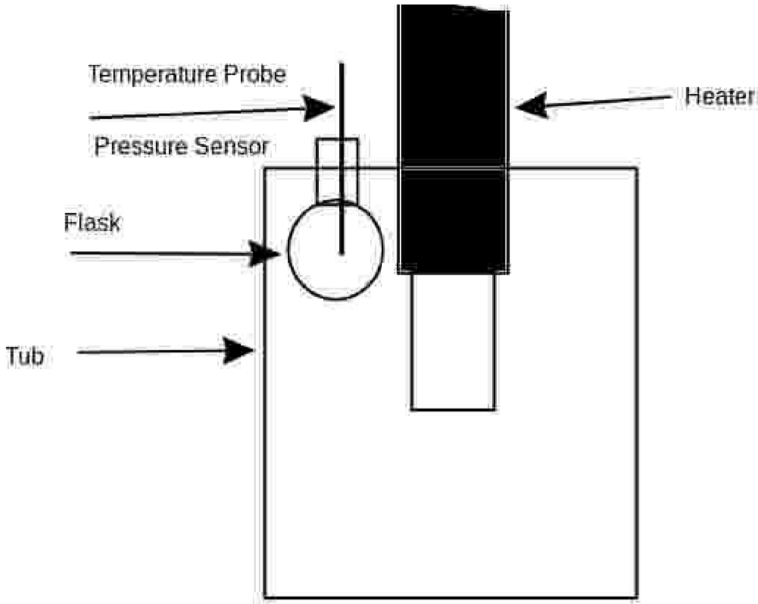
7. a. The units of C_1 are $\frac{J}{\text{ml}}$:

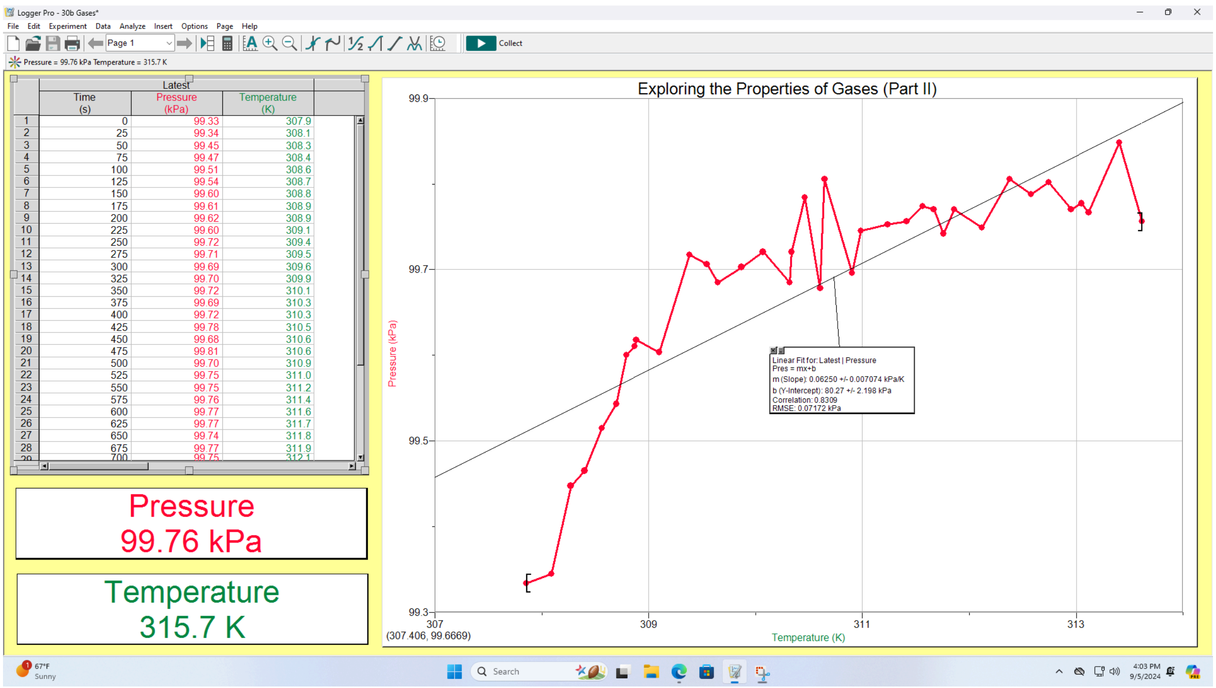
$$\text{ml}^{-1}\ \text{mol}\ \left(\frac{J}{\text{mol}\ K}\right) K = \frac{J}{\text{ml}}$$

b. Pressure is proportional to the Energy

8. Pushing air into a vessel, like lungs or a balloon, increases the volume.

9.





10. The constants are Volume and nR.

11. The units of C_2 are $\frac{J}{K\ \text{ml}}$:

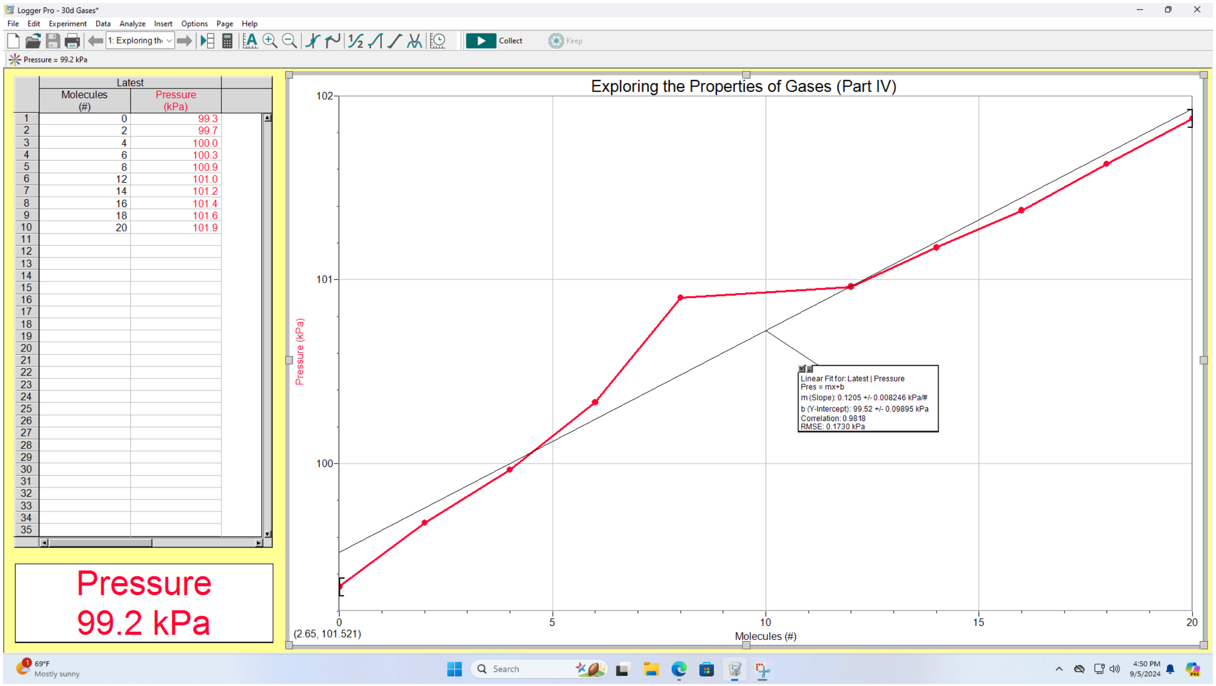
$$C_2 = \text{mol}\ \frac{\frac{J}{\text{mol}\ K}}{\text{ml}} = \frac{J}{K\ \text{ml}}$$

12. The air in tube is exposed to the air outside, which cools it down and reduces the pressure. By attaching the sensor directly to the stopper, we would eliminate any tubing exposed to the outside environment.

13. The amount of moles of air, the temperature, and the volume of the flask. The pressure of a gas at $T = 0$ should be 0. According to our very good data, at $T = 0$, the pressure is 80.2 kpa.

14. As the temperature increases, the pressure increases - we use this for things like engines and electrical generation by venting steam under pressure.

15. We had a hiccup in communication and recorded one of points of data wrong. Other than this, there are some slight variations due to eye-balling how many ml were added.



16. The units for C_3 are $\frac{J}{\text{mol ml}}$:

$$C_3 = \frac{RT}{V} = \frac{\frac{J}{\text{mol } K} K}{\text{ml}} = \frac{J}{\text{mol ml}}$$

17. 0.

18. The pressure would increase proportionally to the added molecules.

19. The seals could be leaky, the temperature could not be constant, we recorded the wrong data point. Our data was pretty decent except for the bad data point at 8 molecules.

20.

Relationship	Constant	Value of Constant and Absolute Uncertainty
$P \propto \left(\frac{1}{V}\right)$	Moles, Temperature, and R	nRT; ± 9.061
$P \propto T$	Volume, Moles, and R	$\frac{nR}{T}$; ± 0.007074
$P \propto n$	Volume, Temperature, and R	$\frac{RT}{V}$; ± 0.008246

1.

- $T \propto V$: Water changing volume with temperature.
- $n \propto V$: A water balloon incerasing in volume as you add more water.
- $T \propto \frac{1}{n}$: Using a propane tank cools the bottle.