**11.4 - Combined Gas Law – Putting it all together!**

**Minds On! RECAP**

**Fill in the blanks:**

**STP: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ P = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ T= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SATP: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ P = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ T= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Do you think this is realistic? That only TWO variables change at a time 🡪 NO!

**Boyle’s Law: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Charles’s Law: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Gay-Lusac’s Law: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Combined Gas Law:**

** Practice Rearranging for:**

 **V2 = T2 =**

**Example 1:**

 **Alex is having a birthday party on a mild winter’s day. The weather changes and a higher-pressure (103.0 kPa) cold front (-25°C) rushes into town. The original air temperature was -2°C and the pressure was 100.8 kPa. What will happen to the volume of the 4.2 L balloons that were tied to the front of the house?**

**Example 2:**

 **An automated instrument has been developed to help drug-research chemists determine the amount of nitrogen in a compound. Any compound containing carbon, nitrogen and hydrogen is reacted with copper (II) oxide to produce CO2, H2O and N2 gases. The gases are collected separately and analyzed.**

 **In an analysis of 39.8 mg of caffeine using this instrument, 10.1 mL of N2 gas was produced at 23°C and 746 torr. What must the new temperature of nitrogen be, in °C, if the volume is increased to 12.0 mL, and the pressure is increased to 780 torr?**

**Practice Problems**

1. **A sample of gas has a volume of 150 mL at 260K and 92.3 kPa. What will the new volume be at 376K and 123 kPa?**
2. **A cylinder at 48 atm pressure and 290 K releases 35 mL of carbon dioxide gas into a 4.0 L container at 297 K. What is the pressure inside the container?**
3. **In a large syringe, 48 mL of ammonia gas at STP is compressed to 24 mL and 110 kPa. What must the new temperature of the gas be?**
4. **A 100 W light bulb has a volume of 180.0 cm3 at STP. The light bulb is turned on and the heated glass expands slightly, changing the volume of the bulb to 181.5 cm3 with an internal pressure of 214.5 kPa. What is the temperature of the light bulb (in °C)?**
5. **Sulphur hexafluoride, SF6(g), is used as a chemical insulator. A 5.0 L sample of this gas is collected at 205.0°C and 250 kPa. What pressure must be applied to this gas sample to reduce its volume to 1.7 L at 25°C?**