Gas Laws - Review

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Convert the following pressures into the given units. ***(Go to 2 decimal places)***
   1. 2.50 atm = \_\_\_\_\_\_\_\_ kPa
   2. 742 mmHg = \_\_\_\_\_\_\_ kPa
   3. 1.13 atm = \_\_\_\_\_\_\_\_ mmHg
   4. 0.375 atm = \_\_\_\_\_\_\_\_ mmHg
   5. 113 kPa = \_\_\_\_\_\_\_\_ atm
   6. 95.6 kPa = \_\_\_\_\_\_\_\_ atm
2. What are the conditions for SATP? Molar volume?
3. What are the conditions for STP? Molar volume?
4. **Complete the following table:**

|  |  |  |
| --- | --- | --- |
| Law | Variables Involved | Assumptions made /  Conditions met |
| Boyle |  |  |
| Charles |  |  |
| Combined |  |  |
| Ideal Gas |  |  |

1. **Practice Problems:**
   1. A sample of CO2(g) at 33 °C has a volume of 15.2 L and a pressure of 1.35 atm. Determine the following for the same gas sample:
      1. Its volume, in litres, at 35 °C and a pressure of 3.5 atm.
      2. Its volume, in millilitres, at 97 °C and a pressure of 6.70 atm.
      3. Its volume, in litres, at –33 °C and a pressure of 2.70 atm.
   2. A sample of unknown gas is held in a non-rigid container. The volume is 4.00 L at a certain temperature and pressure. What will the gas volume be, in litres, in each of the following situations?
      1. Both the pressure and Kelvin temperature are **doubled**.
      2. Both the pressure and Kelvin temperature are **halved**.
      3. The pressure is **halved** and Kelvin temperature is **doubled**.
   3. A gas in a sealed balloon at 100kPa, occupying a volume of 750 mL is squeezed down to 500mL. What is the new pressure?
   4. 0.300L of a gas at SATP is placed in an STP environment. What is the new volume?
   5. Calculate the number of moles of methan e gas in 6.0L at SATP.
   6. Calculate the mass of 20.0L of nitrogen gas at STP.
   7. Calculate the molar volume of selected gases at the following conditions (remember molar volume is the volume of exactly one mole of gas at the conditions given):
      1. Oxygen at 1.06 atm and 23 °C
      2. Neon at 2.10 atm and -23 °C
   8. What volume does 40.0g of oxygen gas occupy at 120 kPa and 20.0°C?
   9. At what temperature, in °C, does 15.0g of fluorine exert a pressure of 85.0 kPa in a 13.0L container?
2. Derive the Ideal Gas Constant ‘R’ using SATP conditions for the following pressure units: (Assume that molar volume is 24.8 L/mol)
   1. kPa
   2. atm
   3. mmHg
3. In an experiment similar to the one you did to find molar mass, *a different gas* was used in place of butane. Given the following data, what was the molar mass of the gas?

air pressure .............................................. 92.7 kPa

temperature ............................................... 21.5ºC

volume of gas collected ........................... 428 mL

initial mass of gas cylinder ................... 529.725 g

final mass of gas cylinder ..................... 529.261 g

1. A sample of water was decomposed to produce H2(g) and O2(g) at the same temperature and pressure. If the volume of H2(g) was 42.5 mL, what was the volume of O2(g)?