Name_____
Period_____

Chemistry I: Chapter 14 Test, Gases

$PV=nRT$      $P_1V_1/T_1 = P_2V_2/T_2$      760 mm Hg = 1 atm   K = °C + 273      1000 mL = 1 L

22.4 L = 1 mol (at STP)

R= 0.0821 $\underline{atm \cdot L}$                R= 8.314 $\underline{kPa \cdot L}$                R= 62.4 mm $\underline{Hg \cdot L}$
        Mol·K                              Mol·K                                Mol·K


1. Two 500 mL flasks contain gas at the same temperature and pressure. Flask 1 contains carbon monoxide, CO. Flask 2 contains $CO_2$. How does 1 compare to 2?
   A. Flask 1 has less mass and the same number of particles.
   B. Flask 1 has less mass and fewer particles.
   C. Flask 1 has more mass and fewer particles.
   D. Flask 1 has more mass and more particles.

2. As the temperature of a gas is increased, which of the following is true?
   A. The molecules of gas move more quickly.
   B. The molecules exert less pressure.
   C. The molecules occupy a smaller volume.
   D. The molecules decrease in average energy.

3. If the pressure exerted by one mole of gas molecules remains constant while the temperature increases, the volume of the gas…
   A. remains constant
   B. increases
   C. decreases

4. What does 'n' stand for in the ideal gas law?
   A. Pressure
   B. Gas constant
   C. Volume
   D. Moles
   E. Temperature

5. What happens to a sample of gas when the pressure is doubled and the temperature is held constant?
   A. The volume is cut in half
   B. The volume goes down by ¼
   C. The volume doubles
   D. The volume does not change

6. What is the temperature in Celsius of a 100 K sample of gas?
   A. -173°C
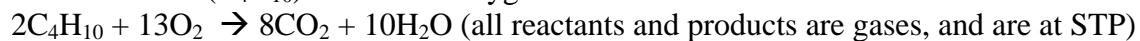   B. 173 °C
   C. 373 °C
   D. 100 °C

7. A gas occupies a volume of 375 mL at 45°C. What will its volume be at 90°C?

8. A gas has a volume of 500 mL at 320 K and 2.3 atm of pressure. What will its volume be at STP?

9. Calculate the volume of 5.3 x $10^{24}$ molecules of $O_2$ at 300 K and 1.5 atm.

10. Find the number of moles of a gas in 1.30 L at a pressure of 1.20 atm and 27°C.

11. Butane ($C_4H_{10}$) burns with oxygen to make water and carbon dioxide.
$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ (all reactants and products are gases, and are at STP)

a. If 20 L of $C_4H_{10}$ is used, what volume of $CO_2$ is formed?

b. How many liters of $CO_2$ would be formed if 6.0 L of $O_2$ reacted?

12. Calculate the volume in liters of 3.2 moles of $N_2$ gas at STP.

13. Calculate the temperature of 3.0 mol of a gas at 11 atm with a volume of 1.8 L.

14. What is the volume of 1 mole of a gas at STP? (HINT: no calculation needed!)

15. At 0.50 atm and 15°C a sample of gas occupies 120 L.  What volume does it occupy at 0.250 atm and 10°C?

16. In the reaction $H_2 + Cl_2 \rightarrow 2HCl$, what is the volume ratio of HCl to $Cl_2$?

17. Carbon monoxide (CO) is a product of incomplete combustion of fuels.  Find the volume that 42 g of carbon monoxide occupies at STP.

18. A fixed amount of a gas is held in a 1.00 L tank at a pressure of 3.50 atm.  The tank is connected to an empty 2.00 L tank.  The gas is then allowed to flow freely between the two tanks, at a constant temperature.  What is the final pressure of the system?

19. A 5.0 L flask is filled with $CH_4$ (methane) at 2.0 atm and -11°C.  What is the mass of the methane in the flask?

20. Explain, using the gas laws, why liquid nitrogen caused the volume of a balloon to decrease so dramatically.  (You don't have to name the law, but showing the relationship between P, V, and T would be a good thing.)

21. Explain, using the gas laws, why a balloon placed in a vacuum will grow in size. (You don't have to name the law, but showing the relationship between P, V, and T would be a good thing.)

22. 3 equal size bottles are sitting on a countertop. One contains He gas, another contains $CF_4$ gas, and the final one contains $CO_2$ gas. If they are all at the same pressure and temperature, what can we say about them? Also, who discovered this?

23. Explain why a gas expands as it is heated.

24. In a mixture of $H_2$ and $O_2$ where the partial pressures of the two gases are equal, the number of hydrogen molecules is ___?____than the number of oxygen molecules.
    a. Fewer
    b. Equal
    c. Greater than
    d. Twice as many

25. If the volume occupied by one mole of gas molecules remains constant as the temperature is raised, the pressure of the gas
    a. Remains constant
    b. Steadily increases
    c. Steadily decreases
    d. Increases, then decreases