Name: _____ Block: _____ Date: _____

Chapter 10 & 12: States of Matter & Gases Study Guide

1. A sample of oxygen gas is collected over water at 22°C and 0.974 atm pressure. If the partial pressure of the water is 0.541 atm, what is the partial pressure of the oxygen?

$P_T = P_{H_2O} + P_{O_2}$

$0.974 \text{ atm} = 0.541 \text{ atm} + P_{O_2}$

$\boxed{P_{O_2} = 0.433 \text{ atm}}$

2. A gas storage tank has a volume of 3.5 x 10^3 L when the temperature is 27°C and the pressure is 101kPa. What is the new volume of the tank if the temperature drops to -10°C and the pressure drops to 95 kPa? Identify which law is used to solve this problem.

$V_1 = 3.5 \times 10^3$ L

$T_1 = 27°C + 273 = 300$ K

$P_1 = 101$ kPa

$V_2 = ?$ L

$T_2 = -10°C + 273 = 263$ K

$P_2 = 95$ kPa

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$T_2P_1V_1 = P_2V_2T_1$

$V_2 = \frac{T_2P_1V_1}{P_2T_1} = \frac{(263 \text{ K})(101 \text{ kPa})(3.5\times10^3 \text{ L})}{(95 \text{ kPa})(300 \text{ K})}$

$\boxed{V_2 = 3.3 \times 10^3 \text{ L}}$

3. If 4.50g of methane gas (CH_4) is introduced into an evacuated 2.00L container at 35°C, what is the pressure in the container? Identify which law is used to solve this problem.

$\frac{4.50 \text{ g } CH_4}{} \left| \frac{1 \text{ mol } CH_4}{16.05 \text{ g}} \right. = 0.280$ mol

$PV = nRT$

$P = \frac{nRT}{V} = \frac{(0.280 \text{ mol})(0.0821)(308)}{2 \text{ L}}$

$\boxed{P = 3.5 \text{ atm}}$

4. A gas occupies a volume of 0.7 L at 10.1 kPa. What volume will the gas occupy at 101kPa? Identify which law is used to solve this problem.

$P_1V_1 = P_2V_2$

$V_2 = \frac{P_1V_1}{P_2} = \frac{(10.1 \text{ kPa})(0.7 \text{ L})}{101 \text{ kPa}} = \boxed{0.07 \text{ L}}$

5. If the heat of fusion is 32.2 kJ/mol, what amount of heat energy is required to melt 5.67 grams of FeO(s)?

ΔH_{fus}

32.2 kJ needed to melt 1 mol FeO(s)

$\frac{5.67 \text{ g FeO}}{} \left| \frac{1 \text{ mol FeO}}{71.85 \text{ g}} \right| \frac{32.2 \text{ kJ}}{1 \text{ mol FeO}} = \boxed{2.54 \text{ kJ}}$

6. Why does the pressure inside a container of gas increase if more gas is added to the container?

More gas = More collisions of gas w/container = More Pressure

7. What are the major assumptions of the kinetic theory?

1. gases are far apart from one another
2. elastic collisions - no loss of total kinetic energy
3. gases move randomly and continuously
4. No attractions between gas particles
5. Temperature depends on average kinetic energy of gas particles

8. Describe the relationship between temperature, kinetic energy, and movement of particles.

increase in temperature = increase of movement of particles = increase in kinetic energy

9. Describe the relationship between temperature, gas particle collisions, and pressure.

increase in temperature = increase movement of particles = increase in # of collisions = increase in pressure

10. What happens to the pressure of a gas inside a container if the temperature of the gas is lowered? Why?

A decrease in temperature causes less movement of particles, thus less collisions will occur and pressure will decrease.

11. Why does air leave a tire when the tire valve is opened?

The pressure inside the tire is lower than pressure outside tire; gas always moves from high pressure to low pressure.

12. Explain effusion and diffusion. Provide an example of each.

Effusion = escape of gas from a container.
ex) air leaking from a tire.

Diffusion = spreading/mixing of gases ex) smell of cookies baking spreading throughout the house.

13. Which gas effuses faster at the same temperature: hydrogen or chlorine? Why?

H_2 will effuse faster because it has less mass than Cl_2.

14. Describe the boiling point and its relationship to external pressure.

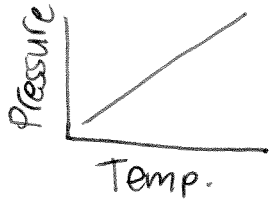
As external pressure increases, boiling point increases due to a higher vapor pressure requirement.

15. Which phase changes are endothermic?

melting, vaporization, sublimation

16. Describe the relationship between temperature and pressure keeping volume constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.

increase T = increase P
Directly Proportional

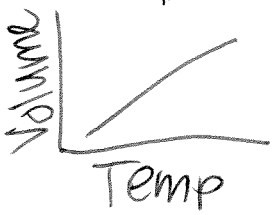


Lussac's Law

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

17. Describe the relationship between temperature and volume keeping pressure constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.

increase T = increase V
Directly Proportional



Charles' Law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

18. Describe the relationship between volume and pressure keeping temperature constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.

Increase V = decrease P
Inversely proportional

Boyles Law

$$P_1V_1 = P_2V_2$$