**The Kinetic-Molecular Theory of Matter**

1. Compared to 1 mole sample of hydrogen at 273 K and 1 atmosphere, a 1 mole sample of hydrogen at 298 K and 1 atmosphere contains

|  |  |  |  |
| --- | --- | --- | --- |
| a. | more molecules | c. | molecules having higher average kinetic energy |
| b. | fewer molecules | d. | molecules having lower average kinetic energy |

2. Samples of SO2 (g) and N2 (g) contain equal number of molecules. If the gases are at STP, the sample have

|  |  |  |  |
| --- | --- | --- | --- |
| a. | equal number of atoms | c. | the same molecular mass |
| b. | equal volume | d. | the same density |

3. When a sample of a gas is heated at constant pressure, the average kinetic energy of its molecules

|  |  |  |  |
| --- | --- | --- | --- |
| a. | decreases, and the volume of the gas increases | c. | increases, and the volume of the gas increases |
| b. | decreases, and the volume of the gas decreases | d. | increases, and the volume of the gas decreases |

4. According to KMT, which assumption is correct?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Gas particles strongly attract each other. | c. | The volume of gas particles prevents random motion. |
| b. | Gas particles travel in curved paths. | d. | Pressure is created by gas collision of surfaces. |

2. Consider 3 identical flasks filled with different gases.

Flask A: nitrogen gas at 240 kPa and 0°C

Flash B: oxygen gas at 750 kPa and 0°C

Flask C: chlorine gas at 125 kPa and 0°C

1. In which flask will the molecules have the greatest average kinetic energy? Lowest average kinetic energy?

They are at the same temperature so they have the same kinetic energy

1. In which flask will the molecules have the greatest velocity? Lowest velocity?

Nitrogen gas has a MM of 28, Oxygen gas 32, and chlorine gas 70.9. The gas with the greatest velocity is nitrogen gas and the gas with the lowest velocity is chlorine gas

1. Which flask has the greatest number of gas molecules? Lowest number of gas molecules?

All three containers have the same volume and same temperature. They differ in their pressures. Flask B has the highest pressure which means it must have the most moles. Container C has the lowest pressure which means it has the smallest number of moles.

1. If pressure, temperature, and volume are equal, then what else must be equal? The number of moles
2. If pressure, temperature, and amount (moles) are equal, then what else must be equal? The volume

**Gas Laws Practice Problems** (Write out givens to help you figure out which equation to use!)

1. Calculate the amount of oxygen gas collected by the displacement of water at 14◦C if the atmospheric pressure is 790 Torr and the volume is 5.00 L. The vapor pressure of water at 14◦C is 12 Torr.

Don’t forget the find the partial pressure of the O2 .217 moles O2

1. At what temperature would 1.28 moles of hydrogen have a pressure of 1.00 atm and a volume of 55.0 L?

523K

1. C3H8 combusts with oxygen gas. What volume of oxygen gas at 25˚C and 1.04 atm is needed for the complete combustion of 5.53 g of propane? Write a balanced equation then use PV=nRT

14.7L

1. 8.4 L sample of gas contains 1.5 moles of oxygen. At the same temperature and pressure, how many moles of gas would there be in a 2.8 L sample?

.5 mol

1. How much pressure must be applied to 1250. L of helium to get it to fit into a tank that has a volume of 18.25 L? Assume standard pressure for initial conditions and calculate in kilopascal.

6938 KPa

1. A weather balloon is filled with 5040 L of helium on a day when the temperature is 18°C and the pressure is 767 mmHg. It rises in the atmosphere to where the temperature is -7°C and the pressure is only 458 mmHg. What is the new volume?  
     
   7720L
2. A gas mixture consisting of oxygen, helium and carbon dioxide has a total pressure measurement of 921 mmHg. If the partial pressure of the oxygen is 242 mmHg and the partial pressure of the carbon dioxide is 333 mmHg, find the partial pressure of helium.   
     
   346 mmHg
3. What mass of calcium hydroxide must be used to produce 56.34L of water vapor at 22°C and 0.482atm?

Ca(OH)2 🡪 CaO + H2O Use PV=nRT to calculate moles of water and the convert to moles of Ca(OH)2  then to grams

83.1g

1. True/False (if false, correct the sentence.)

* As temperature increases, gas molecules ~~slow~~ down and exert greater pressure.
* According to the KMT, gas molecules are always moving. True
* Volume and temperature have an ~~indirect~~ relationship.
* 0°C is ~~colder~~ than 200K.

1. What is the pressure of hydrogen collected over water when the temperature is 20°C and the atmospheric pressure is 741.8 mmHg? The partial pressure of water at 20°C is 17.5 mmHg.  
   724.3 mmHg
2. A soccer ball containing 12.0 L of gas at 21°C is left outside on a cold, winter day. What is the temperature outside if the ball shrunk to 10.5 L?

257K

1. Determine how many grams of water vapor will be produced by the complete combustion of 10.5 L of methane gas (CH4) at 40°C and 1 atm. Write a balanced chemical equations first then us PV=nRT to solve for moles of CH4 then convert to grams of water  
   14.72g
2. If 5.45 g of potassium chlorate decompose to potassium chloride and oxygen gas, how many liters of oxygen gas are given off at STP? Write balanced chemical reaction and convert grams of KClO3 to L of O2  
     
   1.49L
3. What happens to the volume of a gas if the pressure increases (assuming temperature is constant)?

it decreases

1. What happens to the pressure of a gas if the temperature is decreased (assuming volume is constant)?

It decreases

1. The equation for the ideal gas law is the following: **PV=nRT**.
2. What type of relationship exists between pressure and temperature in this equation? direct
3. What type of relationship exists between volume and pressure? Inverse or indirect
4. A balloon is filled with 0.34 mols of pure nitrogen. If the balloon is at 37°C and is under a pressure of 100. kPa, calculate the volume of the balloon.

8.76L

1. A balloon is filled to 2.18 L on a day when the temperature is 23°C. Assuming no change in pressure, what is the volume of the balloon on a day when the temperature is 17°C?

2.14L

1. How many moles of gas will occupy a 0.562 L flask at standard temperature and pressure?

.025mol

1. Copper and sulfuric acid (H2SO4) react to form copper (II) sulfate, water vapor and sulfur dioxide gas.

What mass of copper would be needed to produce 8.00L of sulfur dioxide gas at 202.89kPa and 92°C?  
  
Cu + 2H2SO4 🡪 CuSO4 + 2H2O + SO2  Use PV=nRT to calculate moles of SO2 then calculate grams of Cu 34.0gCu

1. A balloon is filled with helium on a day when the atmospheric pressure is 780. mmHg. A storm comes through and the pressure drops to 715 mmHg. If the initial volume of helium was 1500. mL, what is the new volume?

1640mL