1441 Test Two Chapters 4 and 5
(Gases and Solution Stoichiometry)

Chapter 4 (Types of Chemical Reactions and Solution Stoichiometry)

1. Write the net ionic reaction for the following reactions:
   (a) $NaOH + HCl \rightarrow$

   (b) $AgNO_3 + CaCl_2 \rightarrow$

   (c) $HC_2H_3O_2 + KOH \rightarrow$

2. __ g of NaOH is required to make 200 ml of 3M NaOH.

3. 30 g of NaOH is dissolved in enough water to make 300 ml. What is the M?

4. How many ml of water must be added to 300 ml of 3M KOH to change it to 1.5 M KOH?

5. How many ml of 2 M $Ca(OH)_2$ are required to exactly neutralize 400 ml of 1.5 M HCl?

6. A solution was prepared by dissolving 4.75 g of NaCl and 0.575 g of $CaCl_2$ in water and diluting to a volume of 500.0 mL. What is the molarity of chloride ions in this solution? (The molar mass of NaCl is 58.44 g/mol; the molar mass of $CaCl_2$ is 110.98 g/mol.)
   (a) 0.183 M (b) 0.163M (c) 0.173M (d) 0.014M (e) 0.233M

7. How many ml of 1.4 M HCl will be required to exactly react with 2.5 g of $Ca(OH)_2$

Chapter 10 : Gases

8. What is the total pressure of a mixture of 15 g of NO and 28 g of CO in a 22.4 liter container at 0^o C?

9. A gas is heated from -20^oC to 57^o C and the volume is increased from 2 L to 4.5 L. If the initial pressure is 1.25 atm, what is the final pressure?

10. A tank of a fixed volume contains air at -23^oC and a pressure of 10 atm. If the temperature of the air rises to 27^oC, what will be the new pressure?

11. A sample of NH_3 at 10^o C and 380 mm Hg is contained in a 2.5-L container. How many molecules of NH_3 are in the flask?

12. A 10-L sample of N_2 has a pressure of 4 atm. A 5-L sample of O_2 has a pressure of 6 atm. If these two samples are mixed and compressed to 5 L, what is the final pressure?

13. A flask contains a mixture of He(g) and Ne(g) at a total pressure of 7.50 atm. There are 2.50 mol of He and 4.25 mol of Ne in the flask. What is the partial pressure of He?
(a) 3.00 atm (b) 1.88 atm (c) 4.41 atm (d) 4.72 atm (e) 2.78 atm

14. What is the density of N_2 at STP?

15. A gas has a mass of 10 grams and is held in a 3 L flask at 100^{o}C at a pressure of 3 atm. What is the molar mass of the gas?

16. Fluorine gas reacts with solid calcium bromide to form calcium fluoride and liquid bromine. What volume of fluorine gas (in mL) is required to react with 2.67 g of calcium bromide at 41°C and 4.31 atm?
(a) 10.4 ml (b) 210 ml (c) 420 ml (d) 79.9 ml (e) 104 ml

17. A sample of N_2 gas effused through a pinhole in 5.5 s. How long would it take the same amount of CH_4 to effuse under the same conditions?
(a) 7.3 s (b) 5.5s (c) 3.1 s (d) 4.2 s (e) 9.6 s

Extra Questions:

18. At high temperatures, ammonium nitrite undergoes thermal decomposition to produce only gases:

$$NH_4NO_2(s) \rightarrow N_2(g) + 2H_2O(g)$$

What volume of gas is produced by the decomposition of 35.0 g of NH_4NO_2 (molar mass = 64.05 g/mol) at 525°C and 1.5 atm? (a) 47L (b) 160L (c) 16L (d) 72L (e)24L

19. When does a real gas behave most like an ideal gas?

a) high temperature and high pressure b) high temperature and low pressure
c) low temperature and high pressure d) low temperature and low pressure

20. Consider two identical flasks filled with different gases:

Flask A: N_2 at 10.0 atm and 100°C
Flask B: H_2 at 0.500 atm and 100°C

Which of the statements below are correct?

I. The N_2 molecules have a higher average kinetic energy than the H_2 molecules.
II. The H_2 molecules have a higher average kinetic energy than the N_2 molecules.
III. The N_2 molecules have the same average kinetic energy as the H_2 molecules.
IV. The N_2 molecules have a higher average velocity than the H_2 molecules.
V. The H_2 molecules have a higher average velocity than the N_2 molecules.
VI. The N_2 molecules have the same average velocity as the H_2 molecules.

a) I and IV (b) II and V (c) III and VI (d) III and V (e) II and VI

21. What is the root mean square velocity of the argon molecules in a 1.00 L container of Ar(g) under STP conditions? (a) 413 m/s (b) 171 m/s (c) 3.40 X 10^3 m/s (d) 1.31 m/s (e) 482 m/s

Memorize for Test

Strong Electrolytes (ionize 100% in water)

1. Strong Acids: HCl, HBr, HI, H_2SO_4, HNO_3, $HClO_4$, $HClO_3$

2. Strong Bases: Hydroxides of Group I A and II A except Be and Mg in II A

3. Soluble Salts (metal/nonmetal)

Always Soluble	**Exceptions**
NO_3^-, Group IA, NH_4^+, $C_2H_3O_2^-$, ClO_3^-, ClO_4^-	**none**
Cl^-, Br^-, and I^-	**Pb, Ag, Hg_2^{2+}**
SO_4^{2-}	**Pb, Ag, Hg_2^{2+}, Ca, Sr, Ba**

All the forms of PV = nRT

$P_1V_1 / P_2V_2 = n_1R_1T_1 / n_2R_2T_2$

If you read a problem and the P, V, and T changes, the equation to use is:

$P_1V_1 / P_2V_2 = T_1/T_2$ In other words, just cancel out the letters that aren't used in the equation at the top.

PV = nRT (n = moles, moles can be replaced with grams/molar mass

PV = (gram/molar mass) RT This equation allows you to calculate the molar mass of a gas.

Rearranging the above equation:

molar mass = (grams)(R)(T) / PV grams over V = density so:

molar mass = (density)(R)(T) / P