Big Chem: Units 18-23 Gases, Entropy, Reaction Rates

PRINT Name _____ Period _____

Hint for the following problems. Use the Gas Law equation:
$$PV/T = P'V'/T'$$
Standard Pressure = 101 kPa
Standard Temperature = 273 K

1. Correct the volumes of the following gases as indicated:
   Remember that T must be in K. K = C + 273.
   a. 7.51 L at 5.00°C and 59.9 kPa to STP.   Ans: 4.36 L
   b. 80.0 L at 35.0°C and 111 kPa to STP.   Ans: 78.0 L

2. Theoretically, what would happen to a gas which is cooled to absolute zero?
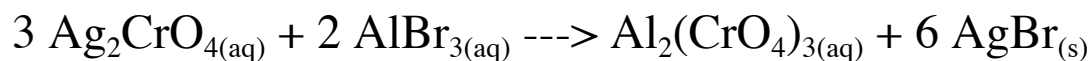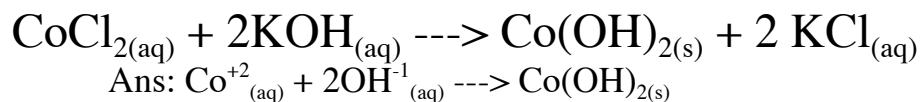   Why can we not get colder than absolute zero?

Hint: The Ideal Gas Law Equation: PV = nRT. Where P is the pressure in kPa,
   V is the volume in L, n is the number of moles, T is the absolute temperature
   in K (K = C + 273), and R is the gas constant = 8.31 L•kPa/mol•K.

3. What pressure will be exerted by 0.300 mol of gas contained in an 8.00 L vessel
   at 18.0°C? Ans: 90.7 kPa. *Remember to change* °C *into* K.

4. How many moles of gas will occupy a 0.486 L flask at 10.0°C and 66.7 kPa
   pressure? Ans: 0.0138 mol. Hint: rearrange, PV = nRT, solving for n.

5. What volume will be occupied by 0.362 mol of gas at 100.3 kPa and 8.00°C?
   Ans: 8.43 L. Hint: rearrange the equation, PV = nRT, solving for V.

6. At what temperature is a gas if 0.0851 mol of it are found in a 0.604 L vessel at
   100.4 kPa? Ans: 85.3K = -187°C. Hint: rearrange the equation, PV = nRT,
   solving forT.

For the following you need a balanced equation. The Molar Volume for any gas at
   STP is 22.4 L/mol.

7. Balance the equation: Br_2 + NaI ---> NaBr + I_2. Find how many liters of Br_2 gas are
   needed to procuce 5.0 grams of I_2 at STP. MM of I_2 is 254 g/mol. Ans: 0.44 L

8. Calculate the molarity of the ion designated in the following solutions: *Hint: you*
   *need a **balanced ionic equation** for dissolving to get the mole ratio of the*
   ions. And M = mol/L. *And* mol = g/MM.
   a. Br^{1-} for 316 g $MgBr_2$ in 859 mL solution. Ans: 4.00M.
   b. Ca^{2+} for 8.28 g $Ca(C_5H_9O_2)_2$ in 414 mL of solution. Ans: 0.82M.

9. Calculate the molarity of the following solutions:
   a. 31.1 g $Al_2(SO_4)_3$ in 756 mL solution. Ans: 0.120M.
   b. 59.5 g $CaCl_2$, in 100 mL solution. Ans: 5.36M.

10. Balance these IONIC Equations:

$CoCl_{2(aq)} + 2KOH_{(aq)} \text{---}> Co(OH)_{2(s)} + 2 KCl_{(aq)}$
Ans: $Co^{+2}_{(aq)} + 2OH^{-1}_{(aq)} \text{---}> Co(OH)_{2(s)}$

$3 Ag_2CrO_{4(aq)} + 2 AlBr_{3(aq)} \text{---}> Al_2(CrO_4)_{3(aq)} + 6 AgBr_{(s)}$

Ans: $6 Ag^+_{(aq)} + 6 Br^-_{(aq)} \text{---}> 6 AgBr_{(s)}$ or $Ag^+_{(aq)} + Br^-_{(aq)} \text{---}> AgBr_{(s)}$

11. Define volatile and nonvolatile and give an example of each.

12. Define solute and give an example.

13. How does a colloid differ from a suspension? Give two examples.

14. Assume that $NO_{(g)}$ and $H_{2(g)}$ react according to the rate law:
$rate = k[NO]^2[H_2]$. How does the rate change if
   a. the concentration of H_2 is doubled? Ans: doubled (explain).
   b. the volume of the enclosing vessel is suddenly halved? *Hint: Halving the volume doubles the concentration of both reactants.* Ans: 8 times (explain).
   c. the temperature is decreased? Ans: slows down (explain).

15. Explain the *Collision Theory* of reactions.

16. What are the five factors determining the rate of a reaction?

17. What are the two factors of *Activation Energy*?

18. What are the three factors needed to have a fire.

10. What is *Spontaneous Combustion*?

20. Draw an *Activation Energy Curve* for an *exothermic reactio*n, label the parts and explain it.

21. Draw an *Activation Energy Curve* for an *endothermic reaction*, label the parts and explain it.

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Turn in at the Beginning of the Period when due.