TYPO #6 #36

Name_____ Date_____ Period_____

Chemistry: Review for 2nd Half Final Exam

A. Periodicity

1) What is ionization energy? Energy required to remove an e^- from an atom

a) Which element has the highest ionization energy? Why?
He, full outer shell so happy as it
Small radius, so e^- held tight by + protons

b) Which element has the lowest ionization energy? Why?
Fr, wants to lose e^- so it achieves octet
Big radius, so e^- easy to remove

2) What is electronegativity? ability of an atom to attract e^- to itself

a) Which element has the highest electronegativity? Why?
F, wants another e^-
Small radius to good attraction to e^-

b) Which element has the lowest electronegativity? Why?
Fr, does NOT want another e^-
outer shell far away, so not alot of attraction

3a) What happens to atomic radius as you go across a period? decreases

b) Why? More +/- attraction

4a) What happens to atomic radius as you go down a row? increase

b) Why? # of energy levels (shells) increases

5a) What happens to atomic radius as a neutral element becomes a positive ion? (remove e^-) Decreases

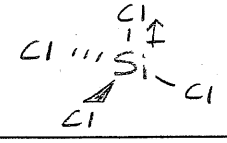
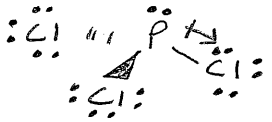
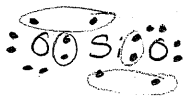
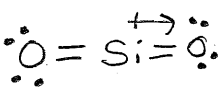
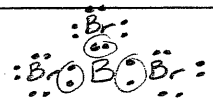
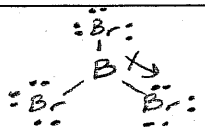
b) Why? less -/- repulsion, sometimes lose a shell

6a) What happens to atomic radius as a neutral element becomes a negative ion? (add e^-) Increases

b) Why? more -/- repulsion, so e^- try to get further away from each other

7) What do elements in the same group/family have in common?
# of valence electrons - so same chemical properties

B. Molecular Geometry Complete the table below.

Formula	Lewis	Stick	Polarity	Geometry
8) $SiCl_4$			Non-Polar	Tetrahedral
9) SBr_2			Polar	Bent
10) PCl_3			Polar	Trigonal Pyramidal
11) SiO_2			Non-Polar	Linear
12) BBr_3			Non-Polar	Trigonal Planar

STP : 1 atm 0°C (273.15 K)

Boyle's $P_1V_1 = P_2V_2$ Charles's $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ Amonton $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ Avogadro $\frac{V_1}{n_1} =$

$PV = nRT$

C. Gas Laws Show set up and all steps. Remember units!

13) 725 mL (V_1) of hydrogen are at a pressure of 1234 mbar (P_1). The volume decreased to 600.0 mL (V_2). What is the new pressure? (P_2)

$P_1V_1 = P_2V_2$

$$\frac{(1234\ \text{mbar})(725\ \text{mL})}{600.0\ \text{mL}} = \frac{(P_2)(600.0\ \text{mL})}{600.0\ \text{mL}}$$

$P_2 = 1490$ mbar

14) A particular gas occupied 72.3 L (V_1) at 212°C (T_1). An hour later, the volume that the gas occupied was 55.5 L (V_2). What is the temperature at this new volume? (T_2)

$T_1 = 212 + 273.15 = 485.15\ K$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{72.3\ L}{485.15\ K} = \frac{55.5\ L}{T_2}$$

$T_2 = 372$ K

15) A gas occupied in a steel container has a pressure reading of 526 mmHg (P_1) at 98.4°C (T_1). The temperature was decreased to 65.3°C (T_2). Find the new pressure reading. (P_2)

$T_1 = 98.4 + 273.15 = 371.55\ K$

$T_2 = 65.3 + 273.15 = 338.45$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \qquad \frac{526\ \text{mmHg}}{371.55\ K} = \frac{P_2}{338.45\ K}$$

$P_2 = 479$ mmHg

16) 1.76 moles of a gas occupied 21.2 mL. Additional gas was added so that the gas occupied 30.0 mL. Determine the current number of moles of gas.

$\frac{V_1}{n_1} = \frac{V_2}{n_2}$ $\quad \frac{21.2\text{ mL}}{1.76\text{ moles}} = \frac{30.0\text{ mL}}{n_2}$ $\quad \boxed{n_2 = 2.49\text{ moles}}$

17) A sample of nitrogen monoxide has a volume of 72.6 mL at a temperature of 16.0°C and a pressure of 104.1 kPa. What volume will the sample occupy at 24.0°C and 99.3 kPa?

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\quad \frac{(104.1\text{ kPa})(72.6\text{mL})}{289.15\text{K}} = \frac{(99.3\text{kPa})(V_2)}{297.15\text{K}}$

$T_1 = 16 + 273.15 = 289.15\text{ K}$

$T_2 = 24 + 273.15 = 297.15\text{ K}$

$\boxed{V_2 = 78.2\text{ mL}}$

18) What volume does 0.056 mol of H_2 gas occupy at 25°C and 1.11 atm pressure?

$PV = nRT$

$V = \frac{nRT}{P}$

$V = \frac{(0.056\text{ mol})(0.0821\frac{\text{L}\cdot\text{atm}}{\text{K}\cdot\text{mol}})(298.15\text{K})}{1.11\text{ atm}}$

$T = 25 + 273.15 = 298.15\text{ K}$

$\boxed{V = 1.2\text{ L}}$

D. Concentration Show set up and all steps. Remember units!

19) A solution contains 321 g of HCl. The volume of the solution is 988 mL. Determine its molarity. → $\frac{\text{mol solute}}{\text{L solvent}}$

$\frac{321\text{ g HCl}}{988\text{ mL Soln}} \left| \frac{1\text{ mol HCl}}{36.46\text{ g HCl}} \right| \frac{1000\text{ mL Soln}}{1\text{ L Soln}} = \boxed{8.91\frac{\text{mol HCl}}{\text{L Soln}}}$

20) Cammie has a 8.00% solution of potassium chloride. The mass of the solution is 431g. What is the mass of potassium chloride in the solution?

$8\% \rightarrow \frac{8\text{ g KCl}}{100\text{ g Soln}}$

$\frac{431\text{ g Soln}}{} \left| \frac{8\text{ g KCl}}{100\text{ g Soln}} \right. = \boxed{34.5\text{ g KCl}}$

21) Dane needs to make a 3.00 M solution of H_2SO_4. In the prep room he finds 250.0 mL of a 10.0 M solution of H_2SO_4. Determine the volume of Dane's new solution.

$M_CV_C = M_DV_D$

$\frac{(10.0\text{ M})(250.0\text{mL})}{3.00\text{ M}} = \frac{(3.00\text{ M})(V_D)}{3.00\text{ M}}$

$\boxed{V_D = 833\text{ mL}}$

E) Reaction Rates

22) Summarize 4 ways that you can speed up a reaction AND why the rate would increase.

a) Catalyst : ↓ activation energy

b) ↑ Surface Area : more surface allows more collisions

c) ↑ Concentration : molecules closer together, more collisions

d) ↑ Temperature : more energy, molecules move more + faster, more collisions

F) pH and Neutralization Show set up and all steps. Remember units!

23) The pH of solution is 5.25. Determine the following.

$pH + pOH = 14$

a) pOH = 8.75 b) $[H^+] = 5.6 \times 10^{-6}$ c) $[OH^-] = 1.8 \times 10^{-9}$ d) acid or base?

$14 - 5.25$ $[H^+] = 10^{-pH} = 10^{-5.25}$ $[OH^-] = 10^{-pOH} = 10^{-8.75}$

24) Calculate the pOH of a 0.300 M HCl solution. → Acid

$pH = -\log[H^+]$

$= -\log(0.300)$

$pH = 0.523...$

$pH + pOH = 14$

$\boxed{pOH = 13.477}$

25) The pH of an acid is 4.15. Determine $[H^+]$.

$[H^+] = 10^{-pH}$

$= 10^{-4.15}$

$\boxed{[H^+] = 7.08 \times 10^{-5}}$

26) It took 35.8 mL of 0.060 M KOH to neutralize 58.3 mL of HNO_3. What was the concentration of HNO_3?

$HNO_3 + KOH \rightarrow KNO_3 + HOH$

$$\frac{1\ mol\ HNO_3}{1\ mol\ KOH} \left| \frac{0.060\ mol\ KOH}{1\ L\ KOH} \right| \frac{1\ L\ KOH}{1000\ mL\ KOH} \left| \frac{35.8\ mL\ KOH}{58.3\ mL\ HNO_3} \right| \frac{1000\ mL\ HNO_3}{1\ L\ HNO_3} = \boxed{0.037\ M\ HNO_3}$$

27) It took 14.6 mL of 0.150 M HCl to neutralize 37.9 mL of LiOH. Determine the molarity of the base.

$HCl + LiOH \rightarrow LiCl + HOH$

$$\frac{1\ mol\ LiOH}{1\ mol\ HCl} \left| \frac{0.150\ mol\ HCl}{1\ L\ HCl} \right| \frac{1\ L\ HCl}{1000\ mL\ HCl} \left| \frac{14.6\ mL\ HCl}{37.9\ mL\ LiOH} \right| \frac{1000\ mL\ LiOH}{1\ L\ LiOH} = \boxed{0.0578\ M\ LiOH}$$