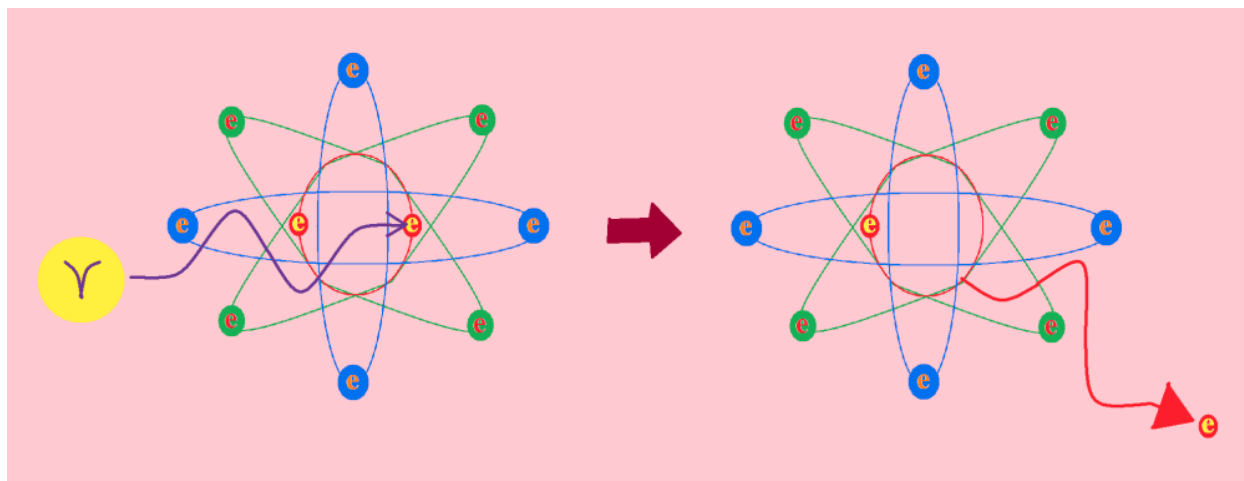


Complete on your own using only a non-programmable calculator and a pencil. You have one hour in which to complete this worksheet. You'll not receive this worksheet back.

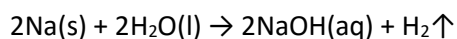
1) As discussed in class, ethyne contains 1 triple bond and one single bond per carbon atom. Each carbon atom in ethyne is in \_\_\_\_\_ hybridization.

2) As discussed in class, Ni, Pt and Pd take 4 bonds per atom. When that occurs, these metals are in \_\_\_\_\_ geometry.



3) Gamma radiation interacts with atoms in several ways to lose its energy. The illustration, above, shows one of those manners. Which energy loss mechanism is this?

4) The following reaction is a classic reaction involving the reaction of Group I elements with water:



What is the reaction product that catches fire and burns as the reaction goes to completion? Use both elemental and/or molecular symbols and spelled out.

5) Processing sodas of any kind requires pressurizing the beverage with  $\text{CO}_2$ . This is an application of \_\_\_\_ Law.

6) The graphic at right best represents/illustrates which chemical technique:

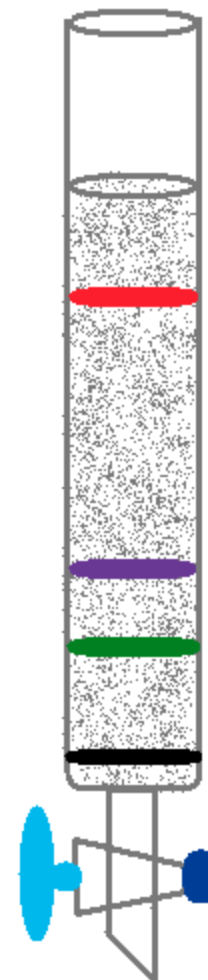
7) Using your knowledge of chromatography and the chromatography column image at right, if you were told this was SEC (or GPC) chromatography, then you'd know that the \_\_\_\_\_ sample has the highest molecular weight.

8) Using your knowledge of chromatography and the chromatography column image above, if you were told this was Reverse Phase chromatography, then you'd know that the \_\_\_\_\_ sample is the most polar sample.

9) In the phrase " $\text{pCO}_2$ ", the "p" means:

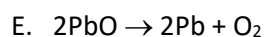
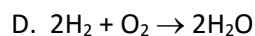
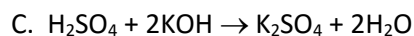
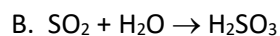
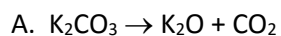
10) In the phrase " $\text{pK}_a$ ", the "p" stands for:

11) That "no two electrons in a particular atom can have the same set of 4 quantum numbers" is the:

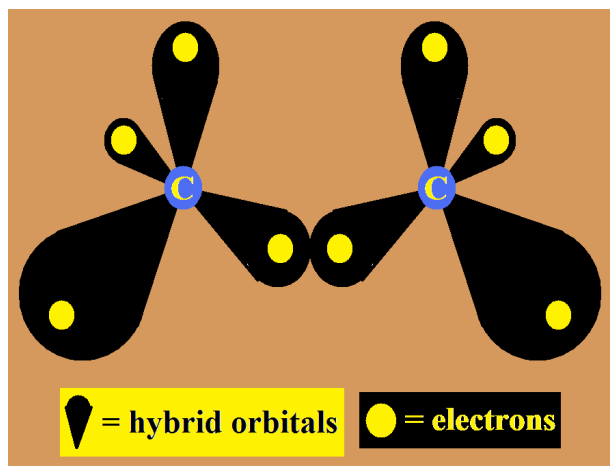


12) What is a quantum address for an N shell electron in a dumb-bell –shaped p subshell that's spinning counter clockwise?

13) Name the kinds of reactions:



14) The image below illustrates two (2) carbon atoms bonded together in such a way that each C atom will take 4 single bonds. In what geometry are the carbon atoms? What is their hybridization?

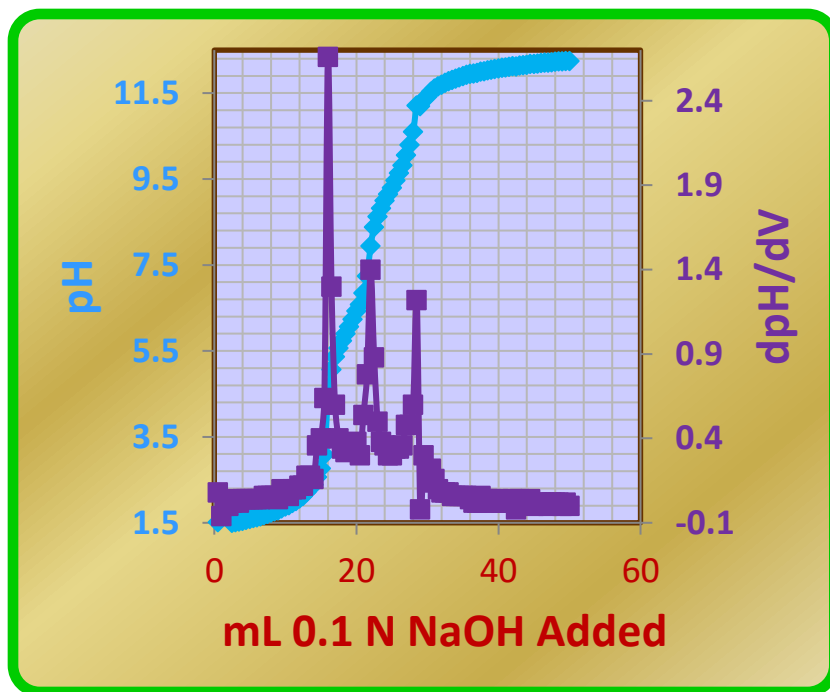


15) For this reaction, 200 g butane ( $\text{C}_4\text{H}_{10}$ ; MW=58 g/mol) and 496.5 g oxygen (MW = 32 g/mol) are used as follows:  $2\text{C}_4\text{H}_{10} + 9\text{O}_2 \rightarrow 8\text{CO} + 10\text{H}_2\text{O}$

What's the limiting reagent based on CO production? If you actually obtained 193.1 g CO, what is your % yield? Show your work.

16) The EN for Mg is 1.2 and the EN for O is 3.5. What kind of bond really exists between Mg and O?

17) The image at right best represents the titration of which mineral acid?



18) Write out and label the formulas for the following:

A) Gay-Lussac's Law

B) Combined Gas Law

c) Universal Gas Law

D) Boyles' Law

E) Charles' Law

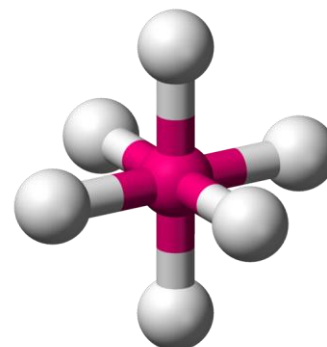
F) Poiseuille's Law

19) What are the units on "R", the universal gas constant (use the units most commonly applied in CHEM 121)?

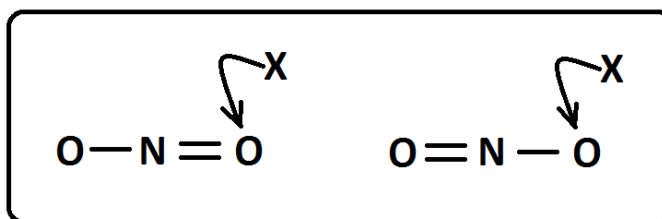
20) A \_\_\_\_\_ is the substance present in a solution in the largest amount.

21) A \_\_\_\_\_ is the substance present in a solution in the least amount.

22) What's the geometry and the hybridization of the model at right?



23) According to resonance theory, each bond in the nitrite ion ( $\text{NO}_2^{-1}$ ) is consistent with the observation that the two bonds in the nitrite ion have the same bond length. Given that the  $\text{N}=\text{O}$  bond energy is 143 kcal/bond and that the  $\text{N}-\text{O}$  bond energy is 55 kcal/bond, determine the bond energy for the O labeled "X" in the diagram, below. Perform your measurement in kJ.



24) What's the most important factor in rate determination, relating to elementary reaction rates?

25) According to Fick's law, if a membrane thickens to 9 times normal, a gas will diffuse across that membrane: