

Name: CALVIN

Date:

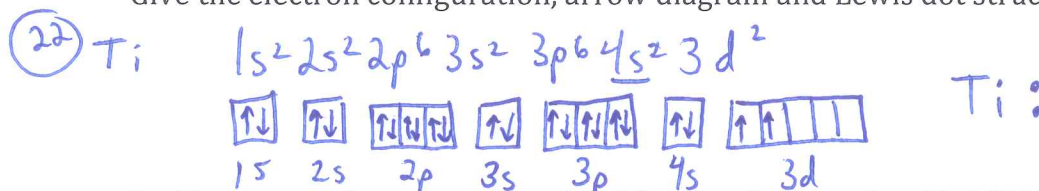
Hour:

### Midterm Partner Review Questions

1. Write out the ground state electron configuration for

- Zn  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
- F<sup>-</sup>  $1s^2 2s^2 2p^6$
- Ca<sup>2+</sup>  $1s^2 2s^2 2p^6 3s^2 3p^6$

Give the electron configuration, arrow diagram and Lewis dot structure for Titanium



2. How many electrons can each sublevel and energy level hold? Identify periods/groups/families.

s, p, d, f, etc... Alkali metals, etc...

3. Trends of the Periodic Table: You should identify the definitions and the trends for:

- Ionic Radius  
↳ size
  - Electronegativity  
↳ attract e's in a bond
  - Ionization Energy  
↳ NRG to remove one electron
- |    | Across Period | Down a group |
|----|---------------|--------------|
| AR | ↓             | ↑            |
| EN | ↑             | ↓            |
| IE | ↑             | ↓            |

4. The ionization energies for removing successive electrons from sodium are 496 kJ/mol, 4562 kJ/mol, 6912 kJ/mol, and 9544 kJ/mol. What does the jump in ionization energy tell you?

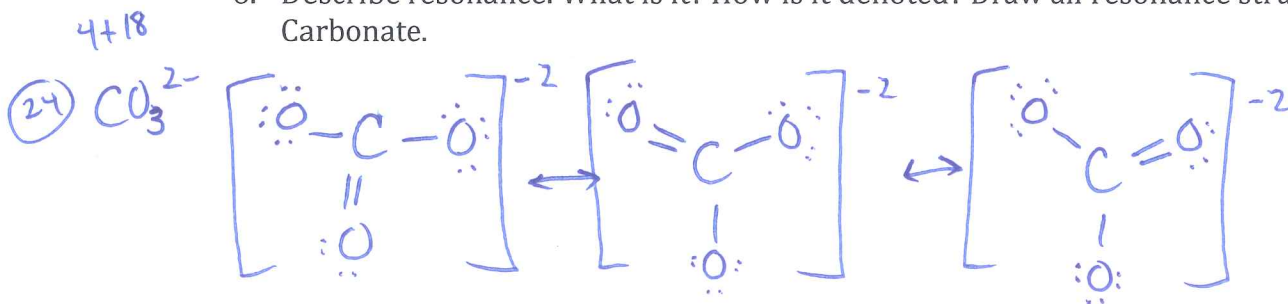
Successive electrons more difficult to remove

↗ octet  
↘ cations smaller

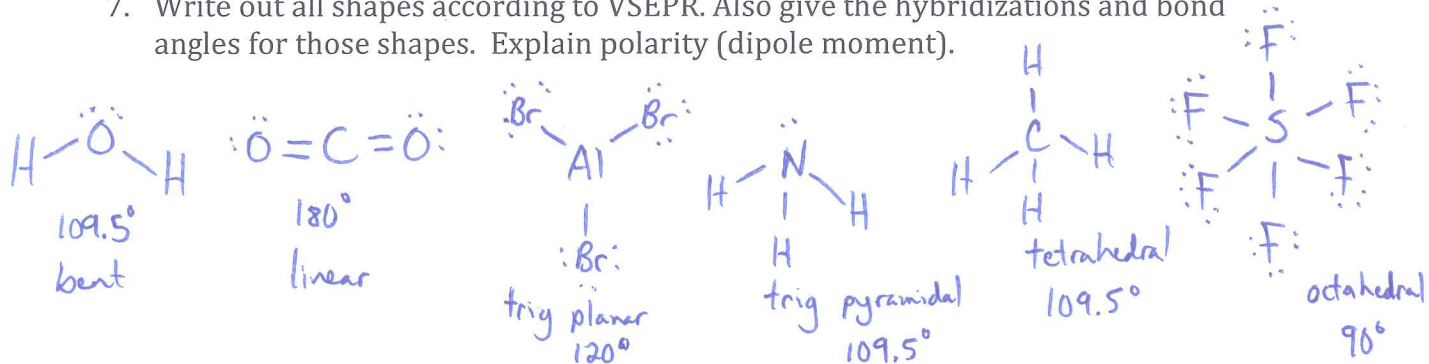
5. Why do atoms bond? Which bonds are stronger: single, double or triple? What elements are often involved in multiple bonds? Use Lewis to show ionic vs. covalent



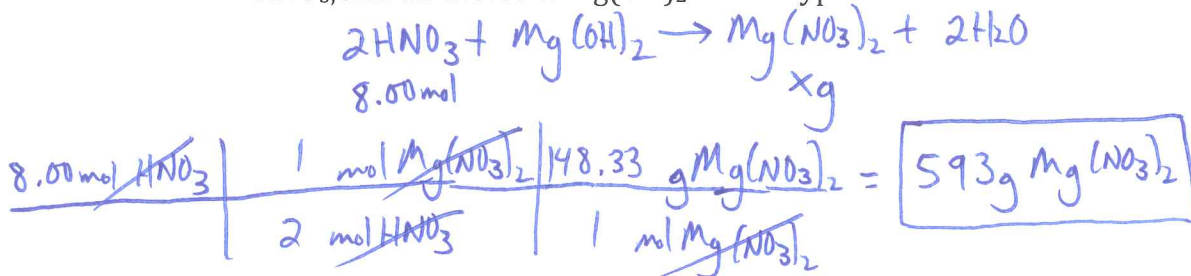
6. Describe resonance. What is it? How is it denoted? Draw all resonance structures for Carbonate.



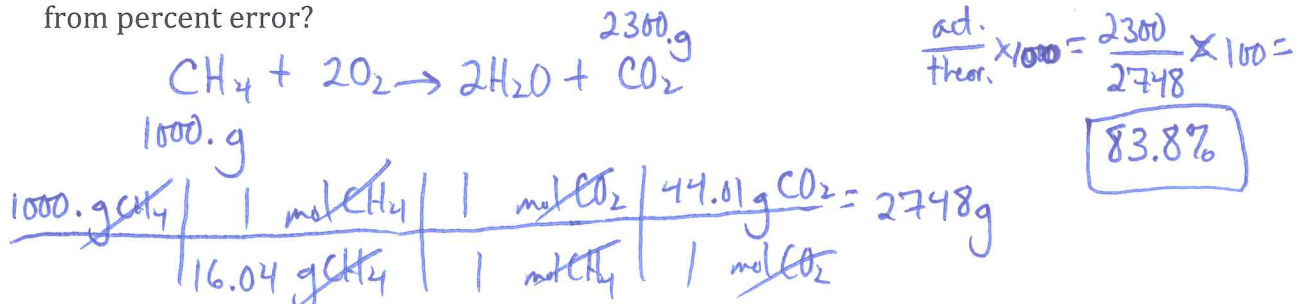
7. Write out all shapes according to VSEPR. Also give the hybridizations and bond angles for those shapes. Explain polarity (dipole moment).



8. For the reaction represented by the equation  $2\text{HNO}_3 + \text{Mg}(\text{OH})_2 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$ , how many grams of magnesium nitrate are produced from 8.00 mol of nitric acid,  $\text{HNO}_3$ , and an excess of  $\text{Mg}(\text{OH})_2$ ? What type of reaction is this?



9. For the reaction represented by the equation  $\text{CH}_4 + 2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{CO}_2$ , calculate the percentage yield of carbon dioxide if 1000. g of methane react with excess oxygen to produce 2300. g of carbon dioxide. What is percentage yield? How does it differ from percent error?



10. Be able to define and apply the ideal gas law and the combined gas law. Understand the molar volume constant and when to use it.

$$PV = nRT, \text{ STP } (0^\circ\text{C}, 1\text{atm}), 1\text{mol} = 22.4\text{L}, \text{ temps in Kelvin}$$

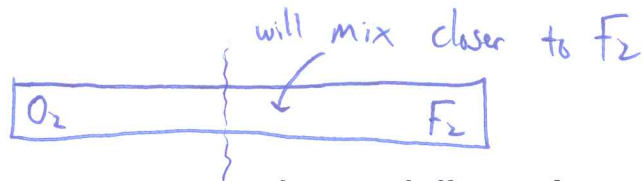
11. A 2.50 L sample of a gas has a mass of 0.44 g. What is the molar mass of the gas? Identify the gas at STP.

$$PV = nRT$$

$$n = \frac{PV}{RT} = \frac{(1\text{atm})(2.50\text{L})}{(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(273\text{K})} = 0.112\text{mol}$$

$$\frac{0.44\text{g}}{0.112\text{mol}} = \mathbf{3.9\text{g/mol}}$$

**Helium**



12. State Graham's Law of Effusion. How many times greater is the rate of effusion of molecular oxygen than that of molecular fluorine at the same temperature and pressure? What affects rate of effusion?

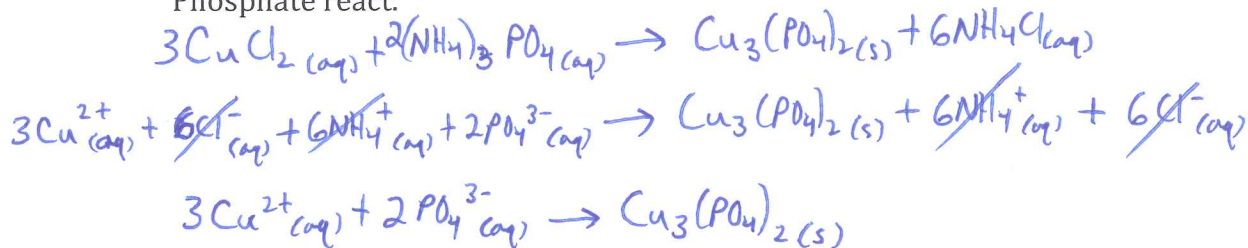
$$\frac{\text{Rate}_1}{\text{Rate}_2} = \sqrt{\frac{M_2}{M_1}} = \frac{\sqrt{38}}{\sqrt{32}} = 1.09 \text{ times faster}$$

13. Review oxidation numbers and rules. Be able to apply these in bonded molecular and ionic compounds. (see back page)

14. Know Reduction vs. Oxidation. Be able to identify redox reactions vs. non redox reactions.

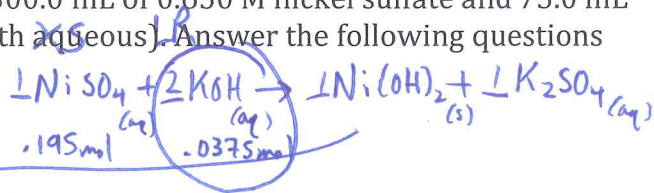
15. Significant Digits! Rules!!!

16. Write the net ionic equation when solutions of Copper (II) Chloride and Ammonium Phosphate react.



17. You are in lab and are asked to mix 300.0 mL of 0.650 M nickel sulfate and 75.0 mL of 0.500 M potassium hydroxide (both aqueous). Answer the following questions about this reaction.

a. Write the balanced equation.



b. Identify the solid.

$$\frac{0.195 \text{ mol NiSO}_4}{1 \text{ mol NiSO}_4} \times 1 \text{ mol K}_2\text{SO}_4 = 0.195 \text{ mol}$$

c. Identify the limiting reactant.

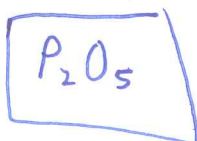
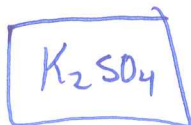
KOH

$$\frac{0.0375 \text{ mol KOH}}{2 \text{ mol KOH}} \times 1 \text{ mol K}_2\text{SO}_4 = 0.0188 \text{ mol}$$

18. You should be able to name ionic and covalent compounds. Name the following:

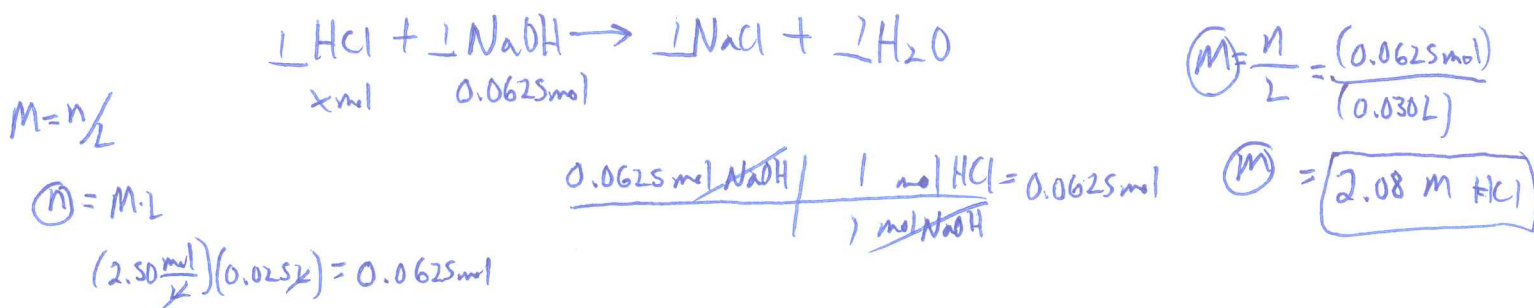
- $\text{NaNO}_3$  Sodium Nitrate
- $\text{C}_2\text{H}_4$  dicarbon tetrahydride
- $\text{KF}$  Potassium Fluoride
- $\text{Na}_3\text{PO}_4$  Sodium Phosphate

19. Write the formulas for the following: Potassium sulfate, diphosphorus pentoxide

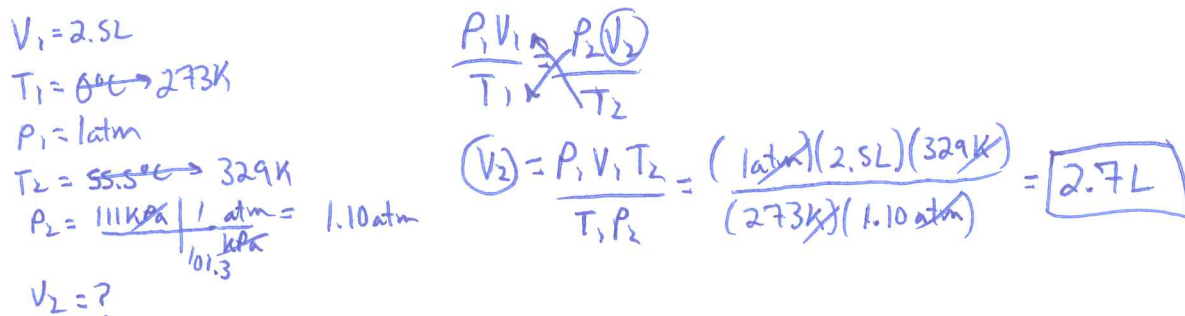




20. Find the concentration of Hydrochloric acid if 30.0mL are needed to titrate 25.0mL of 2.50M sodium hydroxide.



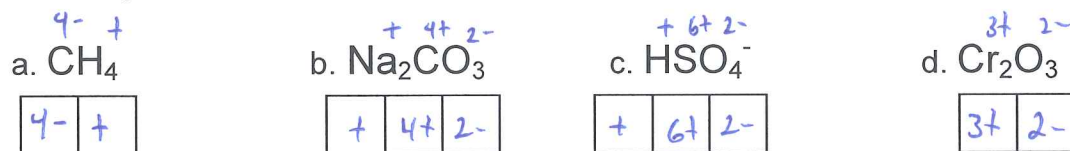
21. 2.5L of a gas at STP is heated to 55.5 degrees Celsius and a pressure of 111 kPa. Find the new volume of the gas?



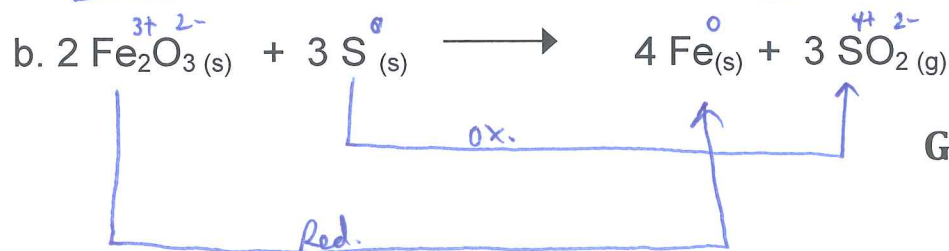
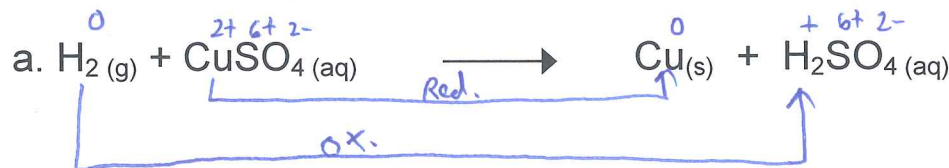
22. Determine the oxidation number for each element.



23. Assign oxidation states to all of the atoms in each of the following:



24. In each of the following reactions, identify which element is oxidized and which is reduced by assigning oxidation numbers.



Go Vikings!!