Notes by Aaron Hui

Chemistry Lecture 02.28.17

- Diatomic molecules:
 - Rule of 7's. Start at atomic number 7 (N), go to column 7 and down to iodine.
- Ion charged species
 - Cation: + charge
 - Metals, lose e-
 - Anion: charge
 - Nonmetals, gain e-
- Monatomic ion only 1 atom (Ex: Na⁺, N³⁺)
 - Octet rule want 8 valence e- (be like nearest noble is a valence e)
 Valence e = grown // //
 - e n.ents) Valence e- = group # (main-grou
 - Metals: chard Group #
- etals: charge 🔼 🚺 (Ex: OH⁻, NO₃⁻) more
- How many protons and electrons are in ²³13Al³⁺
 - Protons: 13 protons
 - Electrons: 10 electrons
- How many protons and electrons are in ⁷⁸₃₄Se²⁻
 - Protons: 34 protons
 - Electrons: 36 electrons
- What is the formula of the phosphorus ion (phosphide)? How many electrons are present?
 - P³⁻, (15+3)= 18 electrons
- lonic compounds cation(s) + anion(s)
 - Sum of charges must equal **zero**
 - The ionic compound NaCl

- LEO the lion goes GER
 - Lose Electrons Oxidize
 - Gain Electrons Reduce
- Reducing agent is oxidized, causes the other to be reduced.
- Oxidizing agent is reduced, causes the other to be oxidized.
- Example: Zinc reacts with copper sulfate. What is the oxidizing agent in the reaction? What substance is being oxidized?
 - \circ Zn + CuSO₄ -> Cu + ZnSO₄
 - 0 +2 same 0 +2 same
 - Cu went from +2 to 0, so CuSO₄ is the oxidizing agent (Cu is being reduced)
 - Zn went from 0 to +2, so Zn is the reducing agent (Zn is being oxidized)
- Example: Copper wire reacts with silver nitret communication silver metal and copper(II) nitrate. What is the existence agent in the reaction?
 - $Cu(s) + 2AgNO(aq) -> 2Ag(s) + Cu(NO_3)$

rev +1 speage +2 same

- Cu went from 0 to +2, so Cu is the reducing agent (while also being oxidized)
 - Ag went from +1 to 0, so AgNO₃ is the oxidizing agent (and Ag is being reduced).

Lecture 03.02.17

- Average Atomic Mass avg. mass of all naturally occurring isotopes
 - Ex: Natural Lithium is
 - 7.42% ⁶Li (6.015 amu)
 - 92.85% ⁷Li (7.016 amu)
 - .0742 (6.015 amu) = .446 amu

• How many Na atoms are present in 35.2 mol sample?

$$35.2 \ mol \ Na * \frac{6.022*10^{23} a toms \ Na}{mol \ Na} = 2.12 * 10^{25} \ a toms \ Na$$

• How many Cu atoms are present in a 6.5 mol sample of copper?

• 6.5 mol
$$Cu * \frac{6.022*10^{23} atoms Cu}{mol Cu} = 3.9 * 10^{24} atoms Cu$$

- Practice using Chemical Formulas as Conversion Factors
 - How many moles of O are there in 18 moles of CO_2 ?

$$\blacksquare 18 \ mol \ CO_2 * \frac{2 \ mol \ O}{mol \ CO_2} = 36 \ mol \ O$$

• How many moles of O are there in 18 moles of $CaCO_3$?

$$\blacksquare \quad 18 \ mol \ CaCO_3 * \frac{3 \ mol \ O}{mol \ CaCO_3} = 54 \ mol \ O$$

- Using Both Avogadro's Number and Formulas
 - How many O_3 molecules are in 1.37 moles of ozone? How many oxygen atoms are present.

• Part One of the problem
1.37 mol O₃ *
$$\frac{6.022 * 10^{23} hol c_{2}}{mol s}$$
 = 8.25 * 10 ²³ molec. O₃
• Part Two of the problem (2 ways to do it)
8.25 * 10²³ molec. O₃ * $\frac{3 atoms O}{molec. O_3}$ = 2.48 * 10²⁴ atoms O

1.37 mol O₃ *
$$\frac{3 \mod O}{\mod O_3}$$
 * $\frac{6.022 \times 10^{23} a toms}{\mod O}$ = 2.48 * 10²⁴ atoms O

- How many $C_6H_{12}O_6$ molecules are present in a 0.225 mol sample? How many C atoms are present?
 - Part One of the problem

.225 mol C ₆H ₁₂O ₆ *
$$\frac{6.022*10^{23} \text{ molec } C_{6}H_{12}O_{6}}{\text{mol } C_{6}H_{12}O_{6}} = 1.35*10^{23} \text{molec } C_{6}H_{12}O_{6}$$

Part Two of the problem

$$1.35 * 10^{23} molec C_{6}H_{12}O_{6} * \frac{6 atoms C}{molec. C_{6}H_{12}O_{6}} = 8.13 * 10^{23} atoms C$$

■ 2AI + 6HCI \rightarrow 2AICI₃ + 3H₂ 50.0g 75.0g

$$50.0 g Al * \frac{mol Al}{26.98 g Al} * \frac{3 mol H_2}{2 mol Al} * \frac{2.016 g H_2}{mol H_2} = 5.60 g H_2$$

$$75.0 g HCl * \frac{mol HCl}{36.46 g HCl} * \frac{3 mol H_2}{6 mol HCl} * \frac{2.016 g H_2}{mol H_2} = 2.07 g H_2$$

2.07 g H_2 is the theoretical yield and HCl is the limiting reagent.

Start with L.R. (0 g HCl left since its L.R.)

75.0 g HCl *
$$\frac{mol HCl}{36.46 g HCl}$$
 * $\frac{2 mol Al}{6 mol HCl}$ * $\frac{26.98 g Al}{mol Al}$ = 18.5 g Al used up
Al : 50.0 g - 18.5 g = 31.5 g Al left
% Y ield = $\frac{1.92 g}{2.07 g}$ * 100% = 92.6%
OTHER WE HOD FOR DETERMINING L.R.
1. Take onsecactant and convert into other
2. Compare to what was given

 $50.0 \ g \ Al * \frac{mol \ Al}{26.98 \ g \ Al} * \frac{6 \ mol \ HCl}{2 \ mol \ Al} * \frac{36.46 \ g \ HCl}{mol \ HCl} = 203 \ g \ HCl$

Need 203 g HCl. Don't have 203 g, only have 75 g, thus HCl is

L.R.

QUIZ 1 TOPICS:

Sig fig

Measurements

Dim Analy

Atomic Theory

- Pressure-Volume (PV) Work: •
 - Work done by an expanding gas (w is)
 - Work done on a gas compressing it (w is +)

Heat •

- Exothermic process releases heat
 - $2H_2(g) + O_2(g) \rightarrow 2H_2O(I) + energy$
 - $H_2O(g) \rightarrow H_2O(I)$ + heat
 - FEELS HOT
- Endothermic process absorbs heat
 - Energy + 2HgO (s) \rightarrow 2Hg (l) + O₂
 - Energy + $H_2O(s) \rightarrow H_2O(l)$
 - **FEELS COLD**
- tesale.co.uk Solid \rightarrow (endo) \rightarrow Liquid 0 -(exa)2. G f 33
- Solid +

• ΔH = heat given off or absorbed during a reaction **at constant pressure**.

- $\Delta H = H_{\text{products}} H_{\text{reactants}}$
- $\Delta H < 0$ exothermic
- $\Delta H > 0$ endothermic
- $H_{products} < H_{reactants}$

