

1-9-18 WB Chem 8 Pre-conf Review

- ① 35.4g CO is combined with 10.2g H₂ to produce CH₃OH by:
 - a) Find LR
 - b) Calc the yield mass CH₃OH
 - c) Calc mass H₂ used in the rxn
 - d) Given: 3O₂ + 2KCl → 2KClO₃ 1.5 mole O₂ is combined with 0.666 mole KCl. Find LR and calc the yield of KClO₃ in MOLES!
 - e) Given: 4P + 5O₂ → 2P₂O₅ 1.75 mole of P is combined with 1.5625 mole O₂. Find LR and calc the yield of P₂O₅ in MOLES!
 - f) List the 2 ways to separate a heterogeneous mixture.
 - g) List the 2 ways to separate a homogeneous mixture.
- ② Which main group is X from? XCl₂
 - a) Which main group is X from in XBr₃?
 - b) Determine the ~~bonding units~~ around C. $\begin{array}{c} \text{H} \\ | \\ \text{C} \\ | \\ \text{H} \end{array}$
- ③ Given: C₆H₁₀O₂ → 2C₆H₈O + 2CO₂ Calc mass C₆H₈O if 7.5g of C₆H₁₀O₂ was formed in the reaction.
 - a) Given the unbalanced equation: AlCl₃ + HCl → AlCl₄ + H₂O
 - b) balance
 - c) Calc mass AlCl₃ if 0.5g AlCl₃ reacts with excess HCl.
 - d) Calc % mass of C in C₁₀H₁₆N₂O₄.
 - e) Identify the most content compound: KMnO₄, HClO₄, Na₂CO₃, BaO, Li₂PO₄
 - f) Name Mg(OH)₂, Cu(NO₃)₂, Zn(SiH₃)₂, BaO₂, PbI₂
 - g) Why is it easier to remove an e⁻ from Ca versus Ca²⁺? Must calculate Zeff for Ca and Ca²⁺.
- ④ LF and shape BCl₃, ClO₃⁻, BrO₂, SiCl₄, BeI₂
 - a) Use arrows and words to rank the ions from small to big: Se, S, O
 - b) Select the element or ion with 3 unpaired e⁻ in its highest energy level. Draw OD for each choice: Cu, Zn²⁺, Cr³⁺, Ti²⁺
 - c) Identify the compound with 2 pairs unpaired e⁻ on the central atom: SeI₂, H₃O⁺, BF₃, NH₃, POCl₃
 - d) Given 2.67g Ba and 3.11g Br. Find EF
 - e) A compound contains 6.164 mole C, 8.63 mole H, 1.233 mole N and the M_m is 162.12. Find EF and MF
- ⑤ Identify the atom with the highest IE: Sn, Nb, Rh, Zr, Ag
 - a) LF O₂, Na, H₂, Cl₂, Br₂, I₂, O₃, HCN, CN⁻, HCl, POCl₃
 - b) Rank polar bonds from high to low using arrows and words: Si-B, Si-F, Si-O, Si-N
 - c) Formula copper (I) oxide
 - d) aluminum hydroxide
 - e) iron nitrate
 - f) iron (III) carbonate ammonia
 - g) A compound contains 40% C, 6.7% H, and 53.3% O. The M_m is 180. Find EF and MF
 - h) Which element has a valence of 3e⁻? S, Ca, Ga, Sb, Br
 - i) Why is N³⁻ larger than N?
- ⑥ Why does Mg ionize more easily than Mg²⁺?
 - a) Why is Ba²⁺ smaller than Ba?
 - b) The EF of a compound is CHCl. The M_m is 129. Find MF
 - c) Given the unbalanced equation: Al + HCl → AlCl₃ + H₂ 1g Al reacts with 7.5g HCl.
 - d) balance eq
 - e) Find LR
 - f) Calc the yield in mass AlCl₃
 - g) Calc mass other reactant USED
 - h) Determine # core e⁻ in O
 - i) Determine # core e⁻ in K
 - j) Calc Zeff for valence of N
 - k) Write the EC of Al³⁺

③ 35.4g of carbon monoxide are combined with 10.2g of hydrogen to produce methanol, CH_3OH .

a) L.R

b) calc mass methanol

c) calc remaining reactant

L.R



$$35.4\text{g CO} \times \frac{1\text{mole}}{28.01\text{g}} \times \frac{1\text{CH}_3\text{OH}}{1\text{mol CO}} = 1.263\text{mol CH}_3\text{OH} \times 32.042$$

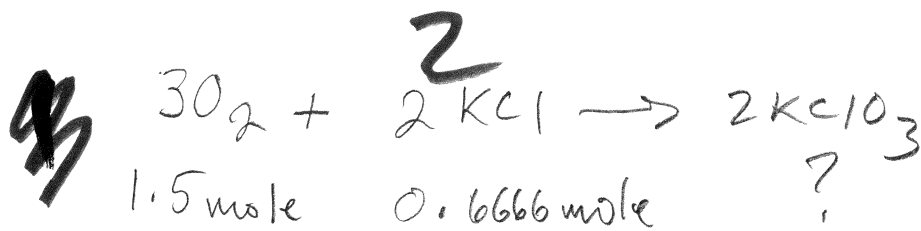
$$10.2\text{g H}_2 \times \frac{1\text{mole}}{2.016\text{g}} \times \frac{1\text{CH}_3\text{OH}}{2\text{H}_2} = 2.529\text{CH}_3\text{OH} = 40.5\text{g CH}_3\text{OH}$$

H_2 remains

$$1.263\text{mol CO} \times \frac{2\text{H}_2}{1\text{CO}} = 2.527\text{mol H}_2 \times 2.016 = 5.0957\text{g H}_2 \text{ used}$$

$$\text{H}_2 \text{ remains} = 10.2\text{g H}_2 - 5.0957 = \text{Excess}$$

$$= 5.104\text{g H}_2 \text{ remains}$$

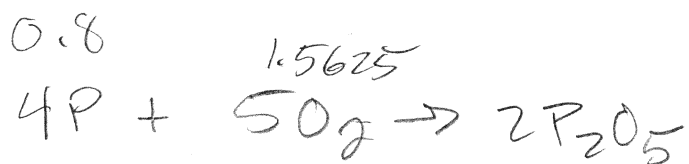


Find LR and calc theo yield KClO_3 in moles. Show work.

$$1.5 \text{ mole O}_2 \times \frac{2\text{KClO}_3}{3\text{O}_2} = 1 \text{ mole KClO}_3$$

$$\text{LR } 0.6666 \text{ mole KCl} \times \frac{2\text{KClO}_3}{2\text{KCl}} = \underline{0.6666 \text{ mole KClO}_3}$$

Theo yield



$$1.25 \text{ P} \times \frac{5\text{O}_2}{4\text{P}} = 1.5625 \text{ mole O}_2$$

1.25 mole 1.5625 mole ?

$$1.25 \text{ mole P} \times \frac{2\text{P}_2\text{O}_5}{4\text{P}} = 0.625 \text{ mole P}_2\text{O}_5$$

~~same/same~~

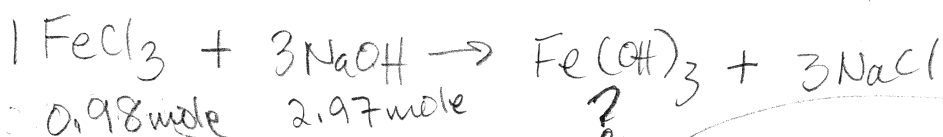
$$1.5625 \text{ mole O}_2 \times \frac{2\text{P}_2\text{O}_5}{5\text{O}_2} = 0.625 \text{ mole P}_2\text{O}_5$$

Theo yield

NO LR

$$3\text{NaOH} \times \frac{1\text{FeCl}_3}{3\text{NaOH}} = 1 \text{ mole FeCl}_3$$

$$0.35 \text{ mole FeCl}_3 \times \frac{3\text{NaOH}}{1\text{FeCl}_3} = 1.05 \text{ mole NaOH}$$



$$\text{LR } 0.98 \text{ mole FeCl}_3 \times \frac{\text{Fe(OH)}_3}{1\text{FeCl}_3} = 0.98 \text{ mole Fe(OH)}_3$$

$$2.97 \text{ mole NaOH} \times \frac{\text{Fe(OH)}_3}{3\text{NaOH}} = 0.99 \text{ mole Fe(OH)}_3$$

Theo yield

4 List the 2 ways to separate a heterogeneous mixture: decanting, filtration

5 List the 2 ways to separate a homogeneous mixture (soln):

TLC, Distillation

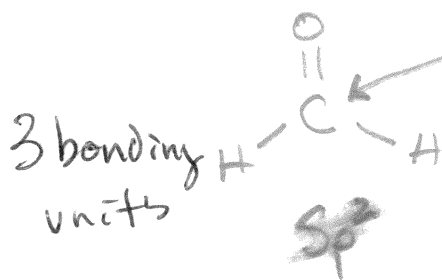
6 which ^{Main} group is X from:
 XCl_2

2A

7 ^{main} which group is X from: XBr_3

3A

8 Determine the hybridization of



9 Given: C_3H_8 (44 g/mol) + 5O_2 (Ex) $\rightarrow 3\text{CO}_2$ + $4\text{H}_2\text{O}$

If actual is 2.1g and % yield is 69.2%, find Theoretical.

$0.0692 = \frac{2.1}{\text{Theo}}$ Theo = 3.03g

$0.023 \text{ mole C}_3\text{H}_8 \times \frac{3\text{CO}_2}{1\text{C}_3\text{H}_8} = 0.069 \text{ mole CO}_2 \times 44 = 3.036 \text{ g CO}_2$

Act 2.1g % yield = 69.2%

Given:

~~11~~ 10



0.5 mole H_2 is combined with

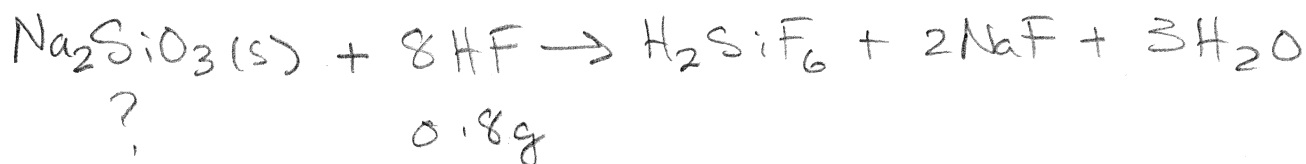
0.25 mole O_2 . Find L.R. Calc mole H_2O .

No L.R

0.5 mole H_2O

~~31~~ 11

How many grams of Na_2SiO_3 can react with 0.800g HF? Calc mass NaF formed.



$$0.8\text{g HF} \times \frac{1\text{mole}}{20.01\text{g HF}} \times \frac{1\text{mol Na}_2\text{SiO}_3}{8\text{mol HF}} \times \frac{122.1\text{g Na}_2\text{SiO}_3}{1\text{mole}} = 0.610\text{g}$$

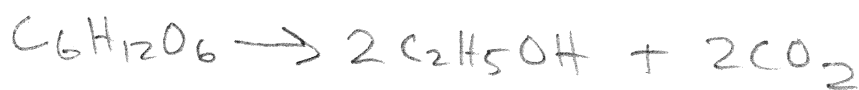
used Na_2SiO_3

$$0.03998\text{ mole HF} \times \frac{2\text{NaF}}{8\text{HF}} = 0.009995\text{ mole NaF} \times \frac{41.99\text{g}}{\text{mole}} =$$

= 0.41969g NaF
Theor yield

~~32~~ 12

7.50g $\text{C}_2\text{H}_5\text{OH}$ are formed by:



Calc mass $\text{C}_6\text{H}_{12}\text{O}_6$

$$7.5\text{g C}_2\text{H}_5\text{OH} \times \frac{1\text{mole}}{46.07\text{g}} \times \frac{1\text{C}_6\text{H}_{12}\text{O}_6}{2\text{C}_2\text{H}_5\text{OH}} \times \frac{180.2\text{g}}{\text{mole}} = 14.7\text{g}$$

$\text{C}_6\text{H}_{12}\text{O}_6$

~~33~~ 13

Given: $\text{Al}(\text{OH})_3 + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2\text{O}$

(a) balance equation: $\text{Al}(\text{OH})_3 + 3\text{HCl} \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O}$

(b) Calc mass AlCl_3 if 0.5g $\text{Al}(\text{OH})_3$ reacts.

(c) Calc mass HCl used.

$$0.5\text{g Al}(\text{OH})_3 \times \frac{1\text{mole}}{78\text{g}} \times \frac{\text{AlCl}_3}{\text{Al}(\text{OH})_3} \times \frac{133.34\text{g}}{\text{mole}} = 0.855\text{g AlCl}_3$$

mass used

$$0.00641\text{ mole Al}(\text{OH})_3 \times \frac{3\text{HCl}}{1\text{Al}(\text{OH})_3} \times \frac{36.46\text{g}}{\text{mole}} = 0.701\text{g HCl}$$

calc % mass first element in formula

a. ammonium nitrate,
 NH_4NO_3 35% N
80

b. $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$
194.12
14
 $\text{C} = 49.47\% \text{ C}$

c. $\text{C}_6\text{H}_{11}\text{OH}$
100.06
 $\text{C} = 71.92\%$

d. $\text{C}_2\text{H}_5\text{OH}$ (46)
 $\text{C} = 52.14\%$

Calc moles

0.0492 g SO_3 0.000614 mole
80

59.1 g CHCl_3 0.495 mole CHCl_3
119.4

4.01 g lithium hydroxide 0.167 mole LiOH
24

2.01 g Sodium sulfate 0.0142 mole Na_2SO_4
142
142

Calc mass

1.5 mol AlI_3 612 g

1.91×10^3 mol C_6H_6 0.149 g

4 mol $\text{C}_6\text{H}_{12}\text{O}_6$ 721 g

4.56×10^5 mol $\text{C}_2\text{H}_5\text{OH}$ 2.1×10^7 g

2.27 mol $\text{Ca}(\text{NO}_3)_2$ 373 g

Calc molecules

2.62×10^{-6} mol H_2O 1.58×10^{18}

5.23 g C_6H_6 4.03×10^{22}

~~10~~ Covalent or Ionic
HBr C CaCl_2 I

CH_4 C KMnO_4 I

H_2SO_4 C

KCN I

C_2H_4 C

~~14~~ 15

Identify the most covalent compound:

KMnO_4

HClO

Na_2CO_3

BaO

Li_2PO_4

1

Name

1002

3

NaOH

16

Sodium hydroxide

Mg(OH)₂

magnesium hydroxide

19

Cu(NO₃)₂

copper (II) nitrate

Zn(C₂H₃O₂)₂

zinc acetate

BaCO₃

barium carbonate

SrCl₂

strontium chloride

AgCl

Silver chloride

PbI₂

lead (II) iodide

19

11

Formula

11

lead (II) chromate

PbCrO₄

iron (II) sulfate heptahydrate

FeSO₄ · 7H₂O

copper (II) oxide

CuO

sodium chloride

NaCl

potassium carbonate

K₂CO₃

ammonium chloride

NH₄Cl

~~11~~ use Z_{eff} to explain why Mg^{+3} does not form.



$$Z_{eff} = 12 - 2 = +10 \text{ on } -$$

Nuclear charge is $\uparrow$, So Mg^{+3} does not form.

~~12~~ write the OD for Co^{+2}



~~13~~

Valence EC of Sn:



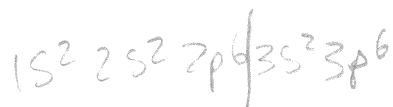
~~14~~

Valence EC of S^{-2}



17

why is it easier to remove an e^- from Ca than Ca^{+2} ?



$$Ca \quad Z_{eff} = +2$$

$$Z_{eff} = 20 - 10 = +10$$

$$Ca^{+2} \quad Z_{eff} = +10$$

Draw the LE, Hyb, Shape:



18



19

Use arrows and words to rank the size of Se^{2-} , O^{2-} , S^{2-}



Small

large

Select the element or ion with 3 unpaired e^- in its highest energy level:

20



Identify the compound with 2 pairs unshared e^- on central atom.



~~E22~~ given moles

Given 0.01950 mole of Ba and 0.03899 mole Br
(2.678g) (3.115g)

find EF

22

$$\frac{0.01950 \text{ mole Ba}}{0.01950} = 1 \text{ Ba}$$

$$\frac{0.03899 \text{ mole Br}}{0.01950} = 1.999 \text{ Br}$$



~~23~~

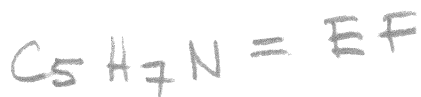
$$74.02 \text{ g C} \times \frac{1 \text{ mole}}{12.01} = \frac{6.164 \text{ mol C}}{1.233 \dots} = 4.999 = 5 \text{ C}$$

$$8.70 \text{ g H} \times \frac{1 \text{ mole}}{1.008} = \frac{8.63 \text{ mol H}}{1.233 \dots} = 6.999 = 7 \text{ H}$$

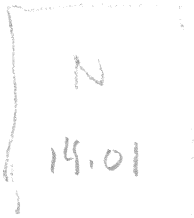
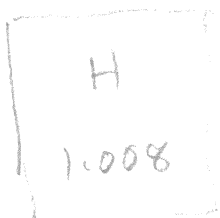
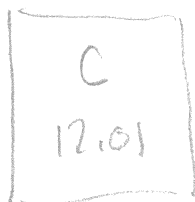
23

$$17.27 \text{ g N} \times \frac{1 \text{ mole}}{14.01} = \frac{1.233 \text{ mole N}}{1.233 \dots} = 1 \text{ N}$$

$$\frac{162.12}{81.16} = 1.998 = \underline{2}$$



$$\begin{aligned} &60.05 \quad 7.056 + 14.01 \\ &5(12.01) + 7(1.008) + 14.01 = \\ &= 81.16 \end{aligned}$$



Identify the element with highest IE

24 Sn , Nb, Rh, Zr, Ag

Sketch the LF

O_2

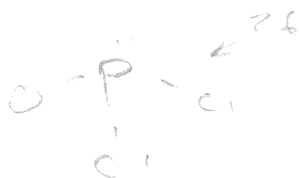
HCN

N_2

HCl

Cl_2

POCl_2^-



I_2

Br_2

O_3

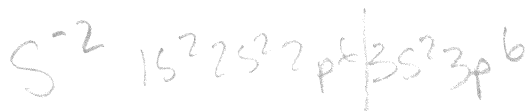
Given K^+ , Cl^- , S^{2-} ; calc Z_{eff} for each ions valence. THEN use words and arrows to rank the size.



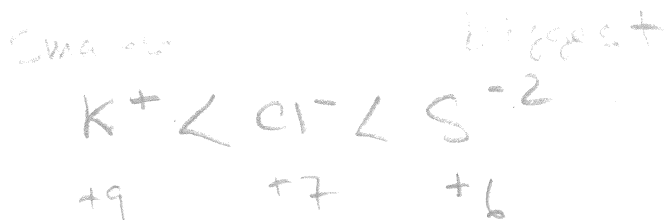
$$Z_{\text{eff}} = 19 - 10 = +9$$



$$Z_{\text{eff}} = 17 - 10 = +7$$



$$Z_{\text{eff}} = 16 - 10 = +6$$



26

Rank polar bonds from high to low using arrows and words.

Si-B, Si-F, Si-O, Si-N

Si-F > Si-O > Si-N > Si-B

Formula

copper (I) oxide Cu_2O

potassium peroxide K_2O_2

aluminum hydroxide $\text{Al}(\text{OH})_3$

zinc nitrate $\text{Zn}(\text{NO}_3)_2$

iron (II) carbonate FeCO_3

iron (III)

ammonia (NH_3)

$\text{Fe}_2(\text{CO}_3)_3$

ammonium (NH_4^+)

Find EF

a) 0.0130 mol C , 0.0390 mol H , 0.0065 mol O

$\text{C}_2\text{H}_6\text{O}$ 46.068 $\text{C}_4\text{H}_{12}\text{O}_2$ 92.136

11.66g iron, 5.01g O

$$11.66\text{g Fe} \times \frac{1}{55.85} = 0.2087735 \text{ mole Fe} = 1 (2)$$

$$5.01\text{g O} \times \frac{1}{16.00} = 0.313125 \text{ mole O} = 1.499831157 (2) = 3$$

Fe_2O_3

40% C, 6.7% H, 53.3% O

CH_2O

$M_m = 180$

$\text{C}_6\text{H}_{12}\text{O}_6$

which element has a valence of $3e^-$?

29

S, Ca, Ga, Sb, Br

why is N^{3-} larger than N?
 e^- repulsion

why is the ionization of Mg^{+2} greater than Mg?

Mg^{+2} has higher Z_{eff}

32

why is Ba^{+2} smaller than Ba?

Ba^{+2} is in a lower n level
increased Z_{eff}

3. continued - % composition

24.1, 27, 48

calculate % composition all elements in $\text{Cu}(\text{NO}_3)_2$

calculate % composition all elements in $(\text{NH}_4)_2\text{SiF}_6$
22.6, 6.52, 19.4

4. Empirical Formula

a. Calculate empirical formula of a compound that contains 1.67g Ce and 4.54g I. CeI_3

b. Calculate EF for a compound that is 68.8% C, 4.95% H, and 26.2% O by mass. $\text{C}_7\text{H}_6\text{O}_2$

c. The EF of a compound is CHCl . The molar mass of the compound is 129g.

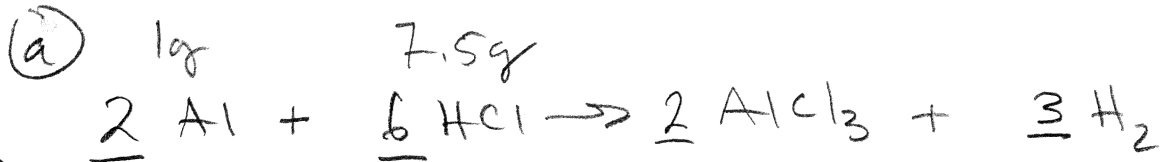
33 Calculate and determine the molecular formula. $\text{C}_2\text{H}_2\text{O}_2\text{Cl}_2$

12 Find the formula for the hydrate that contains 0.737g MgSO_3 and 0.763g H_2O .



~~14~~ ~~10~~ ~~10~~ 34

1g Al reacts with 7.5g HCl to produce aluminum chloride and hydrogen gas.



(b)

$$1 \text{ g Al} \times \frac{1 \text{ mol Al}}{26.98} = 0.037064 \text{ mol Al} \times \frac{2 \text{ AlCl}_3}{2 \text{ Al}} = 0.037064 \text{ mol AlCl}_3 \times 133.33 = 4.94 \text{ g AlCl}_3$$

$$7.5 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.458} = 0.2057 \text{ mol HCl} \times \frac{2 \text{ AlCl}_3}{6 \text{ HCl}} = 0.06856 \text{ mole HCl}$$

↓

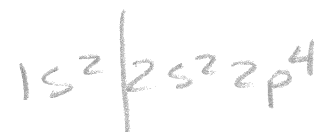
$$0.037064 \text{ mole Al} \times \frac{6 \text{ HCl}}{2 \text{ Al}} = 0.1112 \text{ mole HCl} \times 4.054 \text{ g HCl} = 4.51 \text{ g HCl used}$$

Remaining is: $7.5 - 4.054 = 3.446 \text{ g HCl Remains}$

(c) write the EC of Al³⁺
1s²2s²2p⁶

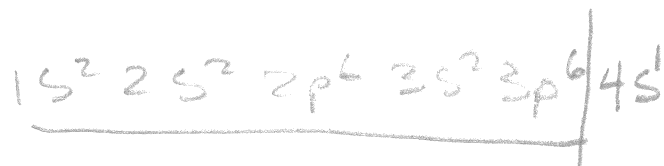
(d) From which is it harder to remove an e⁻, Cl or Al. Justify with trends. Al is to the left of Cl on the edge of metals. IE increases L → R so Al loses e⁻ more easily

35 Determine # core e^- in O:



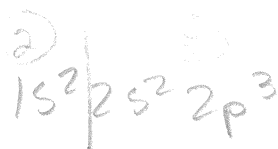
(2) core

36 Determine # core e^- in ¹⁹K



18

37 Calc Z_{eff} for valence N



$$Z_{eff} = 7 - 2 = 5$$

38 Write the EC for ¹³Al³⁺

