

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

- ① $35.4g CO$ is combined with $10.2g H_2$ to produce CH_3OH by:
- ② $CO + 2H_2 \rightarrow CH_3OH$
- ③ Find LR
- ④ Calc the yield mass CH_3OH
- ⑤ Calc mass H_2 used in the rxn.
- ⑥ Given:
- $3O_2 + 2KCl \rightarrow 2KClO_3$
- $15 \text{ mole } O_2$ is combined with 0.666 mole KCl . Find LR and calc the yield of $KClO_3$ in MOLES!
- ⑦ Given: $4P + 5O_2 \rightarrow 2P_2O_5$
- $1.75 \text{ mole of } P$ is combined with $1.5625 \text{ mole } O_2$. Find LR and calc the yield of P_2O_5 in MOLES!
- ⑧ List the 2 ways to separate a heterogeneous mixture.
- ⑨ List the 2 ways to separate a homogeneous mixture.

- ⑩ Which main group is X from? $[XCl_2]$
- ⑪ Which main group is X from in XBr_3 ?
- ⑫ Determine the ~~bonding units~~ around C , $H-C-H$
- ⑬ If the actual yield is $2.1g$ and the % yield is 69.2% , calc the theod yield.
- ⑭ Given: $2H_2 + O_2 \rightarrow 2H_2O$
- $0.5 \text{ mole } H_2$ reacts with $0.25 \text{ mole of } O_2$. Find LR and calc the yield in moles H_2O .
- ⑮ Given: $Na_2SiO_3 + 8HF \rightarrow H_2SiF_6 + 2NaF + 3H_2O$
- Find mass Na_2SiO_3 that reacts with $0.8g HF$. Find mass NaF produced.

- ⑯ Given:
- $C_6H_{10}O \rightarrow 2C_3H_7OH + 2CO_2$
- Calc mass $C_6H_{10}O$ if $7.5g$ of C_3H_7OH was formed in the reaction.
- ⑰ Given the unbalanced equation:
- $AlCl_3 + HCl \rightarrow AlCl_4 + H_2O$
- ⑱ balance
- ⑲ Calc mass $AlCl_3$ if $0.5g$ $Al(OH)_3$ reacts with excess HCl .
- ⑳ Calc % mass of C in $C_{10}H_{10}O_2$.
- ㉑ Identify the most abundant compound:
- $KNO_3, HClO, H_2CO_3, BaO, Li_2PO_4$
- ㉒ Name
- $Mg(OH)_2, Cu(NO_3)_2, Zn(CH_3COO)_2, BaCO_3, PbI_2$
- ㉓ Why is it easier to remove an e^- from Ca versus Ca^{2+} ? Must calculate Z_{eff} for Ca and Ca^{2+} .

- ㉔ LF and shape
- $BCl_3, ClO_2^-, BrO_2^-, SiCl_4, BeI_2$
- ㉕ Use arrows and words to rank the ions from small to big: Se^{2-}, S^{2-}, O^{2-}
- ㉖ Select the element or ion with 3 unpaired e^- in its highest energy level. Draw OD for each choice: $Cu, Zn^{2+}, Cr^{3+}, Ti^{2+}$
- ㉗ Identify the compound with 2 pairs unshared e^- on the central atom: $SeI_2, H_2O^+, BF_3, NH_3, POCl_3$
- ㉘ Given $2.678g Ba$ and $3.115g Br$. Find EF
- ㉙ A compound contains $6.164 \text{ mole } C, 8.63 \text{ mole } H, 1.733 \text{ mole } N$ and the M_m is 162.12 . Find EF and MF.

- ㉚ Identify the atom with the highest IE.
- Sr, Nb, Rh, Zr, Ag
- ㉛ LF
- $O_2, Na, H_2, Cl_2, Br_2, I_2, O_3, HCN, CN^-, HCl, POCl_2$
- ㉜ Rank polar bonds from high to low using arrows and words:
- $Si-B, Si-F, Si-O, Si-N$
- ㉝ Formula
- copper(I) oxide
- aluminum hydroxide
- zinc nitrate
- iron(II) carbonate
- ammonia
- ㉞ A compound contains $40\% C, 6.7\% H$, and $53.3\% O$. The M_m is 180 . Find EF and MF.
- ㉟ Which element has a valence of $3e^-$?
- S, Ca, Ga, Sb, Br
- ㊱ Why is N^{3-} larger than N ?

- ㊲ Why does Mg ionize more easily than Mg^{2+} ?
- ㊳ Why is Br^{2-} smaller than Br ?
- ㊴ The EF of a compound is CH_3OCl . The M_m is $126g$. Find MF.
- ㊵ Given the unbalanced equation:
- $Al + HCl \rightarrow AlCl_3 + H_2$
- $1g Al$ reacts with $7.5g HCl$.
- a) balance eq
- b) Find LR
- c) Calc theod yield in mass $AlCl_3$
- d) Calc mass other reactant USED
- ㊶ Determine # core e^- in O
- ㊷ Determine # core e^- in K
- ㊸ Calc Z_{eff} for valence of N
- ㊹ Write the EC of Al^{3+}

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

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

$$= 5.0957 \text{ g H}_2 \text{ used}$$

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

H₂ remains

$$35.4 \text{ g CO} \times \frac{1 \text{ mole}}{28.01 \text{ g}} \times \frac{1 \text{ mole CH}_3\text{OH}}{1 \text{ mole CO}} = 1.263 \text{ mol CH}_3\text{OH} \times 32.042 = 40.5 \text{ g CH}_3\text{OH}$$

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



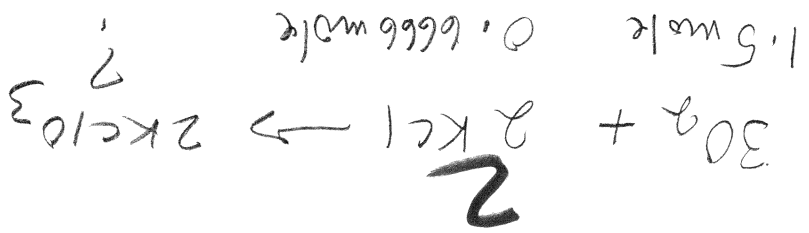
- (a) L.R
- (b) calc mass methanol
- (c) calc remaining reactant

(a) L.R

CH₃OH.

with 10.2g of hydrogen to produce methanol,

(3) 35.4g of carbon monoxide are combined



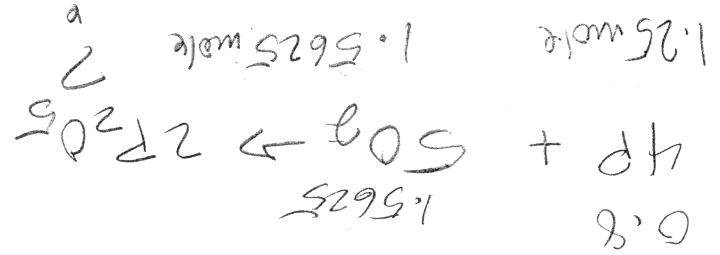
Find LR and calc the yield $KClO_3$ in moles. Show work.

LR

$$1.5 \text{ mole } O_2 \times \frac{30g}{2KClO_3} = 1 \text{ mole } KClO_3$$

$$0.666 \text{ mole } KCl \times \frac{2KClO_3}{2KCl} = 0.666 \text{ mole } KClO_3$$

the yield



3

$$1.25 \text{ mole } P \times \frac{4P}{2P_2O_5} = 0.625 \text{ mole } P_2O_5$$

same/came

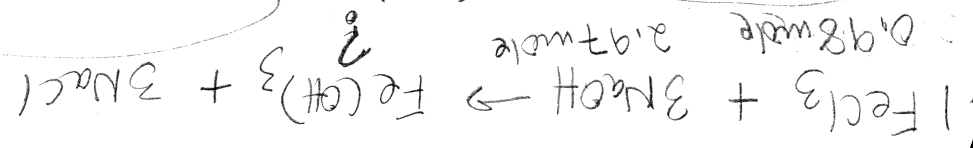
$$1.5625 \text{ mole } O_2 \times \frac{2P_2O_5}{5O_2} = 0.625 \text{ mole } P_2O_5$$

the yield

NO LR

$$1 \text{ mole } FeCl_3 \times \frac{3NaOH}{3NaOH} = 1.05$$

$$0.35 \text{ mole } FeCl_3 \times \frac{3NaOH}{1FeCl_3} = 1.05$$



LR

$$0.98 \text{ mole } FeCl_3 \times \frac{1Fe(OH)_3}{1FeCl_3} = 0.98 \text{ mole } Fe(OH)_3$$

$$2.97 \text{ mole } NaOH \times \frac{1Fe(OH)_3}{3NaOH} = 0.99 \text{ mole } Fe(OH)_3$$

the 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

Main group is X from?

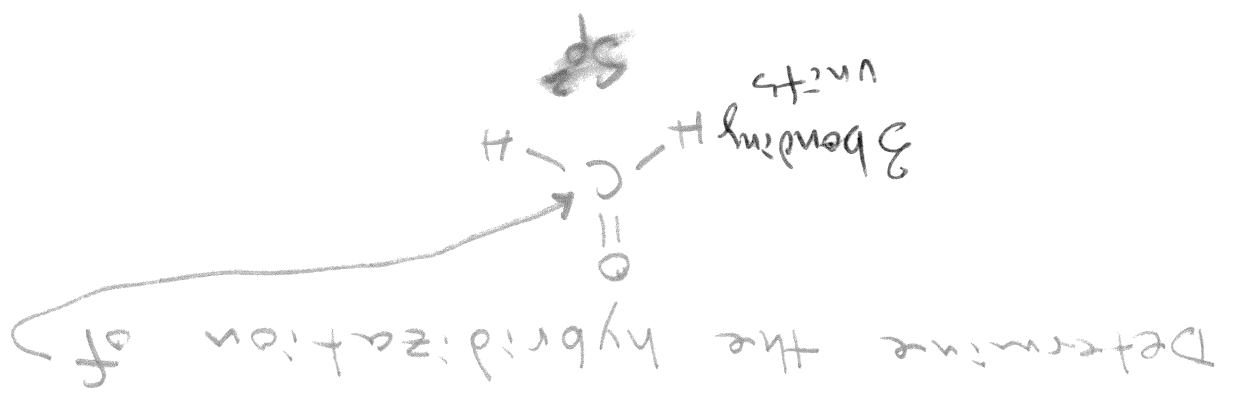


2A

7

Main group is X from: XBr_3

8



9

Given: $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

It actual is 2 g and % yield is 69.2%, find % yield.

$0.692 = \frac{\% \text{ yield}}{100}$

$\% \text{ yield} = 69.2\%$

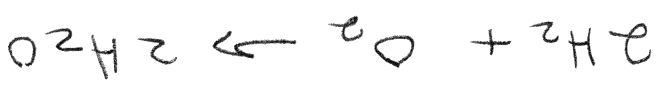
Al 2.1g % yield = 69.2%

$0.023 \text{ mole } C_3H_8 \times \frac{3CO_2}{1C_3H_8} = 0.069 \text{ mole } CO_2 \times 44 = 3.036 \text{ g } CO_2$

10

Given:

10 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

11

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



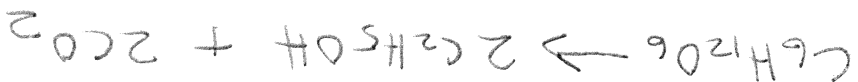
0.8g

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

$$0.03998 \text{ mole HF} \times \frac{2 \text{ NaF}}{8 \text{ HF}} = 0.009995 \text{ mole NaF} \times \frac{41.99\text{g}}{1 \text{ mole}} =$$

$$= 0.41969\text{g NaF}$$

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



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

$$7.5\text{g C}_2\text{H}_5\text{OH} \times \frac{1 \text{ mole}}{46.07\text{g}} \times \frac{1 \text{ C}_6\text{H}_{12}\text{O}_6}{2 \text{ C}_2\text{H}_5\text{OH}} \times \frac{180.1\text{g}}{1 \text{ mole}} = 14.7\text{g C}_6\text{H}_{12}\text{O}_6$$



(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.

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

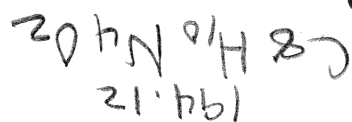
$$0.00641 \text{ mole Al}(\text{OH})_3 \times \frac{3 \text{ HCl}}{1 \text{ Al}(\text{OH})_3} \times \frac{36.46\text{g}}{1 \text{ mole}} = 0.701\text{g HCl} \rightarrow \text{mass used}$$

calc % mass first element in formula

ammonium nitrate

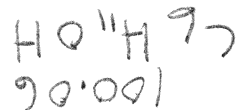


35% N



14

$$C = 49.47\%$$

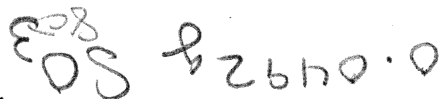


$$C = 71.92\%$$



$$C = 52.14\%$$

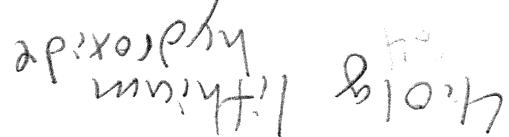
Calc moles



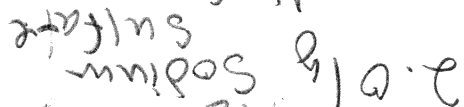
$$0.000614 \text{ mole}$$



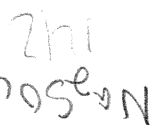
$$0.495 \text{ mole CHCl}_3$$



$$0.167 \text{ mole LiOH}$$



$$0.0142 \text{ mole Na}_2\text{SO}_4$$



Calc moles

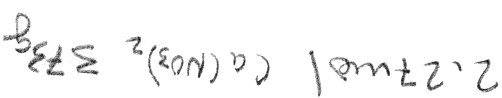


$$1.58 \times 10^{-18}$$

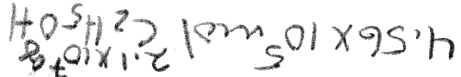


$$4.03 \times 10^{-22}$$

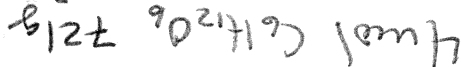
Calc moles



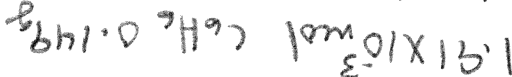
$$373 \text{ g}$$



$$2.1 \times 10^7 \text{ g}$$



$$721 \text{ g}$$



$$0.149 \text{ g}$$



$$612 \text{ g}$$

Calc mass



$$78 \text{ g}$$

Covalent or Ionic

HBr	C
CH ₄	C
H ₂ SO ₄	C
KCN	I
C ₂ H ₄	C

15 Identify the most covalent compound:

KMnO₄ HClO Na₂CO₃ BaO Li₂PO₄

Lead (II) chromate $PbCrO_4$
 Iron (II) sulfate heptahydrate $FeSO_4 \cdot 7H_2O$
 Copper (II) oxide CuO
 Sodium chloride $NaCl$
 Potassium carbonate K_2CO_3
 ammonium chloride NH_4Cl

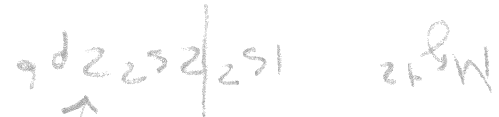
~~Formula~~

Sodium hydroxide $NaOH$
 Magnesium hydroxide $Mg(OH)_2$
 Copper (II) nitrate $Cu(NO_3)_2$
 Zinc acetate $Zn(C_2H_3O_2)_2$
 Barium carbonate $BaCO_3$
 Strontium chloride $SrCl_2$
 Silver chloride $AgCl$
 Lead (II) iodide PbI_2

~~Name~~

1002

Use Z_{eff} to explain why Mg^{+3} does not form.



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

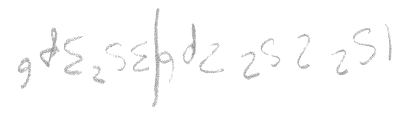
Nuclear charge is $\uparrow$, so Mg^{+3} does not form.

3d	...	1s	1s	1s	1s	1s	1s
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Valence EC of Ca^{+2} : $... 5s^2 5p^2$

Valence EC of S^{-2} : $... 3s^2 3p^6$

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



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

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

$Ca Z_{eff} = +2$

Draw the LF, Hyb, Shape:

18



19

Use arrows and words to rank the size of Ce^{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.



21

12.01	1.008	14.01
C	H	N

$$= 81.116$$

$$= 10.71 + (800.1) + 7(12.01) + 14.01 = 60.05$$

$$2(C_5H_7N) = C_{10}H_{14}N_2$$

$$C_5H_7N = EF$$

$$\frac{162.12}{81.116} = 1.998 \approx 2$$

23

$$M_w = 162.12$$

$$74.02g C \times \frac{1 \text{ mole}}{12.01} = 6.164 \text{ mole C} = 4.99 = 5C$$

$$8.70g H \times \frac{1 \text{ mole}}{1.008} = 8.63 \text{ mole H} = 6.99 = 7H$$

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

~~23~~



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

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

22

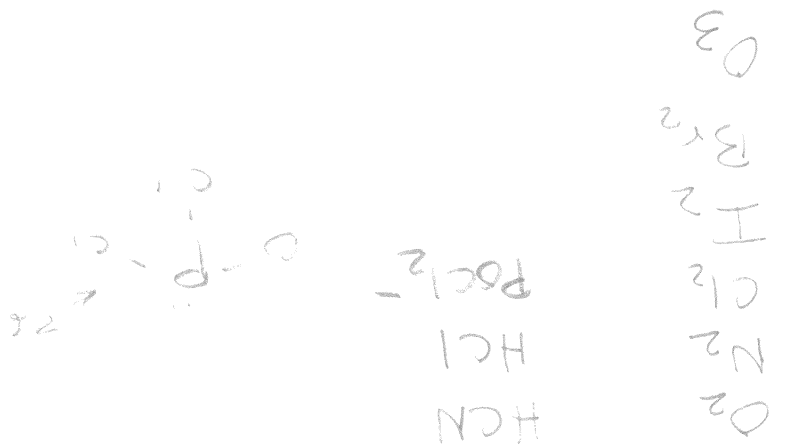
Given 0.01950 mole of Ba and 0.03899 mole Br find EF (2.678g) (3.115g)

~~22~~ Given moles

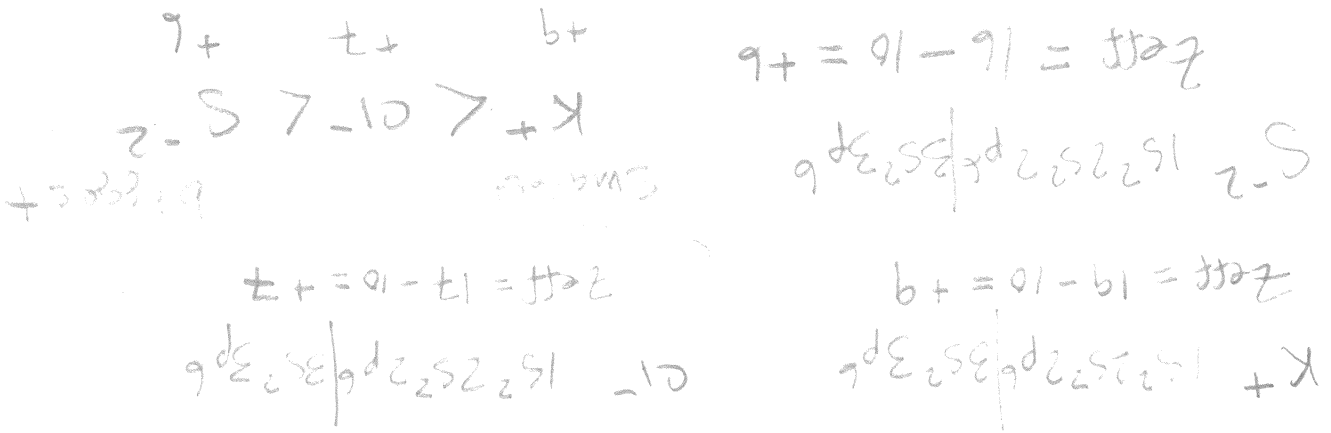
Identify the element with highest IE

24 Sn , Nb, Rh, Zr, Ag

Sketch the LF



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



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

S:-B, S:-F, S:-O, S:-N

S:-F > S:-O > S:-N > S:-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

ammonia (NH_3)

ammonium (NH_4^+)

Find EF

0.0130 mol C, 0.0390 mol H, 0.0065 mol O

$\text{C}_2\text{H}_6\text{O}$

46.068 C 4 H 12 O 2 92.136

11.66g iron, 5.01g O

$11.66\text{g Fe} \times \frac{55.85}{0.208735} = 31.15\text{g Fe}$

$5.01\text{g O} \times \frac{16.00}{0.313125} = 25.44\text{g O}$

Fe_2O_3

40% C, 6.7% H, 53.3% O

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

$M_m = 180$

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

Which element has a valence of $3e^-$? **29**

S, Ca, Ga, Sb, Br

Why is N^{3-} larger than N ? **30**

e^- repulsion

Why is the ionization of Mg^{+2} greater than Mg ? **31**

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

Why is Bo^{+2} smaller than Ba? **32**

Bo^{+2} is in an lower n level
increased z_{eff}

3. continued - % composition

24.1, 27.1, 48

calculate % composition all elements in $\text{Cu}(\text{NO}_3)_2$
22.6, 6.52, 19.4, 51.6
calculate % composition all elements in $(\text{NH}_4)_2\text{SO}_4$

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. $\text{C}_7\text{H}_6\text{O}_2$

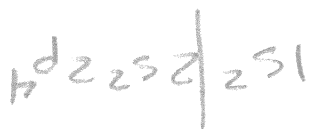
- c. The EF of a compound is CH_2Cl . The molar mass of the compound is 129 g.

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

- Find the formula for the hydrate that contains 0.737g MgSO_4 and 0.763g H_2O .

~~$\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$~~
 ~~$\text{MgSO}_4 \cdot 0.763$~~

35

Determine # core e^- in D:

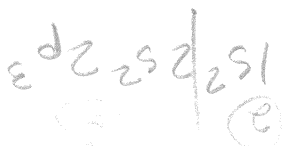
② core

36

Determine # core e^- in K

18

37

Calc Z_{eff} for valence N

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

38

Write the EC for Al^{+3} 