2017 Finals Review

① $LiNO_3$ - lithium ~~nitride~~ nitrate
Mg_3N_2 - magnesium nitride
$CoCO_3$ - cobalt (II) carbonate
$Ca(ClO_4)_2$ - calcium perchlorate
NiS_2 Nickel (IV) sulfide
N_2O_5 dinitrogen pentoxide
P_2Cl_6 diphosphorus hexachloride
S_2Br_4 disulfur tetrabromide
N_2I_7 dinitrogen heptaiodide
C_2Cl_4 dicarbon tetrachloride
$HC_2H_3O_2$ acetic acid
$HClO_4$ perchloric acid
H_3PO_4 phosphoric acid
H_2SO_3 sulfurous acid
$Fe(OH)_3$ iron (III) hydroxide
$Ba(OH)_2$ barium hydroxide

② aluminum chloride $AlCl_3$
cesium carbonate Cs_2CO_3
beryllium chromate $BeCrO_4$
iron (III) nitrate $Fe(NO_3)_3$
nickel (IV) cyanide $Ni(CN)_4$
copper (II) phosphate $Cu_3(PO_4)_2$
disulfur tetroxide S_2O_4
nitrogen monoxide NO
tricarbon hexafluoride C_3F_6
triphosphorus heptafluoride P_3F_7
nitrogen disulfide NS_2
Hydrofluoric acid HF
Hydroselenic acid H_2Se
beryllium hydroxide $Be(OH)_2$

Hydrophosphonic acid H_3P

nitrous acid HNO_2

Iron (II) hydroxide $Fe(OH)_2$

sulfuric acid H_2SO_4

(3) $(x)\ mol = 137.3\ g\ Ba_3N_2 \left| \frac{1\ mol}{439.9\ g\ Ba_3N_2} \right. = .3121\ mol$

(4) $3.36 \times 10^{-3}\ mol\ S_2Cl_4 \left| \frac{206.2\ g}{1\ mol} \right. = .693\ g$

(5) $18.21\ g\ Ca_3(PO_4)_2 \left| \frac{1\ mol}{310.18\ g} \right| \frac{6.022 \times 10^{23}\ molec}{1\ mol} = 3.534 \times 10^{22}\ molec$

(6) $19.95\ g\ Na_3PO_4 \left| \frac{1\ mol}{163.94\ g} \right. = .1217\ mol$

$75.0\ mL \left| \frac{L}{1000\ mL} \right. = .0750L$

$M = \frac{mol}{L} = \frac{.1217\ mol}{.0750L} = 1.62\ M$

(7) $110.5\ mL \left| \frac{L}{1000\ mL} \right| \frac{1.80\ mol}{1L} \left| \frac{182.93\ g}{1\ mol\ Co(NO_3)_2} \right. = 36.4\ g$

6 (8) a) Na_2SO_4

Na: $\frac{45.98\ g}{142.05\ g} = 32.37\%\ Na$

S: $\frac{32.07\ g}{142.05\ g} = 22.58\%\ S$

O: $\frac{64.00\ g}{142.05\ g} = 45.05\%\ O$

⑧ b) CCl_4

C: $\frac{12.01g}{153.81g}$ = 7.81% C

Cl: $\frac{141.80g}{153.81g}$ = 92.19% Cl

c) H_3PO_4

H: $\frac{3.03g}{98.00g}$ = 3.09% H

P: $\frac{30.97g}{98.00g}$ = 31.60% P

O: $\frac{64.00}{98.00}$ = 65.31% O

⑨ 5.00g Cu

5.37g compound

5.37g − 5.00g = .37g N

a) $\frac{5.00g\ Cu}{5.37g}$ = 93.1% Cu

$\frac{.37g}{5.37g}$ = ~~6.8~~ 6.9% N

b) *you can start with the masses in the problem or with your percents from a

$\frac{93.1g\ Cu}{63.55g} \left| \frac{1\ mol}{} \right.$ = $\frac{1.46\ mol\ Cu}{.49}$ = 3

$\frac{6.9g\ N}{14.01g} \left| \frac{1\ mol}{} \right.$ = $\frac{.49\ mol\ N}{.49}$ = 1

EF = Cu_3N

c) copper (I) nitride

8 (16) $\frac{74.02\text{ g C}}{12.01\text{ g}} \times \frac{1\text{ mol}}{} = \frac{6.163\text{ mol C}}{1.233} = 5$

$\frac{8.71\text{ g H}}{1.01\text{ g}} \times \frac{1\text{ mol}}{} = \frac{8.62\text{ mol H}}{1.233} = 7$ $\quad EF = C_5H_7N_1$

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

$\frac{MF}{EF} = \frac{162.26\text{ g/mol}}{81.13\text{ g/mol}} = 2$ $\quad MF = C_{10}H_{14}N_2$

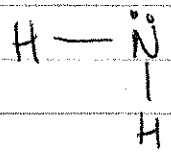
9 (17) 10.21 g cmpd
6.07 g Fe
10.21 g cmpd − 6.07 g Fe = 4.14 g F

Determine formula

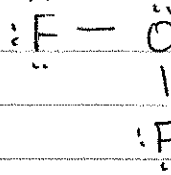
$\frac{6.07\text{ g Fe}}{55.85\text{ g}} \times \frac{1\text{ mol}}{} = \frac{.109\text{ mol Fe}}{.109} = 1$

$\frac{4.14\text{ g F}}{19.00\text{ g}} \times \frac{1\text{ mol}}{} = \frac{.218\text{ mol F}}{.109} = 2$

FeF_2 = iron (II) fluoride

10 (12) 

pyramidal
polar – slice off N away from Hs
H-bonds

11 (13) 

bent
polar – slice off O
dipole

12 (14) a) $Ca + F_2 \rightarrow CaF_2$ Combo

b) $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ Combust

c) $Al + 3AgNO_3 \rightarrow Al(NO_3)_3 + Ag$ SR

d) $2NaCl \rightarrow 2Na + Cl_2$ decomp

e) $CrBr_3 + (NH_4)_3PO_4 \rightarrow CrPO_4 + 3NH_4Br$ DR

f) $H_2SO_4 + 2KOH \rightarrow 2H_2O + K_2SO_4$ DR
$2HOH$

13 (15) a) $3Ca(NO_3)_2 + 2Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6NaNO_3$

b)

33.50 g Na_3PO_4	1 mol Na_3PO_4	1 mol $Ca_3(PO_4)_2$	310.18 g $Ca_3(PO_4)_2$
	163.94 g Na_3PO_4	2 mol Na_3PO_4	1 mol $Ca_3(PO_4)_2$

$= 31.69\ g\ Ca_3(PO_4)_2$

14 (16) $3SrCl_2 + 2Sn(NO_3)_3 \rightarrow 2SnCl_3 + 3Sr(NO_3)_2$

get TY using 7.85 g $SrCl_2$

7.85 g $SrCl_2$	1 mol $SrCl_2$	2 mol $SnCl_3$	225.21 g $SnCl_3$ = 7.43 g
	158.62 g $SrCl_2$	3 mol $SrCl_2$	1 mol $SnCl_3$ TY

$$\%\ yield = \frac{A}{T} = \frac{6.86\ g\ SnCl_3}{7.43\ g\ SnCl_3} = 92.3\%$$

This is a challenging one! skip it if you want!

15 ~~17~~ $2\ Na_3N + 3\ Co(NO_3)_2 \rightarrow Co_3N_2 + 6\ NaNO_3$

26.8 g Na_3N	1 mol Na_3N	1 mol Co_3N_2	204.81 g Co_3N_2	= 33.1 g Co_3N_2
	83 g Na_3N	2 mol Na_3N	1 mol Co_3N_2	TY

$$\%\ yield = \frac{A}{T}$$

$$.8561 = \frac{A}{33.1\ g} \qquad A = 28.3\ g$$

16 ~~18~~ $3\ K_2CO_3 + 2\ Fe(NO_3)_3 \rightarrow 6\ KNO_3 + Fe_2(CO_3)_3$

b a) 18.43 g K_2CO_3	1 mol K_2CO_3	1 mol $Fe_2(CO_3)_3$	291.6 g $Fe_2(CO_3)_3$
	138.2 g K_2CO_3	3 mol K_2CO_3	1 mol $Fe_2(CO_3)_3$

$= 12.96\ g\ Fe_2(CO_3)_3$

12.36 g $Fe(NO_3)_3$	1 mol $Fe(NO_3)_3$	1 mol $Fe_2(CO_3)_3$	291.6 g $Fe_2(CO_3)_3$
	241.8 g $Fe(NO_3)_3$	2 mol $Fe(NO_3)_3$	1 mol $Fe_2(CO_3)_3$

$= 7.452\ g\ Fe_2(CO_3)_3$

7.452 g $Fe_2(CO_3)_3$ produced

a) LR = ~~12.36~~ $Fe(NO_3)_3$

ER = K_2CO_3

17 (19) $2Na_3PO_4 + 3Mg(NO_3)_2 \rightarrow Mg_3(PO_4)_2 + 6NaNO_3$

a) $7.536\,g\ Na_3PO_4 \times \frac{1\ mol\ Na_3PO_4}{164\ g\ Na_3PO_4} \times \frac{1\ mol\ Mg_3(PO_4)_2}{2\ mol\ Na_3PO_4} \times \frac{262.9\ g\ Mg_3(PO_4)_2}{1\ mol\ Mg_3(PO_4)_2}$

$= 6.040\,g\ Mg_3(PO_4)_2$

$12.12\,g\ Mg(NO_3)_2 \times \frac{1\ mol\ Mg(NO_3)_2}{148.3\ g\ Mg(NO_3)_2} \times \frac{1\ mol\ Mg_3(PO_4)_2}{3\ mol\ Mg(NO_3)_2} \times \frac{262.9\ g\ Mg_3(PO_4)_2}{1\ mol\ Mg_3(PO_4)_2}$

$= 7.162\,g\ Mg_3(PO_4)_2$

Theoretical yield = $6.040\,g\ Mg_3(PO_4)_2$

LR = Na_3PO_4

ER = $Mg(NO_3)_2$

b) $\%\ yield = \frac{A}{T} = \frac{5.01\,g\ Mg_3(PO_4)_2}{6.040\,g\ Mg_3(PO_4)_2} = 82.9\%$

18 (30) $Sr(OH)_2 + 2HBr \rightarrow SrBr_2 + 2\,HOH$

2.94 g $Sr(OH)_2$	1 mol $Sr(OH)_2$	1 mol $SrBr_2$	247.42 g $SrBr_2$	= 5.98 g $SrBr_2$
	121.62 g $Sr(OH)_2$	1 mol $Sr(OH)_2$	1 mol $SrBr_2$	

5.07 g HBr	1 mol HBr	1 mol $SrBr_2$	247.42 g $SrBr_2$	= 7.75 g $SrBr_2$
	80.9 g HBr	2 mol HBr	1 mol $SrBr_2$	

a) LR = $Sr(OH)_2$
ER = HBr

b) 5.98 g $SrBr_2$