Chem 1 12 → 4-17 Stoich

Start Here ↓

(25) Calc mass H_2SO_4 needed to react with 15.2g of Al by:
$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$

(26) 1.8 mole Na reacts with bromine:
$2Na + Br_2 \rightarrow 2NaBr$
Calc moles NaBr.

(27) Calc moles O_2 required to react with 2.2g C_3H_8 to produce CO_2 and H_2O. Also, find theo yield in mass CO_2.

(28) 9.23g Al reacts with HCl:
$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$
Calc mass H_2 produced.

(29) Given:
$K_2PtCl_4 + 2NH_3 \rightarrow 2KCl + Pt(Cl_2(NH_3)_2$
If 2.5g K_2PtCl_4 reacts calculate mass $Pt(Cl_2(NH_3)_2$.

(30) Balance
$MnO_2 + Mg \rightarrow Mn + MgO$

(31) $P_4 + 6F_2 \rightarrow 4PF_3$
6.1g F_2 reacts with P_4. Calc mass PF_3 and mass P_4 that reacts.

(32) Aluminum metal reacted with oxygen to produce aluminum oxide. 1.5g Al reacts. Calc oxygen reacted and aluminum oxide produced.

(33) 1g lead (II) nitrate reacts with potassium iodide by the following rxn:
$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
Calc mass of PbI_2 produced.

(34) 2g iron (III) nitrate reacted with sodium hydroxide to produce iron (III) hydroxide and sodium nitrate. Calc mass of iron (III) hydroxide

(35) 1g of iron (III) oxide reacts with an excess of carbon monoxide:
$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
Calc mass of CO_2.
If the actual yield is 0.76g CO_2, calc % yield.

(36) Calc the # of neutrons in an atom of carbon with a mass number of 13.

(37) Given 8g NH_3, Calc molecules.

(38) Given 6.03×10^{28} units of $FeSO_4 \cdot 7H_2O$, calc the mass of H_2O.

(39) Write the outer valence orbital diagram for Br^-.

(40) List the coloration of flames expected for
Li =
Na =
K =

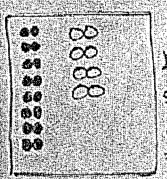
(41) Write the EC expected for Mg and Cl after they react.

(42) Calc the mass of 1.73 mole CaH_2.

(43) Calc the molecules in 4.2g H_2SO_4.

(44) Balance:
$AgNO_3 + Ca \rightarrow Ag + Ca(NO_3)_2$

(45) Given:
$2H_2 + O_2 \rightarrow 2H_2O$
The following ratio of reactants are combined:



Draw the box that shows the correct # products.

(46) Given:
$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
12.5g $C_6H_{12}O_6$ reacts. Calc mass O_2 needed for rxn.

(47) 3.41g hydrogen reacts with nitrogen to form ammonia. Calc mass NH_3 produced.

(48) Given:
$2KClO_3 \rightarrow 2KCl + 3O_2$
If 80.5g O_2 is formed in the rxn, Calc mass KCl.

(49) write the balanced ionization equations:
$Mg(OH)_2$
$Na_2C_2O_4$
$Cr(ClO_4)_3$

(50) 150g sulfur dioxide reacts with calcium carbonate and oxygen to form calcium sulfate and carbon dioxide. Calc calcium sulfate and calcium carbonate used.

(51) 5g of lithium reacts with nitrogen to form lithium nitride.
a) Calc mass lithium nitride
b) If 6.47g Li_3N produced calc % yield.

25

Calculate the mass H_2SO_4 required to dissolve 15.2g of Al by:

$$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$$

$$15.2g\,Al \times \frac{1\,mole}{26.98g\,Al} \times \frac{3H_2SO_4}{2\,Al} \times \frac{98.09g\,H_2SO_4}{mole} = 82.9g\,H_2SO_4$$

$\frac{1\,mole}{26.98g\,Al}$ → 0.563 mole Al

$\frac{3H_2SO_4}{2\,Al}$ → 0.845 mole H_2SO_4

26

Given $2Na + Br_2 \rightarrow 2NaBr$

1.8 mole 1.4 mol

Find L.R

$$1.8\,mole\,Na \times \frac{2NaBr}{2Na} = 1.8\,mole\,NaBr$$ (L.R)

$$1.4\,mole\,Br_2 \times \frac{2NaBr}{1Br_2} = 2.8\,mole\,NaBr$$

Given $4Al + 3O_2 \rightarrow 2Al_2O_3$

16 mole 13 mole

Find L.R

$$16\,mole\,Al \times \frac{2Al_2O_3}{4Al} = 8\,mole\,Al_2O_3$$ (L.R)

$$13\,mole\,O_2 \times \frac{2Al_2O_3}{3O_2} = 8.66\,mole\,Al_2O_3$$

27

Calc moles O_2 required to combust 2.2g C_3H_8 to CO_2 and H_2O.

a) balanced eq

b) calc moles O_2

c) calc mass CO_2 produced.

$$1\,C_3H_8 + 5\,O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$$

2.2g

$$2.2\text{g}\,C_3H_8 \times \frac{1\text{ mole}}{44\text{g}} = 0.05\text{ mole}\,C_3H_8 \times \frac{5\,O_2}{1\,C_3H_8} = 0.25\text{ mole } O_2$$

$$0.05\text{ mole}\,C_3H_8 \times \frac{3\,CO_2}{1\,C_3H_8} = 0.15\text{ mole}\,CO_2 \times 44 = 6.6\text{g}\,CO_2$$

Calc grams oxygen in 1g CO_2.

$$1\text{g}\,CO_2 \times \frac{1\text{ mole}}{44\text{g}\,CO_2} = 0.023\text{ mole}\,CO_2 \times \frac{2\,O}{1\,CO_2} =$$

$$= 0.0455\text{ mole O} \times \frac{16\text{g O}}{\text{mole}} = 0.727\text{g O}$$

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9.23g Al reacts with HCl by:

$$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$$

Calc mass hydrogen produced.

$$9.23g\ Al \times \frac{1mole}{27g\ Al} \times \frac{3H_2}{2Al} \times \frac{2.016g\ H_2}{mole} = 1.04g\ H_2$$

29

Given: $K_2PtCl_4 + 2NH_3 \rightarrow 2KCl + PtCl_2(NH_3)_2$

Calc $PtCl_2(NH_3)_2$ is produced from 2.5g K_2PtCl_4. How much mass NH_3 needed?

$$2.5g\ K_2PtCl_4 \times \frac{1mole}{415g\ K_2PtCl_4} \times \frac{1\ PtCl_2(NH_3)_2}{1\ K_2PtCl_4} \times$$

$$2.5g\ K_2PtCl_4 \times \frac{1mole}{415g} \times \frac{2NH_3}{1K_2PtCl_4} \times \frac{300g\ PtCl_2(NH_3)_2}{mole} =$$

$$\times \frac{17g\ NH_3}{mole} = 0.205g\ NH_3 \qquad = 1.81g\ PtCl_2(NH_3)_2$$

Balance the following equations Key

For efficiency the physical states have been left off. Rewrite equation in notebook, then balance.

30

1. $2H_2O_2 \rightarrow 2H_2O + O_2$

2. $2Ag + H_2S \rightarrow Ag_2S + H_2$

3. $2FeO + C \rightarrow 2Fe + CO_2$

4. $Cl_2 + 2KI \rightarrow 2KCl + I_2$

5. $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

6. $3KBr + H_3PO_4 \rightarrow K_3PO_4 + 3HBr$

7. $TiCl_4 + 4Na \rightarrow 4NaCl + Ti$

8. $SiI_4 + 2Mg \rightarrow Si + 2MgI_2$

9. $MnO_2 + 2Mg \rightarrow Mn + 2MgO$

10. $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$

123.89 38 87.97

$P_4 + 6F_2 \rightarrow 4PF_3$

? 6.1g ?

6.4g → 9.8g

$0.16052 \text{ mole } F_2 \times \frac{4PF_3}{6F_2} = 0.1070 \text{ mole } PF_3$

$\times \frac{87.97 \text{ g}}{\text{mole}} =$

$0.16052 \text{ mole } F_2 \times \frac{1P_4}{6F_2} =$ $= 9.414 \text{ g } PF_3$

If actual is 7.988g calc % yield.

$= 0.02675 \text{ mole } P_4 \times 123.89 \text{ g} =$

84.76%

$= 3.314 \text{ g } P_4$

2.98 32.00 53.96 (g)

$4Al + 3O_2 \rightarrow 2Al_2O_3$ (mole)

1.5g ? ?

$1.5 \text{ g Al} \times \frac{1 \text{ mole}}{26.98 \text{ g}} = 0.05559 \text{ mole Al} \times \frac{2Al_2O_3}{4Al} =$

$= 0.02779 \text{ mol } Al_2O_3 \times$

$\times \frac{101.96 \text{ g}}{\text{mole}} =$

$= 2.834 \text{ g } Al_2O_3$

$0.05559 \text{ mole Al} \times \frac{3O_2}{4Al} =$

$= 0.04169 \text{ mole } O_2 \times \frac{32 \text{ g}}{\text{mole}} =$

$= 1.334 \text{ g } O_2$

331.2 461.02

$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

$1g\ Pb(NO_3)_2 \times \frac{1}{331.2} = 0.00302\ mole \times 461.02$

$= 1.4g\ PbI_2$

$3g\ Pb(NO_3)_2$

$0.00906\ mole \times 461.02 = 4.2g\ PbI_2$

241.85 18L 106.85

$Fe(NO_3)_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaNO_3$

$\frac{2g}{241.85} = 0.0083\ mole\ Fe(OH)_3 \times 106.85 =$

$= 0.88g\ Fe(OH)_3$

$2g\ Pb(NO_3)_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaNO_3$

261.3 233

$\frac{2g}{261.3} = 0.00763\ mole \times 233 = 1.78g\ BaSO_4$

35 1g iron (III) oxide reacts with an excess of carbon monoxide to form iron and carbon dioxide.

a) bal eq
b) calc Theo yield CO_2
c) If act. yield is 0.76g CO_2, calc % yield.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

1g

$$1g\ Fe_2O_3 \times \frac{}{159.7} = 0.006262\ mole\ Fe_2O_3 \times \frac{3CO_2}{1\ Fe_2O_3} = 0.018785\ mole\ CO_2$$

$$\times 44 = 0.83g\ CO_2$$

$$\%\ yield = \frac{0.76}{0.83} \times 100 = 91.56\%$$

a) bal eq
b) calc moles Fe_2O_3
c) calc moles CO_2
d) calc mass CO_2
e) cal % yield

chem 7

^{13}C

of

36

Calculate the # of neutrons in an atom of carbon with a mass number of thirteen.

7

Given 8g of NH_3, calc molecules.

2.83×10^{23} molecules

37

Given 6.03×10^{28} formula units of $FeSO_4 \cdot 7H_2O$, calc the mass of H_2O

38

$$6.03 \times 10^{28} \text{ molecules} \times \frac{1 \text{ mole}}{6.02 \times 10^{23}} = 1.002 \times 10^{5} \text{ mole}$$

$$1.002 \times 10^{5} \text{ mole } FeSO_4 \cdot 7H_2O \times \frac{7 \ H_2O}{1 \ FeSO_4 \cdot 7H_2O} = 7.012 \times 10^{5} \text{ mol } H_2O$$

$$\times 18 = 1.26 \times 10^{7} \text{ g } H_2O$$

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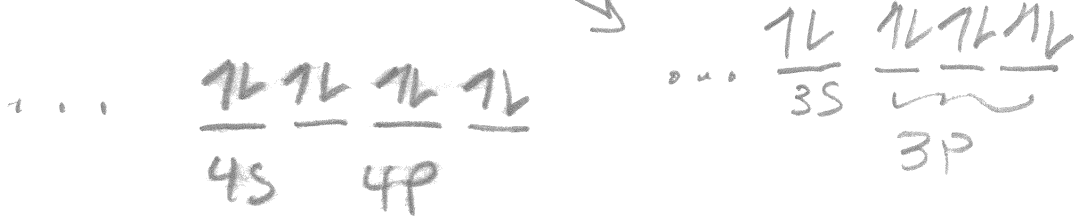
write the outer valence OD

for Br^-, Ca^{+2}



40

List the coloration of flames expected for the rxn of the following metals in H_2O, Li, Na, K

Li = red

Na = yellow

K = peach

41

Write the correct EC for Mg and Cl, after they react.

$Mg^{+2} = 1s^2 2s^2 2p^6$

$Cl^- = 1s^2 2s^2 2p^6 3s^2 3p^6$

(5) [redacted]) calc mass of 1.73 mole CaH_2 (72.8g)

[redacted]) calc moles $Mg(NO_3)_2$ in 3.25g $Mg(NO_3)_2$ (0.0219 mole)

[redacted]) calc molecules in 0.245 mole CH_3OH (1.48×10^{23} molecules)

[redacted]) calc H atoms in 0.585 mole C_4H_{10} (3.52×10^{24} H atoms)

[redacted]) calc grams in 2.50×10^{-2} mole $MgCl_2$ (2.38g $MgCl_2$)

(6) Identify as ionic (I) or Molecular (M)

B_2H_6 M
CH_3OH M
$LiNO_3$ I
Sc_2O_3 I
$CsBr$ I
$NOCl$ M

[redacted]) Name

Li_2O lithium oxide
$Fe_2(CO_3)_3$ iron (III) carbonate
$NaClO$ sodium hypochlorite
$(NH_4)_2SO_3$ ammonium sulfite
$Sr(CN)_2$ strontium cyanide

Calculate moles

$5g\ Na_2CO_3$ (106) = 0.047

$7g\ NaOH$ (40) = .175

$3g\ HC_2H_3O_2$ (60) = 0.05

$8.2g\ H_2SO_4$ (98) = 0.084

$21g\ MgCr_2O_7$ (200) = 0.105

$4.5g\ H_2SO_4$ (98) 2.76×10^{22}

4.2 2.58×10^{22}

$11.3g\ MgCr_2O_7$ (200) 2.6×10^{22}

Balancing Equations Answers

1) $\underline{1}\ Al(NO_3)_3 + \underline{1}\ (NH_4)_3PO_4 \rightarrow \underline{1}\ AlPO_4 + \underline{3}\ NH_4NO_3$

2) $\underline{2}\ AgF + \underline{1}\ CaCl_2 \rightarrow \underline{2}\ AgCl + \underline{1}\ CaF_2$

3) $\underline{1}\ ZnBr_2 + \underline{1}\ Pb(NO_2)_2 \rightarrow \underline{1}\ Zn(NO_2)_2 + \underline{1}\ PbBr_2$

4) $\underline{1}\ C_2H_4O_2 + \underline{2}\ O_2 \rightarrow \underline{2}\ CO_2 + \underline{2}\ H_2O$

5) $\underline{1}\ Ca + \underline{1}\ CuF_2 \rightarrow \underline{1}\ CaF_2 + \underline{1}\ Cu$

6) $\underline{3}\ H_2SO_4 + \underline{2}\ B(OH)_3 \rightarrow \underline{1}\ B_2(SO_4)_3 + \underline{6}\ H_2O$

7) $\underline{1}\ S_8 + \underline{8}\ O_2 \rightarrow \underline{8}\ SO_2$

8) $\underline{2}\ H_2O_2 \rightarrow \underline{1}\ O_2 + \underline{2}\ H_2O$

9) $\underline{2}\ K + \underline{1}\ F_2 \rightarrow \underline{2}\ KF$

10) $\underline{3}\ AgNO_3 + \underline{1}\ Ga \rightarrow \underline{3}\ Ag + \underline{1}\ Ga(NO_3)_3$

11) $\underline{1}\ N_2 + \underline{3}\ H_2 \rightarrow \underline{2}\ NH_3$

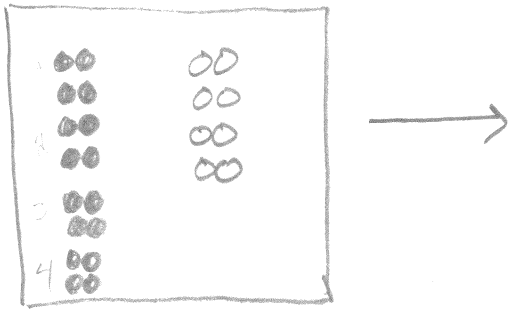
12) $\underline{1}\ NaCl + \underline{1}\ H_2SO_4 \rightarrow \underline{1}\ NaHSO_4 + \underline{1}\ HCl$

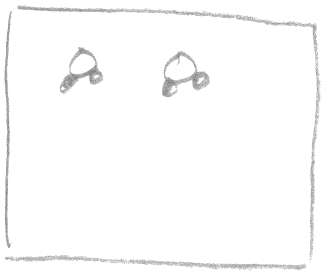
13) $\underline{2}\ KMnO_4 \rightarrow \underline{1}\ K_2MnO_4 + \underline{1}\ MnO_2 + \underline{1}\ O_2$

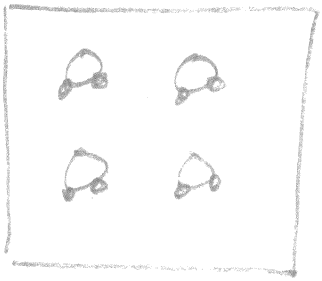
14) $\underline{1}\ Fe + \underline{2}\ AgNO_3 \rightarrow \underline{1}\ Fe(NO_3)_2 + \underline{2}\ Ag$

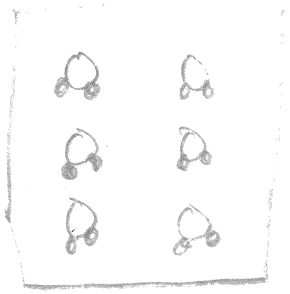
15) $\underline{3}\ Li_2SO_4 + \underline{2}\ K_3PO_4 \rightarrow \underline{2}\ Li_3PO_4 + \underline{3}\ K_2SO_4$

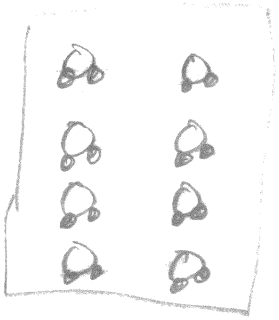
Given: $2H_2 + O_2 \rightarrow 2H_2O$ Draw the box that accurately reflects the rxn shown above:











White Board

Given $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

If 12.5g $C_6H_{12}O_6$, find the O_2 required in mass.

$$12.5g\,C_6H_{12}O_6 \times \frac{1\,mole}{180g\,C_6H_{12}O_6} \times \frac{6\,O_2}{1\,C_6H_{12}O_6} \times \frac{32g}{mole} =$$

$$= 13.3g\,O_2$$

3.41g hydrogen reacts with nitrogen:

$$N_2 + 3H_2 \rightarrow 2NH_3$$

Calc mass ammonia formed.

$$3.41g\,H_2 \times \frac{1\,mole}{2.016g\,H_2} \times \frac{2NH_3}{3H_2} \times \frac{17gNH_3}{mole} =$$

$$= 19.1g\,NH_3$$

Given: $2KClO_3 \rightarrow 2KCl + 3O_2$

If 80.5g O_2 formed in the rxn, find mass of KCl.

$$80.5g\,O_2 \times \frac{1\,mole}{32g} \times \frac{2\,KCl}{3\,O_2} \times \frac{74.6gKCl}{1\,mole} =$$

$$= 125g\,KCl$$

(9) Take the following formulas and write a balanced ionization equation:

Example: $MgCl_2 \rightarrow Mg^{+2} + 2Cl^-$

a. $Mg(OH)_2 \rightarrow Mg^{+2} + 2OH^-$

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b. $Na_2C_2O_4 \rightarrow 2Na^+ + C_2O_4^{-2}$

c. $Cr(ClO_4)_3 \rightarrow Cr^{+3} + 3ClO_4^-$

d. $Zn(CN)_2 \rightarrow Zn^{+2} + 2CN^-$

e. $Al(HSO_4)_3 \rightarrow Al^{+3} + 3HSO_4^-$

(10) Split compounds into ions

$Li_3N \rightarrow Li^+, N^{-3}$

$CaO \rightarrow Ca^{+2} + O^{-2}$

$Fe_2O_3 \rightarrow Fe^{+3}\ O^{-2}$

$FeS \rightarrow Fe^{+2}\ S^{-2}$

$Pb(MnO_4)_2$ $Pb^{+2}\ MnO_4^-$

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$$2SO_2 + 2CaCO_3 + O_2 \rightarrow 2CaSO_4 + 2CO_2$$

150g ? ? ?

2.34 mole SO_2

(a) $150g\ SO_2 \times \frac{1\ mole}{64.07g\ SO_2} \times \frac{2CaCO_3}{2SO_2} \times \frac{100.1g\ CaCO_3}{1\ mole} =$

$= 234g\ CaCO_3$ used

(b) $2.34\ mol\ SO_2 \times \frac{2CaSO_4}{2\ mol\ SO_2} \times \frac{136.1g\ CaSO_4}{mole} =$

$= 319g\ CaSO_4$

$NH_4NO_3 \rightarrow N_2O + 2H_2O$

(13) ~~10.005g~~ $NH_4NO_3 \times \frac{1\ mole\ NH_4NO_3}{80.04g\ NH_4NO_3} = 0.125\ mole\ NH_4NO_3$

$0.125\ mole\ NH_4NO_3 \times \frac{1N_2O}{1NH_4NO_3} \times \frac{44g\ N_2O}{mole} = 5.5g\ N_2O$

$0.125\ mole\ NH_4NO_3 \times \frac{2H_2O}{1NH_4NO_3} \times \frac{18g\ H_2O}{mole} = 4.5g\ H_2O$

(4) Find EF and MF

39.993% C MF = 180.18

6.726% H

53.28% O

(5) EF adipic 146.14

49.31% C 100 − 49.31 − 43.79 = 6.9% H

43.79% O

X% H

(6) A 0.0476g organic unknown is combusted in air and produces some CO_2 and 0.0428g H_2O. The unk. only contains C, H. Calc EF and MF. Mm = 120.

EF = C_3H_4

MF = C_9H_{12}

(7) Calcs & chem. Equations

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$$6Li + N_2 \rightarrow 2Li_3N$$

5g excess ?

$$5g\,Li \times \frac{1\,mole}{6.94g} = 0.7205\,mole\,Li \times \frac{2Li_3N}{6Li} = 0.2402\,mole\,Li_3N \times \frac{34.83g}{mole} = 8.36g$$

If 6.47g Li_3N produced what is % yield: 6.47/8.36 x 100 = 77.4 %