chem8 1-23-18
+chem7

(1) write net ionic equation, identify solid:

$Ba(NO_3)_2 + Na_2CO_3 \rightarrow ?$

$Pb(NO_3)_2 + 2NaBr \rightarrow ?$

$Na_2SO_4 + Hg(NO_3)_2 \rightarrow ?$

(2) write net ionic equation:

$HBr_{(aq)} + KOH_{(aq)} \rightarrow H_2O_{(l)} + KBr_{(aq)}$

$Ca(OH)_{2(aq)} + H_2SO_{4(aq)} \rightarrow CaSO_{4(s)} + 2H_2O_{(l)}$

$NaOH_{(aq)} + HC_2H_3O_{2(l)} \rightarrow H_2O_{(l)} + NaC_2H_3O_{2(aq)}$

(3) Calc oxidation # of designated atom:

$\overset{+}{B}rF_3$, $\overset{+}{P}H_4^+$, $Na_2\overset{+}{S}O_4$, Mn_2O_3

$\overset{0}{Ca} + 2H_2O \rightarrow Ca(OH)_2 + \overset{0}{H_2}$

(4) Re-write equation on board. (a) Identify OX # of all atoms. (b) Identify reactant OX and Red.

(5) Given:

$16H^+ + 2Cr_2O_7^{-2} + C_2H_5OH \rightarrow 4Cr^{+3} + 2CO_2 + 11H_2O$

35.46mL of 0.05961 M $Cr_2O_7^{-2}$ is used to titrate 28g blood plasma.

a) Calc mass % C_2H_5OH in blood.

b) Calc OX # of Cr and C in $Cr_2O_7^{-2}$ and C_2H_5OH.

c) Identify whats OX and Red.

(6) 25mL of 0.15M MnO_4^- reacts with iron(II) by:

$8H^+ + MnO_4^- + 5Fe^{+2} \rightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$

Calc mass Fe^{+2} reacted.

(7) Calc molecules in 0.3 mole $MgCl_2$.

(8) Calc total atoms in $CH_3CH_2OCH_2CCl_3$

(9) Calc molecules in 2g Na_2SO_4.

(10) 0.755g $CuSO_4 \cdot XH_2O$ is heated. After heating, the mass is 0.483g. Find X.

(11) Select the acid:

$NaOH$, SO_4^{-2}, NH_3, $HClO_4$

(12) select the base

Al^{+3}, HCl, H_2SO_4, NH_3

(13) Select the neutralization equation:

$Ba^{+2} + SO_4^{-2} \rightarrow BaSO_4$

$HCl \rightarrow H^+ + Cl^-$

$2H_2 + O_2 \rightarrow 2H_2O$

$Cu(OH)_2 + 2HCl \rightarrow 2H_2O + CuCl_2$

(14) Given:

$C_7H_6O_3 + C_4H_6O_3 \rightarrow C_9H_8O_4 + C_2H_4O_2$

2g of $C_7H_6O_3$ react with 4g of $C_4H_6O_3$.

a) Find L.R

b) Calc mass $C_9H_8O_4$

c) If actual yield is 2.10g, calc % yield.

(15) Given

$7H_2O + 4H^+ + 3As_2O_3 + 4NO_3^- \rightarrow 4NO + 6H_3AsO_4$

Identify molecule OX and Red.

(16) what volume of 0.109M $Pb(NO_3)_2$ is required to react with 20mL of 0.21M NaCl?

$Pb(NO_3)_2 + 2NaCl \rightarrow PbCl_2 + 2NaNO_3$

(17) Calc mass $CaCl_2$ needed to make 200mL of 0.1M $CaCl_2$.

(18) 4g $BaCl_2$ is combined with 4g Na_2SO_4.

a) Bal eq

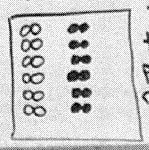
b) Find L.R

c) Calc mass solid

d) Write net ionic equation

(19) Given: $\overset{\infty}{N}_2 + 3\overset{\infty}{H}_2 \rightleftharpoons 2NH_3$

The ratio reactants are combined:



Draw box that shows prod. and remaining reactants.

(20) A compound contains 74.03g C, 8.70g H, 17.27g N. The Mm is 162.12. Find EF and MF.

(21) Given:

$3NaOH_{(aq)} + FeCl_{3(aq)} \rightarrow Fe(OH)_{3(s)} + 3NaCl_{(aq)}$

Identify the spectator ions.

(22) A white powder is 43.64% P and 56.36% O. The Mm is 283.88. Find EF and MF.

(23) Given: $A + 4B \rightarrow 3C$

The Mm of C is 46. If the rxn produces 90g when 1 mole A reacts, Calc % yield.

1 write net ionic equation, identify sol.d:

$Ba(NO_3)_2 + Na_2CO_3 \longrightarrow ?$

$Ba^{+2} + CO_3^{-2} \longrightarrow BaCO_3(s)$

$Pb(NO_3)_2 + 2NaBr \longrightarrow ?$

$Pb^{+2} + 2Br^- \longrightarrow PbBr_2(s)$

$Na_2SO_4 + Hg(NO_3)_2 \longrightarrow ?$

$Hg^{+2} + SO_4^{-2} \longrightarrow HgSO_4(s)$

2 write net ionic equation:

$HBr_{(aq)} + KOH_{(aq)} \longrightarrow H_2O_{(l)} + KBr_{(aq)}$

$H^+ + OH^- \longrightarrow H_2O$

$Ca(OH)_{2(aq)} + H_2SO_4^{(aq)} \longrightarrow CaSO_4^{(aq)} + 2H_2O_{(l)}$

$H^+ + OH^- \longrightarrow H_2O$

$NaOH_{(aq)} + HC_2H_3O_{2(l)} \longrightarrow H_2O_{(l)} + NaC_2H_3O_{2(aq)}$

$Na^+ + OH^- + HC_2H_3O_2 \longrightarrow H_2O + Na^+ + C_2H_3O_2^-$

$OH^- + HC_2H_3O_2 \longrightarrow H_2O + C_2H_3O_2^-$

3 Cal ox # of dosigrated elemet:

BrF_3 : $Br - 3 = 0$, $Br = +3$

PH_4^+ : $P + 4 = +1$, $P = -3$

Na_2SO_4 : $S - 8 = -2$, $S = +6$

Mn_2O_3 : $2Mn - 6 = 0$, $2Mn = 6$, $Mn = +3$

4 Rewrite equation,
Identify ox #S all elements
Identify the reactant that is oxidized:

$$\overset{0}{Ca(s)} + \overset{+1\ -2}{H_2O(l)} \longrightarrow \overset{+2\ -2\ +1}{Ca(OH)_2(aq)} + \overset{0}{H_2(g)}$$

ox R

5 Given:

$C - 4 = 0$, $C = +4$

$$16H^+ + 2Cr_2O_7^{-2} + C_2H_5OH \rightarrow 4Cr^{+3} + 2CO_2 + 11H_2O$$

35.46mL, 0.05961M $Cr_2O_7^{-2}$ is used to titrate 28g of blood plasma.

1) Calc mass percent of alcohol (C_2H_5OH) in blood.

2) Calc ox # Cr in $Cr_2O_7^{-2}$ and C in C_2H_5OH

3. Identify whats OX + R

$$0.03546\,L \times \frac{0.05961\ mole\ Cr_2O_7^{-2}}{L} = 0.00211\ mole\ Cr_2O_7^{-2} \times \frac{1\ C_2H_5OH}{2\ Cr_2O_7^{-2}}$$

$$= 0.001056\ mole\ C_2H_5OH \times \frac{46g}{mole} = \frac{0.0486g\ C_2H_5OH}{28g} \times 100 = 0.173\%\ C_2H_5OH$$

$2Cr - 14 = -2$, $2Cr = 12$, $Cr = +6$

$6 + 2C - 2 = 0$, $2C = 4$, $C = +2$

minus C_2H_5OH = OX, $Cr_2O_7^{-2}$ = R

Magnesium reacts with HCl to produce gas. 0.1648g of the gas is collected in 2L at 1atm and 25°C. what is the ident of gas $(CO_2, (H_2), O_2, CH_4$

25mL of of a 0.15M soln of permanganate reacts with an excess of hydrogen ion and iron (II) by the following rxn:

$$MnO_4^- + 8H^+ + 5Fe^{+2} \rightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$$

Calc mass of iron (II) reacted.

$$0.025L \times \frac{0.15 \text{ mole } MnO_4^-}{L} = 0.00375 \text{ mole } MnO_4^-$$

$$0.00375 \text{ mole } MnO_4^- \times \frac{5Fe^{+2}}{1 MnO_4^-} = 0.01875 \text{ mole } Fe^{+2}$$

$$\times \frac{55.85g}{\text{mole}} = 1.047g \; Fe^{+2}$$

5.2g

278

White Board

Calc molecules in 0.3 mole $MgCl_2$

$$0.3 \text{ mole } MgCl_2 \times \frac{6.022 \times 10^{23} \text{ molec}}{1 \text{ mole}} = 1.8 \times 10^{23} \text{ molec}$$

Calc total atoms in $CH_3CH_2OCH_2CCl_3$

(15)

Calc molecules in 2g Na_2SO_4 (142)

$$2 \text{ g } Na_2SO_4 \times \frac{1 \text{ mole}}{142 \text{ g}} = 0.014084 \text{ mole } Na_2SO_4 \times N_A$$

$$= 8.5 \times 10^{21} \text{ } Na_2SO_4 \text{ molecules}$$

Calc atoms of C in 20 molecules of C_6H_6. (120 atoms C)

A 0.755g $CuSO_4 \cdot X H_2O$ (159.55) is heated releasing all the water. The mass of remaining $CuSO_4$ is 0.483g.

$$\frac{0.483 \text{ g}}{159.55} = 0.003027 \text{ moles } CuSO_4$$

$$\frac{0.015111 \text{ mole } H_2O}{0.003027 \text{ mole } CuSO_4} = 4.99 \approx 5$$

$0.755 - 0.483 = 0.272 \text{ g } H_2O$

$0.015111 \text{ mole } H_2O$

WB Acids / Bases

11

Given the following list, select the acids:

$NaOH$, SO_4^{-2}, NH_3, $HClO_4$, ClO_3^-

Of the following compounds, select the Bronsted base:

12

Al^{+3}, HCl, H_2SO_4, NH_3, HI

13

Select the neutralization equation:

a. $Ba^{+2} + SO_4^{-2} \rightarrow BaSO_4$

b. $HCl \rightarrow H^+ + Cl^-$

c. $2H_2 + O_2 \rightarrow 2H_2O$

d. $Cu(OH)_2 + 2HCl \rightarrow 2H_2O + CuCl_2$

e. $Ba(OH)_2 \rightarrow Ba^+ + 2OH^-$

14

An electron in Na is elevated to $n=6$ from $n=2$. when the e^- falls from $n=6$ to $n=4$, light is _____

emitted absorbed

(4) 14 Given:

$$C_7H_6O_3 + C_4H_6O_3 \longrightarrow C_9H_8O_4 + C_2H_4O_2$$

2.00g 4.00g

ⓐ Calc L.R

ⓑ Calc mass $C_9H_8O_4$ (Theoretical)

If the actual yield of $C_9H_8O_4$ is 2.10g, what is the % yield?

$$2.00\text{g } C_7H_6O_3 \times \frac{1\text{mole}}{138.12} = 0.01448\text{mole } C_7H_6O_3 \times \frac{1\,C_9H_8O_4}{1\,C_7H_6O_3} = 0.01448\text{mol } C_9H_8O_4$$ (lim R)

$$4.00\text{g } C_4H_6O_3 \times \frac{1\text{mole}}{102.09} = 0.03918\text{mol } C_4H_6O_3 \times \frac{1\,C_9H_8O_4}{C_4H_6O_3} = 0.03918\text{mol } C_9H_8O_4$$

$$0.01448\,C_9H_8O_4 \times \frac{180.15\text{g } C_9H_8O_4}{\text{mole}} = 2.609\text{g } C_9H_8O_4$$

$$\%\text{ yield} = \frac{2.10\text{g}}{2.609\text{g}} \times 100 = 80.49\,\%$$

7/8/15

$2As - 6 = 0$
$2As = 6$
$As = +3$

3. Which species acts as an O.Agent

$$7H_2O + 4H^+ + 3\overset{+3\ -2}{As_2O_3} + 4\overset{N-6=-1}{\overset{+5}{N}O_3^-} \rightarrow 4\overset{+2\ -2}{NO} + 6H_3\overset{+5}{As}O_4$$

$3 + As - 8 = 0$
$As - 5 = 0$
$As = +5$

As_2O_3: O
R.A

NO_3^-: R
O.A

9. $NH_3 + H_2O \longrightarrow NH_4^+ + OH^-$

In the rxn above, the species that act as bases include: NH_3, OH^-

The species that act as acids include:

H_2O, NH_4

5. Which of the following form solutions that highly support an electrical current.

a. [redacted]

b. $HC_2H_3O_2$

c. $PbCl_2$

d. HNO_2

e. Hg_2Cl_2

f. Na_2SO_4 $NaNO_3$

What volume of 0.109M $Pb(NO_3)_2$ is required to react entirely with 20mL 0.21M NaCl

$$Pb(NO_3)_2 + 2NaCl \rightarrow PbCl_{2(s)} + 2NaNO_3$$

0.109M 20mL 0.21M

0.0042 moles NaCl

$$0.0042 \text{ moles NaCl} \times \frac{Pb(NO_3)_2}{2NaCl} = 0.0021 \text{ moles } Pb(NO_3)_2$$

4-22

$$\frac{0.0021 \text{ moles } Pb(NO_3)_2}{\frac{0.109 \text{ mole}}{L}} = 0.01926 \text{ L}$$

19.3mL

[redacted] 17

A Scientist needs 200mL of 0.1M $CaCl_2$ (110.99). Calc mass $CaCl_2$ needed.

$0.2L \times 0.1M\ CaCl_2 \times 110.99 =$

$= 2.2198g\ CaCl_2$

[redacted]

A Scientist needs a 100mL of 1M Na_2SO_4. There is a 4M Stock Na_2SO_4 in lab. Calc mLs Stock needed and mLs H_2O.

$(4M)(V_1) = (1M)(0.1L)$

0.025L or 25mL 4M Stock

75mL H_2O

White Board Chem 8

18

Theo yield of NaCl in mass

208.2	142	233	58.44
$BaCl_2$	+ Na_2SO_4	→ $BaSO_4$	+ 2NaCl
4g	4g		

4.47g $BaSO_4$

2.25g NaCl

$4g\ BaCl_2 \times \frac{1\ mole}{208.2} = 0.019212296\ mole\ BaCl_2 \times \frac{2\ NaCl}{1\ BaCl_2} = 0.03842459\ mole\ NaCl$

$4g\ Na_2SO_4 \times \frac{1\ mole}{142} = 0.028169\ mole\ Na_2SO_4 \times \frac{2\ NaCl}{1\ BaCl_2} = 0.056338\ mole\ NaCl$

Remaining Reactant

$Ba^{+2} + SO_4^{-2} \rightarrow BaSO_4$

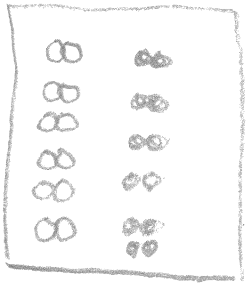
$0.019212296\ mole\ BaCl_2 \times \frac{1\ Na_2SO_4}{1\ BaCl_2} = 0.019212296\ mole\ Na_2SO_4$

$\times \frac{142g}{mole} = 2.728g\ Na_2SO_4\ used$

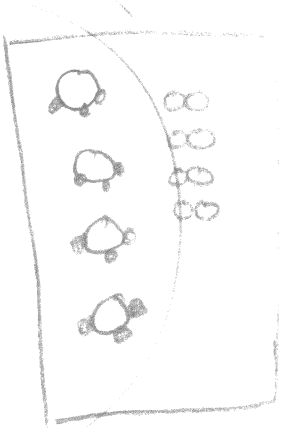
Remain 1.27g

19

$N_2 + 3H_2 \rightarrow 2NH_3$



Draw a box for the products. It contains the correct # NH_3 and left-over reactant.



$6N_2 \times \frac{2NH_3}{1N_2} = 12NH_3$

$6H_2 \times \frac{2NH_3}{3H_2} = 4NH_3$

$6H_2 \times \frac{1N_2}{3H_2} = 2N_2\ used$

E22 given moles

Given 0.01950 mole of Ba and 0.03899 mole Br

find EF

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

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

$$BaBr_2 = EF$$

20

$M_m = 162.12$

11b

$$74.03 \text{ g C} \times \frac{1 \text{ mole}}{12.01} = \frac{6.164 \text{ mol C}}{1.233\ldots} = 4.999 = 5 \text{ C}$$

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

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

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

$C_5H_7N = EF$

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

60.05 7.056 + 14.01

$5(12.01) + 7(1.008) + 14.01 =$

$= 81.116$

C	H	N
12.01	1.008	14.01

Identify spectator ions

$CrBr_2(aq) + Na_2CO_3(aq) \rightarrow CrCO_{3(s)} + 2NaBr(aq)$

Na^+, Br^-

21

$3NaOH(aq) + FeCl_3(aq) \rightarrow Fe(OH)_3(s) + 3NaCl(aq)$

Na^+, Cl^- $\quad Fe^{+3} + 3OH^- \rightarrow Fe(OH)_3$

$2NaCl(aq) + Hg_2(C_2H_3O_2)_2(aq) \rightarrow Hg_2Cl_2(s) + 2NaCl(aq)$

$Na^+, C_2H_3O_2^-$

$NH_4Cl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NH_4NO_3(aq)$

NH_4^+, NO_3^-

$MgS(aq) + CuCl_2(aq) \rightarrow CuS(s) + MgCl_2(aq)$

Mg^{+2}, Cl^-

$2Na_3PO_4(aq) + 3NiCl_2(aq) \rightarrow Ni_3(PO_4)_2(s) + 6NaCl(aq)$

Na^+, Cl^-

Example 1

A white powder is analyzed by MS and found to contain 43.64% P and 56.36% O. The Mm of the compound is 283.88. Find EF and MF

$$56.36\text{g O} \times \frac{1}{16.00} = \frac{3.5225\text{ mole O}}{1.4\ldots} \quad 2.5 \times 2$$

$$43.64\text{g P} \times \frac{1}{30.97} = \frac{1.4091\ldots\text{ mole P}}{1.4\ldots} = 1\text{P} \quad \times 2$$

61.94 80

P_2O_5 EF

141.94

$$\text{Find MF} = \frac{\text{Mm MF}}{\text{Mm EF}} = \frac{283.88}{141.94} = 2$$

P_4O_{10}

Example 2

An oxide is 2.16g osmium (Os) and 0.73g oxygen. Calc EF

$$2.16\text{g Os} \times \frac{1}{190.2} = \frac{0.01135\ldots\text{ mole Os}}{0.0113\ldots} = \text{Os}$$

$$0.73\text{g O} \times \frac{1}{16.00} = \frac{0.045625\text{ mole O}}{0.0113\ldots} = 4\text{O}$$

OsO_4 osmium tetroxide

Nylon is 63.68% C, 12.38% N, 9.8% H and 14.14% O. Calculate EF

$63.68\text{g C} \times \frac{\quad}{12.01} = 5.295587 \rightarrow 5.99$

$12.38\text{g N} \times \frac{\quad}{14.01} = 0.8836515 \rightarrow 1$

$9.8\text{g H} \times \frac{\quad}{1.008} = 9.722222 \rightarrow 11$

$14.14\text{g O} \times \frac{\quad}{16.00} = 0.88375$

$C_6H_{11}NO$

Osmium

A compound contains 0.0113684 moles of osmium and 0.045625 moles of oxygen. Calculate the EF.

OsO_4

Thiocyanate

What is the weight percent of carbon in the thiocyanate ion? (SCN^-) 58.08 — 20.68%

Consider $A + 4B \rightarrow 3C$ 468

1 mole

90 g = actual

If the rxn produces 90g when 1 mole A is reacted, what is the percent yield of the rxn? 65%