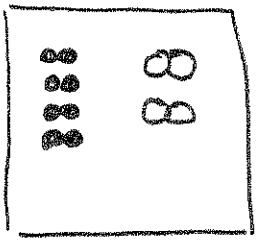
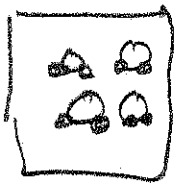
#1 Given:

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

The following reactants are mixed:



Draw box that represents products



#2

Sodium Sulfate forms hydrates.

Find the correct MF if a Sodium Sulfate hydrate looses 43% mass upon heating

Assume 1g

$$1.0 - 0.43_g = 0.57_g\ Na_2SO_4$$

$$0.57_g\ Na_2SO_4 \times \frac{1\text{mole}}{142} = 0.00401408\overline{5}\ \text{mole}\ Na_2SO_4$$

(45.98 + 32.06 + 64 = 142)

$$0.43_g\ H_2O \times \frac{1\text{mole}}{18.02_g} = 0.02386237\overline{5}\ \text{mole}\ H_2O$$

$$\frac{\text{moles}\ H_2O}{\text{moles}\ Na_2SO_4} = \frac{0.02386237\overline{5}}{0.00401408\overline{5}} =$$

$$= 5.94 \cong 6$$

$$\boxed{Na_2SO_4 \cdot 6H_2O}$$

What volume of oxygen at STP is required to react with 3g Ca in the following rxn?

$V = ?$ STP

$2Ca + O_2(g) \rightarrow 2CaO$

3g

$$0.075 \text{ mols } Ca \times \frac{1 O_2}{2 Ca} = 0.0375 \text{ moles } O_2$$

$$V = \frac{nRT}{P} = \frac{(0.0375)(R)(273K)}{1 \text{ atm}}$$

$V = 0.84 L$

0°C, 1 atm

1L	1L	1L
O_2 32	CO_2 44	NH_3 17

(10) calc.

$KE = \frac{3}{2}RT$

~~3405 J~~

greatest mass? CO_2

greatest energy: same

$KE = \frac{3}{2} R (273)$

$KE = \frac{3405 J}{\text{mole}} \times 0.0444 \text{ mole}$

KE = 151.3 J

#4

A compound contains only C, H, O.

0.01068 g comp. combusted gives 0.0160 g CO_2 and 0.00437 g H_2O. M_m = 176.1. EF & MF

$$0.0160\,g\,CO_2 \times \frac{12.01}{44.01} = 0.004369\,g\,C$$

$$0.00437\,g\,H_2O \times \frac{2.016\,g\,H}{18.02\,g} = 0.000489\,g\,H$$

$$g\,O = 0.01068\,g\,comp - 0.004369 - 0.000489 =$$

$$g\,O = 0.005822\,g\,O$$

$$0.004369\,g\,C \times \frac{}{12.01} = \frac{0.00036378\ mole\ C}{0.00036378} = 1 \times 3$$

$$0.000489\,g\,H \times \frac{}{1.008} = \frac{0.000485119\ mole\ H}{0.00036} = 1.33355 \times 3$$

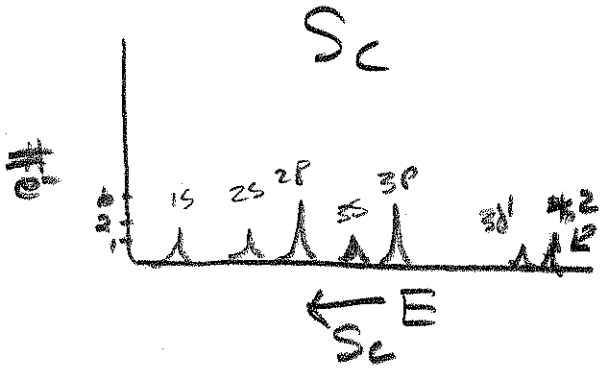
$$0.005822\,g\,O \times \frac{}{16} = 0.00036385\ mole\ O = 1 \times 3$$

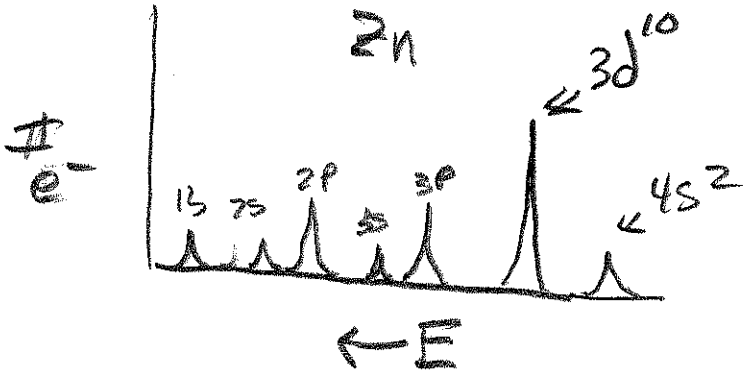
$C_3H_4O_3 = 88$

$$MF \Rightarrow \frac{176.1}{88} = 2$$

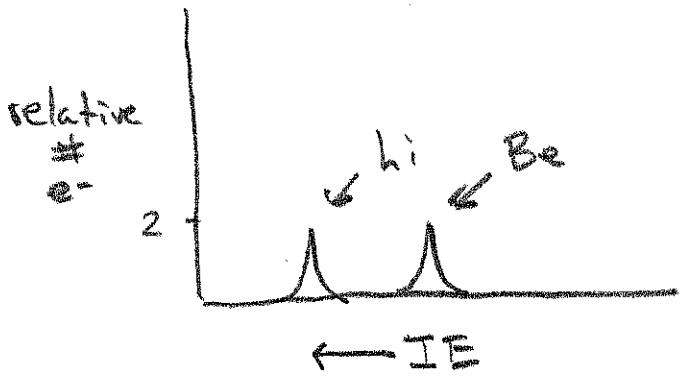
$C_6H_8O_6$

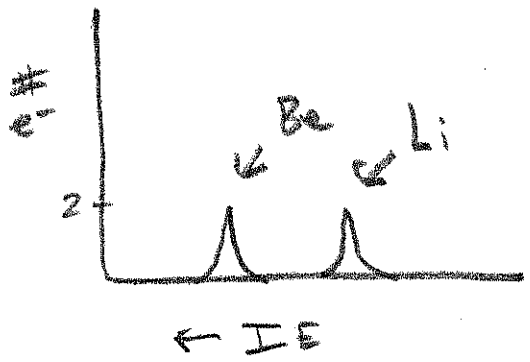
45 write the PES for Sc, Zn





(5) Identify the PES that correctly depicts the relationship in IE between the 1S e⁻'s of Li and Be.





7

$2As - 6 = 0$

$2As = 6$

$As = +3$

4. Which species acts as an O. Agent

$$7H_2O + 4H^+ + 3\overset{+3\ -2}{As_2O_3} + 4\overset{N-6=-1}{\overset{+5}{N}O_3^-} \rightarrow 4\overset{+2\ -2}{NO} + 6\overset{+5}{H_3AsO_4}$$

$3 + As - 8 = 0$

$As - 5 = 0$

$As = +5$

As_2O_3: O, R.A

NO_3^-: R, O.A

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

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

8

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

a. MnF_2

b. $HC_2H_3O_2$

c. $PbCl_2$

- d. HNO_2

e. Hg_2Cl_2

f. Na_2SO_4

9

1. Split
2.

$MnO_4^- + Fe^{+2} \rightarrow Fe^{+3} + Mn^{+2}$

$5\left(Fe^{+2} \rightarrow Fe^{+3} + e^-\right)$

$MnO_4^- \rightarrow Mn^{+2}$

$5Fe^{+2} \rightarrow 5Fe^{+3} + 5e^-$

$MnO_4^- \rightarrow Mn^{+2} + 4H_2O$

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

(+7 over MnO_4^-; +2 over Mn^{+2})

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

$5Fe^{+2} \rightarrow 5Fe^{+3} + 5e^-$

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

10

1atm, 355K

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

10g excess

↑ calc. volume of CO_2 produced. The gas is collected at 1atm and 355K.

$$\frac{10\text{g } C_3H_8}{1} \times \frac{1\text{mole}}{44.1\text{g}} = 0.2268\text{ mole } CO_2 \times \frac{3CO_2}{1\ C_3H_8} = \underline{0.6803\text{mole } CO_2}$$

$PV = nRT$

$$V = \frac{nRT}{P} = \frac{(0.6803\text{ mole } CO_2)\left(0.0821\ \frac{\text{L·atm}}{\text{mole·K}}\right)(355\text{K})}{1\text{atm}}$$

$V = 19.87\text{L } CO_2 \text{ gas}$

Methane, CH_4, is placed in a 5L flask.

The flask contains 7.68g CH_4 at 19°C, what is the P?

$$P = \frac{nRT}{V} = 2.3 \text{ atm}$$

Calculate the density of hydrogen sulfide gas (H_2S) at 56°C, 967mmHg.

$$PM_m = dRT$$

$$d = \frac{PM_m}{RT} = \frac{(1.2723)(34.082)}{R(329)} = \frac{1.605 g}{L}$$

Calculate the volume of 0.5 mole NH_3 gas at STP? 11.205 L

Two different gases are in canisters of the same volume and T.

V=1L	V=1L
A	B
X atm	0.5X atm
1.2g	1.2g

which gas has a molar mass of 60, if the other is 30.

P is directly related to moles so $\frac{P_A}{P_B} = \frac{1}{0.5} = \frac{2}{1}$

P_A has 2x as many parts so

A = 30 B = 60

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

$$2.16\text{g Os} \times \frac{}{190.2} = \frac{0.01136\text{ mol Os}}{0.01136} = 1$$

$$0.73\text{g} \times \frac{}{16.} = \frac{0.0456\text{ mol O}}{0.01136} = 4$$

OsO_4

12

A compound is 65.4% C, 5.5% H, 29.1% O what is EF?

$$65.4\text{g C} \times \frac{}{12.01} = \frac{5.44546\text{ mol C}}{1.81875} = 2.99$$

$$5.5\text{g H} \times \frac{}{1.008} = \frac{5.456349\text{ mol H}}{1.81875} = 2.99$$

$$29.1\text{g O} \times \frac{}{16\text{g}} = \frac{1.81875\text{ mol O}}{1.81875} = 1$$

C_3H_3O

6g aluminum metal reacts with 6g hydrochloric acid to produce aluminum chloride and hydrogen gas.

(a) balanced equation
(b) L.R
(c) calc mass hydrogen gas
(d) calc mass remaining reactant
(e) write EC of Al^{+3} and Cl^-
(f) Is it easier to remove an e^- from Al or Cl? Must cite P. trends.

$$\underline{2}Al + \underline{6}HCl \longrightarrow \underline{2}AlCl_3 + \underline{3}H_2$$

$$6g\ Al \times \frac{}{26.98} = 0.2224 mole\ Al \times \frac{3H_2}{2Al} = 0.3336 mole\ Al$$

$$6g\ HCl \times \frac{}{36.458} = 0.16457 mol\ HCl \times \frac{3H_2}{6HCl} = 0.08223 mole\ H_2$$

L.R

$$\times \frac{2.016g}{mole} =$$

$$= 0.1659 g\ H_2$$

$$0.16457 mole\ HCl \times \frac{2Al}{6HCl} = 0.05485 mole\ Al \times \frac{26.98g}{mole} =$$

$$= 1.48g\ Al\ used$$

(e) $Al^{+3} = 1s^2 2s^2 2p^6$

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

(f) Al easier. IE increases L→R and decreases down and left ... a group. Al is left.

$$Al\ remains = 6g - 1.48g = 4.52g\ Al$$

Remain

14

7. A student mass KHP and dissolves 1.4g in 20mL of H_2O. The soln is titrated with NaOH and it takes 21mL to reach the endpoint. The Mm of KHP is $\frac{204.2\text{g}}{\text{mole}}$.

$$\frac{1.4\text{g}}{204.2} = 0.00685 \text{ moles KHP} = OH^-$$

$$\frac{0.00685 \text{ moles NaOH}}{0.021\text{L}} = 0.3265 \text{ M NaOH}$$

8. 1Kg of H_2O liquid at 100°C is converted to steam at same T. $\Delta H_{vap} = \frac{40.7\text{ KJ}}{\text{mole}}$. Calculate ΔH for the process.

$$\frac{1000\text{g}}{18} = 55.6 \text{ mole} \times \frac{40.7\text{ KJ}}{\text{mole}} = 2263\text{ KJ}$$

9. During the unbalance equation below six moles of gaseous products are formed. If the mole fraction of SO_2 and CO_2 is 0.67 and 0.33 respectively, calculate the mass of CS_2 reacted.

$$CS_2 + O_2 \longrightarrow CO_2 + SO_2$$

A volume of 14.1mL of 0.021M solution of MnO_4^- was reacted with 0.51g of $CoSO_4 \cdot 7H_2O$.

(154.93 / 96 / 280.93)

Given: Same as MnO_4^- rxn with $FeSO_4 \cdot 7H_2O$

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

$0.0141L \times 0.021 =$
$= 0.0002961$ moles

0.51g
0.00182 moles Co^{+2}

$\times \frac{5}{1} \times 280.93 =$
$= 0.4159 / 0.51 \times 100 = 82\%$

MnO_4^-: $0.0002961 \text{ moles} \times \frac{5Co^{+3}}{1 MnO_4^-} = 0.0014805 \text{ moles } Co^{+3}$

Co^{+2}: $0.00182 \text{ moles } Co^{+2} \times \frac{5Co^{+3}}{5Co^{+2}} = 0.00182 \text{ moles } Co^{+3}$

Limiting Reactant

a. Identify Lim Reactant

b. At the point where 14.1mL of the MnO_4^- is added what color is the soln? The solution is clear
not at equivalence

c. Calc mass of Co^{+3} produced.

$0.0014805 \text{ moles } Co^{+3} \times \frac{58.93 g}{\text{mole}} =$

$= 0.0872g \; Co^{+3}$