

AP Chem Unit 2

$$\begin{array}{r} 22.99 \\ 16.00 \\ \hline 1.008 \\ \hline 39.998 \\ \uparrow \end{array}$$

EX 1 Find:

$$M = ?$$

11.5g NaOH

1.50L

Soln. $M = \frac{\text{moles}}{L}$

$$\left(\frac{11.5g \text{ NaOH}}{1} \right) \left(\frac{1 \text{ mole NaOH}}{40.00g \text{ NaOH}} \right) \left(\frac{1}{1.50L} \right)$$

$$= .192 \text{ M NaOH}$$

$$\begin{array}{r} 1.008 \\ 35.45 \\ \hline 36.458 \\ \uparrow \end{array}$$

EX 2 Find:

$$M = ?$$

1.56g HCl

26.8 ml = .0268L

Soln. $M = \frac{\text{moles}}{L}$

$$\left(\frac{1.56g \text{ HCl}}{1} \right) \left(\frac{1 \text{ mole HCl}}{36.46g \text{ HCl}} \right) \left(\frac{1}{.0268L} \right)$$

$$= 1.596 = 1.60 \text{ M HCl}$$

EX 3 ? Concentration of Co^{+2} & NO_3^- in .50M $\text{Co}(\text{NO}_3)_2$

$$\left(\frac{.50 \text{ moles } \text{Co}(\text{NO}_3)_2}{1L} \right) \left(\frac{1 \text{ mole } \text{Co}^{+2}}{1 \text{ mole } \text{Co}(\text{NO}_3)_2} \right) = .50 \text{ M } \text{Co}^{+2}$$

$$\left(\frac{.50 \text{ moles } \text{Co}(\text{NO}_3)_2}{1L} \right) \left(\frac{2 \text{ mole } \text{NO}_3^-}{1 \text{ mole } \text{Co}(\text{NO}_3)_2} \right) = 1.0 \text{ M } \text{NO}_3^-$$

? Concentration of Fe^{+3} & ClO_4^- in 1M

$$\left(\frac{1 \text{ mole } \text{Fe}(\text{ClO}_4)_3}{1L} \right) \left(\frac{1 \text{ mole } \text{Fe}^{+3}}{1 \text{ mole } \text{Fe}(\text{ClO}_4)_3} \right) = 1 \text{ M } \text{Fe}^{+3}$$

$$\left(\frac{1 \text{ mole } \text{Fe}(\text{ClO}_4)_3}{1L} \right) \left(\frac{3 \text{ mole } \text{ClO}_4^-}{1 \text{ mole } \text{Fe}(\text{ClO}_4)_3} \right) = 3 \text{ M } \text{ClO}_4^-$$

AP Chem Unit 2

Ex 4/ ? # moles of Cl^- in 1.75L of $1.0 \times 10^{-3} \text{ M ZnCl}_2$

$$\left(\frac{1.0 \times 10^{-3} \text{ moles ZnCl}_2}{\text{L}} \right) \left(\frac{1.75 \text{ L}}{1} \right) \left(\frac{2 \text{ moles Cl}^-}{1 \text{ mole ZnCl}_2} \right) = \boxed{3.5 \times 10^{-3} \text{ moles Cl}^-}$$

Ex 5/ Given:

• 14M NaCl in Blood Serum

• V of Blood contains 1.0 mg NaCl

$$\left(\frac{1.0 \text{ mg NaCl}}{1} \right) \left(\frac{1 \text{ g}}{1000 \text{ mg}} \right) = 1.0 \times 10^{-4} \text{ g NaCl}$$

$$M = \frac{\text{moles}}{\text{L}}$$

$$L = \frac{\text{moles}}{M}$$

$$\left(\frac{1.0 \times 10^{-4} \text{ g NaCl}}{1} \right) \left(\frac{1 \text{ mole NaCl}}{58.44 \text{ g NaCl}} \right) \left(\frac{1 \text{ L Blood}}{14 \text{ moles NaCl}} \right)$$

$$= 1.2 \times 10^{-5} \text{ L Blood}$$

or

$$= 12 \text{ mL Blood}$$

Ex 6/ Given:

$$2 \times 39.10 = 78.20$$

1.00L $\text{K}_2\text{Cr}_2\text{O}_7$

$$2 \times 52.00 = 104.0$$

• 200M $\text{K}_2\text{Cr}_2\text{O}_7$

$$7 \times 16.00 = 112.0$$

? g $\text{K}_2\text{Cr}_2\text{O}_7$

$$\underline{294.2 \text{ g}}$$

Soln:

$$M = \frac{\text{moles}}{\text{L}}$$

$$\left(\frac{200 \text{ moles K}_2\text{Cr}_2\text{O}_7}{1 \text{ L}} \right) \left(\frac{1.00 \text{ L}}{1} \right) \left(\frac{294.2 \text{ g K}_2\text{Cr}_2\text{O}_7}{1 \text{ mole K}_2\text{Cr}_2\text{O}_7} \right)$$

$$= 58.84 \text{ g}$$

$$= \boxed{58.8 \text{ g K}_2\text{Cr}_2\text{O}_7}$$

AP Chem Unit 2

Ex 7/

given:
 $V_1 = ?$

$$M_1 = 16M \text{ H}_2\text{SO}_4$$

$$V_2 = 1.5L$$

$$M_2 = 0.10M \text{ H}_2\text{SO}_4$$

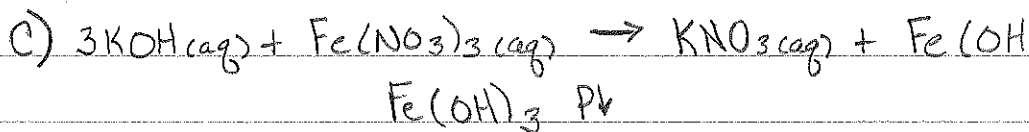
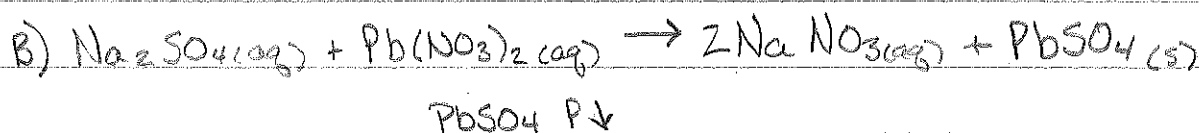
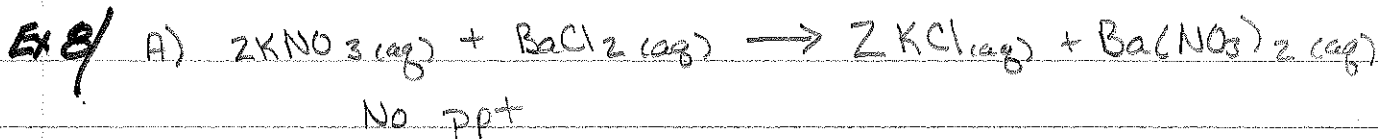
Soln:

$$M_1 V_1 = M_2 V_2$$

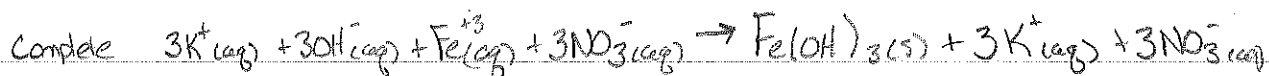
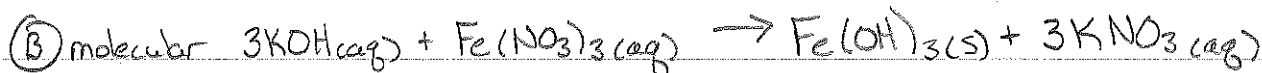
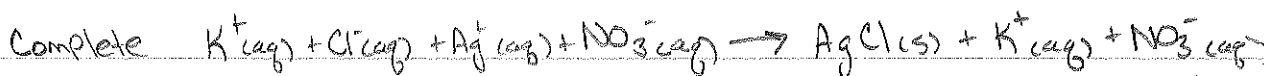
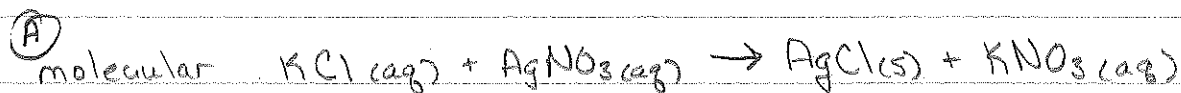
$$V_1 = \frac{M_2 V_2}{M_1} = \frac{(0.10M \text{ H}_2\text{SO}_4)(1.5L)}{(16M \text{ H}_2\text{SO}_4)}$$

$$V_1 = 0.0094L \text{ or } 9.4ml \text{ H}_2\text{SO}_4$$

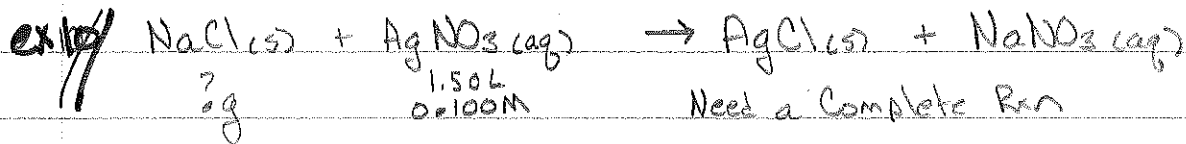
Ex 8/



Ex 9/



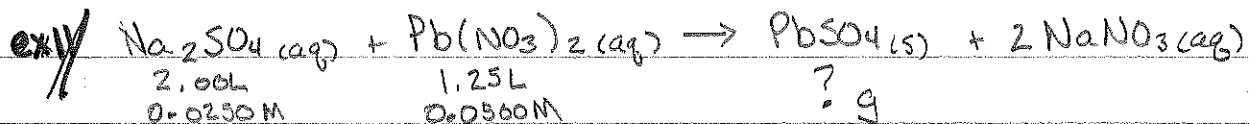
AP Chem Unit 2



Na 22.99
Cl 35.45

58.44

$$\left(\frac{0.100 \text{ moles AgNO}_3}{1 \text{ L}} \right) \left(\frac{1.50 \text{ L}}{1} \right) \left(\frac{1 \text{ mole NaCl}}{1 \text{ mole AgNO}_3} \right) \left(\frac{58.44 \text{ g NaCl}}{1 \text{ mole NaCl}} \right) = \boxed{8.77 \text{ g NaCl}}$$



$$\left(\frac{0.0250 \text{ moles Na}_2\text{SO}_4}{1} \right) \left(\frac{2.00 \text{ L}}{1} \right) = \overset{.0500 \text{ moles}}{\text{Na}_2\text{SO}_4} \left(\frac{0.0500 \text{ moles Pb(NO}_3)_2}{1} \right) \left(\frac{1.25 \text{ L}}{1} \right)$$

	Na_2SO_4	$\text{Pb(NO}_3)_2$	PbSO_4	$\text{Pb(NO}_3)_2$
I	.0500 moles	.0625 moles	0	
C	-X	-X	X	
	<hr/> -.0500 moles	<hr/> -.0500 moles	<hr/> .0500 moles	
E	0	.0125 moles	.0500 moles	
	Limiting	Excess	Produced	

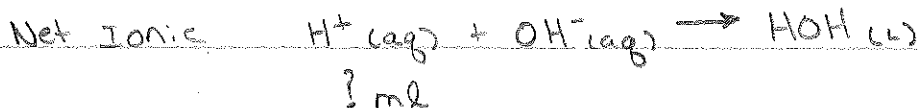
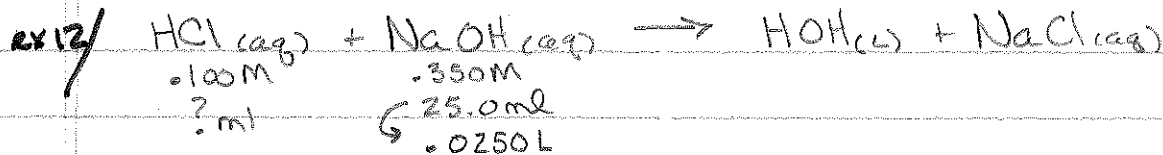
Pb 207.2
S 32.06

0.4116.00 64.00

303.3

$$\left(\frac{0.0500 \text{ moles Pb(NO}_3)_2}{1} \right) \left(\frac{303.3 \text{ g PbSO}_4}{1 \text{ mole PbSO}_4} \right) = \boxed{15.2 \text{ g PbSO}_4}$$

AP Chem Unit 2

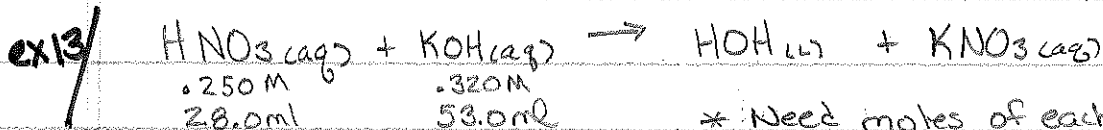


* Neutralization moles Acid = moles Base

$$\left(\frac{0.350 \text{ moles OH}^-}{1\text{L}} \right) \left(\frac{.0250\text{L}}{1} \right) = .00875 \text{ moles OH}^-$$

$$\left(\frac{.00875 \text{ moles OH}^-}{1} \right) \left(\frac{1 \text{ mole H}^+}{1 \text{ mole OH}^-} \right) \left(\frac{1\text{L}}{.100 \text{ moles H}^+} \right) = \boxed{.0875 \text{ L H}^+ \text{ or } 87.5 \text{ mL H}^+}$$

molar Ratio



? M of Ion's
 In Excess

* Need moles of each Rxn
 * Which is Limiting?

1st moles of each Reactant $\left(\frac{.250 \text{ moles HNO}_3}{1\text{L}} \right) \left(\frac{28.0 \text{ ml}}{1} \right) \left(\frac{1\text{L}}{1000 \text{ ml}} \right) = .00700 \text{ m HNO}_3$

H^+ OH^- HOH $\left(\frac{.320 \text{ moles KOH}}{1\text{L}} \right) \left(\frac{53.0 \text{ ml}}{1} \right) \left(\frac{1\text{L}}{1000 \text{ ml}} \right) = .0170 \text{ moles KOH}$

I .00700m .0170m 0

C -X -X X

- .00700 - .00700 .00700

E \emptyset .0100 moles .00700m
 Limiting Excess OH^- HOH produced

28.0ml
 53.0 mL
 81.0 ml Total V

Excess $\left(\frac{.0100 \text{ moles OH}^-}{1} \right) \left(\frac{1}{81.0 \text{ ml}} \right) \left(\frac{1\text{L}}{1000 \text{ ml}} \right) = \boxed{.123 \text{ M OH}^- \text{ Excess}}$

AP Chem unit 2

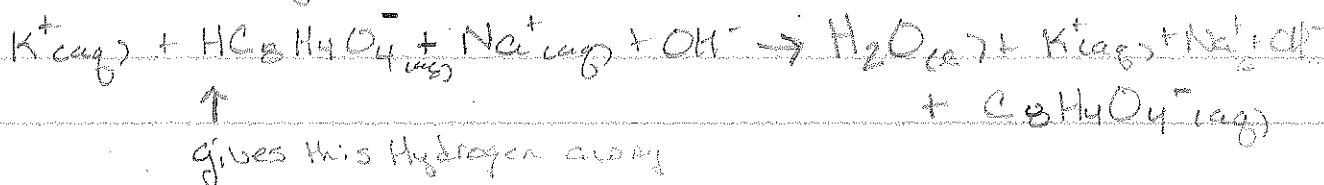
14ex)

$\text{KHC}_8\text{H}_4\text{O}_4$ 1.3009g mm = 204.22g/mole, gives away 1 acidic Hydrogen
 is titrated with 41.20 ml NaOH
 ? M NaOH

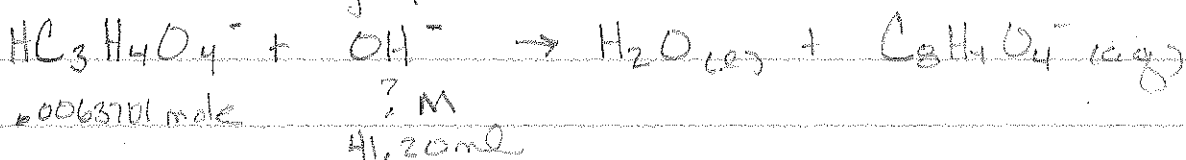
Key

① student dissolves KHP in water, so it's aq

write ionic Eqn



Take away Spectator ions



$$\left(\frac{1.3009\text{g KHP}}{1} \right) \left(\frac{1\text{mole KHP}}{204.22\text{g KHP}} \right) = 0.0063701\text{ mole KHP}$$

Stoich H^+ & OH^- 1:1 Ratio

∴ 41.20 ml NaOH (OH^-) must contain just as many (H^+) in 1.3009g $\text{KHC}_8\text{H}_4\text{O}_4$ (0.0063701 mole)
 * Neutralization w/ Phenolphthalein

$$M = \frac{\text{moles}}{L} \left(\frac{0.0063701\text{ mole NaOH}^+}{0.04120\text{L}} \right) = \boxed{0.1546\text{ M NaOH}}$$

AP Chem Unit 2

15ex / Given:

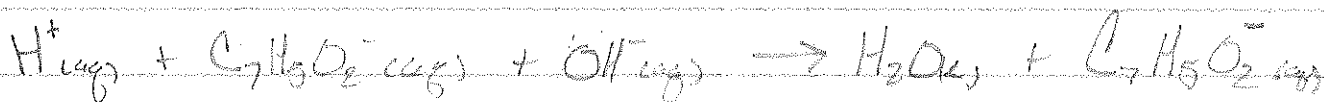
Solid CCl_4 : $\text{HC}_7\text{H}_5\text{O}_2 \Rightarrow \text{effluent} = .3518\text{g}$

$\text{HC}_7\text{H}_5\text{O}_2 \rightarrow \text{weak acid, } 1 \text{ H}^+ \text{ acidic (donor)}$

Effluent (aq) Neutralized w/ 10.59 ml of .1546 M NaOH

* CCl_4 won't dissolve in water

Net Ionic Rxn



.1546 M

10.59 ml = .01059 L

$$\left(\frac{.1546 \text{ moles OH}^-}{1} \right) \left(\frac{.01059 \text{ L}}{1} \right) = .00163 \text{ moles OH}^-$$

1:1 Stoich Ratio Btw H^+ OH^- for Neutralization

\therefore .00163 moles H^+ to Neutralize .00163 moles OH^-

$$\left(\frac{.00163 \text{ moles HC}_7\text{H}_5\text{O}_2}{1} \right) \left(\frac{122.12 \text{ g HC}_7\text{H}_5\text{O}_2}{1 \text{ mole HC}_7\text{H}_5\text{O}_2} \right) = .199 \text{ g HC}_7\text{H}_5\text{O}_2$$

H: $6 \times 1.008 = 6.048$

C: $7 \times 12.01 = 84.07$

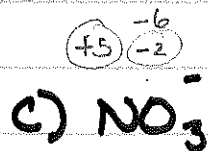
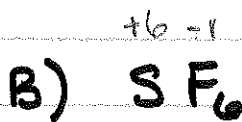
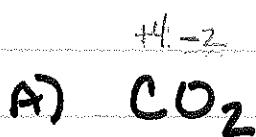
O: $2 \times 16.00 = 32.00$
122.12 g

$$\frac{.199 \text{ g HC}_7\text{H}_5\text{O}_2}{.3518 \text{ g Effluent}} \times 100\%$$

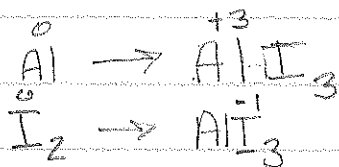
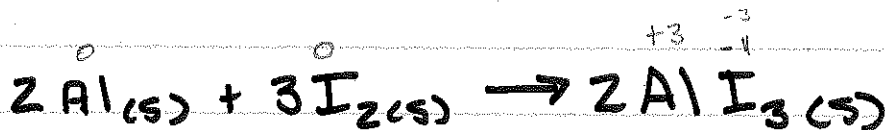
$$= 56.6\% \text{ HC}_7\text{H}_5\text{O}_2$$

AP Chem Unit 2

16ex/



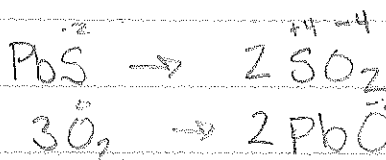
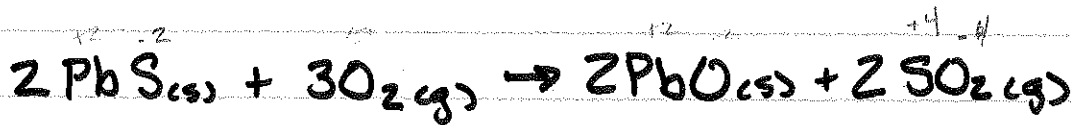
17ex/



LEO \Rightarrow Oxidation

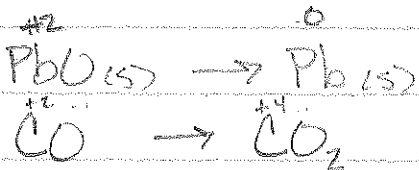
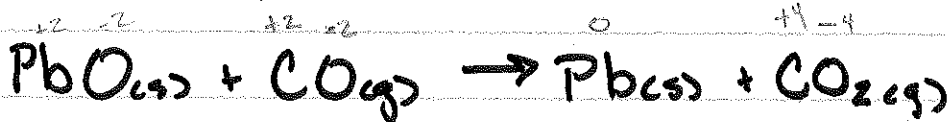
GER \Rightarrow Reduction

18ex/



LEO $6e^-$ Oxidation

GER $2e^-$ Reduction



GER $2e^-$ Reduction

LEO $2e^-$ Oxidation

AP Chem Unit 2-

ex 19/

