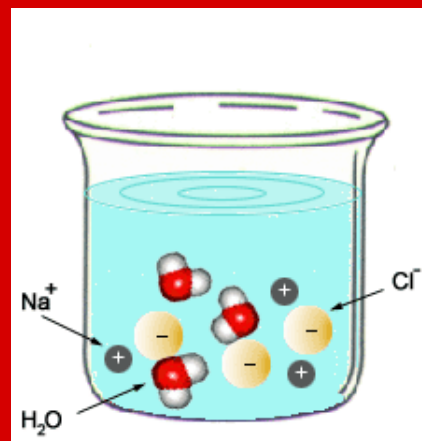WRITE THIS:
Neutralization

objectives

Write molecular and net ionic equations for neutralization reactions.

Determine ISE tables, final pH, final concentrations of neutralization reactions.

Demos:
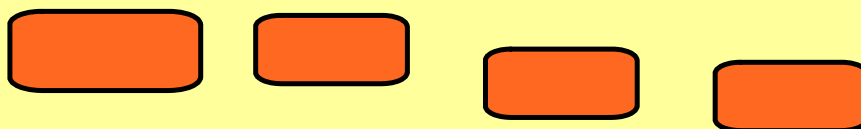 cabbage juice ---neutralization reaction

 pH probe ---

 MOM demo

Neutralization reactions

1. are a type of solubility reaction (dble replacement)
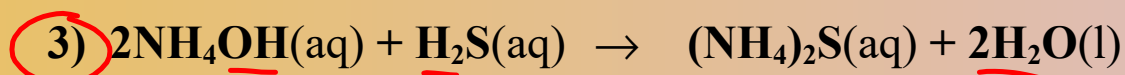**2. reactants must be ACID and BASE**
3. the products are WATER and SALT.

$$NaOH + HCl \longrightarrow H_2O + NaCl$$

H+

(0)

base + acid $\longrightarrow$ water + salt

$$Ca(OH)_2 + H_2SO_4 \longrightarrow 2H_2O + CaSO_4$$

Acid + Base →
Salt + Water

Which reactions are neutralization of acid and base?

1) $3Fe(OH)_2 + 2H_3PO_4 \rightarrow Fe_3(PO_4)_2 + 6HOH$

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

3) $2NH_4OH(aq) + H_2S(aq) \rightarrow (NH_4)_2S(aq) + 2H_2O(l)$

4) $2\ HCl + Zn \rightarrow ZnCl_2 + H_2$

Neutralization reactions
   1. are a type of solubility reaction
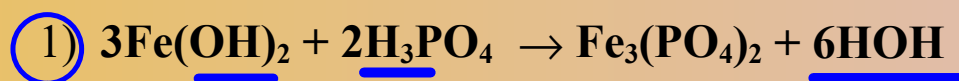   **2. reactants must be ACID and BASE**

What are the products?
                    ionic salt and water

Which reactions are neutralization of acid and base?

only #1 and # 3

Solubility-look for A/B and water as product
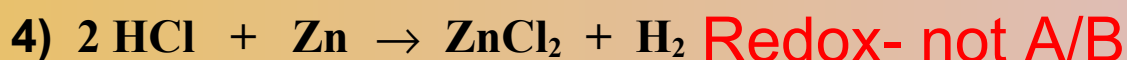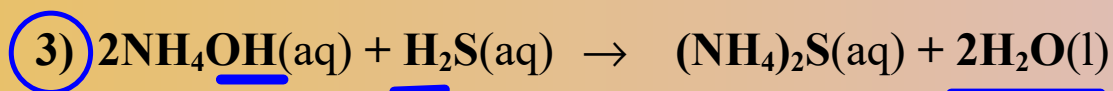
1) $3Fe(OH)_2 + 2H_3PO_4 \rightarrow Fe_3(PO_4)_2 + 6HOH$

2) $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$ Solubility-not A/B

3) $2NH_4OH(aq) + H_2S(aq) \rightarrow (NH_4)_2S(aq) + 2H_2O(l)$

4) $2HCl + Zn \rightarrow ZnCl_2 + H_2$ Redox- not A/B

Neutralization reactions
1. are a type of solubility reaction
2. reactants must be ACID and BASE

What are the products?

ionic salt and water
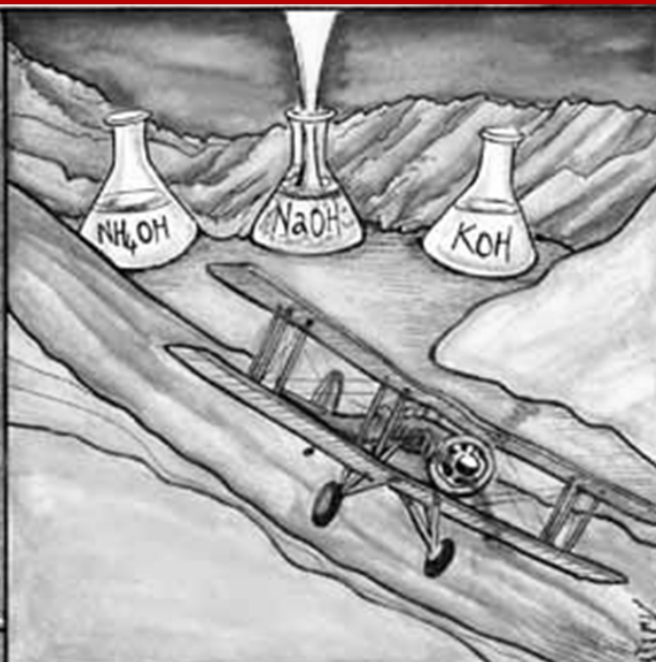
Neutralization reactions p. 53

Reactants	Molecular reaction	Net-ionic reaction
$\overset{(aq)}{HCl} + \overset{(aq)}{NaOH} \rightarrow$ $H^+ + Cl^- + Na^+ + OH^- \rightarrow$	$HOH(\ell) + NaCl(aq)$ $HOH(\ell) + Na^{+1} + Cl^{-1}$	$Li^+ + OH^- \rightarrow HOH$ (ℓ)
$HBr + KOH \rightarrow$		
$HI + LiOH$		
$HCl + LiOH$		
$H_2SO_4 + NaOH$		

Neutralization reactions p. 53

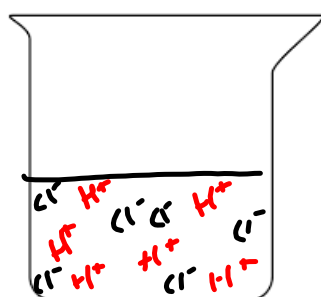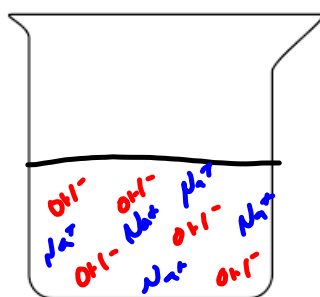| Reactants	Predict pH A/B	Acid/Base Calculations ⟨Need Concentration of Excess⟩	resulting pH
0.025 mol 4. 50 mL of 0.5M HCl mixed with 50 mL of 0.5M NaOH 0.025	Neutral	$1\ HCl + N_2OH \rightarrow 1\ H_2O + 1NaCl$ I 0.025 0.025 S -0.025 -0.025 +0.025 +0.025 E 0 0 0.025 0.025 50mL + 50mL = 100mL → 0.1L $\dfrac{0.025mol}{0.1\ L} = 0.25M$ NaCl	7
0.04 × 0.6 5. 40mL of .6M HCl mixed with 40 mL of 0.5M NaOH		$HCl + NaOH \rightarrow HOH + NaCl$ I 0.024 0.02 S -0.02 -0.02 +0.02 -0.02 E 0.004 0 0.02 0.02 $\dfrac{0.004\ mol\ H^+}{0.08\ L}$	$pH = -log\ 0.05$ $= 1.30$
② 6. 75 mL of .5M HBr mixed with 40 mL of 0.5M KOH 115 mL		$HBr + KOH \rightarrow HOH + KBr$ I 0.0375 0.02 S .02 -0.02 +0.02 +0.02 E 0.0175 0 0.02 0.02 $\dfrac{0.0175\ mol}{0.115\ L} = 0.152$ $-log\ 0.152 = 0.81 = pH$	
7. 60mL of .01 M HNO₃ mixed with 60 mL of .005M Ca(OH)₂			
8. 10mL 0.1M H₂SO₄ is mixed with 10mL of Ca(OH)₂			

#4

50mL
0.5MHCl

50mL
0.5M NaOH

(Strong)

100mL

#5

0.024

40mL

0.6MHCl

(6)

+

0.02 mol

40mL

0.5M NaOH

(5)
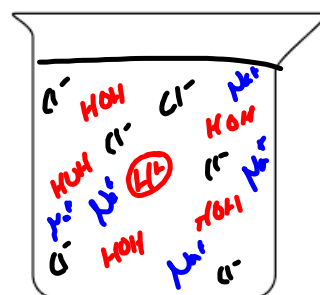
80 mL

$[H^+] = \dfrac{0.004\,mol}{0.08\,L} =$

$[Na^+] \dfrac{0.02}{0.08L} = 0.25M$ Cl⁻

$[Cl^-] \dfrac{0.024}{0.08L} = 0.3M$ Na⁺

#6

0.0375 mol

75mL
0.5MHBr
(4)

+
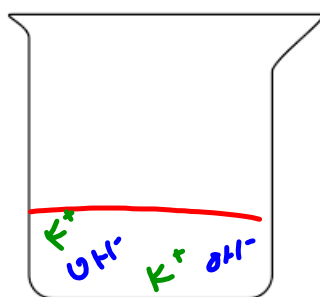
0.02mol

40mL
0.5M KOH
(2)
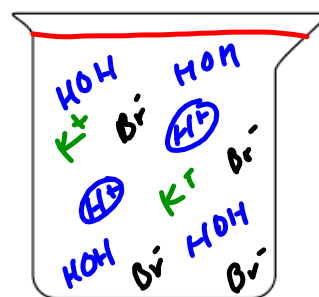
115 mL

$$[Br^-] = \frac{0.0375\,mol}{0.115\,L} = 0.33\ M\ Br^-$$

$$(K^+) = \frac{0.02\,mol}{0.115\,L} = 0.17\ M\ K^{+1}$$