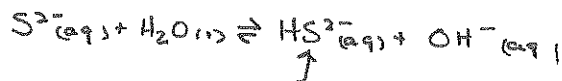


Acid-Base properties of salts

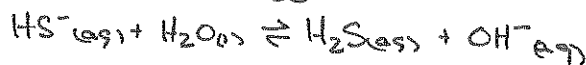


↓
cation of Group I metal
no effect on pH

↘ anion of weak acid
acts as a conjugate base causing a
hydrolysis rxn



↑
also anion of a weak acid
so

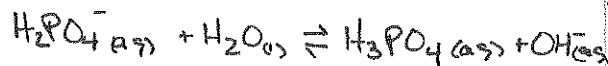
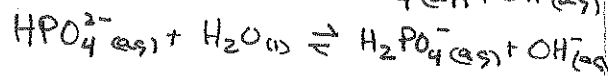
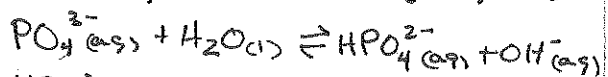


Basic

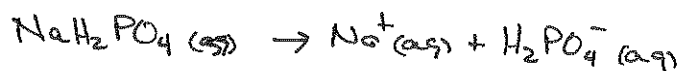


↓
cation of Group I metal
does not cause a hydrolysis rxn

↘ anion of a weak acid acts as a conjugate
base causing a series of hydrolysis rxn

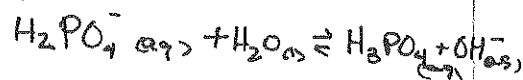


basic

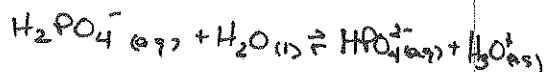


↓
cation of group I metal
does not cause a hydrolysis rxn

↘ anion of a weak acid acts as
conjugate base causing a hydrolysis
rxn



but H_2PO_4^- also has an acidic H



have to compare K_A & K_B to determine
which predominates.

$$K_A \text{ for } \text{H}_2\text{PO}_4^- = 6.3 \times 10^{-8}$$

$$K_B \text{ for } \text{H}_2\text{PO}_4^- = \frac{K_W}{K_A \text{ for } \text{H}_3\text{PO}_4}$$

$$= \frac{1 \times 10^{-14}}{7.1 \times 10^{-3}}$$

$$= 1.4 \times 10^{-12}$$

acidic

$$K_A > K_B$$

∴ acidic properties
dominate.



↓
cation of Group 1 metal
does not cause a hydrolysis rxn

↘ anion of a weak acid, acts as a conjugate base



basic



↓
cation of Group 1 metal
does not cause hydrolysis rxn

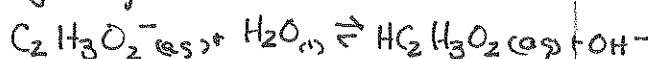
↘ anion of a strong acid, does not cause a hydrolysis rxn

neutral

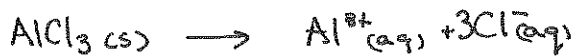


↓
cation of Group 1 metal
does not cause a hydrolysis rxn

↘ anion of a weak acid, causes a hydrolysis rxn

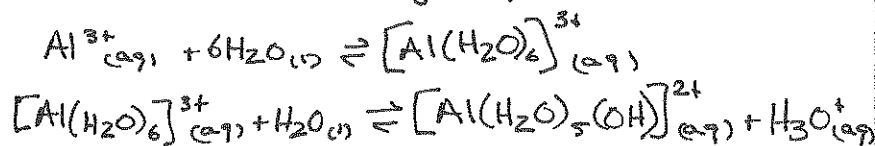


basic

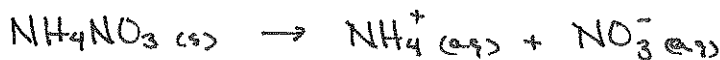


↓
combines w/ H₂O to form a complex ion which then causes a hydrolysis rxn

↘ anion of a strong acid, does not cause a hydrolysis rxn



acidic



↓
cation of a weak base,
acts as a conjugate acid

↘ anion of a weak acid, does not cause a hydrolysis rxn

acidic



↓
cation of a Group 2 metal,
does not cause a hydrolysis rxn

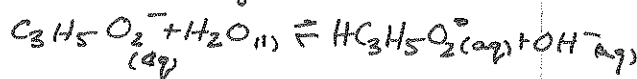
↘ anion of a strong acid, does not cause a hydrolysis rxn

neutral

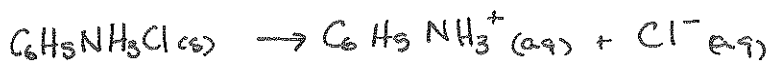


↓
cation of group 1 metal
does not cause a hydrolysis rxn

↘ anion of a weak base,
acts as a conjugate base



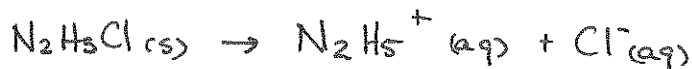
basic



↓
cation of a weak base
acts as conjugate acid

↳ anion of strong acid, does not cause
a hydrolysis rxn

acid



↓
cation of a weak base
acts as a conjugate acid

↳ anion of strong acid, does not cause
a hydrolysis rxn

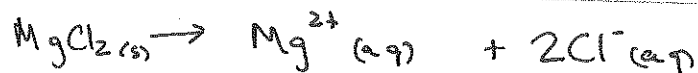
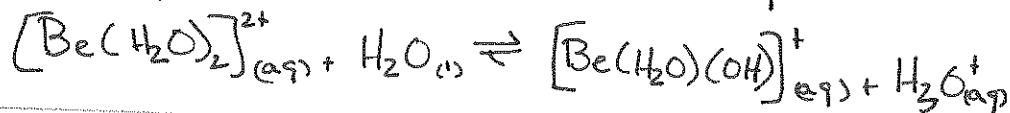
acidic



↓
cation which forms complex
ion which then causes a
hydrolysis rxn

↳ anion of strong acid, does not cause
a hydrolysis rxn

acid



↓
cation of Group 2 metal
does not cause hydrolysis rxn

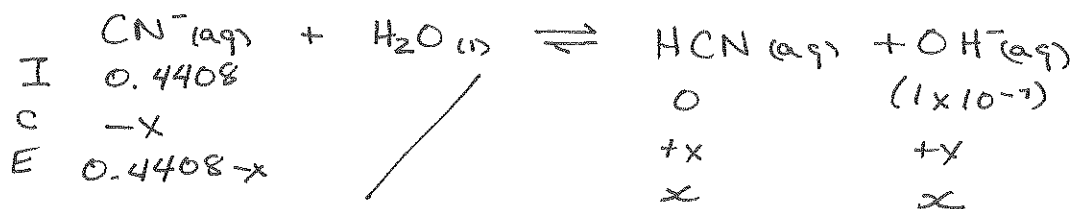
↳ anion of a strong acid does not
cause a hydrolysis rxn

neutral



cation of Group 1 metal
does not cause hydrolysis rxn

anion of a weak acid
causes a hydrolysis rxn



$$[\text{NaCN}] = \frac{m}{MV} = 10.8 \text{ g NaCN} \times \frac{1 \text{ mol NaCN}}{49.00 \text{ g NaCN}} \times \frac{1}{0.500 \text{ L}}$$

$$= 0.4408 \frac{\text{mol NaCN}}{\text{L}}$$

$$[\text{Na}^+] = [\text{CN}^-] = 0.4408 \frac{\text{mol}}{\text{L}}$$

$$K_B = \frac{[\text{HCN}][\text{OH}^-]}{[\text{CN}^-]}$$

$$1.613 \times 10^{-5} = \frac{(x)(x)}{0.4408}$$

$$x = 2.666 \times 10^{-3}$$

$$K_B = \frac{K_w}{K_A}$$

$$= \frac{1 \times 10^{-14}}{6.2 \times 10^{-10}}$$

$$= 1.613 \times 10^{-5}$$

check

$$\frac{[x]}{K_B} = \frac{0.4408}{1.613 \times 10^{-5}}$$

$$= 2.7 \times 10^4 > 100$$

proof

$$\frac{x}{[x]_{\text{I}}} \times 100\% = \frac{2.666 \times 10^{-3}}{0.4408} \times 100\%$$

$$\frac{0.605\%}{0.4408} = 0.605\%$$

$$[\text{OH}^-] = [\text{HCN}] = 2.666 \times 10^{-3} \text{ mol/L}$$

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} = \frac{1 \times 10^{-14}}{2.666 \times 10^{-3}} = 3.75 \times 10^{-12} \frac{\text{mol}}{\text{L}}$$