

CH405

Acid Base Review

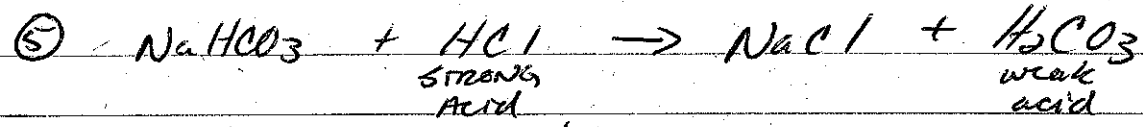
Key

1) HZ \rightarrow K_a is largest \therefore more products (H^+ 's)

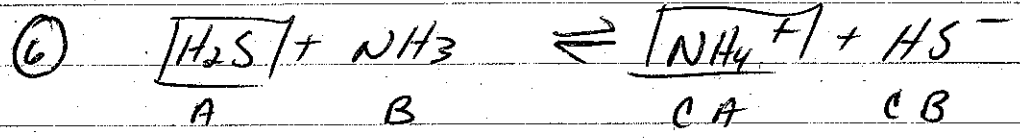
2) NOTES

3) NOTES

- 4) a) HBr - STRONG ACID
- b) O^{2-} - STRONG BASE
- c) ClO_4^- - weak base
- d) H_2O_2 - weak acid
- e) SO_4^{2-} - strong base
- f) OH^- - strong base



\therefore Prod. favoured - strong acid more likely to donate H^+



H_2S is stronger acid, \therefore donates more H^+ \therefore rxn is product favoured.

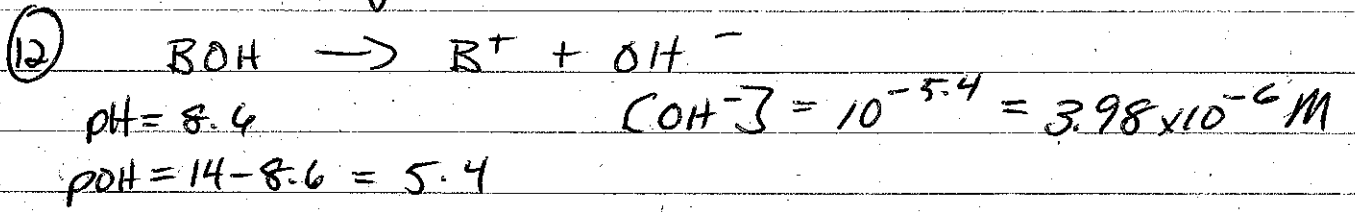
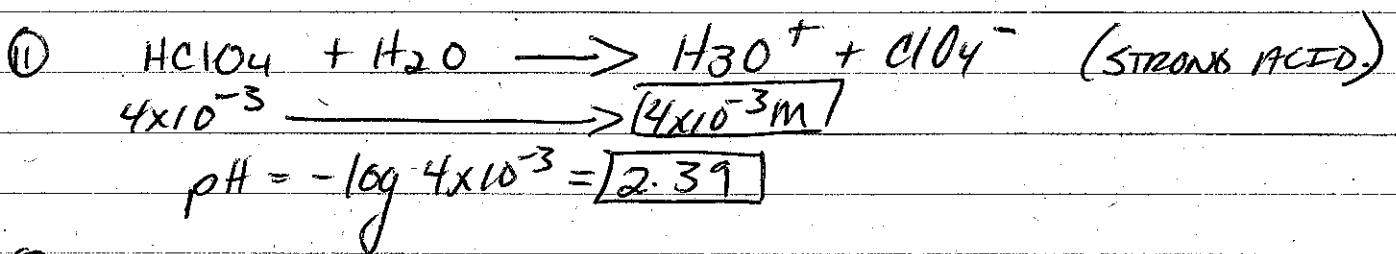
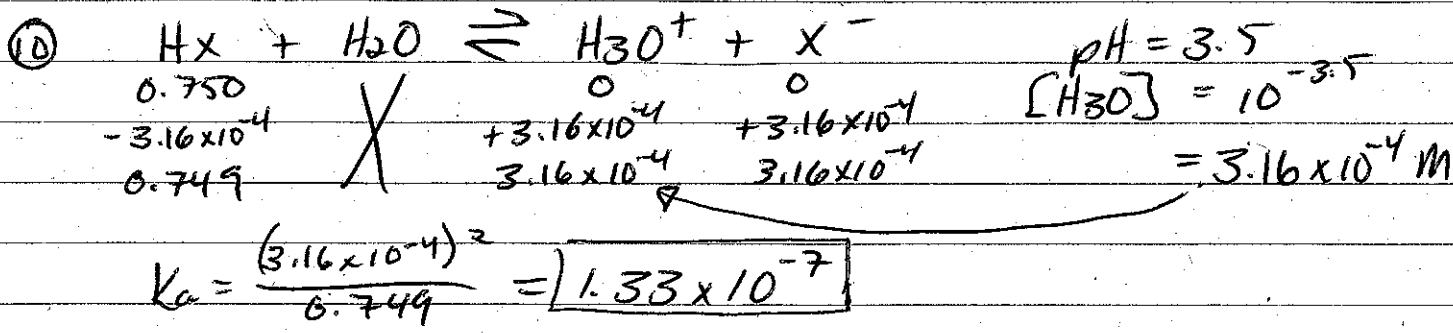
7) NOTES



a) add NaOH - OH^- meets w/ H_3O^+ $\rightarrow [H_3O^+] \downarrow$
rxn shifts right

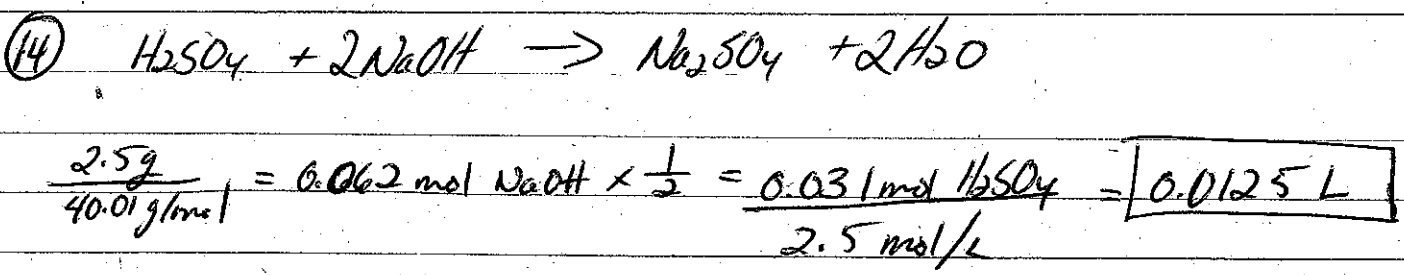
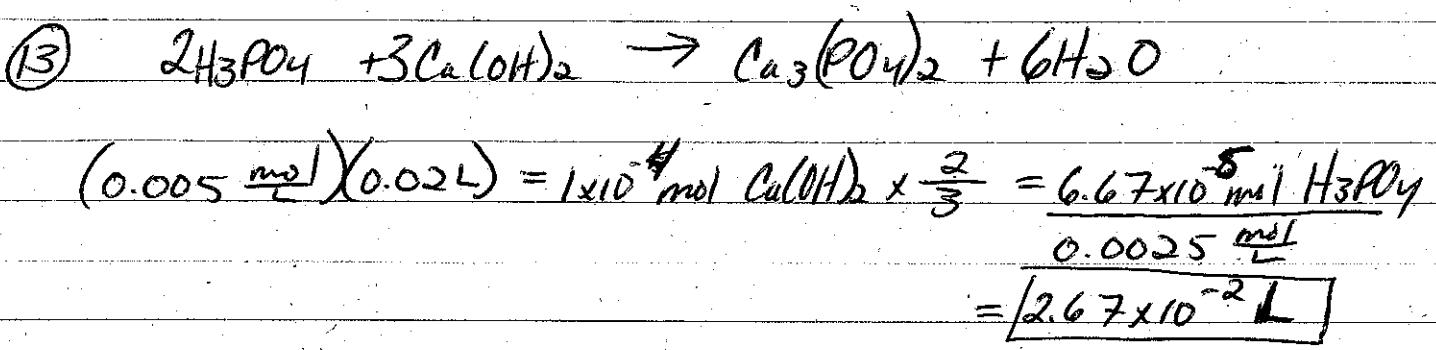
b) add HCl $\rightarrow H^+$ increases $[H_3O^+]$, \therefore rxn shifts left

9) $H_2S + H_2O \rightleftharpoons H_3O^+ + HS^-$ $K_a = \frac{[H_3O^+][HS^-]}{[H_2S]}$
 $\begin{matrix} 0.5 & & 0 & & 0 \\ -x & & +x & & +x \\ 0.5-x & & x & & x \end{matrix}$ $K_a^x = 2.24 \times 10^{-7} M = [HS^-] = [H_3O^+]$
 $[H_2S] = 0.499 M$
 $pH = 3.65$ % diss = 0.045%



$$\% = \frac{[\text{OH}^-]}{[\text{BOH}]} \times 100$$

$$0.948 = \frac{3.98 \times 10^{-6} \text{ M}}{[\text{BOH}]} \times 100 \quad \boxed{[\text{BOH}] = 4.2 \times 10^{-4} \text{ M}}$$



(15) $HA + NaOH \rightarrow NaA + H_2O$
 $(0.15 \frac{mol}{L})(0.03L) = 0.0045 mol NaOH \times \frac{1}{1} = 0.0045 mol HA$
 $\frac{0.900g}{0.0045 mol} = \boxed{200g}$

(16) $[H_3O^+] = 10^{-4.6} = \boxed{2.51 \times 10^{-5} M}$
 $[OH^-] = \frac{K_w}{[H_3O^+]} = \boxed{3.98 \times 10^{-10} M}$

(17) $0.15 \frac{mol}{L} \times \frac{0.06\%}{100} = \boxed{9 \times 10^{-5} M = [H_3O^+]}$, $pH = 4.04$
 * K_a not needed!

(18) $HA + H_2O \rightleftharpoons H_3O^+ + A^-$
 $\alpha = \frac{[H_3O^+]}{[HA]} \times 100$
 $= \frac{6.5 \times 10^{-4} M}{2.0 M} \times 100 = \boxed{0.0325\%}$

(19) $HA + H_2O \rightleftharpoons A^- + H_3O^+$ $K_a = \frac{(2 \times 10^{-5})^2}{0.44}$

0.44	0	0
-2×10^{-5}	$+2 \times 10^{-5}$	2×10^{-5}
0.44	2×10^{-5}	2×10^{-5}

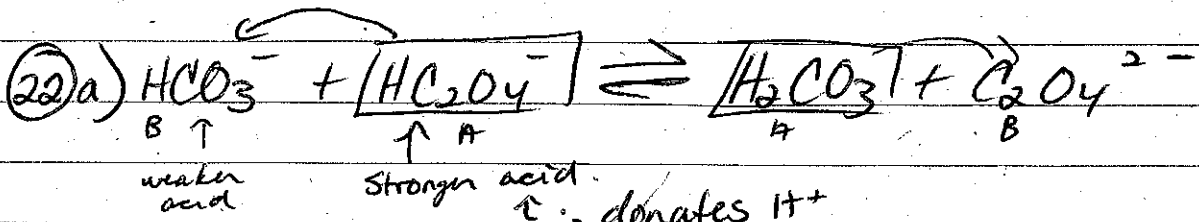
 $= \boxed{9.1 \times 10^{-10}}$

(20) $HA + H_2O \rightleftharpoons H_3O^+ + A^-$ $K_a = \frac{[H_3O^+][A^-]}{[HA]}$

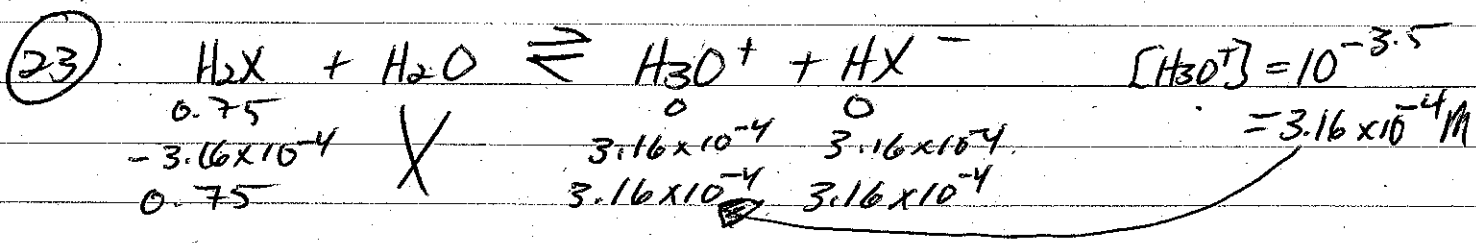
0.25	0	0
-x	+x	+x
0.25-x	x	x

 $3 \times 10^{-8} = \frac{x^2}{0.25-x}$ Assume
 $x = \boxed{8.66 \times 10^{-5} M = [H_3O^+]}$
 $\boxed{pH = 4.06, pOH = 9.93}$

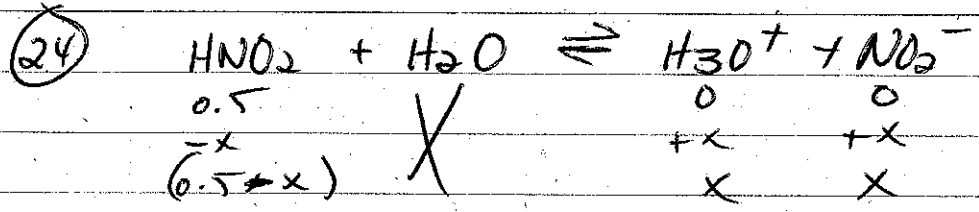
(21) $HA + NaOH \rightarrow NaA + H_2O$
 $(0.1026 \frac{mol}{L})(0.018L) = 0.00185 mol NaOH \times \frac{1}{1} = 0.00185 mol HA$
 $\frac{0.399g}{0.00185 mol} = \boxed{216.1 g/mol}$



b) compare acids on each side, HC_2O_4 is stronger than H_2CO_3 (K_a is bigger) \therefore product favoured (HC_2O_4 donates more H^+)



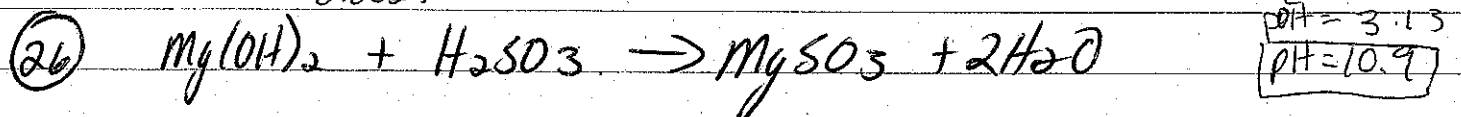
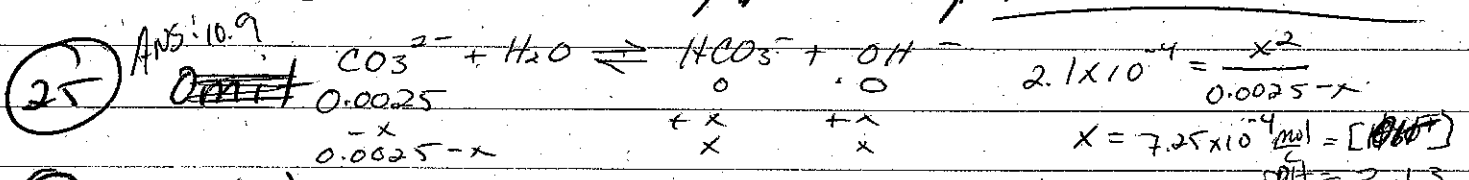
$$K_a = \frac{(3.16 \times 10^{-4})^2}{0.75} = 1.33 \times 10^{-7}$$



$$K_a = \frac{[\text{H}_3\text{O}^+][\text{NO}_2^-]}{[\text{HNO}_2]}$$

$$5.1 \times 10^{-4} = \frac{x^2}{0.5 - x} \quad \text{Assume}$$

$x = 0.16 \text{ M} = [\text{H}_3\text{O}^+]$, $\text{pH} = 1.8$, $\% \text{ diss} = 3.2 \%$

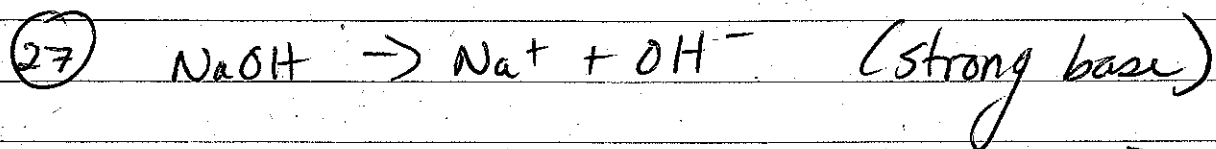


~~(0.35 mol)~~ $(0.35 \frac{\text{mol}}{\text{L}})(0.655 \text{ L}) = 0.229 \text{ mol H}_2\text{SO}_3 \times \frac{1}{1} = 0.229 \text{ mol Mg(OH)}_2$

$\frac{5.2 \text{ ml}}{1} = 0.044 \text{ L}$

$\text{H}_2\text{O} = 1.4 \text{ ml}$

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$$\text{pH} = 12, \text{pOH} = 2, \therefore [\text{OH}^-] = 10^{-2} = 1 \times 10^{-2} \text{ mol/L}$$

$$\text{strong base, } \therefore [\text{NaOH}] = 1 \times 10^{-2} \frac{\text{mol}}{\text{L}} \times 2.0 \text{ L} = 2 \times 10^{-2} \text{ mol NaOH}$$

$$2 \times 10^{-2} \text{ mol} \times 40.01 \text{ g/mol} = \boxed{0.8 \text{ g NaOH}}$$

(28) NOTES