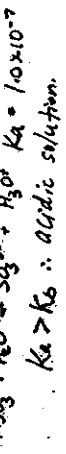
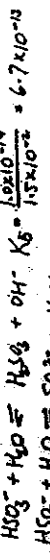
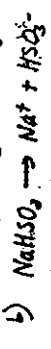
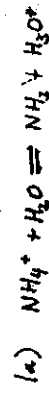
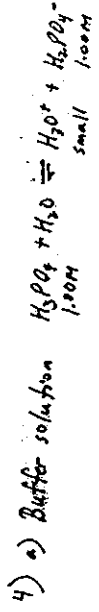
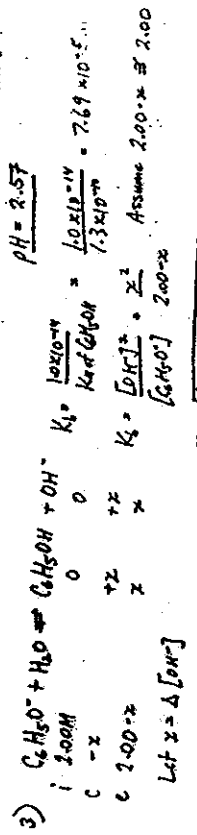
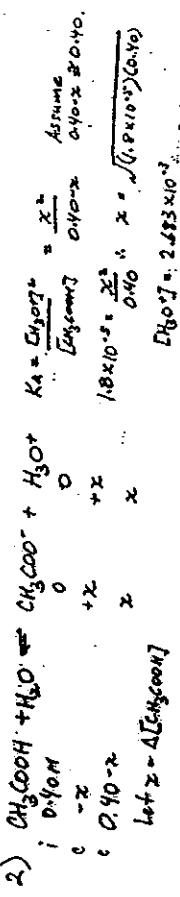


ACID/BASE II REVIEW - ANSWER KEY

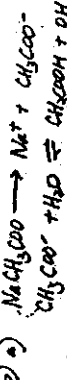
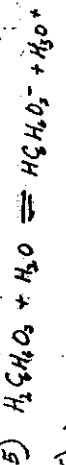


$K_a > K_b \therefore$ acidic solution.

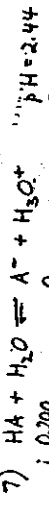


b) $\text{pH} = -\log K_a = -\log (7.5 \times 10^{-3}) = 2.12$

c) 0.10M 2.10M = 0.1000M added of OH⁻. This will cause the pH to raise slightly. The two does not change significantly.



b) $K_b = \frac{K_w}{K_a} = \frac{1.0 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.6 \times 10^{-10}$

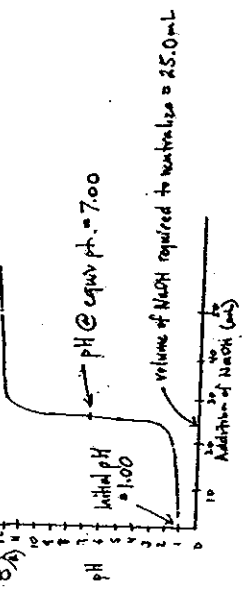


i) 0.200 0 $\text{pH} = 2.44$

c 3.63×10^{-3} 3.63×10^{-3} $[\text{H}_3\text{O}^+] = 3.63 \times 10^{-3} \text{ M}$

e 0.19637 3.63×10^{-3} $K_a = \frac{[\text{H}_3\text{O}^+]}{[\text{HA}]_{\text{eq}}} = \frac{(3.63 \times 10^{-3})^2}{0.19637} = 6.7 \times 10^{-5}$

The acid is BENZOIC

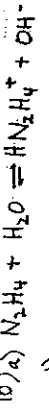


- b) Suitable indicators:
 Bromothymol Blue
 Phenol Red
 Neutral Red
 BTB
 Phenolphthalein will work

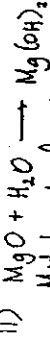
9) i) pH @ equivalence point will be ~5

ii) Initial dip in titration curve

iii) Suitable indicators: bromocresol green, methyl red



b) conjugate is HN_2H_4^+ and $K_a = \frac{1.0 \times 10^{-14}}{8.5 \times 10^{-6}} = 1.2 \times 10^{-9}$



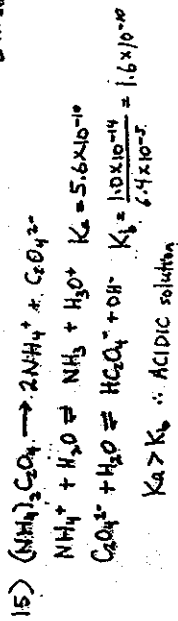
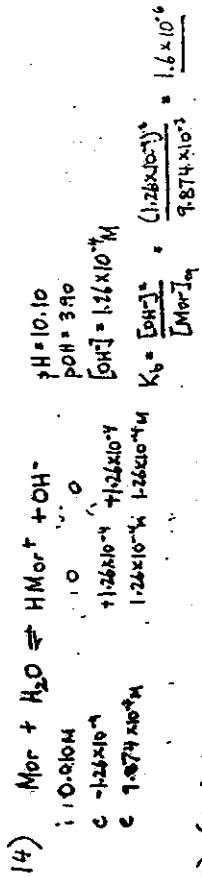
Metal oxides form bases in water.
 The prediction is incorrect.

12) a) blue Bromocresol green is blue at pH > 5.4 and water is pH 7.0.

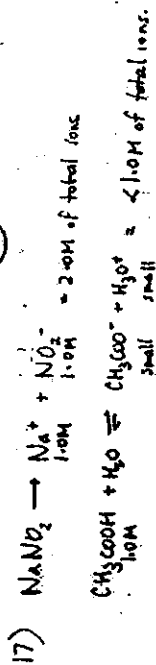
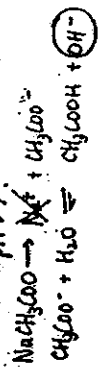
b) The acetic acid produces a pH < 3.8 ∴ bromocresol green changes to yellow. Indicator is in acidic form in acid solutions as H₃O⁺ ↑, equil shifts left and $[\text{HIIn}] > [\text{In}^-]$

13) Transition point is when $[\text{HIIn}] = [\text{In}^-]$ (Combination of the two colours)

$K_a = \frac{[\text{In}^-][\text{H}_3\text{O}^+]}{[\text{HIIn}]}$ and $[\text{HIIn}] = [\text{In}^-] \therefore K_a = \frac{[\text{In}^-][\text{H}_3\text{O}^+]}{[\text{In}^-]} = [\text{H}_3\text{O}^+]$



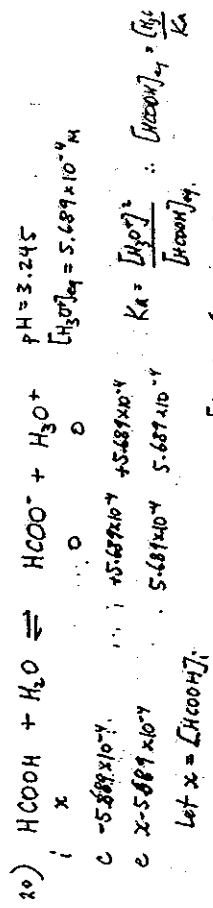
16) $CH_3COOH + NaOH \rightarrow NaCH_3COO + H_2O$
 The salt produces sodium acetate, hydrolyzes basically, creating an equivalence point with a $pH > 7$.



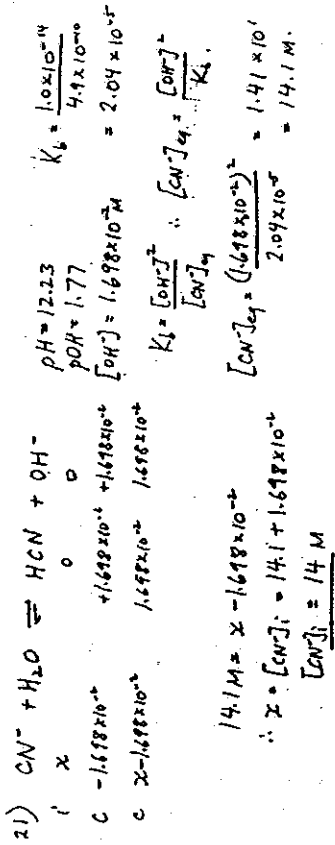
18) $SO_3 + H_2O \rightarrow H_2SO_4$
 $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
 non-metal oxides reacting with water form acid.

19) And weak acid with its conjugate base in equal concs. or vice versa.
 eg CH_3COOH / CH_3COO^-

if HCl added, H_3O^+ result, which will react with CH_3COO^- as follows:
 $CH_3COO^- + H_3O^+ \rightarrow CH_3COOH + H_2O$. This causes a shift to the left. H_3O^+ is reduced by there is an overall slight increase \therefore a slight decrease in pH



Let $x = [HCOOH]_{eq}$
 $x = 5.689 \times 10^{-4} = 1.798 \times 10^{-3}$
 $x = 1.798 \times 10^{-3} + 5.689 \times 10^{-4}$
 $x = [HCOOH]_{eq} = 2.4 \times 10^{-3} M$



22) HNO_3 is a strong acid and reacts 100% to produce electrolytes
 $HNO_3 + H_2O \rightarrow NO_3^- + H_3O^+$
 $1.0M \quad 1.0M \quad 1.0M$
 2.0M of electrolytes produced

HIO_3 is a weak acid and forms an equilibrium.
 $HIO_3 + H_2O \rightleftharpoons IO_3^- + H_3O^+$ let $x = \Delta[H_3O^+]$
 $1.0M \quad 0 \quad 0$
 $C \quad -x \quad +x$
 $E \quad 1.0-x \quad x$
 $K_a = \frac{[IO_3^-][H_3O^+]}{[HIO_3]}$
 Assume $1.0 - x \approx 1.0$

$1.7 \times 10^{-1} = \frac{x^2}{1.0} \quad x = 0.41$
 $[H_3O^+] = 0.41 M \therefore [IO_3^-] = 0.41 M$

therefore 0.82M electrolytes produced.
 because conductivity improves with more electrolytes, the strong acid is a better conductor.

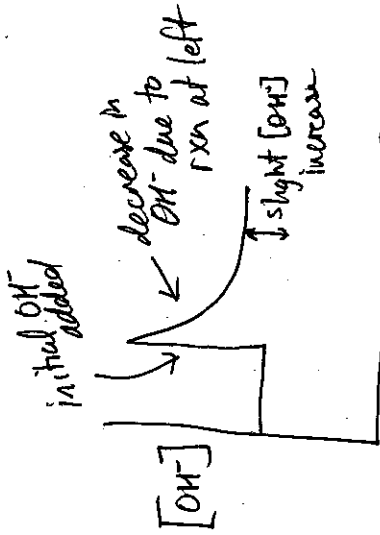
$$23) a) \text{pH} = -\log K_a$$

$$\text{pH} = -\log(1.8 \times 10^{-4})$$

$$= 3.74$$

b) if OH^- added, most of it will react with HCOOH .

$\text{HCOOH} + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{HCOO}^-$
 but there is a slight $[\text{OH}^-]$ increase, resulting in a slight pH increase



- 24) a) use a pH meter
 b) titrate against a standardized base

