Worksheet III

1. $[H_3O^+] = K_a \frac{[acid]}{[salt]}$ adding water decreases <u>both</u> acid and salt concentration

buffer solution — ↑ weak acid — so pH does not change appreciably.

2. $[H_3O^+] = 1.8 \times 10^{-5} \frac{[acid]}{[salt]}$ if $[acid] = [salt]$ then $[H_3O^+] = 1.8 \times 10^{-5}$

$pH = 4.74$

3. $HA \rightleftharpoons H^+ + A^-$

I	0.100 M		
C	-20%	+20%	+20%
E	0.080 M	0.020	0.020

$$K_a = \frac{[H^+][A^-]}{[HA]} = \frac{(0.020)^2}{0.080} = 5.0 \times 10^{-3}$$

4. methyl orange and thymolphthalein.

3.0	6.0	12.0	
red	yellow	yellow	> green.
colourless	colourless	blue	

5. $2HCl + Ba(OH)_2 \rightarrow 2H_2O_{(l)} + BaCl_{2(aq)}$

2 : 1

100.0 mL × 0.20 M HCl → 20.0 mmol H^+

300.0 mL × 0.050 M $Ba(OH)_2$ × 2 → 30.0 mmol OH^-

10.0 mmol OH^- in excess $[OH^-] = \frac{10.0 \text{ mmol}}{100 + 300} = 0.025$ M

$pOH = 1.60$ $pH = 12.40$

6. "Normal" rain water contains dissolved CO_2.

$CO_2 + H_2O \longleftrightarrow H_2CO_3$ (which is acidic) $\longleftrightarrow H^+ + HCO_3^-$

dissolved CO_2 in the air forms an acidic H_2CO_3 sol'n with rain water.

7. HCl and NH_3 (strong acid / weak base)

8. CH_3COOH and NaOH (weak acid / strong base)

9. NH_3

10. NaOH, HCl.

mol H^+ = 25.0 mL × 1.0 M = 25.0 mmol = mol OH^- = mol NaOH.

grams NaOH = 2.50×10^{-2} mol × 40 g/mol = 1.0 g.

% composition = $\frac{1.0\ g}{10.0\ g} \times 100 = 10.0\%$