(1.)

$$AgCl(s) \rightleftharpoons Ag^+(aq.) + Cl^-(aq.) \quad : K_{sp_1}$$
$$x' \qquad\qquad x \qquad\quad (x+y)$$

$$CuCl(s) \rightleftharpoons Cu^+(aq.) + Cl^-(aq.) \quad : K_{sp_2}$$
$$y' \qquad\qquad y \qquad\quad (x+y)$$

$$K_{sp_1} = x(x+y) \quad \cdots (1)$$

$$K_{sp_2} = y(x+y) \quad \cdots (2)$$

$$(1)+(2) \Rightarrow (x+y) = \sqrt{K_{sp_1} + K_{sp_2}} = \sqrt{1.6\times10^{-10} + 10^{-6}}$$

$$= \sqrt{10^{-6}} = 10^{-3}\ M$$

from eqn. (1) $\Rightarrow$

$$[Ag^+] = x = \frac{K_{sp_1}}{(x+y)} = \frac{1.6\times10^{-10}}{10^{-3}}$$

$$= 1.6\times10^{-7}\ M$$

(2.)

$$r = k[H^+][ester] \Rightarrow r \propto [H^+]$$

$$\frac{r_{W.A.(HA)}}{r_{S.A.(HX)}} = \frac{[H^+]_{HA}}{[H^+]_{HX}} = \frac{1}{100} \quad (\text{given})$$

$$\frac{[H^+]_{HA}}{1} = \frac{1}{100} \Rightarrow [H^+]_{HA} = x = 10^{-2}$$

$$K_a = \frac{x^2}{c-x} = \frac{(10^{-2})^2}{1-10^{-2}} = 10^{-4}$$

(3) $Ag_2CrO_4(s) \rightleftharpoons 2Ag^+(aq.) + CrO_4^{2-}(aq.)$: K_{sp}

'x' $\quad (2x+0.1) \quad x$

$\simeq 0.1$ ← from $AgNO_3$

$K_{sp} = [Ag^+]^2 [CrO_4^{2-}]$

$1.1 \times 10^{-12} = (0.1)^2 (x)$

$x = 1.1 \times 10^{-10}$ M

(4.) $|\Delta H| \times$ gm equivalent neutralised $= (C_{calorimeter} + C_{soln.})\Delta T$

$V \times d \times$ Sp. heat

Expt. 1

$57 \times \frac{1 \times 100}{1000} = [C_{calorimeter} + 200 \times 1 \times 4.2] \times 5.7$ ---(1)

Expt. -2

$|\Delta H| \times \frac{1 \times 100}{1000} = [C_{calorimeter} + 200 \times 1 \times 4.2] \times 5.6$ ....(2)

eqn. $\frac{(2)}{(1)} \Rightarrow \frac{|\Delta H|}{57} = \frac{5.6}{5.7} \Rightarrow |\Delta H| = 56$ KJ/mol

$\Delta H_{dissociation} = 57 - |\Delta H| = 57 - 56 = 1$ KJ/mol

(5.) $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

millimoles 200 100 — 100 (Buffer soln. is formed)

100 x

$pH = pK_a + \log(S/a) = 5 - \log 2 + \log(100/100) = 4.7$

6.

$AB(s) \rightleftharpoons A^+(aq.) + B^-(aq.)$: $K_{sp} = 2\times10^{-10}$

'x' $\quad x \quad x$

$H^+(aq.) + B^-(aq.) \rightleftharpoons HB(aq.)$: $\frac{1}{K_a} = 10^8$ (large value)

$C \quad x \quad -$

$C-x \quad \sim \quad x$

$AB(s) + H^+(aq.) \rightleftharpoons A^+(aq.) + HB(aq.)$; $\frac{K_{sp}}{K_a}$

$(C-x) = 10^{-3} \quad x \quad x$

$$\frac{K_{sp}}{K_a} = \frac{x^2}{10^{-3}}$$

$$x = \sqrt{\frac{K_{sp}}{K_a} \times 10^{-3}} = \sqrt{\frac{2\times10^{-10}}{10^{-8}} \times 10^{-3}}$$

$$= 4.47 \times 10^{-3}\ M$$