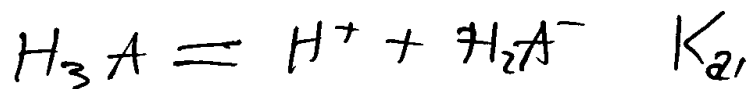
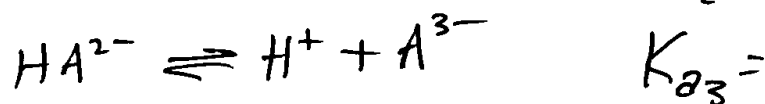
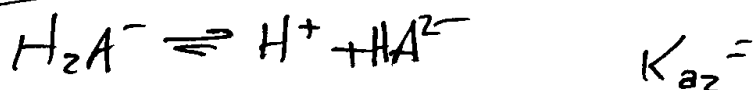
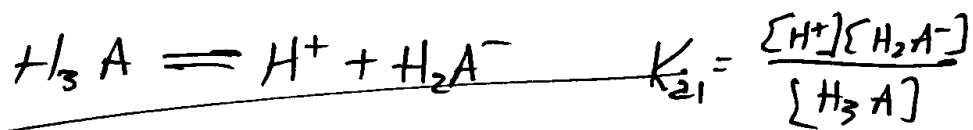


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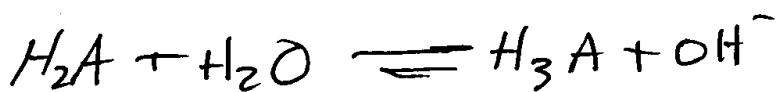
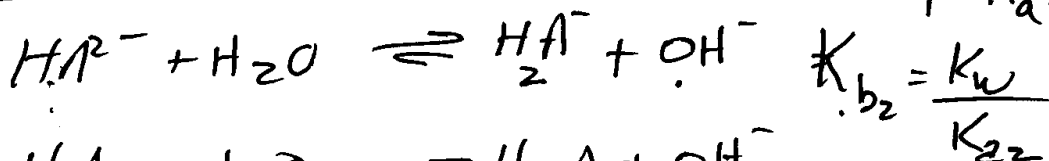
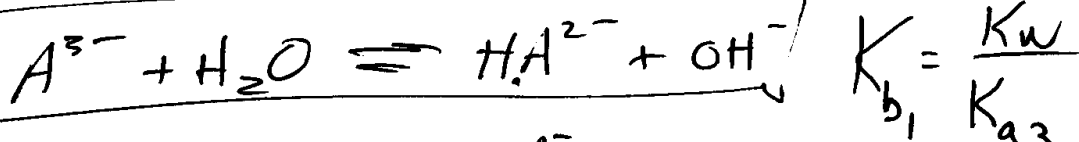
①

## Polyprotic acids



ICE!

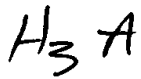
$Na_3A$



ICE!

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(2)

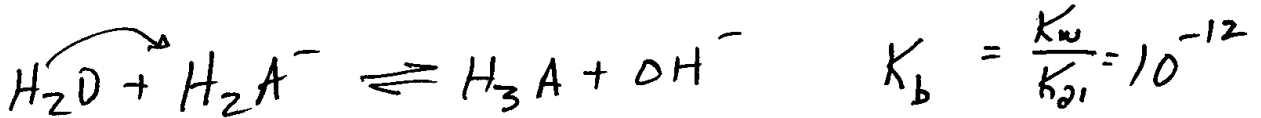
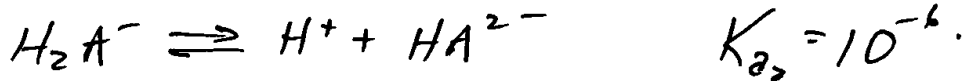
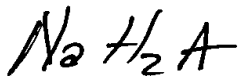


e.g.

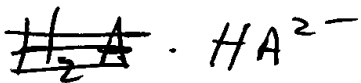
$$K_{a1} = 10^{-2}$$

$$K_{a2} = 10^{-6}$$

$$K_{a3} = 10^{-9}$$

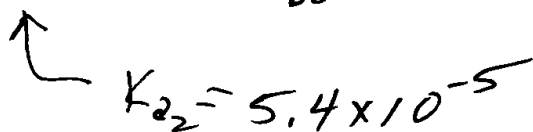
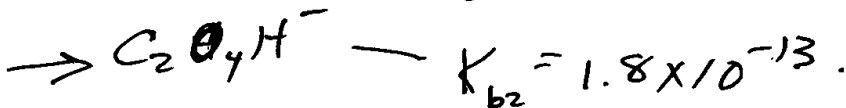
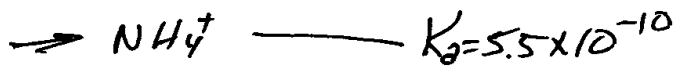
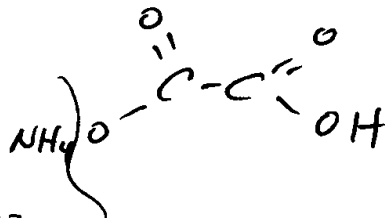
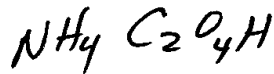


$$pH = \frac{1}{2}(pK_{a1} + pK_{a2}) = \frac{1}{2}(2 + 6) = 4.0$$



$$pH = \frac{1}{2}(pK_{a2} + pK_{a3}) = 7.5$$

ASIDE



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PK.

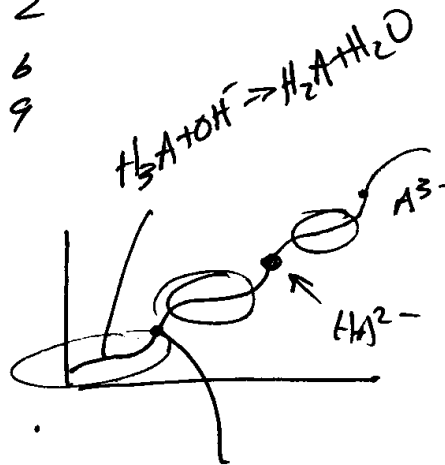
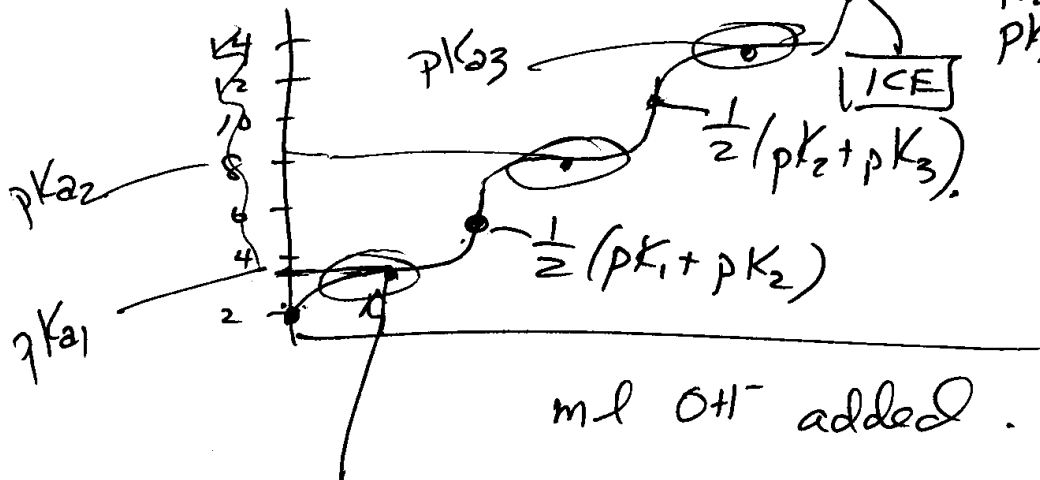
(3)

$10^{-3} F H_3A$

$pK_1$  2

$pK_2$  6

$pK_3$  9



buffer region.

$\frac{1}{2} \text{ way} \rightarrow pH = pK_{a1} + \log \frac{[H_2A^-]}{[H_3A]}$

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(4)

## FRACTIONAL DISTRIBUTION DIAGRAM

 $H_3A$ .

$$\alpha_0 = \frac{[H_3A]}{F_{H_3A}} = \frac{[H_3A]}{[H_3A] + [H_2A^-] + [HA^{2-}] + [A^{3-}]}$$

$$\alpha_1 = \frac{[H_2A^-]}{F_{H_3A}}$$

$$\alpha_2 = \frac{[HA^{2-}]}{F_{H_3A}}$$

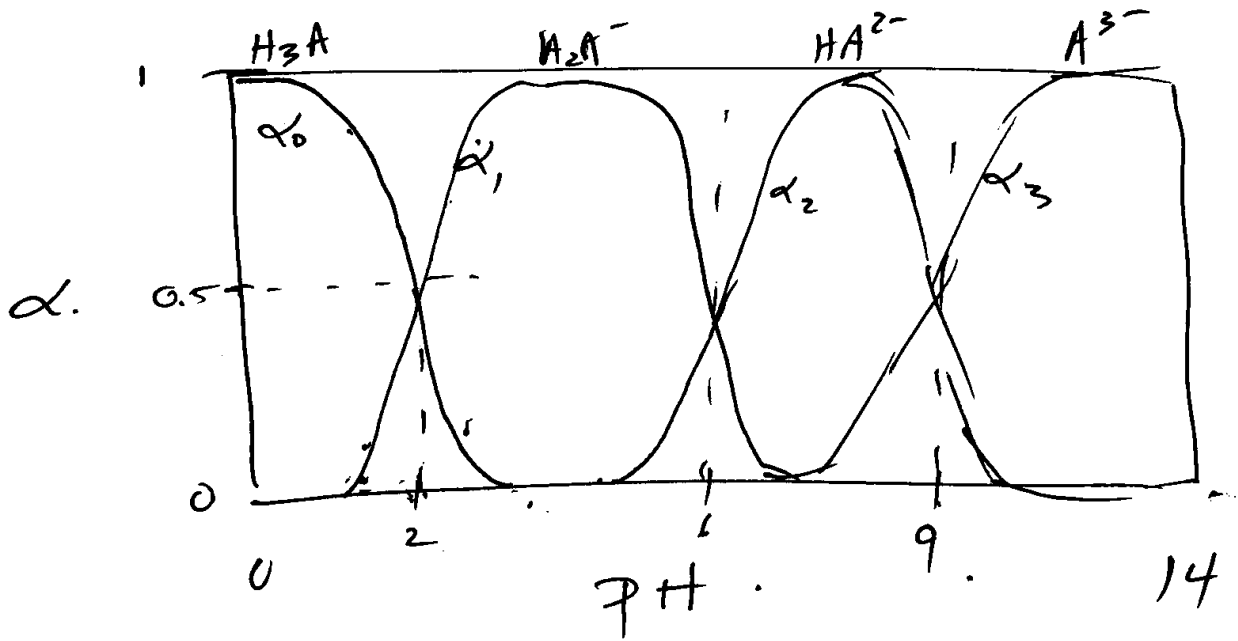
$$\alpha_3 = \frac{[A^{3-}]}{F_{H_3A}}$$

$$\alpha_0 = \frac{[H^+]^3}{[H^+]^3 + K_1 [H^+]^2 + K_1 K_2 [H^+] + K_1 K_2 K_3}$$

$$\alpha_1 = \frac{K_1 [H^+]^2}{\dots}$$

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②



$H_3A$   $PK_2$  2, 6, 9.

