PP #11-20 pg 500

11. $[OH^-] = 0.150$ mol/L

$pOH = -\log(0.150)$

$= 0.8239$

$pH = 14 - pOH$

$= 14 - 0.8239$

$= 13.176$

$[H_3O^+] = 10^{-13.176}$

$= 6.67 \times 10^{-14}$ mol/L

OR $K_w = [H_3O^+][OH^-] = 1.0 \times 10^{-14}$

$[H_3O^+] = \frac{K_w}{[OH^-]}$

$= \frac{1.0 \times 10^{-14}\ mol^2/L^2}{0.150\ mol/L}$

$= 6.67 \times 10^{-14}$ mol/L

12. $[LiOH] = \frac{2.00\ mol}{1.50\ L}$

$= 1.333\ \frac{mol}{L}$

$[OH^-] = 1.333\ \frac{mol}{L}$

$pOH = -\log(1.333)$

$= -0.1249$

$pH = 14 - pOH$

$= 14 + 0.1249$

$= 14.1249$

$[H_3O^+] = 7.50 \times 10^{-15}$

OR $[H_3O^+] = \frac{K_w}{[OH^-]}$

$= \frac{1.0 \times 10^{-14}\ mol^2/L^2}{1.333\ mol/L}$

$= 7.50 \times 10^{-15}$ mol/L

13. The higher $[OH^-]$ the lower $[H_3O^+]$

Solution B will have the higher $[H_3O^+]$

14. K_w will be different at different temperatures but the ratio of $[H_3O^+]$ to $[OH^-]$ will be still inversely proportional

15. $[NaOH] = 4.15\ g \times \frac{1\ mol}{39.997\ g} \times \frac{}{2.40\ L}$

$= 0.04688$ mol/L

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$[OH^-] = 0.04688$ mol/L

$[H_3O^+] = \frac{1.0 \times 10^{-14}}{\text{0.04688}} = 2.02 \times 10^{-13}$

16. Basic → the solution has soluble OH^- ions

17. $K_w = [H_3O^+][OH^-]$

$$[H_3O^+] = \frac{K_w}{[OH^-]}$$

$$= \frac{1.0 \times 10^{-14}}{0.455}$$

$$= 2.20 \times 10^{-14} \text{ mol/L}$$

18. $$[OH^-] = \frac{K_w}{[H_3O^+]}$$

$$= \frac{1.0 \times 10^{-14}}{0.152}$$

$$= 6.58 \times 10^{-14} \text{ mol/L}$$

$\therefore [OH^-]$ is $6.58 \times 10^{-14} \frac{\text{mol}}{\text{L}}$

19. $$[H_3O^+] = \frac{K_w}{[OH^-]}$$

$$= \frac{1.0 \times 10^{-14}}{0.0025}$$

$$= 4.0 \times 10^{-12} \text{ mol/L}$$

$\therefore [H_3O^+]$ is $4.0 \times 10^{-12} \frac{\text{mol}}{\text{L}}$

20. $$[OH^-] = \frac{K_w}{[H_3O^+]}$$

$$= \frac{1.0 \times 10^{-14}}{1.55}$$

$$= 6.45 \times 10^{-15} \text{ mol/L}$$

$\therefore [OH^-]$ is $6.45 \times 10^{-15} \frac{\text{mol}}{\text{L}}$