

42. blue book

$$* @ 40^{\circ}\text{C} \quad K_w = 2.92 \times 10^{-14}$$

a. $[\text{H}^+] = ?$ $[\text{OH}^-] = ?$ in pure H_2O

$$[\text{H}^+] = [\text{OH}^-] \text{ pure } \text{H}_2\text{O}$$

$$K_w = [\text{H}^+][\text{OH}^-]$$

$$2.92 \times 10^{-14} = (x)(x)$$

$$2.92 \times 10^{-14} = x^2$$

$$\sqrt{2.92 \times 10^{-14}} = x$$

$$1.71 \times 10^{-7} \text{ M} = [\text{H}^+] = [\text{OH}^-]$$

b. $\text{pH} = -\log[\text{H}^+]$
 $= -\log(1.71 \times 10^{-7})$
 $= 6.77$

c. $[\text{OH}^-] = 0.10 \text{ M}$

$$[\text{H}^+] = ?$$

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

$$\frac{2.92 \times 10^{-14}}{0.10} = [\text{H}^+]$$

$$2.92 \times 10^{-13} = [\text{H}^+]$$

$$\text{pH} = -\log[\text{H}^+]$$
$$= 12.53$$