

$$13. K_w = [H_3O^+][OH^-]$$

$$[H_3O^+] = \frac{K_w}{[OH^-]} = \frac{1.0 \times 10^{-14}}{0.000055} = 1.8 \times 10^{-10}$$

2

$$14. a) pH = 4.55$$

$$[OH^-] = 10^{-pOH} = 10^{-9.45} = 3.5 \times 10^{-10} M$$

Unit'

$$pH + pOH = 14$$

$$14 - 4.55 = pOH$$

$$pOH = 9.45$$

$$[H_3O^+] = 10^{-pH} = 10^{-4.55} = 2.8 \times 10^{-5} M$$

$$b) [H_3O^+] = 2.45 \times 10^{-12}$$

2.5

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

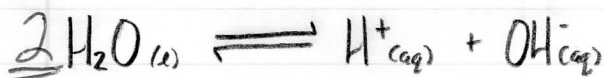
$$[OH^-] = \frac{K_w}{[H_3O^+]} = \frac{1.0 \times 10^{-14}}{2.45 \times 10^{-12}} = 0.00408 \rightarrow 0.0041 M$$

$$pOH = -\log(OH^-) = -\log(0.00408) = 2.39$$

$$pH = -\log(H_3O^+) = -\log(2.45 \times 10^{-12}) = 11.65$$

2.5

15. a) The pH of the water will decrease at a higher temperature because the equilibrium will work to lower the temperature after a temperature rise by absorbing the extra heat in the endothermic process. The forward reaction will be favoured making more  $H^+$  and  $OH^-$  ions. With a higher concentration of  $H^+$  the pH will decrease.



→ products favoured.