

Chapter 17

5) a) iii c) iv
 b) i d) ii

6) a) ii c) i
 b) iii d) iv

15) a) $K_a = 1.3 \times 10^{-5} = \frac{[H^+][0.060]}{0.085}$

$$[H^+] = 1.84 \times 10^{-5}$$

$$-\log(1.84 \times 10^{-5}) = 4.73$$

b) $K_b = \frac{[OH^-][CA]}{\text{Base}} = 6.4 \times 10^{-5} = \frac{[OH^-](0.1)}{0.075}$

$$[OH^-] = 4.8 \times 10^{-5}$$

$$-\log(OH^-) = 4.32 \quad 14 - 4.32 = 9.68$$

16) a) $K_a = 1.8 \times 10^{-4} = \frac{(H^+)(0.150)}{0.200}$

$$pH = 3.62$$

b) $K_b = 1.7 \times 10^{-9} = \frac{(OH^-)(0.350)}{0.210}$

$$pH = 5.01$$

21) a) $pH = pK_a + \log\left(\frac{\text{base}}{\text{acid}}\right)$
 $pH = -\log(1.4 \times 10^{-4}) + \log\left(\frac{0.11}{0.12}\right)$
 $pH = 3.82$

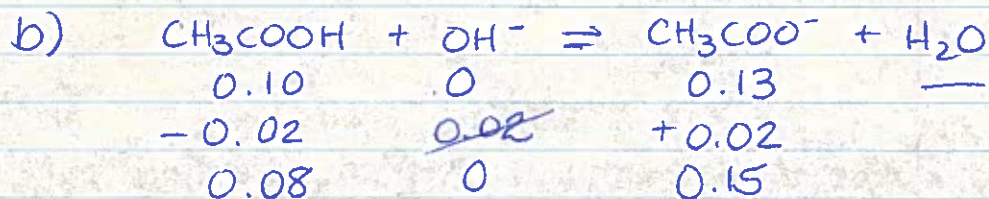
b) $pH = -\log(1.4 \times 10^{-4}) + \log\left(\frac{0.01425}{0.01105}\right)$
 $= 3.96$

22) a) $pH = -\log(5.6 \times 10^{-11}) + \log\left(\frac{0.125}{0.105}\right)$
 $pH = 10.3$

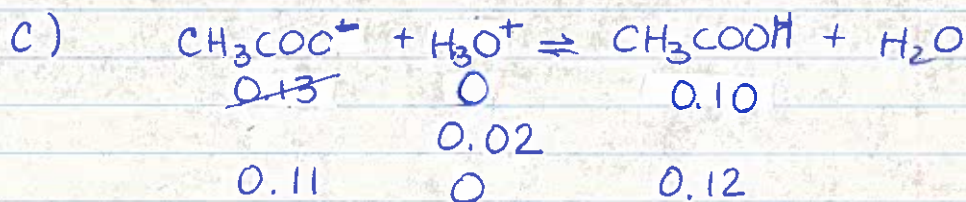
b) $pH = -\log(5.6 \times 10^{-11}) + \log\left(\frac{0.01125}{0.013}\right)$
 $= 10.2$

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27) a) $\text{pH} = -\log(1.8 \times 10^{-5}) + \log\left(\frac{0.13}{0.10}\right)$
 $\text{pH} = 4.86$



$\text{pH} = -\log(1.8 \times 10^{-5}) + \log\left(\frac{0.15}{0.08}\right)$
 $= 5.02$



$\text{pH} = -\log(1.8 \times 10^{-5}) + \log\left(\frac{0.11}{0.12}\right)$
 $\text{pH} = 4.71$

33) a) B

b) A = 8 ; B = 7

c) $\frac{40}{1000} \times 0.1 = \frac{0.004 \text{ moles}}{40/1000} = 0.1 \text{ M} = [\text{B}]$

$[\text{A}] = \frac{30}{1000} \times 0.1 = \frac{0.003 \text{ moles}}{40/1000} = [\text{A}] = 0.075 \text{ M}$

35) a) weak acid + strong base > 7

b) weak base + strong acid < 7

c) strong acid + strong base = 7

39) a) $\frac{0.09 \text{ mol}}{\text{L}} \mid \frac{1.04 \text{ L}}{\text{L}} = 0.0036 \text{ moles}$
 acid = moles NaOH

$\frac{0.0036 \text{ mol}}{\text{L}} \mid \frac{1 \text{ L}}{0.0850 \text{ mol}} \mid \frac{1000 \text{ mL}}{1 \text{ L}} > 42.4 \text{ mL}$

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$$b) \frac{0.0850 \frac{\text{mol}}{\text{L}}}{1} \times \frac{0.035 \text{ L}}{1} = \frac{0.002975 \text{ mol}}{0.0850 \text{ mol}} =$$

35 mL

$$c) \frac{1.85 \text{ g}}{1} \times \frac{1 \text{ mol}}{36.458 \text{ g}} \times \frac{0.05 \text{ L}}{1} = 0.00254 \text{ moles}$$

$$\frac{0.00254 \text{ moles}}{0.0850 \text{ moles}} \times \frac{1 \text{ L}}{1} \times \frac{1000 \text{ mL}}{1} = 29.8 \text{ mL}$$

$$41) a) \frac{0.2 \text{ mol}}{1} \times \frac{0.02 \text{ L}}{1} = 0.004 \text{ moles HBr}$$

$$\frac{0.200 \text{ mol}}{1} \times \frac{0.015 \text{ L}}{1} = 0.003 \text{ moles NaOH}$$

$$0.004 - 0.003 = \frac{0.001 \text{ moles HBr}}{0.035 \text{ L soln}}$$

$$\text{pH} = -\log(0.0286) = 1.54$$

$$b) \frac{0.200 \text{ mol}}{1} \times \frac{0.0199 \text{ L}}{1} = 0.00398$$

$$0.004 - 0.00398 = 2.0 \times 10^{-5} / 0.0399$$

$$-\log(5.01 \times 10^{-4}) = 3.30$$

$$c) \text{pH} = 7$$

$$d) \frac{0.200 \text{ mol}}{1} \times \frac{0.021 \text{ L}}{1} = 0.0042 \text{ moles NaOH}$$

$$0.0042 - 0.004 = \frac{0.0002 \text{ moles OH}^-}{0.041}$$

$$-\log(0.00489) = 2.31 = \text{pOH}$$

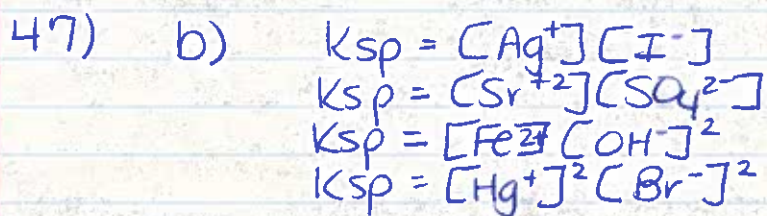
$$14 - 2.31 = 11.7$$

$$e) \frac{0.200 \text{ mol}}{1} \times \frac{0.035}{1} = 0.007 \quad 0.007 - 0.004 = \frac{0.003}{0.055}$$

$$-\log(0.0545) = 1.26$$

$$14 - 1.26 = 12.7$$

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49) a) $K_{sp} = [Ca^{2+}][F^-]^2$
 $= (1.24 \times 10^{-3})(2 \times 1.24 \times 10^{-3})^2$
 $= 7.63 \times 10^{-9}$

c) $K_{sp} = [Ba^{2+}][IO_3^-]^2$
 $6 \times 10^{-10} = x \cdot (2x)^2 = 4x^3$
 $5.31 \times 10^{-4} \text{ mol Ba(IO}_3)_2 / \text{L}$