CONCEPT: HENDERSON-HASSELBALCH EQUATION

1) The Henderson-Hasselbalch Equation

● *Strong acids* have small pK_a & ____________ dissociate, but *weak acids* do _____ completely dissociate.

□ Calculating pH of *strong* acid solutions is *easy* since initial acid concentration equals final $[H^+]$ (ex. $[HCl]_i = [H^+]_f$).

□ Most biological acids are _________ acids.

● The *Henderson-Hasselbalch equation*: expresses relationship between pH & ______.

□ Used to determine: 1) The final _____ of a weak acid solution after it reaches equilibrium.

2) The ratio of [conjugate base] to [conjugate acid] when given pH.

Henderson-Hasselbalch Equation

$$\mathbf{pH = pK_a} + \log\frac{[\text{Conjugate Base}]_f}{[\text{Conjugate Acid}]_f}$$

EXAMPLE: Determine the ratio of [conjugate base] to [conjugate acid] for Aspirin (pK_a = 3.4) in the blood (pH = 7.4)?

a) 16,000

b) 10,000

c) 7.9

d) 4,200

PRACTICE: What is the pH of a mixture of 0.02 M sodium formate & 0.0025 M formic acid (pK_a = 3.75)?

a) pH = 4.21

b) pH = 1.27

c) pH = 4.65

d) pH = 9.34

PRACTICE: What is the ratio of $[CH_3COO^-]$ / $[CH_3COOH]$ in an acetate buffer at pH = 7? pK_a = 4.76.

a) 122.43

b) 173.78

c) 39.84

d) 96.31

CONCEPT: HENDERSON-HASSELBALCH EQUATION

PRACTICE: Consider 100 mL of a 1M acid solution (pK_a = 7.4) at pH = 8. Calculate final pH if 30 mL of 1M HCl is added.

a) pH = 7.4

b) pH = 7.9

c) pH = 7.1

d) pH = 8.2