Chapter 16: Acid Base Equilibrium

1) Please fill in the missing information in the following table.

$[H_3O^+]$	pH	$[OH^-]$	pOH	Acidic, Basic, or Neutral?
1.0×10^{-7} M				
	9.31			
		5.4×10^{-9} M		
			1.4	

2) True or False?

a) _____The K_a for carbonic acid refers to the reaction: $H_2CO_3 + H_2O \rightleftharpoons HCO_3^- + H_3O^+$.

b) _____The K_b for bicarbonate ion refers to the reaction: $HCO_3^- + H_3O^+ \rightleftharpoons H_2CO3 + H_2O$.

c) _____ A solution of sodium bicarbonate in water will be basic.

d) _____ Given $CH_3(CH_2)_2CO_2H$ has $K_a = 1.51 \times 10^{-5}$, $CH_3(CH_2)_2CO_2^-$ has $K_b = 6.61 \times 10^{-10}$.

e) _____ Smaller pK_a, larger K_a, and more acidic are all synonymous.

f) _____ A Lewis base is an electron pair donor.

3) Lactate, $CH_3CH(OH)CO_2^-$, is constantly produced from pyruvate during normal metabolism. When the citric acid cycle backs up due to insufficient oxygen supply, lactate builds up in your exercising muscles and you feel that painful burning sensation.

Lactate has $K_b = 7.24 \times 10^{-11}$ at 25 ºC.

a) Please write the equation described by this K_b.

b) What is the K_a of lactic acid at 25 ºC?

c) If a solution is initially 0.210 M lactic acid, what is the pH at 25 ºC?

4) Please arrange the following 0.10 M solutions in order of increasing acidity:

$BaCl_2$, NH_4Cl, $NaHCO_3$, K_3PO_4, NH_4NO_2, $NaNH_2$,   LiCN

5) A 0.150 M solution of morphine ($C_{17}H_{19}NO_3$) has a pH of 10.5.
   a) What is morphine's K_b?

   b) Morphine is a (circle one):   Strong Acid   Weak Acid   Weak Base   Strong Base

6) The reaction: $2 NH_3 (g) \rightleftharpoons N_2 (g) + 3 H_2 (g)$ has $Kp = 1.89 \times 10^{-6}$ at 25 ºC.

(Challenge – hint, this is not an acid/base problem) When a certain partial pressure of $NH_3 (g)$ is put into an otherwise empty rigid vessel at 25 ºC, equilibrium is reached when 50.0% of the original ammonia has decomposed. What was the original partial pressure of ammonia before any decomposition occurred?