ANSWERS TO "TRY YOURSELF" PROBLEMS FROM STUDY SECTIONS 8.5, 8.6 AND 8.7

Try Yourself 8.5

Decide whether K_3PO_4 will give rise to an acidic, basic or neutral solution in water.

Answer:

An aqueous solution of K_3PO_4 should be basic (pH > 7) because the PO_4^{3-} ion has a K_b value = 2.8×10^{-2} which is smaller than 1 but relative large compared to other well-known bases.

The K^+ ion does not affect the pH of the solution.

Try Yourself 8.6

Is a reaction between HCO_3^- ions and NH_3 product- or reactant-favored at equilibrium?

$NH_3(aq) + HCO_3^-(aq) \leftrightarrows CO_3^{2-}(aq) + NH_4^+(aq)$

Answer:

$NH_3(aq)$	+	$HCO_3^-(aq)$	$\leftrightarrows$	$CO_3^{2-}(aq)$	+	$NH_4^+(aq)$
$K_b = 1.8 \times 10^{-5}$		**$K_a = 4.8 \times 10^{-11}$**		**$K_b = 2.12 \times 10^{-4}$**		**$K_a = 5.6 \times 10^{-10}$**

Both the weaker base and the weaker acid are on the reagent side of the equation (left-hand side), therefore:

All proton transfer reactions proceed from the stronger acid and base to the weaker acid and base. The reaction will proceed from right to left. Reactant-favored!!

* I will supply you with the K_a and K_b values in a test OR I will supply you with a table with values from which you will be able to extract the values.

Try Yourself 8.7

Equal molar amounts of HCl(aq) and NaCN(aq) are mixed. Is the resulting solution acidic, basic or neutral?

Answer:

The two compounds react and form a solution containing HCN and NaCl.

$HCl(aq) + NaCN(aq) \leftrightarrows HCN(aq) + NaCl(aq)$

$K_{b(Cl^-)}$ = smaller than 1.0×10^{-14}

$K_{a(HCN)} = 4.0 \times 10^{-10}$

The solution is acidic (HCN is a stronger acid that the chloride ion is a base).