AP Chemistry
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AP MULTIPLE CHOICE QUESTIONS
CH. 16, SET 2

1989

52. The test for the presence of Ag+ in an unknown solution involves the treatment of the silver-ammonia complex with dilute hydrochloric acid. The appearance of a white precipitate at this point indicates the presence of silver ion in the original sample. The net ionic equation that represents this test is

(A) $Ag(NH_4)_4^+ + 4H^+ \rightleftharpoons Ag\,(s) + 4NH_4^+$
(B) $Ag(NH_4)_4^+ + Cl^- \rightleftharpoons AgCl\,(s) + 4NH_4^+$
(C) $Ag(NH_3)_4^+ + 4HCl \rightleftharpoons AgCl\,(s) + 4NH_4^+ + 3Cl^-$
(D) $Ag(NH_3)_2^+ + Cl^- \rightleftharpoons Ag(NH_3)_2Cl\,(s)$
(E) $Ag(NH_3)_2^+ + 2H^+ + Cl^- \rightleftharpoons AgCl\,(s) + 2NH_4^+$

55. $H_2PO_4^- + HBO_3^{2-} \rightleftharpoons HPO_4^{2-} + H_2BO_3^-$

The equilibrium constant for the reaction represented by the equation above is greater than 1.0. Which of the following gives the correct relative strengths of the acids and bases in the reaction?

	Acids	Bases
(A)	$H_2PO_4^- > H_2BO_3^-$	$HBO_3^{2-} > HPO_4^{2-}$
(B)	$H_2BO_3^- > H_2PO_4^-$	$HBO_3^{2-} > HPO_4^{2-}$
(C)	$H_2PO_4^- > H_2BO_3^-$	$HPO_4^{2-} > HBO_3^{2-}$
(D)	$H_2BO_3^- > H_2PO_4^-$	$HPO_4^{2-} > HBO_3^{2-}$
(E)	$H_2PO_4^- = H_2BO_3^-$	$HPO_4^{2-} > HBO_3^{2-}$

56. A 0.20-molar solution of a weak monoprotic acid, HA, has a pH of 3.00. The ionization constant of this acid is:

(A) 5.0×10^{-7} (C) 5.0×10^{-6} (E) 2.0×10^{-3}
(B) 2.0×10^{-7} (D) 5.0×10^{-3}

67. $BrO_3^- + 5Br^- + 6H^+ \rightleftharpoons 3Br_2 + 3H_2O$

If 25.0 milliliters of 0.200 molar BrO_3^- is mixed with 30.0 milliliters of 0.450 molar Br^- solution that contains a large excess of H^+, the amount of Br_2 formed, according to the equation above is

(A) 5.00×10^{-3} mole (C) 1.35×10^{-2} mole (E) 1.62×10^{-2} mole
(B) 8.10×10^{-3} mole (D) 1.50×10^{-2} mole

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22. $HSO_4^- + H_2O \rightleftharpoons H_3O^+ + SO_4^{2-}$

In the equilibrium represented above, the species that act as bases include which of the following?

I. HSO_4^-
II. H_2O
III. SO_4^{2-}

(A) II only (C) I and II (E) II and III
(B) III only (D) I and III

31. $H_2C_2O_4 + 2H_2O \rightleftharpoons 2H_3O^+ + C_2O_4^{2-}$

Oxalic acid, $H_2C_2O_4$, is a diprotic acid with $k_1 = 5.36 \times 10^{-2}$ and $k_2 = 5.3 \times 10^{-5}$. For the reaction above, what is the equilibrium constant?

(A) 5.36×10^{-2} (C) 2.8×10^{-6} (E) 1.9×10^{-13}
(B) 5.3×10^{-5} (D) 1.9×10^{-10}

61. A 1-molar solution of which of the following salts has the highest pH?

(A) $NaNO_3$ (B) Na_2CO_3 (C) NH_4Cl (D) $NaHSO_4$ (E) Na_2SO_4