Topics 4.7 – 4.9: MCQ Practice

$$Al(s) + H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3\ H_2(g)$$

1. Which of the following is true about the reaction represented by the equation shown above?

   (A) It is a redox reaction, because Al is oxidized and H is reduced.

   (B) It is a redox reaction, because S is oxidized and H is reduced.

   (C) It is a Brønsted-Lowry acid-base reaction, because H_2SO_4 behaves as a proton donor.

   (D) It is a Brønsted-Lowry acid-base reaction, because Al behaves as a proton acceptor.

2. Which of the following represents an acid-base reaction?

   (A) $Zn(s) + 2\ HNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + H_2(g)$

   (B) $Cu(OH)_2(s) \rightarrow CuO(s) + H_2O(l)$

   (C) $NH_3(aq) + HCl(aq) \rightarrow NH_4Cl(aq)$

   (D) $Ba(OH)_2(aq) + K_2SO_4(aq) \rightarrow BaSO_4(s) + 2\ KOH(aq)$

3. A student combines a solution of calcium chloride, $CaCl_2(aq)$, with an excess amount of aqueous sodium carbonate, $Na_2CO_3(aq)$. A solid precipitate is formed. The student collects the solid by filtration, rinses the solid with small amounts of distilled water, and dries the solid.

   During the course of the experiment, which of the following happens to the Cl^- ions?

   (A) They are present in the solid precipitate at the end of the reaction.

   (B) They remain dissolved in the filtrate solution.

   (C) They are oxidized, forming Cl_2 molecules.

   (D) They are reduced as they react with H_2O molecules.

4. Which of the following represents a redox reaction in which O atoms are reduced?

(A) $2\ OF_2 \rightarrow O_2 + 2\ F_2$

(B) $CaCO_3 \rightarrow CaO + CO_2$

(C) $2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$

(D) $P_4O_{10} + 6\ H_2O \rightarrow 4\ H_3PO_4$

$$H_2C_2O_4(aq) + NH_3(aq) \rightleftarrows HC_2O_4^-(aq) + NH_4^+(aq)$$

$$HC_2O_4^-(aq) + NH_3(aq) \rightleftarrows C_2O_4^{2-}(aq) + NH_4^+(aq)$$

5. Which of the following represent a Brønsted-Lowry conjugate acid-base pair from the reactions represented by the equations shown above?

(A) $H_2C_2O_4(aq)$ and $NH_3(aq)$

(B) $C_2O_4^-(aq)$ and $NH_3(aq)$

(C) $H_2C_2O_4(aq)$ and $C_2O_4^{2-}(aq)$

(D) $HC_2O_4^-(aq)$ and $C_2O_4^{2-}(aq)$

$$H_2O(l) + C_6H_5NH_2(aq) \rightleftarrows C_6H_5NH_3^+(aq) + OH^-(aq)$$

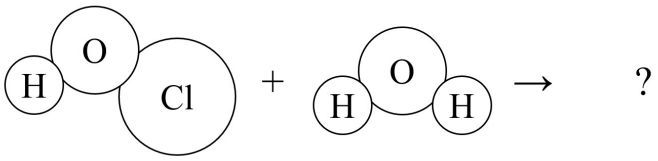
6. Which of the following correctly identifies a Bronsted-Lowry conjugate acid-base pair in the reaction represented by the equation shown above?

(A) The acid is H_2O, and the conjugate base is $C_6H_5NH_2$.

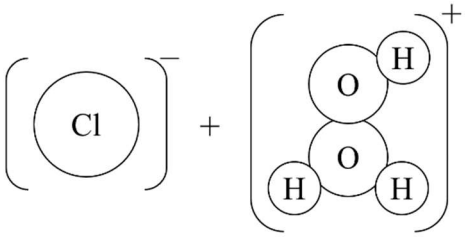
(B) The acid is H_2O, and the conjugate base is OH^-.

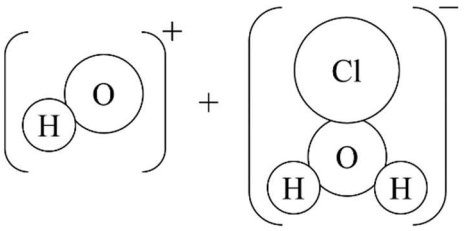
(C) The acid is $C_6H_5NH_2$, and the conjugate base is H_2O.

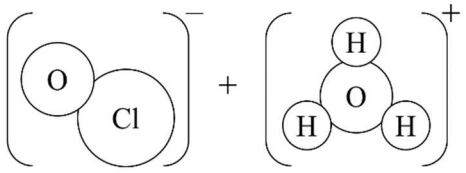
(D) The acid is $C_6H_5NH_2$, and the conjugate base is $C_6H_5NH_3^+$.

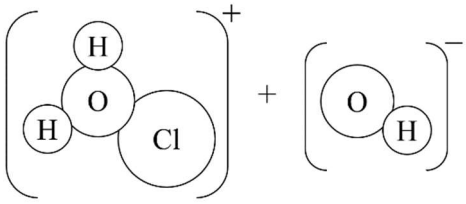


7. Hypochlorous acid, HOCl, behaves as a Brønsted-Lowry acid when it reacts with water. Particulate diagrams for HOCl and H_2O are shown above. Which of the following particulate diagrams represent the products formed in this reaction?

(A) 

(B) 

(C) 

(D) 

$$2\ Al(s)\ +\ 3\ Zn(NO_3)_2(aq)\ \rightarrow\ 2\ Al(NO_3)_3(aq)\ +\ 3\ Zn(s)$$

8. The reaction between solid aluminum and aqueous zinc nitrate is represented by the balanced equation shown above. What is the total number of moles of electrons transferred from Al atoms to Zn^{2+} ions in this chemical equation?

(A) 2

(B) 3

(C) 4

(D) 6

Half-Reaction
$Cr(s) \rightarrow Cr^{3+}(aq) + 3\ e^-$
$O_2(g) + 4\ H^+(aq) + 4\ e^- \rightarrow 2\ H_2O(l)$

9. Based on the half-reactions shown above, which of the following is the balanced net ionic equation for the oxidation-reduction reaction between $Cr(s)$ and $O_2(g)$?

(A) $Cr(s) + O_2(g) + 4\ H^+(aq) \rightarrow Cr^{3+}(aq) + 2\ H_2O(l)$

(B) $Cr(s) + 3\ O_2(g) + 12\ H^+(aq) \rightarrow Cr^{3+}(aq) + 6\ H_2O(l)$

(C) $4\ Cr(s) + O_2(g) + 4\ H^+(aq) \rightarrow 4\ Cr^{3+}(aq) + 2\ H_2O(l)$

(D) $4\ Cr(s) + 3\ O_2(g) + 12\ H^+(aq) \rightarrow 4\ Cr^{3+}(aq) + 6\ H_2O(l)$