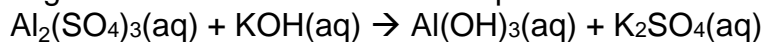


## Chemical Reactions-Multiple Choice Review

PSI Chemistry

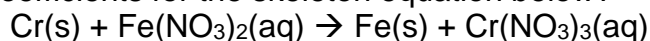
Name \_\_\_\_\_

1) What are the missing coefficients for the skeleton equation below?



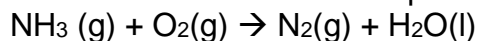
- A) 1,3,2,3
- B) 2,12,4,6
- C) 4,6,2,3
- D) 1,6,2,3
- E) 2,3,1,1

2) What are the missing coefficients for the skeleton equation below?



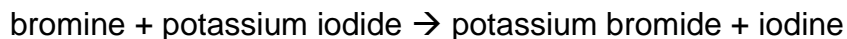
- A) 4,6,6,2
- B) 2,3,2,3
- C) 2,3,3,2
- D) 1,3,3,1
- E) 2,3,1,2

3) What are the missing coefficients for the skeleton equation below?



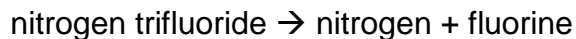
- A) 4,3,2,6
- B) 2,1,2,3
- C) 1,3,1,3
- D) 2,3,2,3
- E) 3,4,6,2

4) If you rewrite the following word equation as a balanced chemical equation, what will the coefficient and symbol for iodine be?



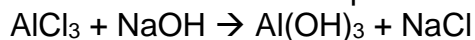
- A)  $2\text{I}^-$
- B) I
- C) 2I
- D)  $\text{I}_2$
- E)  $2\text{I}_2$

5) If you rewrite the following word equation as a balanced chemical equation, what will the coefficient and symbol for fluorine be?



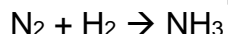
- A) 3F
- B)  $6\text{F}_2$
- C)  $\text{F}_3$
- D) 6F
- E)  $3\text{F}_2$

6) What are the missing coefficients for the skeleton equation below?



- A) 1,3,1,3
- B) 3,1,3,1
- C) 1,1,1,3
- D) 1,3,3,1
- E) 3,1,1,1

7) What are the missing coefficients for the skeleton equation below?



- A) 1,1,2
- B) 1,3,3
- C) 3,1,2
- D) 1,3,2
- E) 2,6,6

8) Aluminum chloride and bubbles of hydrogen gas are produced when metallic aluminum is placed in hydrochloric acid. What is the balanced equation for this reaction?

- A)  $\text{H} + \text{AlCl} \rightarrow \text{Al} + \text{HCl}$
- B)  $2\text{Al} + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2$
- C)  $\text{Al} + \text{HCl}_3 \rightarrow \text{AlCl}_3 + \text{H}$
- D)  $\text{Al} + 2\text{HCl} \rightarrow \text{AlCl}_2 + \text{H}_2$
- E)  $\text{H}_2 + \text{AlCl}_3 \rightarrow \text{Al} + 2\text{HCl}$

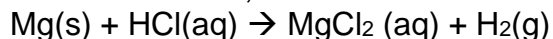
9) What does the symbol  $\Delta$  in a chemical equation mean?

- A) heat is supplied to the reaction
- B) a catalyst is needed
- C) yields
- D) precipitate

10) When the equation,  $\text{Fe} + \text{Cl}_2 \rightarrow \text{FeCl}_3$ , is balanced, what is the coefficient for  $\text{Cl}_2$ ?

- A) 1
- B) 2
- C) 3
- D) 4

11) When the following equation is balanced, what is the coefficient for HCl?



- A) 6
- B) 3
- C) 1
- D) 2

12) Chemical reactions \_\_\_\_\_.]

- A) occur only in living organisms
- B) create and destroy atoms
- C) only occur outside living organisms
- D) produce new substances

13) Which of the following is NOT a true statement concerning what happens in all chemical reactions?

- A) The ways in which atoms are joined together are changed.
- B) New atoms are formed as products.
- C) The starting materials are named reactants.
- D) The bonds of the reactants are broken and new bonds of the products are formed.
- E) In a word equation representing a chemical reaction, the reactants are written on the left and the products on the right.

14) Chemical equations \_\_\_\_\_.

- A) describe chemical reactions
- B) show how to write chemical formulas
- C) give directions for naming chemical compounds
- D) describe only biological changes

15) A skeleton equation does NOT show which of the following?

- A) the correct formulas of the reactants and products
- B) the reactants on the left, the products on the right
- C) an arrow connecting the reactants to the products
- D) the physical states of the substances
- E) the relative amounts of reactants and products

16) Chemical equations describe \_\_\_\_\_. □

- A) nuclear reactions
- B) electrochemical processes
- C) chemical reactions
- D) biological reactions
- E) all the above

17) Chemical equations must be balanced to satisfy the \_\_\_\_\_. □

- A) law of definite proportions
- B) law of multiple proportions
- C) law of conservation of mass
- D) principle of Avogadro

18) Symbols used in equations, together with the explanations of the symbols, are shown below. Which set is correct?

- A) (g), grams
- B) (l), liters
- C) (aq), dissolved in water
- D) (sp), solid product
- E) (lq), liquid

19) In the chemical equation,  $\text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ , the  $\text{H}_2\text{O}_2$  is a \_\_\_\_\_.

- A) product
- B) reactant
- C) catalyst
- D) solid
- E) gas

20) A catalyst is \_\_\_\_\_.

- A) the product of a reaction
- B) is a reactant
- C) one of the reactants in single-replacement reactions
- D) a solid product of a reaction
- E) a chemical that speeds up the reaction

21) When the following equation is balanced,  $\text{KClO}_3(\text{s}) \rightarrow \text{KCl}(\text{s}) + \text{O}_2(\text{g})$ , the coefficient of  $\text{KClO}_3$  is \_\_\_\_\_.

- A) 1
- B) 2
- C) 3
- D) 4
- E) 6

22) Which of the following is the correct skeleton equation for the reaction that takes place when solid phosphorus combines with oxygen gas to form diphosphorus pentoxide?

- A)  $\text{P}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{PO}_2(\text{g})$
- B)  $\text{P}(\text{s}) + \text{O}(\text{g}) \rightarrow \text{P}_2\text{O}_5(\text{g})$
- C)  $\text{P}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{P}_2\text{O}_5(\text{g})$
- D)  $\text{P}_2\text{O}_5 \rightarrow \text{P}_2(\text{s}) + \text{O}_2(\text{g})$
- E)  $\text{P}_2(\text{s}) + \text{O}_5(\text{g}) \rightarrow \text{P}_2\text{O}_5(\text{g})$

23) In every balanced chemical equation, each side of the equation has the same number of \_\_\_\_\_.

- A) atoms
- B) molecules
- C) moles

- D) coefficients
- E) subscripts

24) When potassium hydroxide and barium chloride react, potassium chloride and barium hydroxide are formed. The balanced equation for this reaction is \_\_\_\_\_.

- A)  $\text{KH} + \text{BaCl} \rightarrow \text{KCl} + \text{BaH}$
- B)  $\text{KOH} + \text{BaCl} \rightarrow \text{KCl} + \text{BaOH}$
- C)  $2\text{KOH} + \text{BaCl}_2 \rightarrow 2\text{KCl} + \text{Ba}(\text{OH})_2$
- D)  $\text{KOH} + \text{BaCl}_2 \rightarrow \text{K} + \text{BaOH}$
- E)  $2\text{KOH} + 2\text{BaCl}_2 \rightarrow 2\text{KCl}_2 + 2\text{Ba}(\text{OH})_2$

25) The double arrow symbol indicates \_\_\_\_\_.

- A) that heat must be applied
- B) an incomplete combustion reaction
- C) that a gas is formed by the reaction
- D) that the reaction is reversible

26) If a combination reaction takes place between potassium and chlorine, what is the product?

- A) KCl
- B)  $\text{KCl}_2$
- C)  $\text{K}_2\text{Cl}$
- D)  $\text{PCl}$
- E)  $\text{PCl}_2$

27) The product of a combination reaction is  $\text{Ba}(\text{OH})_2$ . If one reactant was  $\text{H}_2\text{O}$  what was the other reactant?

- A)  $\text{Ba}_2\text{O}$
- B)  $\text{BaO}$
- C)  $\text{BaH}$
- D)  $\text{BaO}_2$
- E)  $\text{Ba}_2\text{O}_7$

28) Write a balanced equation for the combination reaction that takes place when iron(III) oxide is formed from its constituent elements.

- A)  $\text{Fe}_2 + \text{O}_3 \rightarrow \text{Fe}_2\text{O}_3$
- B)  $2\text{Fe} + 3\text{O} \rightarrow \text{Fe}_2\text{O}_3$
- C)  $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$
- D)  $3\text{Fe} + \text{O} \rightarrow \text{Fe}_3\text{O}$
- E)  $\text{Fe} + \text{O}_3 \rightarrow \text{FeO}_3$

29) The reaction,  $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$ , is an example of which type of reaction?

- A) REDOX - combustion reaction
- B) REDOX - disproportionation reaction
- C) REDOX - combination reaction
- D) Precipitation Reaction
- E) Acid/Base Reaction

30) Write a balanced equation to represent the decomposition of lead(IV) oxide into its constituent elements.

- A)  $\text{PbO}_2 \rightarrow \text{Pb} + 2\text{O}$
- B)  $\text{PbO}_2 \rightarrow \text{Pb} + \text{O}_2$
- C)  $\text{Pb}_2\text{O} \rightarrow 2\text{Pb} + \text{O}$
- D)  $\text{PbO} \rightarrow \text{Pb} + \text{O}_2$
- E)  $2\text{PbO} \rightarrow 2\text{Pb} + \text{O}_2$

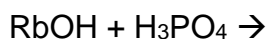
31) What is the balanced equation for the reaction that takes place between bromine and sodium iodide?

- A)  $\text{Br}_2 + \text{NaI} \rightarrow \text{NaBr}_2 + \text{I}$
- B)  $\text{Br}_2 + 2\text{NaI} \rightarrow 2\text{NaBr} + \text{I}_2$
- C)  $\text{Br}_2 + 2\text{NaI} \rightarrow 2\text{NaBr} + 2\text{I}^-$
- D)  $\text{Br} + \text{NaI}_2 \rightarrow \text{NaBrI}_2$
- E)  $\text{Br} + \text{NaI}_2 \rightarrow \text{NaBr} + \text{I}_2$

32) The equation  $\text{Mg}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2$  is an example of which type of reaction?

- A) REDOX reaction
- B) Acid/Base reaction
- C) REDOX - disproportionation reaction
- D) Precipitation reaction

33) What are the correct formulas and coefficients for the products of this acid/base neutralization reaction?



- A)  $\text{Rb}(\text{PO}_4)_3 + \text{H}_2\text{O}$
- B)  $\text{RbPO}_4 + 2\text{H}_2\text{O}$
- C)  $\text{Rb}_3\text{PO}_4 + 3\text{H}_2\text{O}$
- D)  $\text{H}_3\text{Rb} + \text{PO}_4\text{OH}$
- E)  $3\text{RbH} + \text{H}_2\text{OPO}_4$

34) The equation  $\text{H}_3\text{PO}_4 + 3\text{KOH} \rightarrow \text{K}_3\text{PO}_4 + 3\text{H}_2\text{O}$  is an example of which type of reaction?

- A) REDOX - combination reaction
- B) REDOX - disproportionation reaction

- C) Acid/Base reaction
- D) Precipitation reaction

35) When the equation for the complete combustion of ethanol,  $C_2H_5OH$ , is balanced, what is the coefficient for oxygen?

- A) 1
- B) 3
- C) 6
- D) 7
- E) 14

36) The equation  $2C_3H_7OH + 9O_2 \rightarrow 6CO_2 + 8H_2O$  is an example of which type of reaction?

- A) REDOX - combustion
- B) REDOX - synthesis
- C) Acid/base reaction
- D) Precipitation reaction

37) Which of the following is NOT true concerning the decomposition of a simple binary compound?

- A) The products are unpredictable.
- B) The products are the constituent elements.
- C) The reactant is a single substance.
- D) The reactant could be an ionic or a molecular compound.
- E) Energy is usually required.

38) Which of the following is TRUE regarding a precipitation reaction.

- A) Both products must be soluble in water
- B) At least one of the products will be insoluble in water
- C) Spectator ions are always included in the reaction
- D) Electrons are gained and lost
- E)  $H^+$  ions are transferred from one molecule to another

39) Which of the following ions will NEVER form a precipitate?

- A)  $K^+$
- B)  $Ca^{2+}$
- C)  $CO_3^{2-}$
- D)  $SO_4^{2-}$
- E)  $Pb^{2+}$

40) Combining aqueous solutions of  $BaI_2$  and  $Na_2SO_4$  affords a precipitate of  $BaSO_4$ . Which ion(s) is/are spectator ions in the reaction?

- A)  $Ba^{2+}$  only

- B) Na<sup>+</sup> only
- C) Ba<sup>2+</sup> and SO<sub>4</sub><sup>2-</sup>
- D) Na<sup>+</sup> and I<sup>-</sup>
- E) SO<sub>4</sub><sup>2-</sup> and I<sup>-</sup>

41) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl<sub>2</sub> and AgNO<sub>3</sub>?

- A) Co<sup>2+</sup> and NO<sub>3</sub><sup>-</sup>
- B) NO<sub>3</sub><sup>-</sup> and Cl<sup>-</sup>
- C) Co<sup>2+</sup> and Ag<sup>+</sup>
- D) Cl<sup>-</sup>
- E) NO<sub>3</sub><sup>-</sup>

42) The balanced net ionic equation for precipitation of CaCO<sub>3</sub> when aqueous solutions of Na<sub>2</sub>CO<sub>3</sub> and CaCl<sub>2</sub> are mixed is \_\_\_\_\_.

- A) 2Na<sup>+</sup>(aq) + CO<sub>3</sub><sup>2-</sup>(aq) → Na<sub>2</sub>CO<sub>3</sub>(aq)
- B) 2Na<sup>+</sup>(aq) + 2Cl<sup>-</sup>(aq) → 2NaCl(aq)
- C) Na<sup>+</sup>(aq) + Cl<sup>-</sup>(aq) → NaCl(aq)
- D) Ca<sup>2+</sup>(aq) + CO<sub>3</sub><sup>2-</sup>(aq) → CaCO<sub>3</sub>(s)
- E) Na<sub>2</sub>CO<sub>3</sub>(aq) + CaCl<sub>2</sub>(aq) → 2NaCl(aq) + CaCO<sub>3</sub>(s)

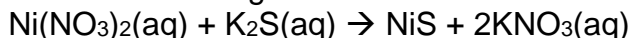
43) When aqueous solutions of AgNO<sub>3</sub> and KI are mixed, AgI precipitates. The balanced net ionic equation is:

- A) Ag<sup>+</sup>(aq) + I<sup>-</sup>(aq) → AgI(s)
- B) Ag<sup>+</sup>(aq) + NO<sub>3</sub><sup>-</sup>(aq) → Ag NO<sub>3</sub>(s)
- C) Ag<sup>+</sup>(aq) + NO<sub>3</sub><sup>-</sup>(aq) → Ag NO<sub>3</sub>(aq)
- D) Ag NO<sub>3</sub>(aq) + KI(aq) → AgI(s) + KNO<sub>3</sub>(aq)
- E) Ag NO<sub>3</sub>(aq) + KI(aq) → AgI(aq) + KNO<sub>3</sub>(s)

44) A precipitation reaction takes place when aqueous cobalt(III) chloride reacts with aqueous lithium hydroxide. One of the products of this reaction would be \_\_\_\_\_.

- A) Co(OH)<sub>3</sub> (s)
- B) Co(OH)<sub>2</sub> (s)
- C) LiCO<sub>3</sub> (s)
- D) LiCl<sub>3</sub> (aq)
- E) Cl<sub>3</sub>OH (s)

45) What is the driving force in the following reaction?



- A) A gas is formed.
- B) A precipitate is formed.
- C) Ionic compounds are reactants.
- D) Ionic compounds are products.
- E) Heat is required.

46) A precipitation reaction takes place when aqueous Na<sub>2</sub>CO<sub>3</sub> reacts with aqueous Sn(NO<sub>3</sub>)<sub>2</sub>. You would expect one of the products of this reaction to be \_\_\_\_\_.



- A)  $\text{NaNO}_3$  (aq)
- B)  $\text{NaSn}$  (s)
- C)  $\text{Sn}(\text{CO}_3)_2$  (s)
- D)  $\text{CNO}_3$

47) Which of the following solutions, when added to a solution of  $\text{Na}_2\text{SO}_4$  would form a precipitate?

- I.  $\text{AgNO}_3$ (aq)
- II.  $\text{KNO}_3$ (aq)
- III.  $\text{CaCl}_2$  (aq)

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

48) Which of the following solutions, when added to a solution of  $\text{Sr}(\text{NO}_3)_2$ (aq), would form a precipitate?

- I.  $\text{Na}_2\text{SO}_4$  (aq)
- II.  $\text{HgC}_2\text{H}_3\text{O}_2$ (aq)
- III.  $\text{NH}_4\text{Cl}$

- A) I only
- B) II only
- C) III only
- D) I and II only
- E) I, II, and III

49) Which of the following represents the correct net-ionic equation for the reaction of calcium nitrate with potassium phosphate?

- A)  $\text{Ca}^{2+}(\text{aq}) + \text{PO}_4^{3-}(\text{aq}) \rightarrow \text{CaPO}_4(\text{s})$
- B)  $2\text{Ca}^{2+}(\text{aq}) + 3\text{PO}_4^{3-}(\text{aq}) \rightarrow \text{Ca}_2(\text{PO}_4)_3(\text{s})$
- C)  $3\text{Ca}^{2+}(\text{aq}) + 2\text{PO}_4^{3-}(\text{aq}) \rightarrow \text{Ca}_3(\text{PO}_4)_2(\text{s})$
- D)  $\text{K}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{KNO}_3(\text{s})$
- E)  $2\text{NO}_3^-(\text{aq}) + \text{Ca}^{2+} \rightarrow \text{Ca}(\text{NO}_3)_2(\text{s})$

50) Which of the following is/are TRUE regarding oxidation/reduction reactions?

- I. Oxidation involves the gain of electrons
- II. electrons are transferred from one substance to another
- III. The number of electrons lost/gained must be equal

- A. I only
- B. II only
- C. III only
- D. II and III
- E. I, II, and III

51) What would be the correct oxidation state of N in the nitrite ion ( $\text{NO}_2^-$ )?

- A. +1
- B. +3
- C. +5
- D. -3
- E. -1

52) What would be the correct oxidation state of N and O respectively in  $\text{KNO}_3$ ?

- A. +1 and -2
- B. +3 and -2
- C. +5 and -2
- D. +5 and -1
- E. -3 and -2

53. Which of the following compounds contain a Cl atom with a +7 oxidation state?

- A.  $\text{Cl}_2$
- B.  $\text{HOCl}$
- C.  $\text{ClO}_3^-$
- D.  $\text{KCl}$
- E.  $\text{KClO}_4$

54. In the following reaction,  $2\text{Al} + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2$ , the oxidation state for aluminum goes from...

- A) 0  $\rightarrow$  +1
- B) 0  $\rightarrow$  +3
- C) +3  $\rightarrow$  +3
- D) +3  $\rightarrow$  -3
- E) 0  $\rightarrow$  -3

55. In which of the following compounds would hydrogen have an oxidation state of zero?

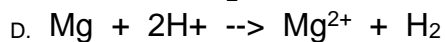
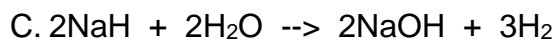
- A)  $\text{HI}$
- B)  $\text{NaH}$
- C)  $\text{Ca}(\text{OH})_2$
- D)  $\text{NH}_4\text{Cl}$
- E)  $\text{H}_2$

56. Which of the following represents an oxidation?

- A.  $\text{Na}^+ \rightarrow \text{Na}$
- B.  $\text{N}_2 \rightarrow 2\text{N}^{3-}$
- C.  $\text{Mn}^{7+} \rightarrow \text{Mn}^{2+}$
- D.  $\text{Fe} \rightarrow \text{Fe}^{3+}$
- E. None of these are oxidations

57. In which of the following reactions does hydrogen get reduced?

- A.  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- B.  $\text{Cl}_2 + \text{H}_2 \rightarrow 2\text{HCl}$



E. H never gets reduced

58. In a combustion reaction, one of the reactants is \_\_\_\_\_.

A) hydrogen

B) nitrogen

C) oxygen

D) a metal

E) a binary ionic compound

59) The products of a combustion reaction do NOT include \_\_\_\_\_.

A) water

B) carbon dioxide

**C) carbon monoxide**

D) heat

E) hydrogen

60) The complete combustion of which of the following substances produces carbon dioxide and water?

A)  $\text{C}_8\text{H}_{18}$

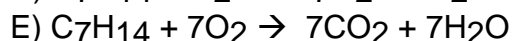
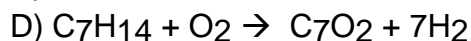
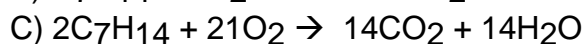
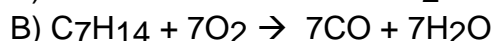
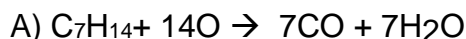
B)  $\text{K}_2\text{CO}_3$

C)  $\text{CaHCO}_3$

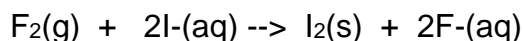
D) NO

E)  $\text{H}_2\text{S}$

61) Which of the following is the correctly balanced equation for the incomplete combustion of heptene,  $\text{C}_7\text{H}_{14}$ ?



62) Which of the following is TRUE regarding the following reaction?



I. Fluorine gets oxidized

II. Iodide ions lose electrons

III. It is a disproportionation reaction

A) I only

B) II only

- C) III only
- D) I and III only
- E) I, II, and III

63) Which of the following would NOT be an oxidation/reduction reaction?

- A.  $\text{Na(s)} + \text{I}_2\text{(s)} \rightarrow 2\text{NaI}$
- B.  $\text{Ca}^{2+}\text{(aq)} + \text{CO}_3^{2-}\text{(aq)} \rightarrow \text{CaCO}_3\text{(s)}$
- C.  $2\text{HgO(s)} \rightarrow 2\text{Hg(s)} + \text{O}_2\text{(g)}$
- D.  $\text{Fe}^{2+}\text{(aq)} + \text{H}^+\text{(aq)} + \text{CrO}_4^{2-}\text{(aq)} \rightarrow \text{Fe}^{3+}\text{(aq)} + \text{H}_2\text{O(l)} + \text{Cr}^{3+}\text{(aq)}$
- E.  $2\text{Fe}_2\text{O}_3\text{(s)} \rightarrow 4\text{Fe(s)} + 3\text{O}_2\text{(g)}$

64) What would be the products of the acid/base reaction between  $\text{KOH(aq)}$  and  $\text{HNO}_3\text{(aq)}$ ?

- A)  $\text{K}^+$  and  $\text{H}^+$
- B)  $\text{H}^+$  and  $\text{OH}^-$
- C)  $\text{K}^+$  and  $\text{NO}_3^-$
- D)  $\text{H}_2\text{O} + \text{K}^+ + \text{NO}_3^-$
- E)  $\text{OH}^-$  only

65) The net ionic equation for the reaction between aqueous solutions of  $\text{HF}$  and  $\text{KOH}$  is \_\_\_\_\_ . (Assume  $\text{HF}$  does not dissociate)

- A)  $\text{HF} + \text{KOH} \rightarrow \text{H}_2\text{O} + \text{K}^+ + \text{F}^-$
- B)  $\text{HF} + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{F}^-$
- C)  $\text{HF} + \text{K}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{KF}$
- D)  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
- E)  $\text{H}^+ + \text{F}^- + \text{K}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{K}^+ + \text{F}^-$

66) When  $\text{H}_2\text{SO}_4$  is neutralized by  $\text{NaOH}$  in aqueous solution, the net ionic equation is \_\_\_\_\_ . (Assume  $\text{H}_2\text{SO}_4$  dissociates)

- A)  $\text{SO}_4^{2-}\text{(aq)} + 2\text{Na}^+\text{(aq)} \rightarrow \text{Na}_2\text{SO}_4\text{(aq)}$
- B)  $\text{SO}_4^{2-}\text{(aq)} + 2\text{Na}^+\text{(aq)} \rightarrow \text{Na}_2\text{SO}_4\text{(s)}$
- C)  $\text{H}^+\text{(aq)} + \text{OH}^-\text{(aq)} \rightarrow \text{H}_2\text{O(l)}$
- D)  $\text{H}_2\text{SO}_4\text{(aq)} + 2\text{OH}^-\text{(aq)} \rightarrow 2\text{H}_2\text{O(l)} + \text{SO}_4^{2-}\text{(aq)}$
- E)  $2\text{H}^+\text{(aq)} + 2\text{NaOH(aq)} \rightarrow 2\text{H}_2\text{O(l)} + 2\text{Na}^+\text{(aq)}$

67) Which of the following would be TRUE regarding acid/base reactions?

- I. Acids donate electrons
- II. Bases accept  $\text{H}^+$  ions
- III. In a neutralization reaction,  $\text{H}_2\text{O}$  is a product

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

68) Which of the following would be a disproportionation reaction?

- A)  $\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{Fe}(\text{s})$
- B)  $2\text{Cl}^{-}(\text{aq}) + \text{Pb}^{2+}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
- C)  $\text{PCl}_5(\text{g}) \rightarrow \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
- D)  $\text{HCN}(\text{aq}) + \text{OH}^{-}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CN}^{-}(\text{aq})$
- E) None of these

For the following, indicate if the first statement is true or false, if the second statement is true or false, and then if the second statement is an explanation of the first. These questions are designed to mimic a type of question found on the SAT II chemistry exam.

69. Acids donate  $\text{H}^{+}$  ions                      BECAUSE                      Bases accept  $\text{H}^{+}$  ions

70. Spectator ions  
are not included in a reaction      BECAUSE                      spectator ions are typically insoluble

71. Iron gets oxidized in the reaction      BECAUSE                      Fe lost electrons  
 $\text{Fe}(\text{s}) \rightarrow \text{Fe}^{3+}(\text{aq})$

Answers:

- |       |       |
|-------|-------|
| 1) D  | 31) B |
| 2) C  | 32) A |
| 3) A  | 33) C |
| 4) D  | 34) C |
| 5) E  | 35) D |
| 6) A  | 36) A |
| 7) D  | 37) A |
| 8) B  | 38) B |
| 9) A  | 39) A |
| 10) C | 40) D |
| 11) D | 41) A |
| 12) D | 42) D |
| 13) B | 43) A |
| 14) A | 44) A |
| 15) E | 45) B |
| 16) E | 46) A |
| 17) C | 47) E |
| 18) C | 48) A |
| 19) B | 49) C |
| 20) E | 50) D |
| 21) B | 51) B |
| 22) C | 52) C |
| 23) A | 53) E |
| 24) C | 54) B |
| 25) D | 55) E |
| 26) A | 56) D |
| 27) B | 57) D |
| 28) C | 58) C |
| 29) C | 59) E |
| 30) B | 60) A |
|       | 61) B |
|       | 62) B |
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- 63) B  
64) D  
65) B  
66) C  
67) E  
68) A  
69) T, T,  
No  
70) T, F,  
No  
71) T, T, Yes