Ch10 Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. A spoonful of sodium chloride is dissolved in a liter of water. What is sodium chloride in this solution?
   a. molecule  
   b. precipitate  
   c. solute  
   d. solvent

2. In an aqueous solution, water is the ___.
   a. homogeneous part.  
   b. precipitate.  
   c. solute.  
   d. solvent.

3. Compounds that produce hydrogen ions in aqueous solutions are ___.
   a. acids.  
   b. aqueous.  
   c. bases.  
   d. ionic compounds.

4. What type of reaction occurs between ions present in aqueous solution?
   a. decomposition  
   b. double-replacement  
   c. single-replacement  
   d. synthesis

5. What type of ions are present in solution but are not actually involved in a chemical reaction?
   a. complete  
   b. net  
   c. precipitate  
   d. spectator

6. If hydrochloric acid and potassium hydroxide react, what is the product of the net ionic equation for the reaction?
   a. hydrochloric acid  
   b. hydrogen ions  
   c. potassium chloride  
   d. water

7. Which of the following gases is not commonly produced in a double-replacement reaction?
   a. carbon dioxide  
   b. hydrogen cyanide  
   c. hydrogen sulfide  
   d. sulfur dioxide

8. $\text{H}^+ (aq) + \text{Br}^- (aq) + \text{K}^+(aq) + \text{OH}_2(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Br}^- (aq) + \text{K}^+(aq)$ is an example of what type of chemical equation?
   a. complete ionic  
   b. net ionic  
   c. precipitation  
   d. spectator

9. What is the probable product of a double-replacement reaction?
   a. A new compound and the replaced metal  
   b. A new compound and the replaced nonmetal  
   c. Two different compounds  
   d. A single compound

10. Which of the following is the complete ionic equation of the reaction between hydroiodic acid and aqueous lithium sulfide?
    a. $2\text{H}^+(aq) + \text{S}^2-(aq) \rightarrow \text{H}_2\text{S} (g)$  
    b. $2\text{H}^+(aq) + 2\text{I}^-(aq) + 2\text{Li}^+(aq) + \text{S}^2-(aq) \rightarrow \text{H}_2\text{S} (g) + 2\text{Li}^+(aq) + 2\text{I}^-(aq)$  
    c. $2\text{I}^-(aq) + 2\text{Li} \rightarrow 2\text{Li}^+ + 2\text{I}^-(aq)$  
    d. $2\text{I}^-(aq) + 2\text{Li} \rightarrow 2\text{LiI}$

11. Which of the following is the net ionic reaction occurring in the blood vessels of human lungs?
    a. $\text{H}_2\text{CO}_3(aq) \rightarrow \text{H}_2\text{O}(l) + \text{CO}_2(g)$  
    b. $\text{H}^+(aq) + \text{Cl}^- (aq) + \text{Na}^+(aq) + \text{HCO}_3^- (aq) \rightarrow \text{H}_2\text{O}(l) + \text{CO}_2(g) + \text{Na}^+(aq) + \text{Cl}^-(aq)$  
    c. $\text{HCl(aq) + NaHCO}_3(aq) \rightarrow \text{H}_2\text{CO}_3(aq) + \text{NaCl(aq)}$
12. What type of reaction takes place when fluorine reacts with sodium bromide?
   a. Single-replacement  
   b. Double-replacement  
   c. Combination  
   d. Decomposition

13. An aqueous solution of magnesium hydroxide is mixed with aqueous copper chloride. Will a visible reaction occur?
   a. No, solid magnesium chloride is soluble in water.  
   b. No, solid copper chloride is soluble in water.  
   c. Yes, solid copper hydroxide will precipitate out of solution.  
   d. Yes, magnesium chloride will precipitate out of solution.

14. What are the products of the double-replacement reaction between aqueous hydrogen bromide and aqueous sodium hydroxide?
   a. Sodium oxybromide and water  
   b. Sodium hydride, bromine, and water  
   c. Sodium hydro bromide and hydroxyl ions  
   d. Water and sodium bromide

15. What is the net ionic equation for the reaction between sulfuric acid and aqueous potassium hydroxide?
   a. $\text{H}^+ \text{(aq)} + \text{OH}^- \text{(aq)} \rightarrow \text{H}_2\text{O(l)}$  
   b. $\text{H}^+(\text{aq}) + 2\text{SO}_4^{2-}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O(l)} + 2\text{K}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$  
   c. $\text{SO}_4^{2-}(\text{aq}) + 2\text{K}^+ \rightarrow 2\text{K}^+ + \text{SO}_4^{2-}(\text{aq})$  
   d. $\text{SO}_4^{2-}(\text{aq}) + 2\text{K}^+ \rightarrow \text{K}_2\text{SO}_4$

**Completion**

Complete each statement.

16. Forest fire releases energy in the form of ____________________ and ____________________.

17. A chemical reaction in which two or more substances react to produce a single product is called a(n) ____________________ reaction.

18. A chemical reaction in which oxygen combines with a substance and releases energy in the form of heat and light is called a(n) ____________________ reaction.

19. A reaction in which the atoms of one element replace the atoms of another element in a compound is called a(n) ____________________ reaction.

20. In an aqueous solution, the solvent is always ____________________.

21. Double-replacement reactions occurring in an aqueous solution producing water ____________________ the number of solvent particles.

22. The net ionic equation of $\text{HCl(aq)} + \text{LiOH(aq)} \rightarrow \text{H}_2\text{O} + \text{LiCl (aq)}$ is ____________________.

**Matching**

Assume that $Q$, $T$, $X$, and $Z$ are symbols for elements. Match each equation with the reaction type it represents

a. decomposition  
   b. double-replacement  
   c. single-replacement  
   d. synthesis

23. $Q + XZ \rightarrow X + QZ$

24. $Q + Z \rightarrow QZ$
25. QT → Q + T
26. QT + XZ → QZ + XT

*Match the terms below with their correct definitions.*

a. combustion  
  d. single-replacement  
  b. decomposition  
  e. synthesis  
  c. double-replacement

27. Aluminum lawn furniture becomes coated with a layer of aluminum oxide when it sits out in the air.
28. Chlorine gas is bubbled through a calcium bromide solution. The solution turns brown, the color of bromine.
29. Lime is added to acid water in a lake. Water and a salt form.
30. Propane is a common household fuel. When burned, water and carbon dioxide are produced.
31. Steel wool burns, forming an iron oxide.
32. When an electric current is passed through molten potassium bromide, potassium and bromine form.
33. When solutions of sodium iodide and lead nitrate are combined, a yellow solid forms.

*Match the terms below with their correct definitions.*

a. aqueous solution  
  j. precipitate  
  b. chemical equation  
  k. product  
  c. chemical reaction  
  l. reactant  
  d. coefficient  
  m. single-replacement reaction  
  e. combustion reaction  
  n. spectator ion  
  f. complete ionic equation  
  o. synthesis reaction  
  g. decomposition reaction  
  p. solute  
  h. double-replacement reaction  
  q. solvent  
  i. net ionic equation

34. A reaction in which a compound breaks down into two or more elements or new compounds
35. A number written in front of a chemical formula
36. A solid produced during a chemical reaction in a solution
37. A solution in which the solvent is water
38. A statement that uses chemical formulas to show the identities and relative amounts of the substances involved in a chemical reaction
39. An equation that shows all of the particles in solution as they actually exist
40. Substance dissolved in a solution.
41. An equation that includes only the particles that participate in the reaction
42. An ion that is present but does not participate in a reaction
43. A reaction in which oxygen combines with a substance and releases heat and light energy
44. A reaction in which the atoms of one element replace the atoms of another element in a compound
45. A reaction involving the exchange of positive ions between two compounds dissolved in water
46. The process by which the atoms of one or more substances are rearranged to form different substances
47. A starting substance in a chemical reaction
48. A substance formed during a chemical reaction
49. A reaction in which two or more substances react to produce a single product
50. The most plentiful substance in a solution.

Ch11 Test
Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Which information about a compound can you use to begin to determine the empirical and molecular formulas of the compound?
   a. mass of the compound  
   c. percent composition of the compound
   b. number of elements in the compound  
   d. volume of the compound

2. You have determined that a compound is composed of 0.300 moles of carbon and 0.600 moles of oxygen. What must you do to determine the mole ratio of the elements in the empirical formula of the compound?
   a. Multiply each mole value by 0.300 mol.  
   c. Divide each mole value by 0.300 mol.
   b. Multiply each mole value by 0.600 mol.  
   d. Divide each mole value by 0.600 mol.

3. The mole ratio of carbon to hydrogen to oxygen in a compound is 1 mol C : 2 mol H : 1 mol O. What is the empirical formula of the compound?
   a. CHO  
   c. C₂H₂O₂
   b. CH₂O  
   d. C₂H₂O

4. You calculate the mole ratio of oxygen to aluminum in a compound to be 1.5 mol O : 1 mol Al. What should you do to determine the mole ratio in the empirical formula of the compound?
   a. Multiply each mole value by 1.5.  
   c. Divide each mole value by 1.5.
   b. Multiply each mole value by 2.  
   d. Divide each mole value by 2.

5. What is the relationship between the molecular formula and the empirical formula of a compound?
   a. 
   b. 
   c. 
   d. 

6. You know that the empirical formula of a compound has a molar mass of 30.0 g/mol. The experimental molar mass of this compound is 60.0 g/mol. What must you do to determine the value of n in the relationship between the molecular formula and the empirical formula?
   a. Add 30.0 g/mol and 60.0 g/mol.  
   c. Divide 60.0 g/mol by 30.0 g/mol.
   b. Divide 30.0 g/mol by 60.0 g/mol.  
   d. Multiply 30.0 g/mol by 60.0 g/mol.

7. You know that the experimental molar mass of a compound is three times the molar mass of its empirical formula. If the compound’s empirical formula is NO₂, what is its molecular formula?
   a. NO₂  
   c. N₂O₂
   b. NO₆  
   d. N₂O₆

8. A mole of potassium chloride (KCl) contains 6.02 × 10²³ ______.
   a. atoms KCl.  
   c. ions KCl.
   b. formula units KCl.  
   d. molecules KCl.

9. The SI unit of molar mass is the ______.
   a. gram.  
   c. mole.
   b. gram/mole.  
   d. mole/gram.

10. Which conversion factor would you use to calculate correctly the mass of 2 moles of the element titanium?
   a. 
   c. 
   b. 
   d. 

   1 g Ti
   47.87 mol Ti
   1 g Ti
   47.87 mol Ti
11. How many moles of oxygen atoms do 1.5 moles of CO$_2$ contain?
   a. 1 mol  
   b. 1.5 mol  
   c. 2 mol  
   d. 3.0 mol

12. Which compound has the smallest molar mass?
   a. CO  
   b. CO$_2$  
   c. H$_2$O  
   d. H$_2$O$_2$

13. One mole of silicon (Si) has a mass of 28.086 g, and one mole of carbon has a mass of 12.011 g. What is the mass of one mole of silicon carbide (SiC)?
   a. 2.340 g  
   b. 16.075 g  
   c. 40.097 g  
   d. 3.3734 \times 10^2 g

14. Methane (CH$_4$) contains 75% carbon. What percentage of methane is hydrogen?
   a. 4%  
   b. 6%  
   c. 25%  
   d. 33%

15. The mole ratio of the elements in a compound’s molecular formula is _____.
   a. a multiple of the mole ratio of the elements in its empirical formula.  
   b. less than the mole ratio of the elements in its empirical formula.  
   c. not related to the mole ratio of the elements in its empirical formula.  
   d. the same as the mole ratio of the elements in its empirical formula.

16. Sodium bromide dihydrate is correctly written as _____.
   a. NaBrH$_2$.  
   b. (NaBr)$_2$-H$_2$O.  
   c. NaBr-(HO)$_2$.  
   d. NaBr-2H$_2$O.

17. As a hydrated compound is heated, it decreases in _____.
   a. brightness.  
   b. color.  
   c. mass.  
   d. temperature.

18. What is the SI base unit used to measure the amount of a substance?
   a. Kelvin  
   b. Kilogram  
   c. Meter  
   d. Mole

19. Calculate the number of molecules in 4.0 mol H$_2$O.
   a. $6.02 \times 10^{23}$ molecules  
   b. $2.4 \times 10^{24}$ molecules  
   c. $2.4 \times 10^{-23}$ molecules  
   d. $2.4 \times 10^{-23}$ molecules

20. How many moles of Ag contain $4.49 \times 10^{23}$ atoms Ag?
   a. 0.745 $\times 10^{24}$ mol  
   b. 0.745 $\times 10^{23}$ mol  
   c. 0.745 mol  
   d. 27.0 mol

21. Calculate the number of atoms in 13.2 mol copper.
   a. $2.19 \times 10^{23}$ atoms  
   b. $7.95 \times 10^{23}$ atoms  
   c. $7.95 \times 10^{23}$ atoms  
   d. $7.95 \times 10^{23}$ atoms

22. Copper (Cu) is a transition element used in the making of coins. Calculate the mass in grams of 0.0420 moles of copper.
   a. 0.00697 g  
   b. 0.252 g  
   c. 2.67 g  
   d. 6.61 g

23. Determine the mass in grams of 0.0489 mol cobalt.
24. How many moles of potassium contain $3.70 \times 10^{23}$ electrons potassium?
   a. $0.615 \times 10^{24}$ mol          c. $0.615$ mol
   b. $0.615 \times 10^{23}$ mol        d. $22.3$ mol

25. How many moles of calcium are in 425 g calcium (Ca)?
   a. $10.6$ mol                       c. $171$ mol
   b. $70.5$ mol                       d. $255$ mol

26. Copper is one of a group of metals called the coinage metals. How many atoms of copper (Cu) are in a pure copper coin weighing 12.0 g?
   a. $0.0313 \times 10^{23}$ atoms     c. $1.10 \times 10^{23}$ atoms
   b. $0.187 \times 10^{23}$ atoms     d. $1.13 \times 10^{23}$ atoms

27. A balloon contains $4.50 \times 10^{22}$ atoms of helium (He) gas. Calculate the mass of helium in grams.
   a. $0.185$ g                        c. $0.0747$ g
   b. $0.0185$ g                      d. $0.299$ g

28. What is the molar mass of Ca(OH)$_2$?
   a. $57.008$ g/mol                    c. $73.088$ g/mol
   b. $73.080$ g/mol                    d. $74.092$ g/mol

29. What is the mass of 2.25 moles of sulfuric acid (H$_2$SO$_4$)?
   a. $50.0$ g                        c. $112$ g
   b. $98.0$ g                        d. $220$ g

30. How many grams of potassium permanganate are in 2.20 moles?
   a. $53.2$ g                        c. $242$ g
   b. $158$ g                         d. $347$ g

31. Determine the number of moles present in 32.5 g aluminum chloride.
   a. $0.244$ mol                      c. $1.21$ mol
   b. $4.10$ mol                      d. $720$ mol

32. What is the mass in grams of $1.02 \times 10^{24}$ atoms manganese (Mn)?
   a. $0.112 \times 10^1$ g            c. $9.30 \times 10^{-1}$ g
   b. $0.169 \times 10^3$ g           d. $9.30 \times 10^1$ g

33. How many moles are present in 21.2 g hydrochloric acid?
   a. $0.582$ mol                      c. $21.0$ mol
   b. $1.72$ mol                      d. $128$ mol

34. A mass of 2.50 g of hydrated copper(II) sulfate is placed in a crucible and heated. On heating, 1.59 g of white anhydrous copper(II) sulfate is left behind. Determine the ratio of water to copper(II) sulfate.
   a. $5:1$                            c. $167:1$
   b. $14:1$                          d. $23:1$

35. On heating 5.03 g of hydrated barium chloride, 4.23 g is left behind. What is the name of this hydrate?
   a. Barium chloride dihydrate        c. Barium chloride tetrahydrate
   b. Barium chloride trihydrate       d. Barium chloride pentahydrate

Matching

Match the letter of the conversion factor that is needed to solve the problem. You may need to use more than one conversion factor to solve the problem.

a. $\frac{65.4 \text{ g Zn}}{1 \text{ mol Zn}}$                      c. $\frac{6.02 \times 10^{23} \text{ atoms Zn}}{1 \text{ mol Zn}}$
36. Find the number of moles in 23.0 g of zinc.

37. Find the mass of $5.0 \times 10^{20}$ zinc atoms.

38. Find the mass of 2.00 moles of zinc.

39. Find the number of atoms in 7.40 g of zinc.

40. Find the number of moles that contain $4.25 \times 10^{27}$ zinc atoms.

41. Find the number of atoms in 3.25 moles of zinc.

Match the terms below with their correct definitions.

- a. Avogadro’s number
- b. empirical formula
- c. hydrate
- d. molar mass
- e. mole
- f. molecular formula
- g. percent composition

42. Compound that has a specific number of water molecules bound to its atoms

43. Percent by mass of each element in a compound

44. Mass in grams of one mole of any pure substance

45. Formula of a compound with the smallest whole-number mole ratio of the elements

46. Specifies the actual number of atoms of each element in one molecule of a compound

47. SI base unit used to measure the amount of a substance

48. $6.02 \times 10^{23}$
Ch10 Test
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1
2. ANS: D PTS: 1
3. ANS: A PTS: 1
4. ANS: B PTS: 1
5. ANS: D PTS: 1
6. ANS: D PTS: 1
7. ANS: D PTS: 1
8. ANS: A PTS: 1
9. ANS: C

The probable products of a double-replacement reaction are two different compounds.

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<td>C</td>
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<td>D</td>
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PTS: 1 DIF: 1 REF: Page 291
OBJ: 10.2.2 Identify the characteristics of different classes of chemical reactions.
NAT: UCP.1 | B.3 TOP: Identify the characteristics of different classes of chemical reactions.
KEY: Chemical reactions MSC: 1

10. ANS: B

The complete ionic equation of the reaction between hydroiodic acid and aqueous lithium sulfide is:

\[ 2H^+(aq) + 2I^-(aq) + 2Li^+(aq) + S^{2-}(aq) \rightarrow H_2S(g) + 2Li^+(aq) + 2I^-(aq) \]

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<td>C</td>
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<td>D</td>
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</table>

PTS: 1 DIF: 2 REF: Page 293
OBJ: 10.3.2 Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.
NAT: B.3 TOP: Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.
KEY: Complete ionic equation MSC: 2

11. ANS: D

The net ionic reaction occurring in the blood vessels of human lungs is:

\[ H^+(aq) + HCO_3^-(aq) \rightarrow H_2O(l) + CO_2(g) \]
In an ionic equation, the constituents of the reaction are represented in their ionic form.

Sodium and chloride ions are spectator ions of the reaction.

Net ionic reaction consists of reactive ions in ionic form.

Correct!

PTS: 1  DIF: 2  REF:  Page 298
OBJ: 10.3.3 Predict whether reactions in aqueous solutions will produce a precipitate, water, or a gas.
NAT: B.3
TOP: Predict whether reactions in aqueous solutions will produce a precipitate, water, or a gas.
KEY: Ionic equation  MSC: 1

12. ANS: A
As fluorine replaces only bromide ions from sodium bromide and forms sodium fluoride as the product, the reaction is a single-replacement reaction.

Since only one ion of more reactive halogen fluorine replaces one ion of less reactive halogen bromine, it is a single ion replacement reaction.

Fluorine replaces bromine from its compound.

In a decomposition reaction, a single compound breaks into two or more elements or compounds.

PTS: 1  DIF: 1  REF:  Page 290
OBJ: 10.2.2 Identify the characteristics of different classes of chemical reactions.
NAT: UCP.1 | B.3
TOP: Identify the characteristics of different classes of chemical reactions.
KEY: Replacement reaction  MSC: 2

13. ANS: C
Yes, solid copper hydroxide will precipitate out of solution and make the reaction visible.

Magnesium chloride is soluble in water but copper hydroxide is insoluble in water.

Copper hydroxide is insoluble in water.

Correct!

Magnesium chloride is soluble in water and does not form a precipitate.

PTS: 1  DIF: 1  REF:  Page 292
OBJ: 10.3.1 Describe aqueous solutions.
NAT: B.2 | B.3
TOP: Describe aqueous solutions.
KEY: Aqueous solutions
MSC: 2

14. ANS: D
The products of the double-replacement reaction between hydrogen bromide and sodium hydroxide are water and sodium bromide.
The double-replacement reaction occurs as follows:
\[ \text{HBr(aq)} + \text{NaOH(aq)} \rightarrow \text{H}_2\text{O(l)} + \text{NaBr(aq)} \]

Sodium oxybromide cannot be formed in a double-replacement reaction.

In a double-replacement reaction, only two different compounds are formed.

Free hydroxyl ions are formed in a single-replacement reaction.
15. **ANS:** A

The net ionic equation of the reaction between sulfuric acid and aqueous potassium hydroxide is:

\[ \text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l) \].

**Feedback**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>Correct!</td>
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<tr>
<td>B</td>
<td>Sulfate and potassium ions are spectator ions and they do not participate in the reaction.</td>
</tr>
<tr>
<td>C</td>
<td>Spectator ions are represented along with reactive ions in a complete ionic equation.</td>
</tr>
<tr>
<td>D</td>
<td>Potassium sulfate is a salt formed from the spectator ions in the reaction.</td>
</tr>
</tbody>
</table>

**COMPLETION**

16. **ANS:**

heat, light

light, heat

17. **ANS:** synthesis

18. **ANS:** combustion

19. **ANS:** single-replacement

20. **ANS:** water
10.3.1 Describe aqueous solutions.

**TOP:** Describe aqueous solutions.

**KEY:** Aqueous solutions

**MATCHING**

<table>
<thead>
<tr>
<th>ANS</th>
<th>PTS</th>
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<tr>
<td>A</td>
<td>1</td>
<td>1</td>
<td>Page 295</td>
<td>10.3.2 Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.</td>
<td>B.3</td>
<td>Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.</td>
<td>Net ionic equation</td>
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<td>B</td>
<td>1</td>
<td>1</td>
<td>Page 296</td>
<td>10.3.2 Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.</td>
<td>B.3</td>
<td>Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.</td>
<td>Net ionic equation</td>
<td>1</td>
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</table>
The mole is an SI base unit used to measure the amount of a substance.

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<tbody>
<tr>
<td>A</td>
<td>Kelvin is the SI unit of thermodynamic temperature.</td>
</tr>
<tr>
<td>B</td>
<td>Kilogram is the SI unit of mass.</td>
</tr>
<tr>
<td>C</td>
<td>Meter is the SI unit of length.</td>
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<tr>
<td>D</td>
<td>Correct!</td>
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</table>

PTS: 1  DIF: 1  REF: Page 310  
OBJ: 11.1.1 Describe how a mole is used in chemistry.  
NAT: UCP.1 | UCP.3  
TOP: Describe how a mole is used in chemistry.  
KEY: Mole  
MSC: 1  
19. ANS: B

\[
\text{number of moles} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}} = \text{number of molecules}
\]

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<tbody>
<tr>
<td>A</td>
<td>Multiply the number of moles by the number of molecules.</td>
</tr>
<tr>
<td>B</td>
<td>Correct!</td>
</tr>
<tr>
<td>C</td>
<td>Multiply the number of moles with the correct value of Avogadro's number.</td>
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<td>PTS: 1</td>
<td>DIF: 1</td>
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<tr>
<td>OBJ: 11.1.3 Convert moles to number of representative particles and number of representative particles to moles. NAT: UCP.3</td>
<td></td>
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<tr>
<td>TOP: Convert moles to number of representative particles and number of representative particles to moles.</td>
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<tr>
<td>KEY: Converting moles to representative particles</td>
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<td>MSC: 3</td>
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20. **ANS:** C

$$\text{number of atoms} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ atoms}} = \text{number of moles}$$

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<thead>
<tr>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Multiply the number of atoms by the inverse of Avogadro's number.</td>
</tr>
<tr>
<td><strong>B</strong> After multiplying the number of atoms by the inverse of Avogadro's number, the power of the indices is nullified.</td>
</tr>
<tr>
<td><strong>C</strong> Correct!</td>
</tr>
<tr>
<td><strong>D</strong> Divide the number of atoms by Avogadro's number.</td>
</tr>
</tbody>
</table>

---

21. **ANS:** B

$$\text{number of moles} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = \text{number of atoms}$$

<table>
<thead>
<tr>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Multiply the number of moles by the number of representative particles.</td>
</tr>
<tr>
<td><strong>B</strong> Correct!</td>
</tr>
<tr>
<td><strong>C</strong> Multiply the number of moles with the correct value of Avogadro's number.</td>
</tr>
<tr>
<td><strong>D</strong> The position of the decimal value is incorrect.</td>
</tr>
</tbody>
</table>

---

22. **ANS:** C

$$\text{moles Cu} \times \frac{\text{grams Cu}}{1 \text{ mol Cu}} = \text{grams Cu}$$

<table>
<thead>
<tr>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Instead of dividing the known number of moles of copper by Avogadro's number, multiply it with the molar mass of copper.</td>
</tr>
<tr>
<td><strong>B</strong> Instead of multiplying the known number of moles of copper by Avogadro's number, multiply it with the molar mass of copper.</td>
</tr>
<tr>
<td><strong>C</strong> Correct!</td>
</tr>
</tbody>
</table>
Multiply the known number of moles of copper by the molar mass of copper.

PTS: 1  DIF: 1  REF: Page 315
OBJ: 11.2.2 Calculate the number of moles in a given mass of an element and the mass of a given number of moles of an element.
TOP: Calculate the number of moles in a given mass of an element and the mass of a given number of moles of an element.

23. ANS: C

\[ \text{moles Co} \times \frac{\text{grams Co}}{1\text{mol Co}} = \text{grams Co} \]

Feedback

A. Instead of dividing the known number of moles of the element by Avogadro's number, multiply it with the molar mass of the element.
B. Instead of multiplying the known number of moles of the element by Avogadro's number, multiply it with the molar mass of the element.
C. Correct!
D. Multiply the known number of moles of the element by the molar mass of the element.

24. ANS: C

\[ \text{number of electrons} \times \frac{1\text{mole}}{6.02 \times 10^{23}\text{electrons}} = \text{number of moles} \]

Feedback

A. Multiply the number of atoms by the inverse of Avogadro's number.
B. Multiplying the number of atoms by the inverse of Avogadro's number nullifies the power of the indices.
C. Correct!
D. Divide the number of atoms by Avogadro's number.

25. ANS: A

\[ \text{mass} \times \frac{1\text{mole}}{\text{number of grams}} = \text{number of moles} \]

Feedback

A. Correct!
B. Instead of dividing 425 g of calcium by Avogadro's number, divide it by its molar mass.
C. Multiply the known amount of calcium by the inverse of its molar mass.
Instead of multiplying 425 g of calcium by Avogadro's number, divide it by its molar mass.

\[
\text{mass Cu} \times \frac{1 \text{ mol Cu}}{\text{number of grams Cu}} \times \frac{6.02 \times 10^{23}}{1 \text{ mol Cu}} = \text{number of atoms of Cu}
\]

Feedback

A: Instead of dividing, multiply the calculated number of moles of copper by Avogadro's number.
B: Multiply the calculated number of moles of copper by Avogadro's number.
C: The molar mass of copper is 63.5 g/mol
D: Correct!

The molar mass of Ca(OH)_2 is calculated after adding the masses of all the elements.
29. ANS: D
Step 1:
number of moles × molar mass = number of grams

Step 2:
moles \( \text{H}_2\text{SO}_4 \times \frac{\text{number of grams } \text{H}_2\text{SO}_4}{1\text{mol } \text{H}_2\text{SO}_4} = \text{mass } \text{H}_2\text{SO}_4 \)

Feedback
A The number of grams of sulfuric acid is 98.0 g.
B Multiply the molar mass by 2.25 moles of sulfuric acid.
C The atomic mass of oxygen is 16.
D Correct!

30. ANS: B
Step 1:
number of moles × molar mass = number of grams

Step 2:
moles \( \text{KMnO}_4 \times \frac{\text{number of grams } \text{KMnO}_4}{1\text{mol } \text{KMnO}_4} = \text{mass } \text{KMnO}_4 \)

Feedback
A The number of grams of potassium permanganate is 158.04 g.
B Correct!
C The atomic mass of oxygen is 16.
D Multiply the molar mass by 2.20 moles of potassium permanganate.
\[
\text{mass of compound} \times \frac{1 \text{ mol compound}}{\text{molar mass of compound}} = \text{number of moles of compound}
\]
TOP: Calculate the number of moles of a compound from a given mass of the compound, and the mass of a compound from a given number of moles of the compound.  

KEY: Mass to mole conversion  
MSC: 3  

34. ANS: A  
\[
\frac{\text{Number of moles of water}}{\text{Number of moles of copper(II) sulfate}} = \frac{5}{1}
\]

Feedback  
A. Correct!  
B. Divide the amount of water lost, instead of dividing the hydrous mass by the molar mass of water.  
C. The molar mass of the compound is incorrect.  
D. Divide the amount of water lost by the molar mass of water.  

PTS: 1  
DIF: 3  
REF: Page 340  
OBJ: 11.5.2 Determine the formula for a hydrate from laboratory data.  
NAT: B.2 | B.3  
KEY: Hydrate  
MSC: 3

35. ANS: A  
The ratio of water to Barium chloride is 2:1, so the name of the hydrate is barium chloride dihydrate.  

Feedback  
A. Correct!  
B. Divide the amount of water lost, instead of dividing the hydrous mass by the molar mass of water.  
C. The molar mass of the compound is incorrect.  
D. Divide the amount of water lost by the molar mass of water.  

PTS: 1  
DIF: 3  
REF: Page 340  
OBJ: 11.5.2 Determine the formula for a hydrate from laboratory data.  
NAT: B.2 | B.3  
KEY: Hydrate  
MSC: 3

MATCHING  
36. ANS: B  
PTS: 1  
37. ANS: D  
PTS: 1  
38. ANS: A  
PTS: 1  
39. ANS: B  
PTS: 1  
40. ANS: D  
PTS: 1  
41. ANS: C  
PTS: 1  
42. ANS: C  
PTS: 1  
43. ANS: G  
PTS: 1  
44. ANS: D  
PTS: 1  
45. ANS: B  
PTS: 1  
46. ANS: F  
PTS: 1  
47. ANS: E  
PTS: 1
48. ANS: A    PTS: 1