**Chemistry 20**

**Lessons 1 to 23 Review**

Chemical Bonding Review

For each of the following substances, draw the Lewis dot, structural, and shape diagrams for the molecule and identify the molecule as polar or non-polar.

1. BrF(g)

2. CH3CI(g)

3. C2Br4 (s)

4. NCl3 (l)

5. List the intermolecular bonding forces present in methanol.

Consider the substances C2H3CI and C2H3I when answering the next three questions.

6. Which of the substances, C2H3CI and C2H3I, would probably be more polar?

7. Which would probably have the higher boiling point?

8. What specific type of bonding probably contributes most to the intermolecular attractions in these substances?

9. In which of the following does repulsion from a lone pair not influence molecular shape?

A. H2S B. NI3 C. HBr D. OF2 E. PH3

10. The Organic Chemistry unit will provide information about the molecular compound benzene, C6H6 . The boiling points for some benzene compounds are:

C6H5F: 85 oC C6H5Cl:132 oC C6H5I: 188 oC

Which of the following is the boiling point for C6H5Br?

A. 98 oC B. 122 oC C. 156 oC D. 249 oC E. 337 oC

11. Phenol, C6H5OH (182 oC) has a boiling point very close to that of iodobenzene, C6H5I (188 oC).

List, the bond types contributing to the Intermolecular attractions in each substance. Explain why it is not possible to confidently predict which has the higher boiling point.

12. Arrange the following substances in order of increasing boiling points. List beside each substance the type of bonding present in the solid state. For the molecular substances, also list the number of electrons per molecule and note whether any of the substances are isoelectronic.

C8H18 C3H5(OH)3 C6H14 C4H9Cl HF

13. Arrange the following from highest to lowest boiling point.

F2 HCl CH3OH C2H6 H2O2

14. Complete the following statement.

*All chemical bonds result from*...

**Solutions Review**

**Part A**

Fill in the blanks in the following questions:

1. A substance containing only one type of particle is a \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_.

2. A mixture where the individual components remain separate is called a \_\_\_\_\_\_\_\_\_\_\_\_ mixture.

3. Another name for a homogeneous mixture is a \_\_\_\_\_\_\_\_\_\_\_\_. It consists of a \_\_\_\_\_\_\_\_\_\_\_\_ and a \_\_\_\_\_\_\_\_\_\_\_\_.

4. In a sugar water solution, the solvent is the \_\_\_\_\_\_\_\_\_\_ and the solute is the \_\_\_\_\_\_\_\_\_\_\_\_. This is an example of a \_\_\_\_\_\_\_\_\_\_\_\_ solution.

5. If an alloy consisted of 5% carbon and 95% iron, the solvent is the \_\_\_\_\_\_\_\_\_\_ and the solute is the \_\_\_\_\_\_\_\_\_\_\_\_. This is an example of a \_\_\_\_\_\_\_\_\_\_\_\_ solution.

6. When two liquids will homogeneously mix together in all proportions they are said to be \_\_\_\_\_\_\_\_\_\_\_\_. If two liquids will not mix they are \_\_\_\_\_\_\_\_\_\_\_\_.

7. What is the difference between these two states of matter: aqueous and liquid? What is the difference between NaCl(l) and NaCl(aq)?

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. A solution with a small amount of solute relative to the solvent is said to be \_\_\_\_\_\_\_\_\_\_\_\_, while a solution with a large amount of solute relative to the solvent is said to be \_\_\_\_\_\_\_\_\_\_\_\_.

9. Complete the following equations:

**c = ? n = ? v = ?**

10. Solubility has two meanings:

qualitative \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

quantitative \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. In terms of polarity for solubility: \_\_\_\_\_\_\_\_ dissolves \_\_\_\_\_\_\_\_.

12. What are the effects of pressure and temperature changes for different types of solutions?

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13. Determine whether the following are soluble or insoluble.

sodium nitrate hydrogen chloride

ammonium sulfide calcium hydroxide

silver sulfide magnesium bromide

lead (II) sulfate hydrogen acetate

calcium phosphate barium hydroxide

calcium carbonate iron (III) sulfate

copper (I) chloride copper (II) chloride

14. What is a *saturated solution*?

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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15. What is a *supersaturated solution*?

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16. What is *dynamic equilibrium*?

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17. \_\_\_\_\_\_\_\_\_\_\_\_ are compounds which form solutions that conduct electricity. These are \_\_\_\_\_\_\_\_\_\_\_\_ compounds and \_\_\_\_\_\_\_\_\_\_\_ compounds.

18. \_\_\_\_\_\_\_\_\_\_\_\_ are compounds which form solutions that do not conduct electricity. These are \_\_\_\_\_\_\_\_\_\_\_\_ compounds.

19. When compounds dissolve and separate into ions the process is called \_\_\_\_\_\_\_\_\_\_\_\_.

20. When compounds dissolve and react with water to form ions the process is called \_\_\_\_\_\_\_\_\_\_\_\_.

21. Write dissociation equations for the following:

a) sodium silicate

b) barium hydroxide octahydrate

c) sodium phosphate

d) rubidium acetate

e) ammonium dihydrogen phosphate

**Part B**

1. Define the following:

a) solution

b) solvent

c) solute

d) unsaturated solution

e) saturated solution

f) supersaturated solution.

1. What are the units for molar concentration?
2. What is a (a) dilute solution, (b) concentrated solution, and (c) aqueous solution.
3. What does miscible mean?
4. What factors affect solubility?
5. Calculate the concentration of a solution that contains 2.8 mol of nitric acid in 4.0 L of solution. (0.70 mol/L)
6. Calculate the concentration of a solution that contains 25.0 g of magnesium bromide in 500.0 mL of solution. (0.272 mol/L)
7. What is the concentration if 2.25 g of copper (II) sulfate pentahydrate is used to prepare 50.0 mL of solution? (0.180 mol/L)
8. Calculate the number of moles in 50.0 mL of a 2.50 mol/L solution of silver nitrate? (0.125 mol)
9. Calculate the mass of barium hydroxide required to prepare 2.75 L of a 0.125 mol/L solution. (58.9 g)
10. What mass of aluminum chloride is required to prepare 750.0 mL of a 0.30 mol/L solution? (30 g)
11. Calculate the volume of solution that would contain 0.592 mol of hydrosulfuric acid from a 0.75 mol/L solution. (0.790 L)
12. In pure form methanol has a concentration of 24.7 mol/L. What volume of methanol is necessary to prepare 12.0 L of a 5.0 mol/L solution? (2.43 L)
13. What is the molar concentration if 1.0 L of concentrated caustic soda solution (19.1 mol/L) is diluted to 50.0 L? (0.38 mol/L)
14. Concentrated ammonia (NH3(aq)) is 14.8 mol/L. What volume is required to prepare 0.750 L of a 0.070 mol/L solution? (35 mL)
15. If 600 L of a 2.50 mol/L toxic substance were dumped into a pond to give a final volume of 80 kL, what would be the final concentration? (0.0188 mol/L)
16. Write dissociation equations for the following:

a) sodium silicate

b) barium hydroxide octahydrate

c) hydrogen phosphide

d) rubidium acetate

e) hydrogen hypochloride

1. In a 0.65 mol/L solution of Ga2(CO3)3, what is the molar concentration of each ion?
2. In a potassium dichromate solution where the concentration of the potassium ion is 0.360 mol/L, what is the concentration of the solute?
3. A solution contains 4.80 g of sodium carbonate dissolved in water to form 600 mL of solution. What is the concentration of sodium ions in the solution?