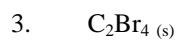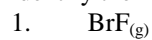# Chemistry 20
Lessons 1 to 23 Review
Chemical Bonding Review

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. $CH_3CI_{(g)}$

3. $C_2Br_{4\ (s)}$

4. $NCl_{3\ (l)}$

5. List the intermolecular bonding forces present in methanol.

Consider the substances C_2H_3CI and C_2H_3I when answering the next three questions.

6. Which of the substances, C_2H_3CI and C_2H_3I, 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. H_2S B. NI_3 C. HBr D. OF_2 E. PH_3

10. The Organic Chemistry unit will provide information about the molecular compound benzene, C_6H_6 . The boiling points for some benzene compounds are:

    C_6H_5F: 85 °C C_6H_5Cl:132 °C C_6H_5I: 188 °C

    Which of the following is the boiling point for C_6H_5Br?

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

11. Phenol, C_6H_5OH (182 °C) has a boiling point very close to that of iodobenzene, C_6H_5I (188 °C).

    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.

    C_8H_{18} $C_3H_5(OH)_3$ C_6H_{14} C_4H_9Cl HF

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

    F_2 HCl CH_3OH C_2H_6 H_2O_2

14. Complete the following statement.

    All chemical bonds result from...

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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: <u>aqueous</u> and <u>liquid</u>? What is the difference between $NaCl_{(l)}$ and $NaCl_{(aq)}$?

   _____

   _____

8. A solution with a <u>small</u> amount of solute relative to the solvent is said to be _____, while a solution with a <u>large</u> amount of solute relative to the solvent is said to be _____.

9. Complete the following equations:

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

10. <u>Solubility</u> 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?

    _____

    _____

    _____

    _____

13. Determine whether the following are <u>soluble</u> or <u>insoluble</u>.

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*?

_____

_____

15. What is a *supersaturated solution*?

_____

_____

16. What is *dynamic equilibrium*?

_____

_____

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.

2. What are the units for molar concentration?

3. What is a (a) dilute solution, (b) concentrated solution, and (c) aqueous solution.

4. What does miscible mean?

5. What factors affect solubility?

6. Calculate the concentration of a solution that contains 2.8 mol of nitric acid in 4.0 L of solution.   (0.70 mol/L)

7. Calculate the concentration of a solution that contains 25.0 g of magnesium bromide in 500.0 mL of solution. (0.272 mol/L)

8. 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)

9. Calculate the number of moles in 50.0 mL of a 2.50 mol/L solution of silver nitrate? (0.125 mol)

10. Calculate the mass of barium hydroxide required to prepare 2.75 L of a 0.125 mol/L solution. (58.9 g)

11. What mass of aluminum chloride is required to prepare 750.0 mL of a 0.30 mol/L solution? (30 g)

12. Calculate the volume of solution that would contain 0.592 mol of hydrosulfuric acid from a 0.75 mol/L solution. (0.790 L)

13. 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)

14. 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)

15. Concentrated ammonia ($NH_{3(aq)}$) is 14.8 mol/L. What volume is required to prepare 0.750 L of a 0.070 mol/L solution? (35 mL)

16. 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)

17. Write dissociation equations for the following:
    a) sodium silicate
    b) barium hydroxide octahydrate
    c) hydrogen phosphide
    d) rubidium acetate
    e) hydrogen hypochloride

18. In a 0.65 mol/L solution of $Ga_2(CO_3)_3$, what is the molar concentration of each ion?

19. In a potassium dichromate solution where the concentration of the potassium ion is 0.360 mol/L, what is the concentration of the solute?

20. 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?