Chemistry 1, H/G
Name: _____

Practice: Chapters 1, 10, 12
Date: _____ Per: ___

1. State whether the following compounds contain polar covalent bonds, non-polar covalent bonds or ionic bonds. Use the electronegativity values and the table of bond characters to calculate your answers.

a. KCl	b. NO_2	c. SO_2	d. HBr	e. N_2
_____	_____	_____	_____	_____
f. AlI_3	g. SiH_4	h. PCl_5	i. MgS	j. OF_2
_____	_____	_____	_____	_____

2. Predict the type of crystalline solid that would form for each of the above substance: ionic, molecular, or network covalent.

a_____ **b**_____ **c**_____ **d**_____ **e**_____

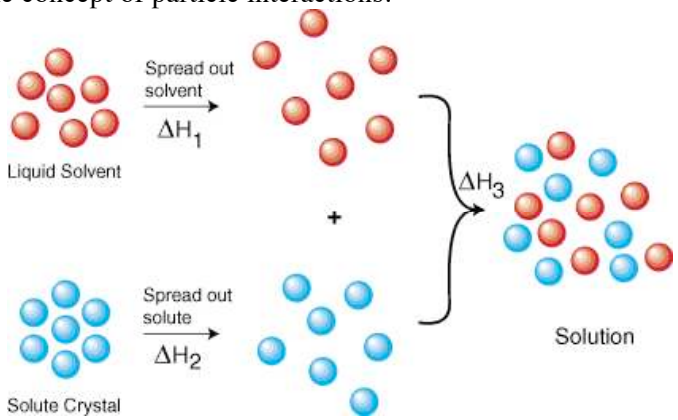
f_____ **g**_____ **h**_____ **i**_____ **j**_____

3. Predict the type of force of attraction that exists *between* particles for each of the crystals formed: electrostatic force, hydrogen "bond", dipole-dipole interaction, or London dispersion force.

a_____ **b**_____ **c**_____ **d**_____ **e**_____

f_____ **g**_____ **h**_____ **i**_____ **j**_____

4. Explain the solvation process or, what is the same, the formation of a solution from solute and solvent particles by using the concept of particle interactions.



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5. Describe how to make a molar solution. Briefly describe the steps involved in the process; include the equipment ware used.

_____

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6. Glycerol boils at a slightly higher temperature than water. What does this reveal about glycerol's attractive forces as compared to the attractive forces found in water? Justify your answer.

_____

_____

_____

Solve the following by finding the *moles* or the *volume* needed to make the solution. Show the dimensional-analysis set-up and follow the rules for significant digits.

1. 2.00 L of 3.50 M potassium bromide, KBr. [ans. 7.00n]

2. 0.250 L of 2.00 M sodium nitrate, $NaNO_3$. [ans. 0.500n]

3. 0.500 L of 0.100 M magnesium chloride, $MgCl_2$. [ans. 0.0500n]

4. 500 mL of 4.00 M sodium hydrogen carbonate, $NaHCO_3$. [ans. 2n]

5. 100 mL of a 10.0 M solution of lithium chloride, LiCl. [ans. 1n]

6. 5.0 L of 4.0 M magnesium sulfate, $MgSO_4$. [ans. 20.n]

7. How much solute would you need, less or more, to make the previous solution if the only magnesium sulfate available were the heptahydrate (common Epsom salts; $MgSO_4 \cdot 7H_2O$) with a greater mass per mole? **Explain.**

8. 100 mL of a 10.0 mM solution of ATP (adenosine triphosphate). The available form is the dipotassium salt, $C_{10}H_{14}N_5O_{13}P_3K_2$. [ans. 0.001n]

9. How much glucose ($C_6H_{12}O_6$) is in 200 mL of a 0.300 M solution? [ans. 0.06n]

10. 8.0 M urea, NH_2CONH_2, is used to denature proteins. How would you make 25mL of this solution? [ans. 0.20n]

11. How would you make 1.00 L of a solution that is 3.00 M NaCl and 0.300 M sodium citrate, $Na_3C_6H_5O_7$? [ans. 3.00n NaCl, 0.300n $Na_3C_6H_5O_7$]

12. What would you change in your previous answer if the sodium citrate is available only as the dihydrate, $Na_3C_6H_5O_7 \cdot 2H_2O$? **Explain.**

13. Given a 1.0 M solution of sodium sulfate, Na_2SO_4, what is the *concentration* of sodium ions? [ans. 2.0M]

14. How much, in L, of a 2.0 M solution do you need to get 8.0 moles of hydrochloric acid, HCl? [ans. 4.0L]

15. How much of a 0.50M soln is needed to get 35g of potassium nitrate, KNO_3, if it is 101.11g/mol? [ans. 0.69L]

16. You have a 0.150 M soln of iron (II) chloride, $FeCl_2$. What volume, in mL, of this do you need to get 100.mg of the salt if it weighs 126.75g/mol? [ans. 5.25mL]

17. You have a 10 mM solution of ATP. How much of this do you need to get 1.0 millimoles of ATP? [ans. 0.1L]

18. Continuing from the previous question…How much (in mL) do you need to get 10 µmol of ATP? [ans. 1mL]

19. Given a 2.00 M solution of glucose ($C_6H_{12}O_6$, MM = 180.g/mol), how much do you need to get 12.5 kg of the solute? [ans. 34.7L]

20. How would you get 2.5 g of lithium perchlorate, $LiClO_4$ (FM = 106.39g/mol), if you have a 0.20 M solution? [ans. 0.12L]

21. Given a 3.00 M solution of sodium chloride, NaCl (FM = 58.44g/mol), what is the concentration in g solute/L solution? [ans. 175g/1.00L]

Solve the following problems. Show the dimensional-analysis set-up and follow the rules for significant digits.

22. What is the maximum amount of KCl that can dissolve in 200 g of water? (The solubility of KCl is 34 g/100 g H_2O at 20°C.) [ans. 68 g]

23. What is the solubility of silver nitrate if only 11.1 g can dissolve in 5.0 g of water at 20°C? [ans. $\frac{222\text{ g}}{100\text{ g } H_2O}$]

24. What mass of NaCl (solubility = 35.0g/100g at 20°C) can dissolve in 3.30×10^2 g of water? [ans. 112g]

25. If the solubility of a particular solute is $\frac{10\text{ g}}{100\text{ g } H_2O}$ at 20°C, which of the following solution concentrations would represent a supersaturated aqueous solution of that solute?

    a. $\frac{10\text{ g}}{100\text{ g } H_2O}$ at 25°C
    b. $\frac{10\text{ g}}{100\text{ g } H_2O}$ at 15°C
    c. $\frac{9\text{ g}}{100\text{ g } H_2O}$ at 20°C
    d. $\frac{11\text{ g}}{100\text{ g } H_2O}$ at 20°C

26. To increase the solubility of a gas at constant temperature from 1.20 g/L, at 1.4 atm, to 2.3 g/L, the pressure would have to be increased to ____. [ans. 2.7 atm]

27. If the solubility of a gas in water is 4.0 g/L when the pressure of the gas above the water is 3.0 atm, what is the pressure of the gas above the water when the solubility of the gas is 1.0 g/L? [ans. 0.75 atm]

28. If the solubility of a gas is 7.5 g/L at 404 kPa pressure, what is the solubility of the gas when the pressure is 202 kPa? [ans. 3.8 g/L]

29. The molar enthalpy of ***fusion*** for water is 6.008 kJ/mol. What quantity of energy is released when 253 g of liquid water freezes? The molar mass (MM) of water is 18.02 g/mol. [ans. 84.4 kJ]

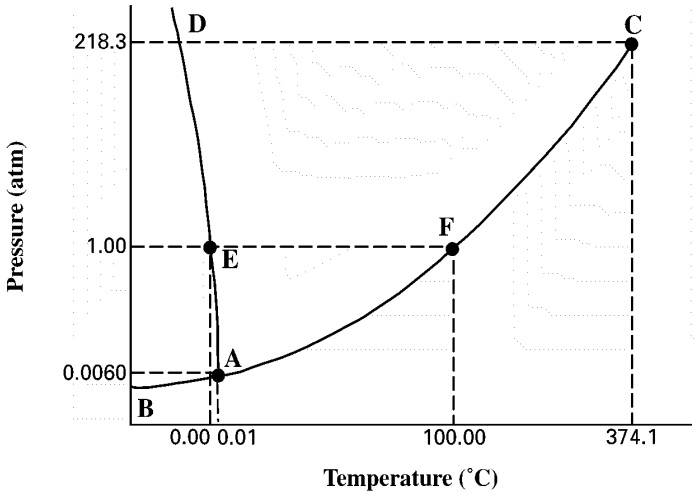
30. The standard molar enthalpy of ***vaporization*** for water is 40.79 kJ/mol. What mass of steam is required to release 500.kJ of energy upon condensation? The MM_{H2O} = 18.02 g/mol. [an. 221 g]

31. Given that benzoic acid has a molar mass of 122.1 g/mol and a 52.9 g sample of benzoic acid absorbs 7.83 kJ of energy when it melts:
    a. Calculate the number of moles in the sample. [ans. 0.433 mol]

    b. Calculate the molar enthalpy of fusion of benzoic acid. [ans. 18.1 kJ/mol]

32. Iron has a molar enthalpy of fusion of 13.807 kJ/mol. Calculate the ***molar mass*** (MM = g/mol) of the substance, given that a 125.9 g sample of iron absorbs 31.12 kJ on melting. [ans. 2.254 mol, 55.86 g/mol]

Use the figure below to answer the following questions.



33. What do points E and F represent in the figure above?

34. What does point A represent in the figure above?

35. Explain what the curves AB, AC, and AD represent in the figure above.