NAME: _____ **CHEMISTRY** Final Exam Review Sheet

U1 - Matter & Measurement

1. A hypothesis is:

2. What is the difference between qualitative and quantitative data?

3. What is the density of a block of marble with a mass of 552g and a volume of $212cm^3$ (mL)? Will this block float or sink in water?

4. What is the difference between accuracy and precision?

5. a. How many significant digits is 13,410? b. Write this in scientific notation:

6. a. How many significant digits is 0.00750? b. Write this in scientific notation:

U2 - Atomic Theory

7. Unknown element X has two naturally occurring isotopes with the following abundances:

Isotope	Mass (amu)	Percent abundance
^{6}X	6.015	7.5%
^{7}X	7.016	92.5%

Determine the average atomic mass **and** probable identity of unknown element X.

8. Define an isotope.

9. Fill in the missing information for the chart below.

	Isotope Symbol	# of protons	# of Neutrons	# of Electrons	Atomic Number	Mass Number	Charge
a	$^{14}_{6}C$						
b				18		41	+2
c	$^{79}_{35}Br^{1-}$						

10. An electron that is in an excited state is at a _____ energy level than at the ground state.

11. Describe how wavelength and frequency of electromagnetic radiation are related.

12. An X-ray has a wavelength of 1.15×10^{-10} m. What is its frequency?

13. What is the energy of a photon of red light having a frequency of 4.48×10^{14} Hz?

14. How many electrons do noble gases have in their outer shell? _____ halogens? _____

15. How many electrons does oxygen have in its outer shell? _____

16. A cation has a _____ charge while an anion has a _____ charge.

17. Write the electron configuration for chlorine.

18. Write the orbital notation for chlorine.

19. Write the shorthand (noble gas) configuration for chlorine.

20. Write the electron configuration for the chloride ion.

Alpha **Beta** **Gamma**

21. Rank the nuclear radiation particles above from least to most penetrating.

22. Rank the nuclear radiation particles above from lightest to heaviest.

23. What is the change in atomic mass when an atom emits a beta particle?

24. What is the change in the atomic number when an atom emits an alpha particle?

25. Fill in the missing particle.

a. $^{98}_{43}Tc \rightarrow$ $+ \ ^{94}_{41}Nb$

b. $^{14}_{6}C \rightarrow \ ^{0}_{-1}e +$

26. Compare and contrast the nuclear terms fission and fusion.

U3 - Periodic Trends

27. Who created the first periodic table?

28. How are the elements arranged on the modern periodic table?

29. What is the name of the energy required to remove an electron from an atom?

30. Which group requires the most energy to remove an electron? _____ least? _____

31. Atomic radii _____ as you go down a group and _____ as you go across a period.

32. Electronegativity _____ as you go down a group and _____ as you go across a period.

33. _____ is the most electronegative element; _____ is the second most electronegative.

34. Label the following as metal, nonmetal, or metalloid.

    Potassium = _____

    Argon = _____

    Arsenic = _____

35. Name the following groups **AND** give one characteristic of each.

    _____ = Group 1 (IA) = _____

    _____ = Group 17 (VIIA) = _____

    _____ = Group 18 (VIIIA) = _____

U4 - Nomenclature & Bonding

	Ionic, Molec or Acid?	Name	Formula
36.			P_4O_5
37.		sodium nitride	
38.			$HClO_2$
39.		ammonium carbonate	

40. A covalent bond is when electrons are _____. It usually forms between a _____ and a _____.

41. Unequal sharing of electrons results in a _____ covalent bond.

42. How many pairs of electrons are shared in a double bond?

43. a. Write the chemical formula for the compound formed from Cr^{3+} and F^{1-} ions.

    b. What is the name of this compound?

    c. Was this compound formed by ionic or covalent bonds?

44. Write the chemical formula for iron (III) oxide.

45. How many bonds would one anticipate carbon forming?

46. State the concept of VSEPR.

Fill in the chart for each of the following.

	Lewis dot structure	Molecular geometry	Polar, Nonpolar, or Ion
47.	CH_3I		
48.	CH_4		
49.	H_2O		

Use the type of interparticle force used in bonding for the following substances to answer the questions that follow.

$SiO_{2(quartz)}$ PCl_3 $NiBr_2$ F_2 $HClO_3$ Cu

50. Which should have the highest melting point?

51. Which should have the lowest melting point?

52. Which substance has three polar bonds?

53. Which is made of cations that are bonded together by a sea of electrons?

54. Which will dissolve in water?

55. Which would conduct electricity when dissolved in water?

U5 – Reactions

56. State the Law of Conservation of Mass/Matter.

57. Name 3 indicators that a chemical reaction has taken place.

a. **b.** **c.**

58. Name five types of chemical reactions.

a.
b.
c.
d.
e.

59. The products of a combustion reaction are _____ and _____.

60. Write the chemical reaction for the synthesis of lithium oxide and water.

61. Write the chemical reaction for the decomposition of magnesium chlorate.

62. Will a reaction take place when **Ag** is added to **LiCl**? If so, write the balanced equation.

63. Will a reaction take place when **Al** is added to **HCl**? If so, write the balanced equation.

64. Circle the following compounds which will dissolve in water.

NH_4Cl $PbBr_2$ $SrSO_4$ $Ba(OH)_2$ $CHCl_3$ HNO_3 C_2H_6

65. Write and balance the chemical reaction between barium hydroxide and potassium carbonate to form potassium hydroxide and barium carbonate.

66. Write the net ionic equation for the reaction above.

U6 & U7 - Moles & Stoichiometry

67. There are 6.02×10^{23} particles in one _____. This is _____ number.

68. How many moles are contained in 5.54×10^{23} atoms of Cu?

69. If 0.940g of a compound containing only magnesium and oxygen consists of 0.564g Mg, what is the compound's empirical formula?

70. Determine the percent composition of each element in acetaminophen, $C_8H_9NO_2$.

71. What is the name of $FeSO_4 \cdot 7H_2O$? What is the percent water in this hydrate?

72. If 35.0g of nitrogen react with excess hydrogen, how many moles of ammonia are produced? $\_\_ H_2 + \_\_ N_2 \rightarrow \_\_ NH_3$

73. What mass of barium chloride will be needed to react completely with 113g of aluminum sulfate in the following reaction? $\_\_ BaCl_2 + \_\_ Al_2(SO_4)_3 \rightarrow \_\_ BaSO_4 + \_\_ AlCl_3$

74. When 75.0 grams of calcium hydride is added to water, the theoretical yield of hydrogen is 7.18 grams. After running this reaction, the amount of hydrogen collected was 6.94g. What is the percent yield of this reaction? $\_\_ CaH_2 + \_\_ H_2O \rightarrow \_\_ Ca(OH)_2 + \_\_ H_2$

U8 - Solids, Liquids, & Gases

75. What is the relationship between kinetic energy and temperature?

76. a. Describe the relationship between pressure and volume of a gas.

b. Is this a direct or inverse relationship?

77. a. Describe the relationship between volume and temperature of a gas?

b. Is this a direct or inverse relationship?

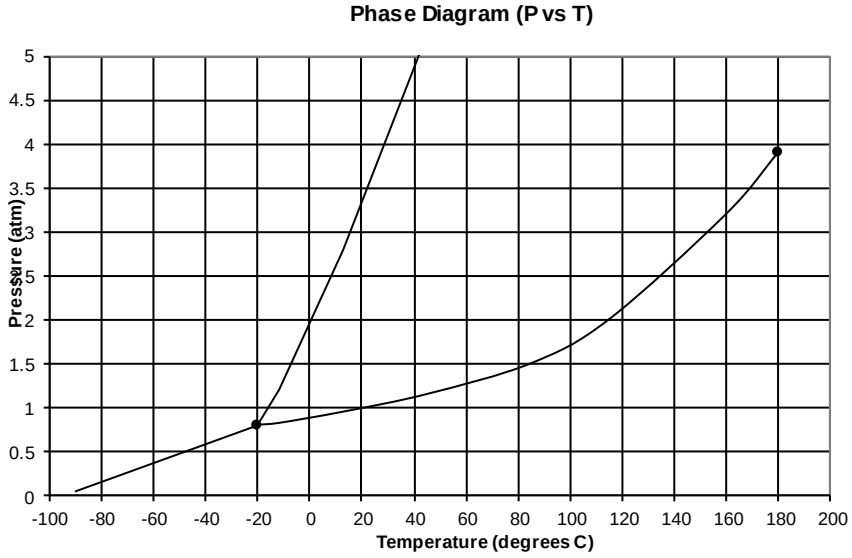
78. A 185mL sample of oxygen is collected over water at 30°C. The total pressure of the system is 8.9 kPa. What is the pressure of the gas? (P_{H2O} at 30°C is 4.2kPa)

79. A balloon contains 1.5L of air at 175kPa and 25.0°C. If the balloon expands to 1.7L at 30.0°C, what is the pressure of the air in the balloon?

80. A 2.25L sample of carbon dioxide is collected at 58°C and standard pressure. Determine the mass of CO_2 in this sample.

81. How many liters of **Cl_2** will combine with 39.0 g of **Na** at STP? ___Na + ___Cl_2 → ___NaCl

Use the phase diagram below to answer the next five questions.



82. At what pressure and temp is the critical point?

83. At what pressure and temp is the triple point?

84. What is the normal boiling pt?

85. What phase exists at 2.5 atm and 100°C?

86. At what pressure will this substance freeze at 20°C?

87. Is energy absorbed or released during condensation?

88. Describe sublimation.

89. What is the Kelvin temperature for 18°C?

U9 - Solutions & Equilibrium

90. Calculate the molar concentration when 15.0g $NaNO_3$ is dissolved in enough water to make a 300mL solution.

91. How many grams of $CaCl_2$ is required to prepare 150mL of a 0.75M solution

92. What volume of 12M HCl is required to prepare 400mL of 0.25M HCl?

93. When 10mL of 18 M H_2SO_4 is diluted to 75mL, what is the solution's new molarity?

94. Name three ways to increase the rate of dissolving.
    a. b. c.

95. Define a "saturated solution."

96. Increasing the pressure on a gas will _____ the solubility.

Use a solubility curve from your worksheets to answer the next three questions.

97. What is the solubility of KCl at 30°C?

98. What type of solution is it if 25g KCl are dissolved in 100g water at 30°C?

99. What type of solution is it if 55g KCl are dissolved in 200g water at 40°C?

100. a. Describe what it means for a chemical reaction to establish equilibrium.

b. Does the reaction stop?

101. What three factors are considered to be stresses to a system at equilibrium?

102. a. Exothermic reactions (absorb / release) energy.

b. Endothermic reactions (absorb / release) energy.

103. Write the equilibrium constant expression for the following chemical reaction:

$P_{4(s)} + 6\ NO_{(g)} + \text{heat} \leftrightarrow P_4O_{6(s)} + 3\ N_{2(g)}$ $K_{eq} =$

104. Determine the shift in equilibrium (in the reaction above) if the following occurs:
a) $P_{4(s)}$ is added
b) The volume of the container is increased
c) $N_{2(g)}$ is removed
d) The reaction is cooled

U10 - Acids & Bases

105. Bronsted-Lowry acids donate _____ in solution.

106. Acidity of a solution depends on the concentration of _____.

107. What is the pH of a 0.089M solution of HCl?

108. What is the pH of a solution that has a $[OH^-]$ concentration of is 7.2×10^{-3}M?

109. What is the $[OH^-]$ of a solution that has a $[H_3O^+]$ of 2.5×10^{-5}M?

110. How do strong acids/bases differ from weak acids/bases?

111. Why is acetic acid a poor conductor of electricity?

112. What happens at the equivalence point of a titration?

113. If 25.0 mL of 0.400M HBr, is required to neutralize 55.0 mL of KOH solution, what is the concentration of the KOH solution?

114. How many mL of 0.125M HCl would be required to exactly neutralize 20.0 mL of a 0.140M NaOH solution?