

Name: _____ Period: _____

PRE-AP CHEMISTRY FINAL EXAM REVIEW (2009)
All constants and a periodic table on included on the last page of the packet.

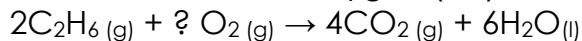
1. The identity of an unknown metal can be determined from its density. Explain how this could be done. _____
 2. Calculate the density of a substance if 2.5 g occupies 253 mL.
 3. Calculate the volume of a substance if the density is 2.5 g/L and the mass is 28.0 g.
 4. When adding or subtracting data, what is the rule for significant figures?
 5. When multiplying or dividing data, what is the rule for significant figures?
 6. Complete the following, giving the answer with the correct number of significant figures.
 - a. $2.7 + 3.25 + 6 =$ _____
 - b. $0.005 \times 7.26 =$ _____
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 - a. $2.7 + 3.25 + 6 =$ _____
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 8. In a particular experiment a student got a value of 29.3 g/mol for the molecular mass of a substance. The actual molecular mass is 32.7 g/mol. Calculate the % error.
 9. Convert the following Celsius degrees to Kelvins:

 - a. $25^{\circ}\text{C} =$ _____
 - b. $-77^{\circ}\text{C} =$ _____
 10. What is the molar mass of $(\text{NH}_4)_2\text{CO}_3$? Show your work.
What is the molar mass of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$? Show work.
 11. Calculate the number of molecules in 4.4 g CO_2 . Show your work.
 12. How many moles of chloroform, CHCl_3 , are required to fill a flask with a volume of 273 cm^3 at a temperature of 100. $^{\circ}\text{C}$ and a pressure of 940. mmHg?
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13. Write the formula or name of each of the following:

- a. NaNO_3 _____
- b. K_2SO_4 _____
- c. barium hydroxide _____
- d. lithium carbonate _____
- e. HCl _____
- f. potassium oxide _____
- g. tin (IV) oxide _____

14. What is the coefficient of oxygen (O_2) in the balanced equation?



- a) 3 b) 4 c) 6 d) 7

14. What is the volume of a gas at -73.0°C and $90. \text{ kPa}$ if it has a volume of $1500. \text{ cm}^3$ at 27.0°C and 100.0 kPa . Show your work.

15. A compound consists of 36.5% sodium, 25.4% sulfur, and 38.0% oxygen. What is the empirical formula of the compound? Show your work.

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17. Calculate the number of grams of water produced when 3.0 mol ammonia (NH_3) reacts with excess oxygen to form nitrogen monoxide and water

18. Using the equation from the previous problem, calculate the volume of $\text{NO}(g)$ at STP that would be produced.

19. Write a balanced equation for the combustion of propane, C_3H_8 .

20. Which has the greatest number of molecules?

- a. 1 mol Cl_2
- b. 1 g of Cl_2
- c. 1 L Cl_2 at STP
- d. 1 cm^3 of Cl_2

21. Which is an empirical formula?

- a) N_2O_4 b) P_4O_{10} c) Hg_2I_2 d) Al_2O_3

22. What is the percent by mass of water in magnesium sulfate heptahydrate, $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$? Show your work.

23. Find the specific heat of a substance if 25.0 J is required to raise the temperature of 5.0 g from 23.0°C to 26.0°C

24. The temperature of 175 g of water is raised from 24.0°C to 30.0°C . How many joules of energy are absorbed by the water? Show your work.

25. Explain the difference between endothermic and exothermic. _____

26. When 0.500 mol of propanol, $\text{C}_3\text{H}_7\text{OH}$, burns completely, what volume of carbon dioxide at STP will be produced? Show your work.

27. Draw the Lewis structures for the following and give their molecular shape and polarity: H_2O , NH_3 , CO_2 and N_2

28. A titration is performed in which $40. \text{ cm}^3$ of 0.1 M HCl completely neutralizes a basic solution of $20. \text{ cm}^3$ of KOH . What is the concentration of the KOH ? Show your work.

29. Which of the following is the *least* ionized in an aqueous solution?

- a) HCl b) $\text{HC}_2\text{H}_3\text{O}_2$ c) HNO_3 d) H_2SO_4

30. What is the pH of a solution whose hydroxide ion concentration is 1.0×10^{-4} ? Is the solution acidic, basic or neutral?

31. How many protons, neutrons and electrons in a neutral atom of uranium-238?

32. What is an isotope? _____

33. Write the electron configuration and the electron dot notation for a neutral atom of nitrogen.

34. Which of the following represents a ground state configuration; which represents an excited state?

- a. $1s^2 2s^2 2p^5$ b. $1s^2 2s^2 3s^1$

35. What neutral atom has the same electron configuration as F^- ?

36. What is the maximum number of electrons in an orbital? _____

Metallic character _____
Boiling Point _____

44. Define boiling point. _____

45. In Denver, water does not boil at 100°C. Does it boil at a higher or lower temperature? How would you explain this? Does it take longer or shorter time to cook an egg at this temperature? What could you add to the water to raise its boiling point? _____

46. Copy the heating curve from your textbook on page 310. Label all parts. Also label the melting point and the boiling point.

47. How many moles are contained in 50.0 mL of a 0.25 M NaOH solution?

48. How many mL of 15 M NH₃ are needed to make 500. mL of 2.5 M NH₃?

49. What is the Molarity of 10.0 mL of 5.0 M NaOH when it is diluted to 500. mL?

50. Draw heat (potential energy) diagrams for each of the following:

- a. Exothermic slow reaction
- b. Exothermic fast reaction
- c. Endothermic slow reaction
- d. Endothermic fast reaction

60. Using the table in your book, p. 316, calculate the heat (enthalpy) of the following reaction: $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$ Is the reaction endothermic or exothermic?

61. A reaction is spontaneous if it can occur, under certain conditions, without assistance. Describe the two conditions which insure that a reaction will be spontaneous:

- (Increase or decrease) in disorder or randomness (entropy)
- (Increase or decrease) in energy (enthalpy)

62. Describe the following acid/base theories:

- Arrhenius: _____

- Bronsted-Lowry: _____

63. Given the following values of K_a , which is the strongest acid?

1.0×10^{-2} 1.5×10^{-3} 7.5×10^{-5} 7.5×10^{-1}

64. What is the $[\text{OH}^-]$ if the $[\text{H}_3\text{O}^+] = 10^{-4}$? What is the pH and the pOH?

65. Which has a lower pH? A **strong** acid or a **weak** acid? Which has a higher pH? A **strong** base or a **weak** base?

66. Fill in the following information:

pH	pOH	$[\text{H}_3\text{O}^+]$	$[\text{OH}^-]$
2.5	_____	_____	_____

67. Write the equilibrium equation and the K_a expression for the ionization of acetic acid in water.

68. Write the equation for the reduction of Ca^{+2} ion.

69. Write the equation for the oxidation of Ca metal.

70. Reduction is defined as: _____

71. Oxidation is defined as: _____

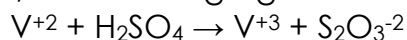
72. What is the difference between a reducing and an oxidizing agent? _____

73. Assign oxidation numbers to each element in the following:

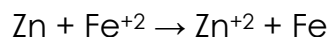
- a. $\text{Cu}_{(s)}$
- b. MnO_4^-
- c. H_2O
- d. CaS
- e. NaCr_2O_7

74. According to the Activity Series of Reduction Potentials, any metallic ion on the left will react with any _____ (above or below) it on the _____ (right or left).

75. In the following redox equation, name the substance that is oxidized, the substance that is reduced, the oxidizing agent and the reducing agent.



76. Write the half-reactions for the following and calculate E° , the cell potential. Which is the oxidation step?



77. What causes acid rain? (page 607) _____

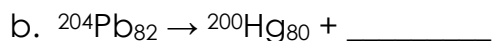
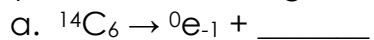
78. To find the vapor pressure of a dry gas when it is collected over water, you must (add or subtract) the water vapor pressure (to or from) the total pressure (atmospheric pressure).

79. If the molecular formula of a compound is $\text{CH}_3(\text{CH}_2)_6\text{COOH}$, what is the empirical formula?

80. When diluting a concentrated acid, it is best to:

- a. Add the acid to water?
- b. Add water to the acid?

81. Complete the following nuclear equations:



82. Write the net ionic equation for the reaction between $\text{AgNO}_3(\text{aq})$ and $\text{NaCl}(\text{aq})$.

83. The equilibrium constant, K , for a given reaction can be changed by changing the _____.

84. Valence electrons are the electrons found in the _____ energy level.

85. Write molecular and structural formulas for the following:

propane	_____	_____
2-methylpentane	_____	_____
1-butanol	_____	_____
2-hexene	_____	_____
2-methyl-1-butene	_____	_____
paradichlorobenzene	_____	_____
cis-dimethylethene	_____	_____

86. Which of the following represents a chemical change?

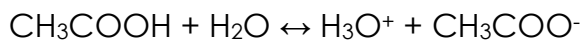
- a. melting ice b. sublimation of I_2 c. rusting of iron

87. When a solute is added to a solvent, the freezing point (raises or lowers) and the boiling point (raises or lowers).

88. Gases are more soluble in water under (high or low) pressure?

89. Solids are more soluble in water at (high or low) temperature?

90. Identify the acid, base, conjugate acid and conjugate base in the following reaction:



91. If 20.0 mL of O_2 and 20.0 mL of H_2 are reacted, how many mL of H_2O can be produced? What is the limiting reagent?