CLS Chemistry 311
Semester One Final Exam Review

Units	Topic	Textbook Sections
Unit 01	Matter & Change	2.1-2.4
Unit 02	Scientific Measurement	3.1-3.3
Unit 03	Atomic Structure & Chemical Quantities	4.1-4.3 & 10.1-10.2
Unit 04	Electrons in Atoms	5.1-5.3
Unit 05	The Periodic Table	6.1-6.3
Unit 06	Ionic Bonding	7.1-7.2 & 10.1-10.3
Unit 07	Covalent Bonding	8.1-8.4
Unit 08	Naming & Formula Writing	9.1-9.3
Unit 09	Chemical Reactions	11.1-11.13

You will be allowed to use the following on the final exam:

- ➔ calculator (no cell phones or iPods)
- ➔ hand-written reference sheet
- ➔ periodic table & common ion sheet (this will be provided to you)
- ➔ pencil

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This review is meant as a guide for you as you prepare for your final exam, it is not all inclusive. You should use all of your unit review guides, notes, labs, and practice worksheets to help you prepare for your final. Copies of all of the notes and answer keys to past review guides are posted online.

Unit One: Matter & Change

1. Identify the following as a pure substance or a mixture:
    a. gold
    b. carbon
    c. salt water
    d. silver
    e. carbon dioxide

2. Identify each of the following as either homogeneous or heterogeneous:
    a. salt water
    b. Orange juice
    c. Vegetable oil

3. Which of the following are compounds?
    a. silver
    b. CO
    c. C_2H_6O
    d. Sulfur
    e. Helium
    f. NaCl

4. Which of the following are physical properties and which are chemical properties?
    a. alcohol is a colorless liquid
    b. the boiling point of water is 100°C
    c. water decomposes to give hydrogen and oxygen gases
    d. sugar dissolves in water

5. Which of the following involve a chemical change?
    a. breaking an egg
    b. exploding a firecracker
    c. melting snow
    d. tearing paper
    e. drying a wet towel

6. Which of the following changes are exothermic and which are endothermic?
    a. evaporation of water from your skin
    b. melting snow
    c. steam changing to water
    d. clothes drying
    e. freezing water
    f. a burning candle

7. What term is described by each of the following?
    a. energy of position
    b. energy of motion
    c. energy stored in chemical substances
    d. energy due to the moving molecules of a substance
8. Would Dihydrogen Monoxide be classified as an element or a compound?

9. Write down two examples of pure substances and two examples of mixtures.

10. Write down 3 examples of a chemical change.

Unit Two: Scientific Measurement

11. How many . . .

    mm in a cm? _____ g in a kg? _____

    mg in a kg? _____ ms in a s? _____

12. Indicate the number of significant figures in each of the following:

    0.0000101 _____ 1.01×10^{-5} _____

    1098 _____ 2001 _____

13. Perform the following calculations, answering with the proper number of significant figures

    $(2.00 \times 10^{6})/(3.00 \times 10^{-7})$ _____ (4.031)(0.08206)(373.1)/(0.995) _____

    55.0001 + 0.0002 + 0.104 _____ (0.15)/(280.62) _____

14. Perform the following conversions:

    5.3 mm to cm _____ 0.0003 km to mm _____

    17 cm to mm _____ 0.010 kg to g _____

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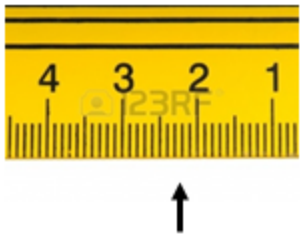
15. Convert the following from scientific notation to regular notation or vice-versa

1.98×10^{4} _____ 4284 _____

2.90433×10^{-7} _____ 0.04909 _____

16. A sample of chlorine atoms is 75.77% Cl-35 and 24.23% Cl-37. Find the atomic mass of the sample.

17. Make a measurement using the correct tolerance.



18. Answer the following question and use significant figures to determine your answer:
(86.5 cm) x (3.693 cm) =

19. Express 0.00000863 moles in proper scientific notation.

20. An unknown sample has a mass of 205.3 grams and a volume of 56.7 mL. Which material from the table to the right matches this data?

Material	**Density (g/mL)**
Kaolin	0.39
Water	1.00
Sugar	1.59

Glass	2.60
Diamond	3.26

21. A chemical reaction theoretically should produce 5.68 g of lead (II) iodide. If a student conducts this reaction in the lab, but only produces 3.21 g, what is the percent error?

Unit Three: Atomic Structure & Chemical Quantities

22. Complete the following table. Each row represents one individual atom of an element.

Chemical Symbol	Mass Number	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons
	87	37			
Ag	108				
	92		41		
Co	59				
		14		16	
	37		17		

23. How many . . .

Protons in K _____ Protons in a Zinc atom _____

Electrons in Sr-91 _____ Electrons in a Bromine atom _____

Neutrons in O _____ Protons in a Copper atom _____

Neutrons in a K atom _____ Neutrons in an Na-24 atom _____

24. How many moles in 1.20×10^{24} atoms of Sc?

25. How many grams in 3.01×10^{23} atoms of S?

26. How many grams in 2.41×10^{24} atoms of P?

27. How many atoms in 2.52 moles of Ba?

28. What is an Isotope?

29. What is the mass number of Oxygen if the isotope has 8 protons, 8 electrons, and 11 neutrons?

30. The nucleus of an atom of Iodine with a mass number of 130 contains how many protons, electrons and neutrons?

Unit Four: Electrons in Atoms

31. When zapped with electricity, a tube containing gaseous element X emits a mixture of red and violet light. In the space below draw the electron energy level transitions and label them:
    a. What causes the electron to "jump"?
    b. What causes the light that we see?

32. Draw the <u>orbital diagrams</u> for the following neutral atoms:

    Beryllium

Oxygen

Silicon

Fluorine

33. Using noble gas abbreviations, give the electron configurations for the following neutral atoms:

Antimony (Sb)

Iodine

Radium (Ra)

Barium

34. How many valence electrons are in each of the above atoms?

Antimony_____ Iodine_____ Radium _____ Barium_____

35. How many unpaired electrons are in each of the above atoms?

Antimony_____ Iodine_____ Radium _____ Barium_____

36. Give the names of each of the following excited neutral atoms.

a. [Ne] $3s^1 4s^1$

b. [Ne] $3s^1 3p^1$

c. [Kr] $5s^2 4d^5 5p^1$

37. List the element that is represented by each of the following electron configurations:

a. [Ar] $4s^2 3d^5$

b. [Kr] $5s^2 4d^{10} 5p^4$

c. [Ne] $3s^2$

38. Draw Lewis Dots for Nitrogen, Boron and Fluorine.

39. Write the electron configuration for Bromine and Aluminum.

40. Draw Lewis Dots for Nitrogen, Boron and Fluorine.

41. What is an Isotope?

42. What is the mass number of Oxygen if the isotope has 8 protons, 8 electrons, and 11 neutrons?

43. The nucleus of an atom of Iodine with a mass number of 130 contains how many protons, electrons and neutrons?

Unit Five: The Periodic Table

44. List at least three characteristics of each of the following: metal, nonmetal, metalloid

45. Rb has properties most similar to which one of the following elements: Co Li Be

    How do you know?

46. Rn has properties most similar to which one of the following elements: Ar Sr At

    How do you know?

47. F has properties most similar to which one of the following elements: Br O C

    How do you know?

48. What is the name of the <u>group</u> in the periodic table that is known for its stability and lack of reactivity?

49. As you go down a column in the periodic table, what happens to atomic radius?

50. As you go across a period in the periodic table (left to right), what happens to atomic radius?

51. As you go down a column in the periodic table, what happens to ionization energy?

52. As you go across a period in the periodic table (left to right), what happens to ionization energy?

53. As you go down a column in the periodic table, what happens to electron affinity?

54. As you go across a period in the periodic table (left to right), what happens to electron affinity?

55. Circle the atom or ion in each of the following pairs which has a LARGER radius:

    Li or Li^+ Sr or Sr^{2+} Br or Br^- H or H^+ S or S^{2-} N or N^{3-}

56. How many moles are there in 512 g of $SiBr_4$?

57. How many grams are there in 10.1 moles of $Ca(OH)_2$?

58. How many moles are there in 0.00199 g of Be_3N_2?

59. Calculate the % composition by mass of each element in the compound $Sn(NO_2)_4$.

60. A compound contains 70.9% K and 29.1% S by mass. Calculate the empirical formula of the compound.

61. On this periodic table, which element has the smallest size?

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar

62. Write down two atoms that would be bigger than silicon.

63. As the size of the atom increases, what happens to the amount of energy it takes to remove an electron from the atom (the ionization energy), why?

64. What do elements in the same family (group) have in common?

65. What are the group numbers for the alkali metals, alkaline earth metals, halogens and noble gases?

Unit Six: Ionic Bonding

66. How do Ionic bonds form? Please draw a picture showing this process.

67. How many Hydrogen atoms are in $Al(OH)_3$?

68. What does Avogadro's Number tell you?

69. Calculate the molar mass of $Pb(NO_3)_2$

70. Calculate the percent composition of K_2CrO_4

71. Describe how you would convert 50 grams of gold into moles.

72. 46. Calculate the mass of 0.832 moles of Na_2CO_3.

73. How many grams of dihydrogen monoxide are present in 0.0624 moles?

74. Calculate the number of moles given 3.64×10^{24} molecules of CO_2.

75. How many molecules of HCl are present in 4.00 moles?

76. The amount of molecules in 125 g of sodium chloride (NaCl) is……..

77. How many grams of KBr are present in 2.18×10^{25} molecules of KBr?

Unit Seven: Covalent Bonding

78. Why do atoms form bonds?

79. What types of atoms are bonded to each other in a covalent bond?

80. What is a diatomic molecule?

81. What is a polar molecule?

82. What is a nonpolar molecule?

83. Explain what dipole forces, london(dispersion) forces, and hydrogen bonding are. What types of molecules are involved in each type of bonding?

84. Rank the intermolecular forces from weakest to strongest.

85. List the five shapes that a molecule can take according to the VESPR theory. Include a drawing and example with each one.

86. Fill in the table below.

Molecule	E.N.D.	Bonds (NPC,PC,I)	Molecule Polarity	Line Structure	Name of Shape	Drawing of Shape
$SiBr_4$						
H_2S						

NBr_3						
CO_2						

Unit Eight: Naming & Formula Writing

87. What is the name of FeO?

88. What is the name of P_6O_7?

89. What is the name of $BaBr_2$?

90. What is the name of K_3PO_3?

91. What is the formula for Magnesium nitrite?

92. What is the formula for Copper (III) Chromate?

93. What is the formula for aluminum nitride?

94. What is the correct formula trihydrogen pentasulfide?

95. What is the correct formula for Calcium hydroxide?

Unit Nine: Chemical Reactions

96. Balance the following equations and state the reaction type:

_____ $Ca(NO_3)_2$ + _____ Na_2SO_4 → _____ $NaNO_3$ + _____ $CaSO_4$

Reaction type:_____

_____ Fe + _____ O_2 → _____ FeO

Reaction type:_____

_____ SO_3 + _____ H_2O → _____ H_2SO_4

Reaction type:_____

_____ C_3H_8 + _____ O_2 → _____ CO_2 + _____ H_2O

Reaction type:_____

_____ Cu + _____ $AgNO_3$ → _____ Ag + _____ $Cu(NO_3)_2$

Reaction type:_____

97. Predict the products of the following reactions. Also, balance the equations and state the reaction type.

_____ C_5H_{12} + _____ O_2 → _____ + _____

Reaction type:_____

_____ NaCl → _____ + _____

Reaction type:_____

_____ Cu + _____ $FeCl_2$ → _____ + _____

Reaction type:_____

98. How do you know when an equation is balanced?

99. Balance and write down the type of equation.

_____$Pb(NO_3)_2$ + _____K_2CrO_4 → _____$PbCrO_4$ + _____KNO_3

Reaction type:_____

100. Balance and write down the type of equation.

_____Mg + _____O_2 → _____MgO

Reaction type:_____

101. Balance and write down the type of equation.

_____$NaHCO_3$ → _____Na_2CO_3 + _____H_2O + _____CO_2

Reaction type:_____

102. What are the reactants and products for all combustion reactions?

103. Predict the Products

_____Zn + _____HCl →

_____$CaCO_3$ + _____KBr →