Fall 2013 Final Exam Review Guide

Chapters 1 and 2

1. **Safety:** a) How should hot glassware be handled?

   b) How does the wafting method work?

Three groups of students measured the length of a certain metal rod and obtained the results listed in the following table. The manufacturer certifies that this metal rod measures 10.16 cm.

Length of Metal Rod (cm)			
Trial	**Group A**	**Group B**	**Group C**
1	10.10	12.14	10.13
2	10.40	12.17	10.23
3	9.60	12.15	10.20
4	9.90	12.18	10.16
Average	**10.00**	**12.16**	**10.18**

2. Which set of data is most accurate?
3. Which set is precise but not accurate?
4. Which set is accurate but not precise?
5. Which set is most precise?
6. Using accuracy and precision, describe the data collected by Group C.
7. Calculate the percent error for Group A.

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8. Write the following numbers in standard (ordinary) notation

   a) 2.47×10^{-3} b) 7.2×10^{8}

9. Write the following numbers in scientific notation:

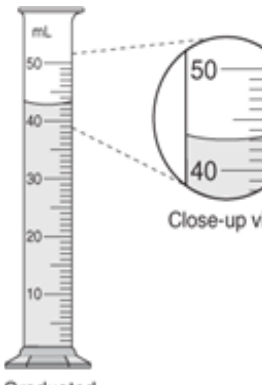
   a) 175,000 b) 0.00084

10. Determine the number of significant figures for the numbers in #12 and #13 above.
11. Find density in g/mL of an object that has a volume of 9.0 mL and a mass of 15.3 g.
12. A 15-g plastic bead is placed in 20.0 mL of water. The water rises to 27.5 mL. Calculate the density of the bead.

    What is the name of the process used to find the volume of the rock?
    What pieces of scientific equipment were used to determine the mass and volume of the rock?

13. Suppose that a sample of an element has a mass of 35.0 g and a volume of 5.00 mL. Which sample would have the same density as the element sample described?
    a) 42.0 g and 6.50 mL b) 31.5 g and 4.50 mL c) 24.0 g and 10.2 mL

14. How do you read a graduated cylinder? Explain the role of significant figures in scientific measurement.



15. Convert the following metric measurements.

a) 27.9 mm = _____ m
b) 157.23 dam = _____ cm
c) 34.5 km = _____ mm
d) 1.2 cm = _____ m
e) 51,700 mL = _____ L
f) 0.675 L = _____ mL
g) 12.759 mL = _____ cm^3
h) 5723.5 cm^3 = _____ L
i) 0.575 g = _____ mg
j) 140 kg = _____ g
k) 4 mg = _____ kg
l) 0.25 mg = _____ g

16. When would you use: a) a pie graph? b) a bar graph? c) a line graph?

What must all graphs have?

Which variable goes on the x-axis of a line graph? The y-axis?

Chapter 3

17. Tell whether the following indicates physical or chemical changes.

a) ice melting in a glass of water
b) rusting an iron pan
c) water evaporating from a puddle
d) dissolving sugar in water
e) mixing hydrochloric acid and sodium hydroxide to make salt and water
f) copper wire conducting electricity
g) digesting food
h) burning methane using a Bunsen burner
i) casting silver in a mold

18. Tell whether the following mixtures are homogeneous or heterogeneous. For the heterogeneous mixtures, indicate whether they are colloids or suspensions.

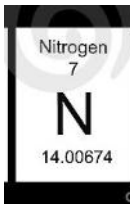
a) chocolate chip cookie
b) orange juice without pulp
c) orange juice with pulp
d) fog
e) air
f) milk
g) sweet tea
h) piece of quartz containing a vein of gold

19. Explain, in the correct sequence, how to separate a mixture containing rocks, iron filings, sand, salt and water. Indicate the specific separation technique to be used for each step.

20. If 29 g of element A reacts with 15 g of element B to form compound AB, what is the mass of the compound that is formed? What law does this obey?

Chapter 4 and 24

21. The atomic number identifies the element and gives the number of _____ in an atom.



a) What is the atomic number of the element on the right?

b) How many protons and electrons are in a neutral atom of this element?

c) What is the most common isotope of the element on the right? (Write its isotopic symbol.)

d) How many neutrons would this isotope have?

22. How many neutrons are in an atom that has a mass number of 206 and atomic number of 83?

Write the isotopic symbol for this element.

23. Complete the table below for the three types of radiation.

Type	Symbol	Penetrating Power

24. The half-life of Zn-71 is 2.4 minutes. How much of a 100.0-g sample would be left after 7.2 minutes has elapsed?

25. Ac-228 has a half-life of about 6 hours. After approximately 18 hours, 0.625 mg remains. How much Ac-228 was present in the original sample?

26. Lead has four stable isotopes: Pb-204, Pb-206, Pb-207, and Pb-208. If the atomic mass of lead is 207.1 amu, which isotope is in the greatest abundance? How do you know? How does atomic mass differ from mass number?

Chapter 5

27. Write both the standard and shortened (noble gas) electron configuration for the following elements.

    a) sodium b) argon c) B d) Mg

    Which of these elements would have the most stable electron configuration and why?

28. Draw the orbital diagram for the following elements.

    a) carbon b) chlorine c) potassium

    Where are the valence electrons for each of these elements found (electron configuration)?

29. Determine the number of valence electrons for the following elements.
    a) magnesium b) phosphorous c) krypton d) selenium e) aluminum
    Draw Lewis Dot structures for each of these elements.

30. Explain how a flame test can be used to identify the presence of an element. (Example data: lithium chloride – red, potassium chloride – violet)

31. Identify the element based on the electron configuration endings given.

    a) $2p^1$ b) $6s^2$ c) $4p^6$ d) $3s^1$ e) $5p^2$

Chapter 6

Define:

a) atomic number	b) atomic mass	c) atomic radius	d) ion
e) ionic radius	f) group/family	g) period	h) electron dot diagram
i) metal	j) nonmetal	k) metalloid	l) energy level
m) oxidation number	n) ionization energy	o) electronegativity	p) reactivity
q) diatomic molecules	r) representative elements	s) transition elements	

32. What characteristic of the atom is used to organize the periodic table? What characteristic of the atom determines the row placement of an element?

33. a) For the representative elements, the A Groups, how is the number of valence electrons determined?

    b) Find the number of valence electrons for: silicon phosphorus sulfur sodium

    c) Draw electron dot structures for each of the atoms in b) above.

d) What does the period tell you about an atom?

e) What is the location of the s, p, d and f block elements on the periodic table?

34. How does an element's position on the periodic table affect its properties? What do elements in the same group/family have in common?

35. a) What type of ion do metals form? What happens to the size of a magnesium atom when it becomes an ion?

b) What type of ion do nonmetals form? What happens to the size of an oxygen atom when it becomes an ion?

36. Explain the trend across a period (left to right) for each of the following properties.

a) Atomic radius b) Ionic radius

c) Ionization energy d) Electronegativity

Select two elements in the same period and compare their size (atomic and ionic radii), their ionization energy and their electronegativity.

37. Explain the trend down a group (top to bottom) for each of the following properties.

a) Atomic radius b) Ionic radius

c) Ionization energy d) Electronegativity

Select two elements in the same group and compare their size (atomic and ionic radii, their ionization energy and their electronegativity.

38. Complete the table below for the groups of the periodic table. (**A Groups only*)

Name	**Group #**	**Block on PT**	**# Valence e^- ***	**Reactivity***	**Oxidation #***	**Physical Properties**
Alkali metals						
Alkaline earth metals						
Boron group						
Carbon group						
Nitrogen group						
Oxygen group (chalcogens)						
Halogens						
Noble gases						
Inner transition metals						
Transition metals						
Lanthanide series						
Actinide series						
Representative elements						

39. Explain the periodic trend of reactivity for metals and nonmetals.

    a) Which group of metals is most reactive? Which metal is most reactive?

    b) Which group of nonmetals is most reactive? Which nonmetal is most reactive?

    c) Which group is considered inert or unreactive? Explain why.

40. a) Explain where metals, nonmetals, and metalloids are located on the periodic table. What is used to separate these classifications?

    b) Give an example from each classification.

    c) Describe the physical and chemical properties of each classification.

    d) Describe the block (s, p, d, f) to which each classification generally belongs.

41. Determine the number of valence electrons and draw the dot diagrams, electron configuration notation, noble gas notation, and orbital diagrams for the following:

    a) Ba

    b) Se

    c) Na

    d) As

Chapters 7 and 8

42. Define:

a)	anion	b)	cation	c)	chemical bond	d)	electrolyte
d)	formula unit	e)	ionic bond	f)	lattice energy	g)	monatomic ion
h)	oxidation number	i)	oxyanion	j)	polyatomic ion	k)	covalent bond
l)	endothermic	m)	exothermic	n)	Lewis dot structure	o)	nonpolar covalent bond
p)	oxyacid	q)	polar covalent bond			r)	structural formula
s)	binary ionic compound			t)	ternary ionic compound		
u)	binary acid	v)	tertiary acid				

43. Using Lewis dot structures and arrows, demonstrate the formation of ionic compounds. Label the cations and anions.

    a) Between lithium and bromine

    b) Between calcium and fluorine

44. a) When naming binary compounds, what ending is used for the second element?

    b) When is the Stock System (Roman numerals) used?

45. How are formulas and names written for binary ionic compounds?

46. How are formulas and names written for ternary ionic compounds?

47. Name the following compounds:

    a) KBr b) $CaCl_2$ c) SnO_2 d) $Cu(NO_3)_2$ e. $Sr(OH)_2$

48. Complete the following table.

Compound Name	Cation Symbol	Anion Symbol	Compound Formula	Binary or Tertiary
Lithium fluoride				
Silver oxide				
Barium carbonate				
Gold(III) sulfite				
Copper(II) hydroxide				

49. Indicate whether the following ionic compounds are binary or ternary, then name the compound.

a) Na_2SO_4 b) PbO_2

c) $FePO_4$ d) $Ca(NO_2)_2$

e) $MgCO_3$ f) $Al(OH)_3$

g) $(NH_4)_3N$ h) $AgC_2H_3O_2$

i) Fe_3P_2 j) $CuCl_2$

50. How is a covalent compound formed? How is the octet rule applied to atoms that bond covalently? How are Lewis structures used to represent covalent bonds (single, double, and triple)?

51. What are the seven diatomic molecules?

52. Show the formation of water (a covalent compound) using Lewis dot diagrams for hydrogen and oxygen and then the Lewis structure for the molecule. What shape does a water molecule have? In the Lewis structure, remember that a dash replaces a shared pair of electrons.

53. How are covalent compounds named?

a) Give the prefixes used for the numbers 1 through 10 when naming binary covalent compounds.

b) What ending is used when naming a binary covalent compound?

54. How are acids named? What distinguishes an acid formula from that of other covalent compounds? In what physical state to acids exist?

55. Indicate whether the following compounds are acid (A) or binary covalent (BC), then name the compound.

Formula	**Type (A or BC)**	**Name**
PH_3		
CCl_4		
HCl		
NO		
H_2CO_3		
As_2O_5		
HNO_2		

56. Draw Lewis structures for the following covalent compounds.

a) F_2 b) NH_3 c) CO_2 d) N_2

57. What causes some bonds to be polar? Explain the role of electronegativity in polarity of bonding.

58. How does polarity affect solubility? Explain the phrase “like dissolves like.”

59. Indicate whether the bonds are polar covalent, nonpolar covalent, or ionic.

a) H – H b) H – Br

c) N – O d) Na – Cl

60. What are the properties of ionic, polar covalent, and nonpolar covalent compounds?

61. For ionic, polar, and nonpolar compounds, explain the following:
    a) what happens to electrons
    b) their properties
    c) how the compounds are named
    d) how to recognize the type of compound based on its formula

62. Complete the table below.

Compound Formula	**Covalent, Ionic, or Acid**	**Compound Name**
$MgCl_2$		
NO_2		
HF		
H_3PO_4		
NH_4Br		
$Cu(NO_3)_2$		
		Hydrobromic acid
		Tetraphosphorus hexoxide
		Aluminum sulfide
		Lead(IV) sulfite
		Sulfuric acid
		Acetic acid

63. Complete the following table for alkanes.

# of Carbons	**Formula**	**Name**	**# of Carbons**	**Formula**	**Name**
1			6		
2			7		
3			8		
4			9		
5			10		

Chapter 9

64. Define:
    a) coefficient
    b) combustion reaction
    c) reactant
    d) product
    e) balanced equation
    f) activity series of metals
    g) decomposition reaction
    h) single replacement reaction
    i) synthesis (combination)
    j) double replacement reaction
    k) catalyst

65. What do the symbols (s), (l), (g), and (aq) represent?

66. Why must chemical equations be balanced? What law governs the balancing of equations?

67. What nonmetals replace each other?

68. Balance the following reactions and identify the type of reaction shown.

a) ____H_2 + ____O_2 → ____H_2O _____

b) ____H_2O → ____H_2 + ____O_2 _____

c) ____Zn + ____H_2SO_4 → ____$ZnSO_4$ + ____ H_2 _____

d) ____CO + ____O_2 → ____CO_2 _____

e) ____HgO → ____Hg + ____O_2 _____

f) ____KBr + ____Cl_2 → ____KCl + ____Br_2 _____

g) ____CaO + ____H_2O → ____$Ca(OH)_2$ _____

h) ____$AgNO_3$ + ____NaCl → ____AgCl + ____$NaNO_3$ _____

i) ____H_2O_2(l) → ____H_2O(l) + ____O_2(g) _____

j) ____$Ca(OH)_2$(aq) + ____H_2SO_4(aq) → ____$CaSO_4$(aq) + ____H_2O(l) _____

69. Write balanced chemical equation for the following word equations.

a) Copper(II) carbonate decomposes into copper(II) oxide and carbon dioxide.

b) Sodium metal reacts with water to produce sodium hydroxide and hydrogen gas.

c) Calcium carbonate reacts with hydrochloric acid to produce calcium chloride, water, and carbon dioxide gas.

d) Aluminum metal reacts with hydrochloric acid to produce aluminum chloride and hydrogen gas.

93. Identify the type of reaction and predict the products of the following reactions. If no reaction occurs, write NR. Balance the equations.

a) ____$AgNO_3$(aq) + ____H_2SO_4(aq) →

b) ____C_2H_{10}(g) + ____O_2(g) →

c) ____H_2(g) + ____CuO(s) →

d) ____$Pb(C_2H_3O_2)_2$(aq) + K_2CrO_4(aq) →

94. Balance the following equations.

a) ____$AsCl_3$(s) + ____H_2O(l) → ____HCl(aq) + ____$As(OH)_3$(s)

b) ____Na(s) + ____O_2(g) → ____Na_2O(s)

c) ____Cu(s) + ____H_2SO_4(aq) → ____$CuSO_4$(s) + ____SO_2(g) + ____H_2O(l)

d) ____Sb + ____H_2O → ____Sb_2O_3 + ____H_2

e) ____$La(NO_3)_3$ + ____NaOH → ____$La(OH)_3$ + ____$NaNO_3$

f) ____C_4H_8(g) + ____O_2(g) → ____CO_2(g) + ____H_2O(g)

g) ____C_3H_8(g) + ____O_2(g) → ____CO_2(g) + ____H_2O(g)