Name_____

CHEMISTRY 2
SUMMER 2001 EXAM #1

Answer the following by writing the word, words, letter, letters or number in each blank that best completes each sentence. (3/4 point each blank)

1. _____ is the amount of matter in an object. It can also be defined as the property of matter that leads to gravitational attractions between objects and therefore gives rise to weight.
2. _____ describes the closeness in value of a series of measurements of the same entity. _____ describes how closely a measured value approaches the true value of a property.
3. The accepted SI unit for temperature is the _____, which has an abbreviation of _____.
4. The metric prefix that represents 10^{-6} is _____. Its abbreviation is _____.
5. There are _____ milligrams per gram.
6. If a value derived from a volume measurement is reported as 8.0 mL, we assume that the values could be as low as _____ and as high as _____.
7. At a track meet, three different timers report the times for the winner of a 100-m sprint as 10.51 s, 10.32 s, and 10.43 s. The average is 10.42 s. To reflect the uncertainty of the measurements, you would reports the time as _____.
8. A(n) _____ is a simplified approximation of reality.
9. A(n) _____ is a substance that cannot be chemically converted into simpler substances is a substance in which all of the atoms have the same number of protons and therefore the same chemical characteristics.
10. The elements that have some but not all of the characteristics of metals are called _____.

11. _____ means capable of being extended or shaped by the blows of a hammer.
12. The horizontal rows on the periodic table are called _____.
13. The _____ of an element is equal to the number of protons in an atom's nucleus. It establishes the element's identity.
14. An ion formed from an atom that has gained one or more electrons and thus has become negatively charged is called an _____.
15. A(n) _____ bond is a link between atoms that results from their sharing two electrons.
16. A(n) _____ is an uncharged collection of atoms held together with covalent bonds.
17. The _____ are the elements in groups 3 through 12 (the "B" groups) on the periodic table.
18. A(n) _____ is a substance that contains two or more elements, the atoms of these elements always combining in the same whole-number ratio.
19. A(n) _____ bond is a bond in which electrons are shared unequally, leading to a partial negative charge on the atom that attracts the electrons more and to a partial positive charge on the other atom.
20. A(n) _____ bond is a link between atoms that results from the sharing of four electrons. It can be viewed as two 2-electron covalent bonds.
21. Two electrons that are not involved in the covalent bonds between atoms but are important for explaining the arrangement of atoms in molecules are called a _____. They are represented by pairs of dots in Lewis structures.
22. _____ are ompounds that contain only carbon and hydrogen.
23. _____ chemistry is the branch of chemistry that involves the study of carbon-based compounds.
24. _____ are compounds that contain a hydrocarbon group with one or more -OH groups attached.

25. _____ are negatively charged particles, such as Cl^-, O^{2-}, and N^{3-}, that contain single atoms with a negative charge.
26. A(n) _____ is a charged collection of atoms held together by covalent bonds.
27. The symbol for an ion with 13 protons and 10 electrons is _____.
28. The name of the group of elements on the periodic table that includes fluorine and chlorine is _____.
29. The most common bonding pattern for oxygen atoms is _____ covalent bonds and _____ lone pair.
30. The conversion of one or more pure substances into one or more different pure substances is called a(n) _____.
31. _____ are the substances that change in a chemical reaction. Their formulas are on the left side of the arrow in a chemical equation.
    _____ are the substances that form in a chemical reaction. Their formulas are on the right side of the arrow in a chemical equation.
32. A(n) _____ is a mixture whose particles are so evenly distributed that the relative concentrations of the components are the same throughout. They can also be called homogeneous mixtures.
33. A(n) _____ reaction is a reaction in which one of the products is insoluble in water and comes out of solution as a solid.
34. A(n) _____ equation is a chemical equation for which the spectator ions have been eliminated, leaving only the substances actively involved in the reaction.
35. Of the three temperatures, 100 K, 200 K, or 300 K, _____ is closest to the temperature around you now.
36. In a solution of solid camphor and liquid ethanol, the camphor is the _____ (solute or solvent) and the ethanol is the _____ (solute or solvent).

37. Would you expect the bonds between the following atoms to be ionic or covalent bonds? (1 point each)

    a. P-S _____

    b. Li-F _____

38. Classify each of the following as either a molecular compound or an ionic compound. (1 point each)

    a. $C_{12}H_{22}O_{11}$ (white table sugar) _____

    b. Co_2O_3 (used in coloring enamels) _____

    c. NH_4NO_3 (in fertilizers) _____

39. Complete the following table. (1/4 point per blank)

Element Name	Element Symbol	Group Number in Periodic Table	Metal, Nonmetal, or Metalloid?	Representative Element, Transition Metal, or Inner Transition Metal?	Number of Period
	Mg				
lead					
	Fe				
argon					
		7			4

40. Draw a Lewis structure for each of the following formulas: (2 points each)

a. HOCl

b. CCl_3F

41. Complete the following table of names and symbols for ions. (1/2 point each box)

nickel(II) ion		oxide ion	
	NO_3^-		HCO_3^-
magnesium ion		iron(III) ion	
	Cl^-		Co^{2+}

42. Classify each of the following as a pure substance or a mixture. If it is a pure substance, is it an element or a compound? Explain your answer. (1 point each)

a. phosphorus (an additive to semiconductors)

_____ _____

b. phosphoric acid, H_3PO_4 (used to make fertilizers)

_____ _____

c. tomato catsup

_____ _____

43. Complete the following table by classifying each of the following chemical formulas as representing either (1) a binary ionic compound, (2) an ionic compound with polyatomic ion(s), or (3) a binary covalent compound. Write the name that corresponds to each formula. (3/4 points each)

Formula	Type of Substance	Name
Na_2SO_4		
Ca_3N_2		
$LiHSO_4$		
P_2O_4		
$Fe(C_2H_3O_2)_2$		

44. Complete the following table by classifying each of the following formulas as representing either (1) a binary ionic compound, (2) an ionic compound with polyatomic ion(s), or (3) a binary covalent compound. Write the chemical formula that corresponds to each name. (3/4 points each)

Name	Type of Substance	Formula
Magnesium fluoride		
nitrogen tribromide		
manganese(III) hydroxide		
hydrogen chloride		
ammonium phosphate		

45. Balance the following equations. (1½ points each)

a. $Cl_2(g) + CH_4(g) + O_2(g) \rightarrow HCl(g) + CO(g)$

b. $Al(s) + H_3PO_4(aq) \rightarrow AlPO_4(s) + H_2(g)$

c. $C_6H_{14}(l) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$

46. Complete the following table by indicating whether each substance is soluble or insoluble in water. (1 point each blank)

Substance	Soluble or Insoluble?	Substance	Soluble or Insoluble?
$PbCl_2$		$Fe(OH)_3$	
Na_3PO_4		$Cu(NO_3)_2$	

47. For each of the following pairs of formulas, predict whether the substances they represent would react in a precipitation reaction. The products formed in the reactions that take place are used in ceramics, cloud seeding, photography, electroplating, paper coatings, and anti-fouling paints. If there is no reaction, write, "No Reaction". If there is a reaction, write the complete equation for the reaction. (2 points each)

a. $Fe(NO_3)_2(aq) + K_2CO_3(aq)$

b. $LiCl(aq) + AgNO_3(aq)$

c. $Ni(NO_3)_2(aq) + LiCl(aq)$

Answer six of the following eight questions. It is not to your advantage to answer more than six questions. If you answer more than six, be sure to indicate which questions you want graded. If you do not, I will grade the first six questions answered. (4 points each)

48. If the pistons and cylinders in your car engine get too hot, the pistons can get stuck in the cylinders, causing major damage to the engine. Why does this happen?

49. You find an old bathroom scale at a garage sale on your way home from getting a physical exam from your doctor. You step on the scale, and it reads 135 lb. You step off and step back on, and it reads 134 lb. You do this three more times and get readings of 135 lb, 136 lb, and 135 lb.

    a. What is the precision of this old bathroom scale? (For example, the precision of a typical laboratory balance is ±0.001 g.) Would you consider this to be adequate precision for this type of measurement?

    b. The much more carefully constructed and better-treated doctor's scale that you stepped on just a few minutes before read 126 lb. Assuming that you are wearing the same clothes that you wore when the doctor weighed you, do you think the accuracy of the old bathroom scale is high or low?

    c. Why is it easier to determine the precision of this bathroom scale than to determine its accuracy?

50. Describe the carbon atom, and make a rough sketch.

51. Atoms of potassium and fluorine form ions and ionic bonds in a very similar way to atoms of sodium and chlorine. Each atom of one of these elements loses one electron, and each atom of the other element gains one electron. Describe the process that leads to the formation of the ionic bond between potassium and fluorine atoms in potassium fluoride. Your answer should include mention of the charges that form on the atoms.

52. Describe the structure of bromine liquid, including a description of the nature of the particles that form each structure.

53. What are the particles that form the basic structure of water? What type of attraction holds these particles together? Draw a rough sketch of the structure of liquid water.

54. Describe the process for dissolving the ionic compound lithium iodide, LiI, in water, including the nature of the particles in solution and the attractions between the particles in the solution.

55. Black and white photographic film has a thin layer of silver bromide deposited on it. When light strikes the film, silver ions are converted to uncharged silver atoms, which create a dark image on the film. Describe the precipitation reaction that takes place between water solutions of silver nitrate, $AgNO_3(aq)$, and sodium bromide, NaBr(aq), to form solid silver bromide, AgBr(s), and aqueous sodium nitrate, $NaNO_3(aq)$. Include mention of the nature of the particles in the system before and after the reaction, a description of the cause of the reaction, and a description of the attractions between the particles before and after the reaction.