"Yellow" Name _____

SSN _____

CHEM 121a Exam 1 Fall 1998

This exam consists of 10 true-false questions (each worth 2 pts), 10 naming questions (each worth 1 pt), 20 multiple choice questions (each worth 2 points), and 2 short problems (each worth 15 points). There are a total of 100 possible points.

True-False

If the statement is true, do nothing. If the statement is false, write a replacement for the underlined word, phrase, or number to make the statement true.

1. A compound composed of two nonmetals would have <u>covalent</u> bonds. _____
2. When an atom loses one or more electrons it forms a(n) <u>anion</u>. _____
3. The mass of a proton is equal to the mass of a(n) <u>electron</u>. _____
4. A sparkling clear wine would be best classified as a <u>homogeneous mixture</u>. _____
5. The <u>molecular</u> formula is the simplest whole-number ratio for the various atoms in a compound. _____
6. In a chemical reaction the mass of the reactants is <u>greater than</u> the mass of the products. _____
7. A measurement of 307.081 g rounded to four significant figures and expressed in scientific notation is <u>3.00×10^{-2}</u> g. _____
8. Magnesium, calcium, and strontium are all <u>alkali metals</u>. _____
9. There are <u>36</u> hydrogen atoms in 3 molecules of $(NH_4)_3C_6H_5O_7$. _____
10. Ions are formed when a neutral atom gains or loses a(n) <u>electron</u>. _____

Naming

Give the name or the formula of each compound.

1. phosphorus pentachloride _____
2. sodium bromide _____
3. calcium acetate _____
4. nickel(II) chloride _____
5. hydroiodic acid _____
6. PbS_2 _____
7. MnO_2 _____
8. N_2O_4 _____
9. HNO_2 _____
10. Li_2HPO_4 _____

Multiple Choice

Please print your name and the "Test Color" on your Scantron sheet. Carefully mark the appropriate answer to each question on the Scantron sheet, and show any work in the space provided. Each question is worth 2 points (40 pts toward exam total of 100 pts). Please hand in both the Exam and the Scantron sheet.

1. In a recent accident, some drums of uranium hexafluoride were lost in the English Channel, which is known for its cold water (about 17 °C). The melting point of uranium hexafluoride is 148 °F. In what physical state is the uranium hexafluoride in these drums?

   a. solid
   b. liquid
   c. gas
   d. a mixture of solid and liquid
   e. not enough information

2. By knowing the number of protons a neutral element has, you should be able to determine

   a. the number of neutrons in the neutral element.
   b. the number of electrons in the neutral element.
   c. the name of the element.
   d. two of these.
   e. none of these

3. A sample of copper weighing 6.93 g contains how many moles of copper atoms?

   a. 9.17 moles
   b. 0.917 moles
   c. 0.109 moles
   d. 0.0645 moles
   e. 1.09 moles

4. The empirical formula of a group of compounds is CHCl. Lindane, a powerful insecticide, is a member of this group. The molar mass of lindane is 290.8. How many atoms of carbon does a molecule of lindane contain?

   a. 2
   b. 3
   c. 4
   d. 6
   e. 8

5. Given the equation $3\ A + B \rightarrow C + D$, you react 2 moles of A with 1 mole of B. Which of the following is true?

   a. A is the limiting reactant because of its higher molar mass.
   b. A is the limiting reactant because you need 3 moles of A and have 2.
   c. B is the limiting reactant because you have fewer moles of B than A.
   d. B is the limiting reactant because 3 A molecules react with 1 B molecule.
   e. Neither reactant is limiting.

6. $^{40}Ca^{2+}$ has

   a. 20 protons, 20 neutrons, and 18 electrons.
   b. 22 protons, 20 neutrons, and 20 electrons.
   c. 20 protons, 22 neutrons, and 18 electrons.
   d. 22 protons, 18 neutrons, and 18 electrons.
   e. 20 protons, 20 neutrons, and 22 electrons.

7. A piece of indium with a mass of 16.6 g is submerged in 46.3 cm^3 of water in a graduated cylinder. The water level increases to 48.6 cm^3. The correct value for the density of indium from these data is:

a. 7.217 g/cm^3
b. 7.2 g/cm^3
c. 0.14 g/cm^3
d. 0.138 g/cm^3
e. more than 0.1 g/cm^3 away from any of these values.

8. Which one of the following statements about atomic structure is false?

a. The electrons occupy a very large volume compared to the nucleus.
b. Almost all of the mass of the atom is concentrated in the nucleus.
c. The protons and neutrons in the nucleus are very tightly packed.
d. The number of protons and neutrons is always the same in the neutral atom.
e. None of the above.

9. Iron is biologically important in the transport of oxygen by red blood cells from the lungs to the various organs of the body. In the blood of an adult human, there are approximately 2.60×10^{13} red blood cells with a total of 2.90 g of iron. On the average, how many iron atoms are present in each red blood cell? (molar mass of Fe = 55.85 g)

a. 8.33×10^{-10}
b. 1.20×10^{9}
c. 3.12×10^{22}
d. 2.60×10^{13}
e. 5.19×10^{-2}

10. Which of the following pairs can be used to illustrate the law of multiple proportions?

a. SO and SO_2
b. CO and $CaCO_3$
c. H_2O and $C_{12}H_{22}O_{11}$
d. H_2SO_4 and H_2S
e. KCl and $KClO_2$

11. Sulfuric acid may be produced by the following process:

$4\ FeS_2 + 11\ O_2 \rightarrow 2\ Fe_2O_3 + 8\ SO_2$
$2\ SO_2 + O_2 \rightarrow 2\ SO_3$
$SO_3 + H_2O \rightarrow H_2SO_4$

How many moles of H_2SO_4 will be produced from 5.00 moles of FeS_2?

a. 6.11
b. 5.00
c. 10.0
d. 12.2
e. 20.0

12. Cortisone consists of molecules, each of which contains 21 atoms of carbon (plus other atoms). The mass percentage of carbon in cortisone is 69.98%. What is the molar mass of cortisone?

a. 176.5 g/mol
b. 252.2 g/mol
c. 287.6 g/mol
d. 312.8 g/mol
e. 360.4 g/mol

13. What is the coefficient for oxygen when the following equation is balanced?

$NH_3(g) + O_2(g) \rightarrow NO_2(g) + H_2O(g)$

a. 3
b. 6
c. 7
d. 12
e. 14

14. Give (in order) the correct coefficients to balance the following reaction:

$H_2SnCl_6 + H_2S \rightarrow SnS_2 + HCl$

a. 1, 2, 1, 6
b. 1, 2, 2, 2
c. 1, 1, 1, 6
d. 6, 2, 1, 1
e. 2, 4, 2, 6

15. Convert 0.7891 L to cL.

a. 0.007891 cL
b. 789.1 cL
c. 78.91 cL
d. 0.07891 cL
e. 7.891 cL

16. The boiling of water is a

a. physical change because the water merely disappears.
b. physical change because the gaseous water is chemically the same as the liquid.
c. chemical change because heat is needed for the process to occur.
d. chemical change because a gas (steam) is given off.
e. chemical and physical change.

17. In balancing an equation, we change the _____ to make the number of atoms on each side of the equation balance.

a. formulas of compounds in the reactants
b. coefficients of compounds
c. formulas of compounds in the products
d. subscripts of compounds
e. none of these

18. A substance contains 35.0 g nitrogen, 5.05 g hydrogen, and 60.0 g of oxygen. How many grams of hydrogen are there in a 185-g sample of the substance?

a. 9.34 g
b. 18.7 g
c. 10.6 g
d. 5.05 g
e. 36.6 g

19. A chloride of rhenium contains 63.6% rhenium. What is the formula of this compound?

a. ReCl
b. $ReCl_3$
c. $ReCl_5$
d. $ReCl_7$
e. Re_2Cl_3

20. The average mass of a magnesium atom is 24.31. Assuming you were able to pick up only one magnesium atom, the chances that you would randomly get one with a mass of 24.31 is

a. 0%.
b. 0.31%.
c. 24.31%.
d. 31%.
e. greater than 70%.

Scratch Page

(Don't forget the written problems on the back of this page!)

Written Problems

Write out the solution to each written problem. Please show all of your work.

1. Given the balanced equation: $CaCO_3(s) + 2\ HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

   How many grams of carbon dioxide are formed from reaction of 3.45 g of calcium carbonate with 3.45 g of hydrochloric acid? Which reactant is limiting?

2 Norm Abram must stain the deck at the New Yankee Workshop. The deck is 5.4 meters wide and 7.2 meters long. There are also 6 stairs that are each 12 in by 30. in. A one-quart can of chocolate-brown Minwax deck stain will cover 150. square feet. How many cans of stain does he need? (Assume only the top surface will be stained, and remember that 1 in = 2.54 cm.) Continue your calculation on the back, if needed.

Extra Credit Problem (up to 5 bonus points) This problem is optional.

In class, several demonstrations have been shown to illustrate chemical phenomena. Use your knowledge of chemistry to explain why a can of Regular Coke sinks in a cooler full of ice water while a can of Diet Coke floats. Please describe your theory completely. You may use the back of this page if you need more room.

True-False	(20)	_____
Naming	(10)	_____
Multiple Choice	(40)	_____
Written Problems	(30)	_____
Exam 1 Total	(100)	_____