

Chemistry 105-Fundamental Chemistry

Exam 1A-Wednesday, 9 October 1996

Name _____.

Laboratory Section _____.

PLEASE ANSWER IN THE SPACE PROVIDED. SHOW WORK WHEREVER POSSIBLE. THERE WILL BE ABSOLUTELY NO TALKING DURING THIS EXAM PERIOD. IF YOU HAVE A QUESTION RAISE YOUR HAND. IF YOU FINISH EARLY, BRING YOUR EXAM TO THE FRONT AND LEAVE QUIETLY. DURING THE LAST TEN MINUTES OF THE EXAM PERIOD, DO NOT LEAVE YOUR SEAT AND DO NOT SPEAK TO OTHERS UNTIL ALL PAPERS HAVE BEEN COLLECTED. INITIAL EACH PAGE SO THAT IF THE PAGES BECOME SEPARATED I CAN PIECE YOUR EXAM BACK TOGETHER. IF YOU NEED MORE PAPER RAISE YOUR HAND. USE A PEN. FILL YOUR STUDENT ID NUMBER IN THE SPACE PROVIDED AT THE BOTTOM OF THIS SHEET. GOOD LUCK.



ID NUMBER _____.

1) (5 pts) To the right of each name, give the correct chemical formula for each of the following:

phosphorus pentabromide

dicarbon hexoxide

magnesium chlorite

sodium phosphate

ammonium sulfite

2) (5 pts) PRINT the correct chemical name for each formula shown below.

C_2H_6

$Hg(NO_3)_2$

$MgSO_3$

FeS

SO_3

3) (5 pts) What mass of Na_2SO_4 is needed to prepare 250.0mL of a 0.100M Na_2SO_4 solution?

4) (16pts) Given the four liquid chemical compounds listed in the table below:

a) compute the density for each and place your answers in the appropriate boxes.

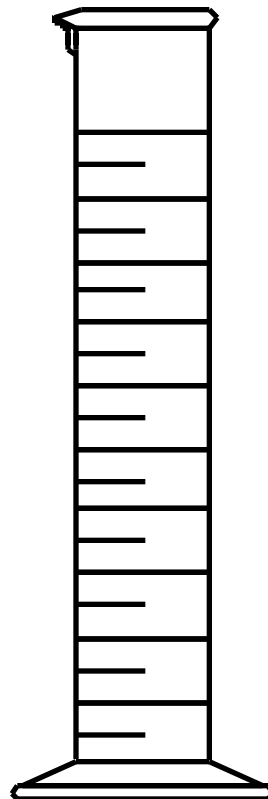
b) calculate the mass percent composition (to one decimal place) for each liquid.

c) indicate whether the properties are intensive or extensive by placing an "I" or "E" in the box at the bottom of each column.

SHOW ALL YOUR WORK IN THE SPACE BELOW THE TABLE.

Compound Name	Chemical Formula	Mass in kg	Volume in L	Density in g/mL	Mass Percent Composition
chloroform	CHCl ₃	0.224	0.150		
glycol	C ₂ H ₆ O ₂	0.443	0.400		
ethyl acetate	C ₄ H ₈ O ₂	0.225	0.250		
ether	C ₄ H ₁₀ O	0.154	0.215		
I/E	Not Needed				

5) a) (12pts) Assume you were given actual samples of each liquid in problem number 4 with the physical properties as shown in the table. If you poured them all into the 1L graduated cylinder shown at right, draw the result on the figure at right by showing where the meniscus would be for each liquid and then label each liquid.



b) (3pts) If a sphere with a volume of 16.75mL and a mass of 6.980g, were dropped into the graduated cylinder, where would the sphere come to rest? Indicate its position by drawing a circle in the graduated cylinder at the sphere's final position.

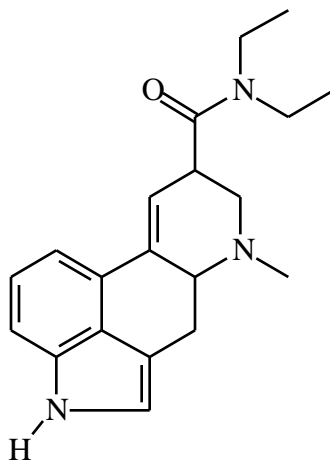
6) (10 pts) If "epsom salt," $\text{MgSO}_4 \cdot x \text{H}_2\text{O}$, is heated to 250°C , all of the water of hydration is lost. On heating a 1.687g sample of the hydrate, 0.824g of MgSO_4 remains. How many molecules of water are there per formula unit? In other words, what should x be in the above chemical formula? Show all work.

7) (5pts) In Germany if you travel by car you most likely will drive on the Autobahn. The Autobahn is a superhighway with no posted speed limit. Therefore, I cannot ask a question about how fast you would be going! However, if you stopped for gasoline and saw a sign which said gas cost 2.28 Marks (the German unit of currency) per liter what would the cost be in American dollars per gallon? (Use three significant digits in this problem and in case you forgot, there are 4 qts = 1 gal, 1.057 qts = 1L, 4.184 J = 1 cal, 453.6 g = 1 lb., 2.54 cm = 1 in, 2000 lbs = 1 ton, 5280 ft = 1 mile, 12 = dozen, 101.325 kps = 1 atm, and the exchange rate is 1.478 German marks = 1 dollar.)

8) (10pts) A 5.00lb. bag of ammonium nitrate, NH_4NO_3 , was to be applied as fertilizer on a large lawn. The complete bag of fertilizer was placed into a bucket and dissolved by adding 10.0 gallons of water. This solution was further diluted to 350.0L by placing it into a tank and sprayed on the lawn. a) How many nitrogen atoms were sprayed on the lawn? b) What was the concentration of ammonium nitrate in the bucket? c) What was the concentration of ammonium nitrate in the tank?

9) (14 pts) The koala bear dines exclusively on the leaves of the eucalyptus tree. Its digestive system detoxifies the eucalyptus oil, a poison to other animals. The chief constituent in eucalyptus oil is a chemical compound called eucalyptol which contains 77.87% C, 11.76% H, and the remainder oxygen. a) What is the empirical formula of this substance? b) What is the molecular formula of this substance (molar mass = 154.24)? Show all work.

- 10) (6 pts) Lysergide, or LSD, is a controlled substance (hallucinogen) listed in the U.S. Code of Federal Regulations, Title 21 Part 1308.11 (1987). The structure is shown below. Give the molecular formula for LSD in the blank provided.



FORMULA _____.

- 11) (4pts) How many protons, neutrons, and electrons are contained in each of the following atoms or ions? Indicate the correct number of each in the spaces provided.

	${}_{23}^{51}\text{V}$	${}_{15}^{32}\text{P}^{3+}$	${}_{13}^{26}\text{Al}^{3+}$	${}_{6}^{14}\text{C}$
p	_____	_____	_____	_____.
e	_____	_____	_____	_____.
n	_____	_____	_____	_____.

- 12) (5pts) Ions which are positively charged are called _____ while those which bear a negative charge are called _____. A _____ charged ion has more electrons than a neutral species while a _____ charged ion has less electrons than the neutral atom. When an ionic compound is _____ in water, the ions which make up the compound are separated by water molecules and are spread throughout the water. The water in this case is called the _____ because it is dissolving the ionic compound which must therefore be called the _____ or the substance being dissolved. When comparing two solutions, the solution which contains more solute per unit volume is said to be more _____. One unit of concentration is molarity. Molarity is defined as the moles of _____ per liter of _____.