

Chem 105
February 9, 2001

Exam 1

Name _____
(write name on back of last page, also)

Please show all work. **Numerical answers with no supporting work will receive zero credit.**

Please round off all final calculated values to the correct number of significant digits to get full credit.

Programmable calculators are not allowed. There are scientific calculators available at the front of the room.

Unit conversion factors (Table 1.3 of text), physical constants, and a periodic table are available on the last page of the exam. This is the only periodic table you may use.

1. (9 pt) Identify each of these as either a *compound*, *element*, *homogeneous mixture*, or *heterogeneous mixture*.

- Solid lithium chloride
- A jar full of pennies, nickels, dimes, and quarters.
- 100% nitrogen gas

2. (10 pts) Light travels 3.00×10^8 meters per second in a vacuum. Calculate the velocity of light in units of feet per minute

3. (12 pts) Tell me about the relative size of the charge, the location within an atom, and the relative mass of these three subatomic particles by filling in the table. For the relative mass, either use descriptors like "light", "medium", "heavy" or use numbers.

<u>Particle</u>	<u>Relative Charge</u>	<u>Location in Atom</u>	<u>Relative Mass</u>
Proton			
Neutron			
Electron			

4. (10 pts) A sample of a white ionic solid was weighed by difference:
weight of empty beaker: 53.109 g
weight of beaker plus ionic solid 62.814 g

The volume of this weighed ionic solid was determined by displacing hexane (density = 0.6603 g/cm^3), which does not dissolve ionic solids, in a graduated cylinder.
Volume reading of hexane alone in graduated cylinder: 12.47 cm^3
Volume reading of hexane plus ionic solid in graduated cylinder: 17.35 cm^3

Calculate the density of the white ionic solid (in units of g/cm^3). Be certain to round appropriately.

5. (10 pts) Predict the formula of the binary compound made by reacting elemental:

- a. sulfur and potassium
- b. calcium and nitrogen

6. (9 pts) There are two common isotopes of chlorine: chlorine-35 and chlorine-37.

- a. How many protons does a chlorine-37 atom have?
- b. How many neutrons does a chlorine-37 atom have?
- c. What is the approximate weight, in units of amu, of a chlorine-37 atom?

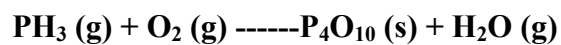
7. (8 pts) Write the correct formula for the following compounds:

a. sulfur trioxide	c. ammonium fluoride
b. lithium sulfide	d. calcium nitrate

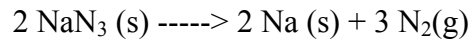
8. (8 pts) Write the correct name for the following compounds:

a. FeBr ₃	c. K ₂ CO ₃
b. PCl ₃	d. Mg(OH) ₂

9. (12 pts) Balance the following skeletal reaction. Show your logic clearly and carefully to maximize your chance of receiving partial credit if you don't get a satisfactory solution.



10. (12 pts) Sodium azide (NaN_3) decomposes to form elemental sodium and elemental nitrogen:



Calculate the mass of elemental nitrogen that can be produced from 12.7 g of sodium azide, assuming 100% reaction.

KEY EQUATIONS AND CONSTANTS

$$d = m / V$$

$$\text{Avogadro's number} = 6.02 \times 10^{23}$$

$$1 \text{ amu} = 1.661 \times 10^{-24} \text{ g}$$

□