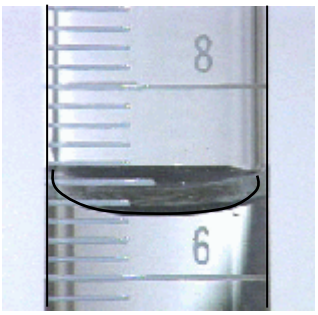
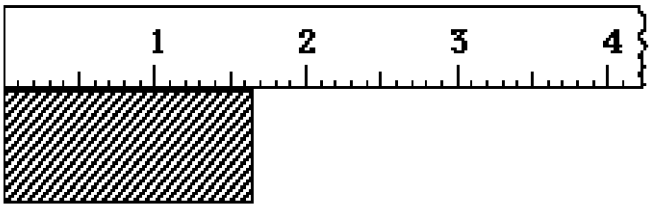
# Chem-is-try 1st Semester Study Guide 2016

## I. Measurement and Matter




1. Measure the liquid shown to the appropriate (significant) level. →
2. Name the piece of equipment shown→
3. What is the unit for measuring a liquid (volume) and a solid (mass)?

4. What is the measurement to the right?




5. Calculate the volume of a container that is 6.5 cm x 8 cm x 5 cm.
6. Convert the following metric units using proportions (or ratios):
   (a) 0.23 mL = ____ L  (b) 7 kg = ____ g
   (c) 9.5 cm = ____ m  (d) 1.4 $cm^3$ = _____mL
7. What quantity is represented by the following:
   (a) kilo = _____  (b) centi = _____  (c) milli = _____
8. Draw a particle diagram of each state of matter (solid, liquid, gas).

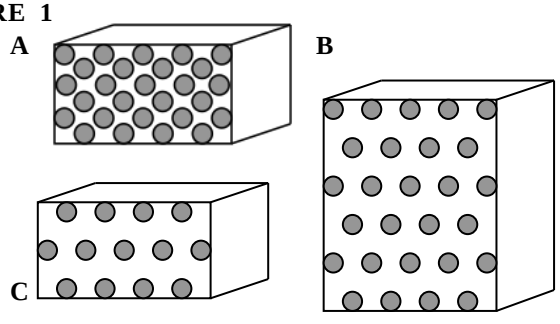
9. Describe the "law of conservation of matter".
10. If a chemical reaction occurs between 4.1 g copper and 5.2 g oxygen, how much Copper (I) oxide would be formed (assuming all reactants are completely used up)?
11. Define density.

**Use the diagram and description below to answer questions 12-15.** (Assume mass is represented by the grey dots)

**Fill in the blanks using the following key:**
**a) = "greater than" (>)  b) = "less than" (<) c) = "equal to" (=)**

12. Volume A _____ Volume B
13. Mass A _____ Mass B
14. Density A _____ Density B
15. Density B _____ Density C

FIGURE 1



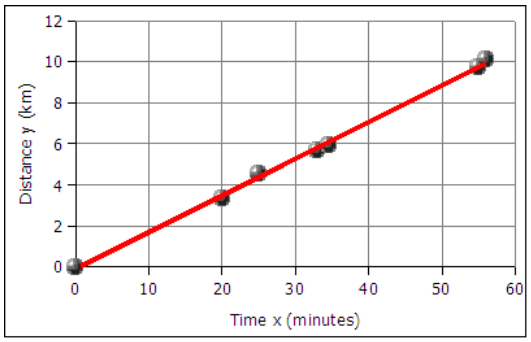
16. Ethanol has a density of 0.789 g/cm$^3$.
    a. What is the mass of 225 cm$^3$ of ethanol?  b. What is the volume of 75.0 g of ethanol?

17. You have a 5.78 g sample of an unknown metal. You fill a graduated cylinder to 6.78 mL of water. After you took your initial reading from the graduated cylinder you submerge your metal sample and the volume rises to 8.92 mL. Calculate the density of the unknown metal.

18. Use the graph on the right for the following:

    a. Calculate the slope of the line (be sure to include units):

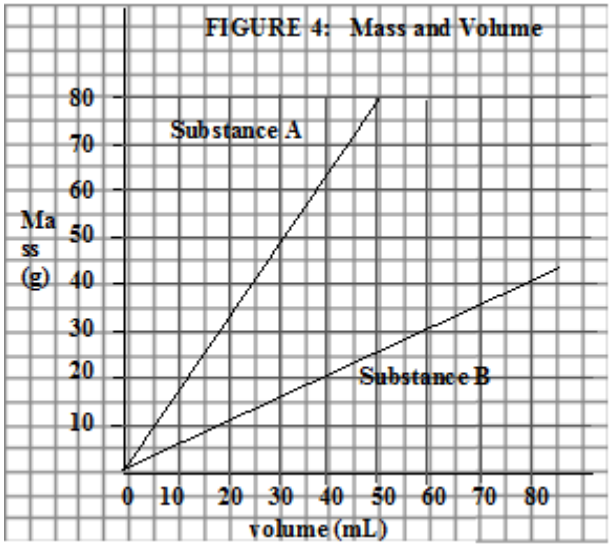
    b. Write a "for every" statement describing the meaning of the slope.




19. Use the graph on the right to compare the density of substances.

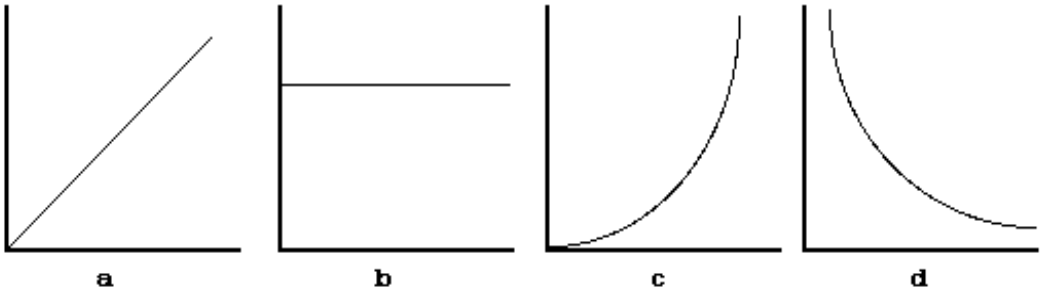
    a. Which substance has the greatest density?

    b. If there is 50 grams of each substance, which substance would have the greatest volume?




## II. Behavior of Gases

Demonstrate knowledge of the relationships that exist among the pressure, volume, temperature and number of molecules of a gas.




20. a) Which graph describes the relationship between gas pressure and volume? Is this an inverse or direct relationship?
    b) Which graph describes the relationship between gas pressure and temperature? Is this an inverse or direct relationship?

21. Explain what causes pressure in a container.

22. a) At the big track meet you bring balloons to give to your friend. A large storm comes through and the temperature drops. Draw a particle picture of the balloon before and after the storm.
b) Explain what happens to the pressure inside the balloons as the temperature drops.

23. Explain why it would be very dangerous to put a can of hairspray in a hot oven.

24. What happens to the volume of a latex balloon when it increases to high altitudes (assuming temperature is somewhat constant)?

25. Draw the before and after pictures for a closed, fixed-volume container of gas that was originally at 1.0 atm and 35 °C and at some later time has a temperature of 100 °C.

26. A sample of gas occupies a volume of 3.0 L at 700 mmHg, what would happen to the volume at 375mmHg?

27. Due to the friction between a tire and the road surface, the temperature of the air inside a tire increases as one drives. If the tire pressure is 26 psi when the car is in the driveway at 25˚C, what would happen to the temperature of the air inside the tire when the pressure increases to 29 psi? Assume tire volume is constant.

**III. Nuclear Chemistry**

28. Describe the 3 types of radiation commonly emitted from a nucleus.

29. Describe the strength of each of the 3 types of radiation, and how they can be stopped.

30. What happens to the mass number of an atom that undergoes beta decay? What happens to the atomic number?

31. Write a nuclear reaction for the alpha decay of francium-208

32. Write a nuclear reaction for beta emission by argon-37

33. Complete the equations for these reactions:

a. $^{6}_{3}\text{Li} + {}^{1}_{0}\text{n} \rightarrow {}^{4}_{2}\text{He} + \_\_\_\_\_$

b. $^{27}_{13}\text{Al} + {}^{4}_{2}\text{He} \rightarrow \_\_\_\_\_ + {}^{1}_{0}\text{n}$

c. $^{235}_{92}\text{U} \rightarrow {}^{90}_{38}\text{Sr} + \_\_\_\_\_ + {}^{1}_{0}\text{n} + 4\ {}^{0}_{-1}\text{e}$

34. Polonium-214 has a relatively short half-life of 164 seconds. How many seconds would it take for 8.0 g for this isotope to decay to 0.25g?

35. In 5.49 seconds, 1.20 g of argon-35 decay to leave only 0.15 g. What is the half-life of argon 35?

36. Describe the difference between fission and fusion reactions.

37. List some beneficial applications of radiation.

**IV. Atomic Theory and Periodic Table**

38. What are rows on the periodic table called? What about columns?

39. What do groups on the periodic table have in common?

40. How many valence electrons do the following elements have?

    a. Mg
    b. I
    c. O
    d. Ne

41. What is group 8A on the periodic table called? What is unique about this group of elements?

42. Draw an atom as it would look according to the current model. Label nucleus, and identify where the protons, neutron and electrons are located.

43. Summarize the main ideas from the sticky tape lab.

44. Review the six scientists and their experiments and models.

45. Review how neutral atoms form ions. (Periodic Table Activity)

**V. Naming and Bonding**

46. How does a Sulfur atom (S) become a Sulfur ion ($S^{-2}$)?

47. Which ions are formed from the following elements? K, Mg, N, O and Br

48. Give 3 common properties of ionic compounds.

49. What type of bonds share electrons between atoms?

50. Describe what type of elements form covalent bonds, and give examples of these.

51. What are the proper names for the following compounds and indicate whether ionic or covalent.
    a. $K_2S$
    b. $CaO$
    c. $Fe_3N_2$
    d. $CF_4$

52. What are the proper chemical formulas for the following compounds?
    a. Aluminum Sulfate
    b. Carbon Dioxide
    c. Beryllium Nitrate
    d. Tin (IV) Bromide

53. What does a roman numeral indicate in an ionic compound?

54. Write the formula or name the following:

    (a) Iron (III) chloride _____
    (b) Sodium sulfate_____
    (c) Barium hydroxide_____
    (d) Cobalt (II) carbonate_____
    (e) LiCl _____
    (f) $Al_2O_3$_____
    (g) NaF _____
    (h) Aluminum chromate_____

55. Name the following: (a) $C_3Cl_5$ (b) $N_6O_4$ (c) $Se_9O_8$ (d) $NF_2$ (e) $C_2O$

56. Draw a Lewis dot diagram for sodium, chlorine and the sodium ion and chlorine ion.