CH 221 Fall 2021:

Problem Set #2

Instructions

Step One (all sections):

Learn the material for Problem Set #2 by **reading Chapter 2 and Chapter 3 (3.1 especially)** of the textbook and/or by watching the videos found on our website (https://mhchem.org/221)

Try the problems for Problem Set #2 found on the next pages on your own first. Use separate paper and write out your answers, showing all of your work. If you write the answers on the problem set itself, you will receive fewer points. Include your name on your problem set!

Step Two:

Section 01 and H1: We will go over Problem Set #2 during recitation. ***Self correct all problems*** of your problem set before turning it in at the end of the class on October 6.

Section W1: **Watch the recitation video** for Problem Set #2:
http://mhchem.org/w/n.htm

Self correct *all* of the problems while viewing the video. Mark correct problems with a star (or other similar mark), and correct all incorrect problems (show the correct answer and the steps required to achieve it.)

Submit Problem Set #2 via email (mike.russell@mhcc.edu) as a single PDF file (use CamScanner (https://camscanner.com), CombinePDF (https://combinepdf.com), etc.) **by 11:59 PM Wednesday, October 6.**

If you have any questions regarding this assignment, please email (mike.russell@mhcc.edu) the instructor! Good luck on this assignment!

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** Complete problem set on separate pieces of paper showing all work, circling final answers, etc.*
** Self correct your work before turning it in to the instructor.*

Covering: **Chapter Two, Chapter 3.1** *and* **Chapter Guide Two**
Important Tables and/or Constants: 1 mol = 6.022×10^{23}, periodic table (http://mhchem.org/pertab)

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1. Give the mass number of:
    a. a nickel atom with 31 neutrons
    b. a plutonium atom with 150 neutrons, and
    c. a tungsten atom with 110 neutrons
2. Give the complete symbol (${}^{A}_{Z}X$) for each of the following atoms:
    a. fluorine with 10 neutrons
    b. chromium with 28 neutrons
    c. xenon with 78 neutrons
3. Strontium has four stable isotopes. Strontium-84 has a very low natural abundance, but ^{86}Sr, ^{87}Sr and ^{88}Sr are all reasonably abundant. Knowing that the atomic weight of strontium is 87.62, which of the more abundant isotopes predominates?
4. Copper exists as two isotopes: ^{63}Cu (62.9298u) and ^{65}Cu (64.9278u). What is the approximate percentage of ^{65}Cu in samples of the element?
    a. 10%
    b. 30%
    c. 50%
    d. 70%
    e. 90%
5. Antimony has two stable isotopes, ^{121}Sb and ^{123}Sb, with masses of 120.9038u and 122.9042u, respectively. Calculate the percent abundances of these isotopes of antimony.
6. Calculate the mass in grams of:
    a. 4.24 mol of gold
    b. 15.6 mol of He
    c. 0.063 mol of platinum
    d. 3.63×10^{-4} mol of Pu
7. Calculate the amount (moles) represented by each of the following:
    a. 16.0 g of Na
    b. 0.876 g of tin
    c. 0.0034 g of platinum
    d. 0.983 g of Xe
8. Here are the symbols for five of the seven elements whose names begin with the letter B: **B, Ba, Bk, Bi** and **Br**. Match each symbol with one of the descriptions below:
    a. a radioactive element
    b. a liquid at room temperature
    c. a metalloid
    d. an alkaline earth element
    e. a Group 5A element

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9. Fill in the blanks in the table (one column per element):

Symbol	**^{65}Cu**	**^{86}Kr**		
Number of protons			**78**	
Number of neutrons			**117**	**46**
Number of electrons in the neutral atom				**35**
Name of the element				

10. The recommended daily allowance (RDA) of iron in your diet is 15 mg. How many moles is this? How many atoms?
11. In an experiment, you need 0.125 mol of sodium metal. Sodium can be cut easily with a knife, so if you cut out a block of sodium, what should the volume of the block be in cubic centimeters? If you cut a perfect cube, what is the length of the edge of a cube? (The density of sodium metal is 0.971 g/cm^3.)
12. An object is coated with a layer of chromium 0.015 cm thick. The object has a surface area of 15.2 cm^2. How many atoms of chromium are used in the coating? (The density of chromium = 7.19 g/cm^3.)
13. Consider at atom of ^{64}Zn:
    a. Calculate the density of the nucleus in g/cm^3 knowing that the nuclear radius is 4.8 x 10^{-6} nm and the mass of the ^{64}Zn atom is 1.06 x 10^{-22} g. [Recall that the volume of a sphere = $^4/_3\pi r^3$]
    b. Calculate the density (in g/cm^3) of the space occupied by the electrons in the zinc atom, given that the atomic radius is 0.125 nm and the mass of a single electron is 9.11 x 10^{-28} g.
    c. Having calculated these densities, what statement can you make about the relative densities of the parts of the atom?
14. Match the name on the left with the description on the right.

a. Democritus	1. ___ Discovered the neutron
b. Aristotle	2. ___ The oil drop experiment for electron charge
c. Dalton	3. ___ Proposed a value for the mole
d. Becquerel	4. ___ Observed radioactivity on photographic plates
e. Curie (Marie)	5. ___ "The world is made of fire, earth, water and air"
f. Avogadro	6. ___ Discovered the nucleus is very dense
g. JJ Thomson	7. ___ Plum pudding model for the atom
h. Millikan	8. ___ Discovered types of radiation, 2 Nobel Prizes
i. Rutherford	9. ___ Matter made of atoms, proposed atomic mass scale
j. Chadwick	10 ___ First to propose the concept of the atom
k. alpha	11 ___ Radioactive negative electron
l. beta	12 ___ Electromagnetic radiation, pure energy, massless
m. gamma	13 ___ Radioactive positive helium nucleus