THE INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY – HCMC

CHEMISTRY FOR ENGINEERS

ASSIGNMENT 1

Date: **3/1/2023**

Duration: **1 week, 11:59 PM 10/1/2023**

PART I: MULTIPLE CHOICE QUESTIONS (15 points)

1. Which element is **INCORRECTLY** matched with its symbol?
a) Cu / copper b) Pb / lead
c) K / potassium d) B / bismuth

2. The density of Au is 19.3 g/mL. What would be the value of a 100 cm^3 ingot of gold if gold is worth $35 per ounce. (Note: There are 16 ounces in a pound; 1 pound = 0.4536 kg)
a) $ 123 b) $ 2,383
c) $ 3,500 d) $ 440

3. Nichrome is an alloy (mixture) commonly used to make heating elements. It is composed of 60% nickel, 24% iron and 16% chronium. If you have 2.15 g of nichrome wire, how much of each element do you have?
a) 1.6g Ni, 0.31g Fe, 0.24g Cr
b) 1.6g Ni, 0.41g Fe, 0.14g Cr
c) 1.3g Ni, 0.52g Fe, 0.34g Cr
d) 1.2g Ni, 0.61g Fe, 0.14g Cr

4. In which item below is the result expressed **INCORRECTLY** in terms of number of significant figures?
a) 3.14 x 2.584 = 8.11
b) 0.003/0.0015 = 2
c) 1.314 + 189.71 = 191.0
d) all results are corrected.

5. Which of the following is **NOT** an SI unit of that measured quantity?
a) Length is expressed in meters
b) Energy is expressed in pokemon
c) Time is expressed in seconds
d) Mass is expressed in kilograms

6. Which of the following numbers has 4 significant figures?
a) 0.04309 b) 0.0430
c) 0.043090 d) 0.43980

7. Atoms are composed of:
a) protons, neutrons, electrons
b) protons, neutrinos, elections
c) positrons, neutrons, electrons
d) positrons, neutrons, negatrons

8. Choose the correct answer:
a) cations have a positive charge, anions have a negative charge
b) anions have a positive charge, cations have a negative charge
c) the opposite of a cat ion is a dog ion
d) uh, what?

9. Which two subatomic particles have approximately the same mass?
a) electrons and nuclei
b) neutrons and electrons
c) protons and electrons
d) protons and neutrons

Isotopes are atoms of the same element
that have different numbers of neutrons,
but the same number of protons and electrons.

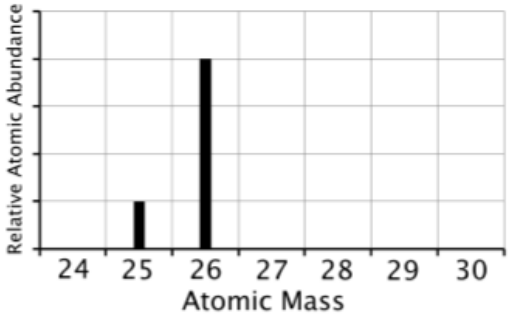
D 138 neutrons and 88 protons

10. Isotopes are atoms of the same element that:
a) have different numbers of electrons.

b) have different numbers of protons.

c) have different numbers of neutrons.

d). have different atomic numbers



11. The mass spectrum shown above for an element shows two mass peaks. Predict the atomic mass (g/mole) for this element.
a) 25.8 b) 26.0

c) 25.5 d) 25.0

12. How many neutrons are in the nucleus of this element: $^{226}_{88}Ra$?
a) 138 b) 88

c) 226 d) 108

13. Select the element with the electron configuration: [Kr] $5s^2$ $4d^2$.
a) Hf b) Y

c) Zr Zirconium d) Ti

14. Which combination of protons, neutrons, and electrons is correct for the $^{63}_{29}Cu$ isotope of Copper?
a) 29 protons, 34 neutrons, and 29 electrons
b) 29 protons, 29 neutrons, and 63 electrons
c) 63 protons, 29 neutrons, and 63 electrons
d) 34 protons, 29 neutrons, and 34 electrons

15. Which of the following elements has the lowest first ionization energy?
a) Be b) Mg
c) Ca d) S

PART II: CONSTRUCTED QUESTIONS (55 points)

1. Complete the following table (10 points):

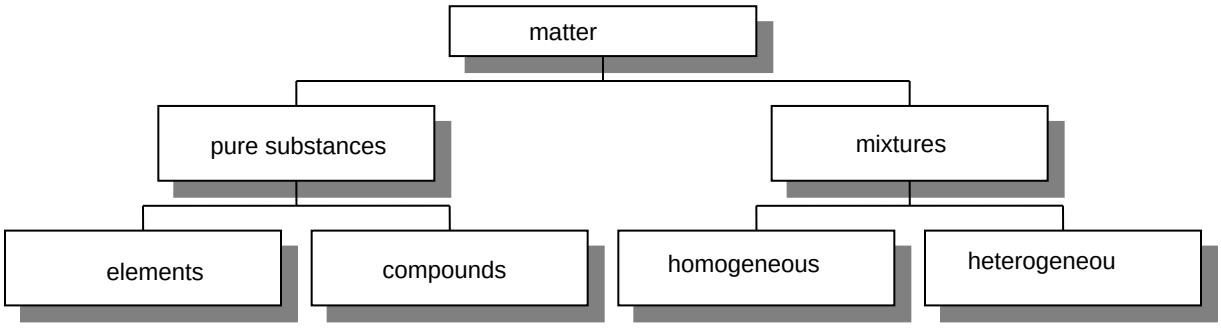
NAME	COMPOUND	How many atoms are in one "formula unit"?
sulfuric acid	H_2SO_4 **(aqueous)**	7
Manganese (VII) oxide	Mn2O7	9
Iron(III) hydroxide	$Fe(OH)_3$	4
Copper (II) chloride hexahydrate	Cl2CuH12O6	21
Hydrogen chloride	HCl **(gas)**	2
Nickel(II) chloride.	$NiCl_4$	5
Hydrogen bromide	HBr **(aqueous)**	2
Sodium carbonate decahydrate	CH20Na2O13	36
Lithium nitrite	$LiNO_2$	4
Potassium cyanide	KCN	3

2. Draw a sketch of an atom. Label the nucleus, protons, neutrons and electrons and answer following questions (8 pts):
   a. Comparing the mass of a neutron to the mass of a proton and a electron, what can we say about this?
   b. How large is the nucleus compared to the size of an atom?
   c. Atoms of the same element that have different masses are called what?

3. Complete the following table (10 points):

Symbol	Number of protons	Number of electrons	Number of neutron	Atomic number	Mass number
$^{34}S^{-2}$	16	18	18	16	34
H	1	1	1	1	1
^{181}Ta	73	108	108	73	181
O	8	10	9	8	17
U	92	88	146	· 92	238

4. Part of the universe can be classified into the following categories: compounds, elements, heterogeneous, homogeneous, matter, mixtures, and pure substances. Organize these in the boxes of the following hierarchy chart (12 pts).



5. Physical and Chemical properties (5 points):
   1. Which of the following describe a chemical change, and which a physical change?
      a. Sheep are sheared, and the wool is spun into yarn. physical change.
      b. Frozen lemonade is reconstituted by adding water to it. physical change.
      c. Milk turns sour when left out of the refrigerator for many hours chemical change
   2. Underline the chemical property/properties of chlorine.

   At 25°C, chlorine is a green-yellow gas with a density of 3 × 10–3 g/cm3. Chlorine has a melting point of –101°C and a boiling point of –35°C, and the energy required to melt and boil chlorine is 6.4 and 20.4 kJ/mol, respectively. Chlorine burns in hydrogen to form hydrogen chloride.

6. Give the electron configurations and noble gas abbreviation of the following elements and ions (5 points):
   a. Ti^{2+} [Ar] 3d2 1s2 2s2 2p6 3s2 3p6 3d2
   b. O [He] 2s2 2p4 1s2 2s2 2p6 3s2 3p4

c. Br^- [Ar] 4s2 3d10 4p6 1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p6
d. Fe [Ar] 3d6 4s2 1s2 2s2 2p6 3s2 3p6 3d6 4s2
e. Cr^{3+} [Ar] 3d3 4s0 1s2 2s2 2p6 3s2 3p6 3d3 4s0

7. Periodic trends (5 points):
   a. Arrange in order of increasing ionization energy: As, F, N N, As, F.
   b. Arrange in order of increasing atomic radii: Si, C, F C, Si, F.
   c. Arrange in order of increasing electron affinity: C, F, Si C, Si, F.
   d. Arrange in order of increasing electronegativity: S, Si, Ge, Ga S, Si, Ge, Ga.
   e. Arrange in order of increasing ionization energy: F, O, P F, O, P

PART III: IDENTIFICATION AND CORRECTION FALSE STATEMENTS (30 points)

a. The formula of a salt is XCl_2. The X-ion in this salt has 28 electrons. The metal X is Cu.
b. Silver has two naturally occurring isotopes ^{107}Ag (106.9051 amu) and ^{109}Ag (108.9048 amu). The average atomic mass of silver is 107.8682 amu. The fraction abundance of ^{107}Ag is 0.5184.
c. Name of compound NH_4Cl (g) is ammonia hydrochloric.
d. Almost all of the mass of the atom is concentrated in the nucleus.
e. The protons and neutrons in the nucleus are very tightly packed.
f. An element with the outermost electron configuration ns^2np^3 would be in group IIIA
g. The electron configuration of selenium (Se) is [Ar] $4s^2$ $3d^{10}$ $4p^4$.
h. V has 3 unpaired electrons.
i. Ca has 2 valence electrons.
j. Milk tea with bubbles is the example of homogenous mixture.
k. Maleic acid, which is used to manufacture artificial resins, has the empirical formula CHO. Its molar mass is 116.1 g/mol. Its molecular formula is $C_4H_4O_4$.
l. $Ca^{2+} < Sr^{2+} < Rb^+ < Br^- < Se^{2-}$ is the trend of increasing radius of these following ions.
m. The cation's ground-state electron configuration of $Co(C_2H_2O_3).4H_2O$ is [Ar] $3d^7$ $4s^2$
n. A postitive charge particle found in the nucleus is called electron.
o. The reaction of Mg metal with oxygen to form magnesium oxide is an example of a chemical change.
p. An atom is the smallest particle of an element that maintains the chemical identity of that element.
q. Molecules that consist of more than one atom are called polyatomic molecules.
r. Elements with atomic numbers of 9, 17, 35, and 53 are members of the halogen family, meaning "salt formers."
s. In the most fundamental sense, the properties of the elements are periodic functions of their atomic weight.
t. The elements at the far right of the periodic table, except the noble gases, have the greatest tendency to form anions.
u. Metals have lower ionization energies than nonmetals.

Good luck!!!