CHUKA   **UNIVERSITY**

SUPPLEMENTARY / SPECIAL EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF BACHELOR DEGREE IN

CHEM 110: INORGANIC CHEMISTRY I

STREAMS:

TIME: 2 HOURS

DAY/DATE: WEDNESDAY   18/11/2020   **8.30 A.M - 10.30 A.M.**

INSTRUCTIONS:
- Answer all questions

QUESTION ONE (3O MARKS)

1. a) (i). Give three Daltons postulates about atoms   (3Marks)

(ii) What were the limitations of Daltons atomic theory   (3 Marks)

   b) State Daltons Law of   i) Conservation of mass

                            ii) Definite proportions

                            iiii) Multiple Proportions   (3 Marks)

2. List two properties of i) cathode rays ii) alpha particles iii) beta particles   (3 Marks)

3. i) Using an illustration discuss briefly the J. J. Thompson Plum Pudding model of the atom

                                                                    (4 Marks)

 ii) Give two ways in which Rutherford modified Thompsons Model of the atom (2 Marks)

4. The element europium exists in nature as two isotopes, 151Eu (mass = 150.9196amu and ^{153}Eu(mass = 152.9209amu). Given that the atomic mass of europium is 151.96amu. Answer the following questions
   (i). Define the term atomic mass unit   (1 Mark)

(ii) Explain clearly what is meant by the statement " the atomic mass of europium is   151.96 amu   (2 Marks)

(iii) From the observations above what would you say is the relationship between isotopic mass and the mass number of a given isotope   (2 Marks)

(iv). Determine the natural abundance of ^{151}Eu and ^{153}Eu   (2 Marks)

5. What is the mass in grams of 20 Ag silver atoms (Ag = 107.9 g, Avogadros. no.= 6.022 x 10 ^{23}

atoms)   (2 Marks)

6. Give the number of protons, neutrons and electrons in each of the following species (3 Marks).

   a) $^{195}_{75}$Au   b)$^{13}_{6}$C

QUESTION 2 (2O MARKS)

7. The combustion of 11.5 g of ethanol produced 22.0 g of CO_2 and 13.5 g of H_2O.   Determine

(i). The empirical formula of ethanol

(ii) The molecular formula of ethanol [C= 12.01g, O=16.0 g and H= 1.008 g]   (5 Marks)

8. Methanol (CH_3OH) is the simplest alcohol known. It is used as a fuel in race cars and is a potential replacement for petro. Methanol can be manufactured by combining gaseous carbon monoxide and hydrogen as shown

$4H_2(g) + 2CO_2(g) \longrightarrow 2CH_3OH$ (l)
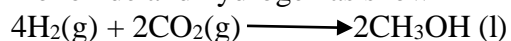
If 68.5Kg of CO is reacted with 8.60Kg of $H_2(g)$

   i)   Deduce the limiting reagent in the above reaction. Explain your answer   (2 Marks)

   ii) Determine the mass in grammes of methanol that would be produced   (2 Marks)

   iii) Calculate the number of moles of excess reagent at the end of the reaction   (2 Marks)

   iv) If 5.57 x 10^4 g of methanol is actually produced, calculate the percent yield of methanol
                                                                                          (2 Marks).

9. During the preparation of infant formula it was found that evaporated milk contained up to 10

ppm of lead. At this concentration of lead, how many grammes of lead would be present in 500

ml baby bottle of evaporated milk   (3 Marks)

   10. A sample of NaOH weighing 0.14g was dissolved in water and the resulting solution

made to 20cm^3 mark in a volumetric flask

      (i) Determine the molarity of the resulting NaOH solution   (2 Marks)

[atomic masses H-1.008 O= 16 Na= 23]

(ii). Calculate the volume in cm^3 of 0.1M H_2SO_4 that would be required to neutralize $25cm^3$ of the above NaOH solution   (2 Marks).

QUESTION 3 (20 MARKS)

1. What is the shortest wavelength line (in nm) in the Lyman series for Hydrogen spectrum   (4 Marks).
2. What is the energy and the wavelength in nm of a photon emitted during a transition from $n = 5$ to $n = 2$ level in a hydrogen atom   (4 Marks)

3. Write the electronic configuration of the following elements   (4 Marks)
   a. He b. O c. F d. Ne
4. Give two advantages and two shortcomings of the Bohrs atomic theory   (4 Marks)

5. Differentiate between electron affinity and electronegativity   (2 Marks)

6. Differentiate between electrovalent and covalent bond   (2 Marks)

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