

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

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**University Examinations 2015/2016**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION BIOLOGICAL & PHYSICAL OPTION AND BACHELOR OF EDUCATION SCIENCE

**SCH 3100: PRINCIPLES OF INORGANIC CHEMISTRY**

**DATE: NOVEMBER, 2015 TIME:** $2 $**HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE - (30 MARKS)**

1. Define the following terms and given an example in each case. (2 Marks)
2. Arrhenius acid
3. Bronsted and Lowry base
4. Define the following terms: (3 Marks)
5. Effective nuclear charge
6. Degenerate orbitals
7. Ionization energy
8. (i) Describe Rutherford’s atomic model. (3 Marks)

(ii) State the failures of Bohr’s atomic model. (2 Marks)

(iii) Describe Thomson’s atomic model (3 Marks)

(iv) State the four quantum numbers. (2 Marks)

(v) Use the idea of quantum numbers to find; (2 Marks)

 (I) The value of L given that n is 4

 (II) The orbital when n=3 and l= 1

1. (i) What is oxidation number of an element? (1 Mark)

(ii) Work out and assign the oxidation number of the underlined elements. (2 Marks)

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1. Show how the hybridized orbitals of the centre atoms in the following compounds are formed; (6 Marks)
2. $BeCl\_{2}$ ; ii) H2O ; iii) PCl5
3. what is the shape of compound i) and iii) in question e (i) above (2 Marks)
4. Describe the photochemical effect and state one of its use. (2 Marks)
5. Draw the shape of the d-orbitals. (3 Marks)

**QUESTION TWO (20 MARKS)**

1. State and describe two rules that govern the electronic configuration. (4 Marks)
2. Write the complete electron configuration for the following atoms giving the appropriate noble gas inner core plus the electrons beyond it;

i) Co (atomic numbers 27), ii) Te (52) , iii) Fe2+ (26) (6 Marks)

1. To which period and groups do they belong? (2 Marks)
2. If the frequency of a harmonic wave is 300Hz, calculate its period. (3 Marks)
3. What is a buffer solution? (1 Mark)
4. Differentiate between; (4 Marks)
5. Reducing agent and oxidizing agent
6. Electrolyte and electrolysis

**QUESTION THREE (20 MARKS)**

1. Balance the following equation in basic solution; (7 Marks)



1. What is a Lewis symbol? (1 Mark)
2. Draw the lewis structure of the following; (5 Marks)
3. Water
4. Nitrogen gas
5. NF3
6. What is the characteristic wavelength of an electron with a velocity of 5.97 x $10^{6} $m/s (the mass of the electron is 9.11 x $10^{-28}$g and Planck’s constant, h = 6.63 x $10^{-34}$j-s, and recalling that 1j = 1 kg-m2/S2. (3 Marks)
7. State and describe properties of harmonic wave. (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. A cook uses a microwave oven to heat a meal. The frequency of the radiation is 2.45 x 109$s^{-1}$. What is the energy of one photon of this microwave radiation? (3 Marks)
2. State Pauli’s exclusion principle of Hund’s rule. (3 Marks)
3. State and describe types of radiation emitted by radioactive substances. (8 Marks)
4. Using BF3 as an example, describe the sp2 hybridization in details. (B) is atomic number 5 and F is atomic number 9). (5 Marks)
5. What is hybridization? (1 Mark)