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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL & PHYSICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION SCIENCE**

**1st YEAR 1st SEMESTER 2015/2016 ACADEMIC YEAR**

**REGULAR**

**COURSE CODE: SCH 3111**

**COURSE TITLE: INORGANIC CHEMISTRY II**

**EXAM VENUE: AH STREAM: BED Sc.**

**DATE: 25/04/16 EXAM SESSION: 11.30 – 1.30 PM**

**TIME: 2HOURS**

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**Instructions:**

1. **Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**SECTION A: ANSWER ALL QUESTIONS -40 MARKS**

1. (a) One type of sunburn occurs on exposure to UV light of wavelength in the vicinity of 325 nm. What is the energy of a photon of this wavelength?

(3 marks)

(b) List the quantum numbers associated with an electron in an atom. Which of the quantum numbers governs (i) the shape of an orbital, (ii) the energy of an orbital.

(6 marks)

(c) Why does the Bohr model of the hydrogen atom violate the uncertainty principle?

(2 marks)

(d) What is the physical significance of the square of the wave function, Ψ2? (2 marks)

(e) How many possible values for *l* and *ml* are there when n = 3.

(4 marks)

1. (a) State Pauli Exclusion Principle.

(2 marks)

(b) Write the electron configuration of:-

1. Zn
2. Co3+
3. S2-
4. Ga

(6 marks)

(c) Briefly explain the following terms:

1. Electron affinity
2. Ionization energy
3. Isoelectronic series

(6 marks)

(d) While the electron affinity of bromine is a negative quantity, it is positive for Kr. Use the electron configurations of the two elements to explain the difference. (4 marks)

(e) Why is the second ionization energy of an atom always greater than its first ionization energy?

(2 marks)

(f) Consider the H2+ ion. Sketch the molecular orbitals of the ion, and draw its energy-level diagram.

(3 marks)

**SECTION B:**

What set of hybrid orbitals are used by the central atom in:

1. SiCl4
2. AlCl4-

(2 marks)

(b) The configuration of the valence electron layer of an atom of an element is

1. 4s24p3
2. 4d55s1

Determine the atomic numbers and names of the elements

(3 marks)

(c) Sketch the shape and orientation of the following types of orbitals.

1. Py
2. dx2-y2

(2 marks)

(d) Use the VSEPR model to predict the molecular geometry of :-

1. O3,
2. SnC13-
3. ICl5

(8 marks)

1. Draw the Lewis structure to show bonding in each of the following species:-
2. BrO3-
3. SiCl4

(4 marks)

(b) How do the sizes of atoms change as we move

1. from left to right across a row in the periodic table,
2. from top to bottom in a group in the periodic table?
3. Arrange the following atoms in order of increasing atomic radius: F, P, S, As.

(5 marks)

(c) Compare the elements fluorine and chlorine with respect to the following properties:-

1. electron configuration,
2. first ionization energy,
3. atomic radius.

Account for the differences between the two elements. (6 marks)

1. Indicate the type of hybridization of oxygen’s, carbon’s, chlorine’s and silicon’s AO’s in the particles: H2O, C2H2, ClF3 and SiF62-, respectively. Evaluate your answer. Sketch the shape of the particles CH4, H2O and ClF3.

(15 marks)

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**Planck’s constant, h**= 6.626 x 10-34 Js