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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR TWO**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 210**

**COURSE TITLE: ATOMIC STRUCTURE AND BONDING**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 09/10/2021 TIME: 12.00-2.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. What is an “atomic symbol” and what does it identify? (4 Marks)
2. Give the number of protons, neutrons and electrons contained in

 (3 Marks)

1. Explain the changes that take place when an electron jumps from a lower orbit to a higher orbit, and vice versa (4 Marks)
2. What is “relative atomic mass”? (2 Marks)
3. Give two examples of applications of isotopes (2 Marks)
4. Describe the following terms:
5. Wave function
6. Quantum number n
7. Quantum number l
8. Quantum number ml
9. quantum number ms (5 Marks)
10. Briefly describe what the “Slater's rules” are used for (2 Marks)
11. Write the Lewis symbols for the following elements:
12. Beryllium
13. Nitrogen
14. Fluorine (3 Marks)
15. Name three types of hybridisation involving s and p orbitals (3 Marks)
16. Briefly explain the main difference between “Valence bond theory” and “Molecular orbital theory” (2 Marks)

**QUESTION TWO (2)-(20 marks)**

1. Discuss the “Bohr atomic model” in detail, in comparison with the “Rutherford model”, and highlighting the problem it was able to remedy (10 Marks)
2. Complete the table below, giving the full details of subshells and orbitals contained in each shell:

|  |  |
| --- | --- |
| **Shell** | **Subshells and orbitals** |
| 1 | 1s |
| 2 | 2s and …………..? |
| 3 | 3s and…………………………….? |

(10 Marks)

**9-23**

**QUESTION THREE (3)-(20 marks)**

1. Explain the following:
2. Electronic configuration
3. Aufbau Principle
4. Pauli Exclusion Principle
5. Hund’s Rule
6. Dot & Cross diagrams (10 Marks)
7. Complete the electronic configuration chart below, showing the order of orbital filling:



(10 Marks)

**QUESTION FOUR (4)** **- (20 marks)**

1. Explain Particle-wave duality with respect to light and other objects (5 Marks)
2. The de Broglie wavelength equation is expressed as follows:

 or 

 In this equation, what is represented by:

1. λ?
2. h?
3. p?
4. m?
5. v? (5 Marks)
6. What is the de Broglie wavelength of a bullet weighing 8 g and moving at 300 m/s? (5 Marks)
7. An electron of mass 9.1x10-31 kg is trapped within an infinite potential well of length 0.5 nm. Calculate the first energy level i.e. E1?

(\*Planck’s constant=6.626x10-34 joule seconds) (5 Marks)

**QUESTION FIVE (5) - (20 marks)**

1. Explain how the following types of chemical bonds are formed, citing examples in each:
2. Ionic bond
3. Covalent bond
4. Polar covalent bond (10 Marks)
5. Define the following terms:
6. Lattice Enthalpy
7. Bond length
8. Bond Angle
9. Bond Enthalpy
10. Bond Order (5 Marks)
11. What is “Molecular geometry”? (2 Marks)
12. Give an example of a molecule with:
13. Linear geometry
14. Tetrahedral geometry
15. Octahedral geometry (3 Marks)