

Reg No:.....

Name :.....

**First Semester FYUGP Chemistry Examination**  
**NOVEMBER 2024 (2024 Admission onwards)**  
**KU1DSCCHE111 (FUNDAMENTALS OF THEORETICAL**  
**and NUCLEAR CHEMISTRY)**  
**(DATE OF EXAM: 4-12-2024)**

Time : 90 min

Maximum Marks : 50

**Part A (Answer any 6 questions. Each carries 2 marks)**

1. Write the Rydberg formula and explain the terms. 2
2. What is the shape of sulfur hexafluoride ( $\text{SF}_6$ )? Explain using VSEPR theory. 2
3. What is orbital overlapping, and how does it lead to bond formation? 2
4. Describe the shape and bond angles in methane ( $\text{CH}_4$ ). 2
5. What are isobars? Write two examples. 2
6. What does the term precision mean in an analytical determination? 2
7. Explain the significance of material safety sheets of chemicals. 2
8. What are the precautions to be taken in case of inhalation of poisonous gas? 2

**Part B (Answer any 4 questions. Each carries 6 marks)**

9. What are the postulates of Bohr atom model and explain the hydrogen spectrum based on it? 6
10. How does hybridization influence the shape of organic molecules like ethylene and acetylene?  
Explain  $\text{sp}^2$  hybridization and its significance in bonding with an example. 6
11. a) Describe with example the significance of molecular orbital theory in predicting the stability of a molecule.  
b) Explain how Molecular Orbital Theory accounts for the bond order in diatomic molecules like  $\text{N}_2$ . 6
12. Correlate N/P ratio and nuclear stability. Explain the nuclear structure using the liquid drop model. 6
13. Discuss the choice of indicators used in acid-base titrations. 6
14. Discuss the hazardous symbols and signs in the environmental and health sectors. 6

**Part C (Answer any 1 question(s). Each carries 14 marks)**

15. (a) Calculate
  - (i) the momentum of a particle which has a de Broglie wavelength of 0.2 nm.
  - (ii) the wavelength of the spectral line in the Balmer series if  $n_2 = 3$ . 7
- (b) State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the velocity of a particle of mass  $1 \times 10^{-6}$  kg whose uncertainty in position is 9.54 Å. 7
16. (a) Explain the term isotopes with examples. What are the different methods for identification and separation of isotopes. Explain. 7
- (b) Explain the different methods for nuclear waste disposal. 7