Name.....

Roll. No.....

# THIRD SEMESTER INTERNAL EXAMINATION, SEPTEMBER 2024
## MAJOR COURSE IN CHEMISTRY
## THEORETICAL CHEMISTRY – I: BASIC QUANTUM CHEMISTRY
## CHE3CJ201

Time: 1 Hr

Max Marks: 35

| Name:<br><br>Class: | Marks Scored | Section A | | Total Marks |
|---|---|---|---|---|
| | | Section B | | |
| | | Section C | | |

Section A

(Each question carries 3 marks, Max marks for section – 7)

1. State Heisenberg's Uncertainty Principle. Calculate the uncertainty in position of an electron whose momentum is determined with an uncertainty of $10^{-3}$.
2. Deduce the expression for energy of an electron in $n^{th}$ stationary state.
3. Explain salient features of hybridisation

Section B

(Each question carries 6 marks, Max marks for section – 18)

4. Explain how the theoretical investigation of Blackbody spectra lead to the birth of quantum science.
5. Bohr atom model is partly based on quantum theory – Justify.
6. Explain $sp^3d$ hybridisation.
7. Write the coefficients of atomic orbitals in $sp^3$ hybridisation.

Section C

(Answer any one question, Each question carries 10 marks)

8. Write a note on the experiments that established the dual nature of quantum particles. Calculate the wavelength limit of Balmer series of hydrogen atom.
9. Explain sp and $sp^2$ hybridisation using the concept of linear combination of atomic orbitals.