



**DOON UNIVERSITY, DEHRADUN**  
**Final Semester Examination, B.Sc. I<sup>st</sup> Semester, December, 2023**  
**School of Physical Sciences, Department of Chemistry**  
**NEP Chemistry**  
**Course Code : CYC-101 : Atomic Structure and Chemical Binding**

*Time Allowed 2 Hours*

*Maximum Marks: 30*

**Note: All Questions are compulsory**

**SECTION: A**

.....08 Marks

1. If the radius of cation is 96 pm and that of anion is 618 pm. Determine the coordination number and structure of crystal lattice?
2. Arrange the following according to the increasing order of covalency  
SrF, CaF, MgF, BeF, BaF  
NaF, NaCl, NaBr, NaI
3. Write the Pauling and Hanna-Smith equation for the calculation of percent ionic character?
4. Write the full form of VSEPR theory?
5. Find the wavelength of electron moving with the speed of  $2 \times 10^6 \text{ ms}^{-1}$ ?
6. Explain the hybridisation in SF<sub>6</sub>, H<sub>2</sub>O and NH<sub>3</sub> ?
7. Calculate the lattice energy of KCl crystal from the data:  
A=1.747, r = 2.814 Å, n=6
8. Write the electronic configuration of Sr, Sn, Br and Xe?

**SECTION: B**

.....12 Marks

1. Write the different postulates of Valence Bond theory and give the application and limitations of VBT?
2. Explain the hybridisation in CO<sub>2</sub> and NO<sub>3</sub><sup>-</sup> molecule?
3. Describe the bent rule and their application to determine the structure of PCl<sub>3</sub>F<sub>2</sub>?
4. Explain the difference between equivalent and non-equivalent hybrid orbitals?
5. Explain SF<sub>4</sub>, ClF<sub>3</sub>, and XeF<sub>2</sub> shows Sp<sup>3</sup>d hybridisation but having different geometry?
6. Explain the Band theory of Metals and describe the different types of defects present in solids with example?

**SECTION: C**

.....10 Marks

1. Define the lattice energy. Derive Born Lande equation and give its importance?
2. Explain the molecular orbital theory (MOT) and draw the molecular orbital diagram of N<sub>2</sub> and NO molecule and calculate the bond order of O<sub>2</sub><sup>+</sup>, O<sub>2</sub>, O<sub>2</sub><sup>-</sup> and O<sub>2</sub><sup>2-</sup> and also explain their paramagnetic and diamagnetic nature?

