



'সমানো মন্ত্র: সমিতি: সমানী'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 1st Semester Examination, 2021

CC1-CHEMISTRY

INORGANIC CHEMISTRY-I

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
All symbols are of usual significance.*

Answer any four questions from the following

10×4=40

1. (a) State the hypothesis of de Broglie. How can Bohr's quantum restriction be obtained from this hypothesis? 1+2
- (b) Write down the time independent Schrödinger equation. Mention the meaning of various terms used in it. 1+2
- (c) Give all possible values for its four quantum numbers of an electron, present in $5d$ orbital. 2
- (d) What is the significance of ψ and ψ^2 ? 2
2. (a) What is node and how many radial nodes are present for $2s$ orbital? 2
- (b) Using VSEPR theory, predict the shape of 2×3=6
 - (i) ICl_2^\ominus
 - (ii) SOF_4
 - (iii) ClF_3
- (c) The magnetic quantum number introduces the concept of space quantization. Explain the term space quantization. 2
3. (a) Why do Zr/Hf, Nb/Ta and Mo/W show similar atomic and ionic radii? 3
- (b) Electronegativity of H and F are 2.1 and 4.0 respectively. Calculate the percentage of ionic character in HF. 2
- (c) Define formal charge. Calculate the formal charge on sulphur atom in SO_3 . 3
- (d) BaSO_4 is insoluble in water. — Explain. 2
4. (a) In the trigonal bipyramidal structure the lone pairs and π -bonding moieties preferably occupy equatorial position. — Justify. 3
- (b) The melting point of CuCl (422°C) is much lower than that of KCl (776°C). — Explain. 2
- (c) Using Slater's rule, calculate the effective nuclear charge for the following electrons: 3
 - (i) $4s$ electron in Zn atom ($Z = 30$)
 - (ii) $3d$ electron in Zn atom ($Z = 30$).

- (d) Discuss the shape and bond angles in CH_2F_2 on the basis of Bent's rule. 2
5. (a) What are eigen values and eigen functions? 2
 (b) Draw the radial probability distribution curves for $3s$, $3p$ and $3d$ and discuss. 3
 (c) What is the kinetic energy of an electron whose de Broglie wavelength is 10^{-10} m? 2
 (d) Arrange the bond order of NO , NO^\oplus and NO^\ominus using the molecular orbital theory (idea of s - p mixing considered). 3
6. (a) Why does the bond angle of $\angle\text{ONO}$ decrease in the following order
 $\text{NO}_2^\oplus > \text{NO}_2 > \text{NO}_2^\ominus$? 3
 (b) Using 'band theory' explain the term semiconductors and insulators. 3
 (c) MgCO_3 is thermally less stable than CaCO_3 . — Explain. 2
 (d) Calculate the value of Z^2 in MgO . Given that $r_0 = 2.10 \text{ \AA}$, $n = 7$, $N = 6.023 \times 10^{23}$,
 $e = 4.8 \times 10^{-10}$ esu, $U_0 = -3940 \text{ kJmol}^{-1}$ and $A = 1.74$. 2
7. (a) CsAu is a stable compound. — Why? 2
 (b) Write down the basic features of a primary standard solution. 3
 (c) Discuss the effect of H-bonding in the structure of Ice. 3
 (d) Show how the value of Rydberg constant vary with the mass of nucleus? 2

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