

U.G. 3rd Semester Examination-2022

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-6

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions : 2×5=10
- a) Explain with an example the non-stoichiometric defects.
 - b) What is 'Madelung constant'?
 - c) Calculate the limiting radius ratio of a planar lattice.
 - d) What is Born-Haber cycle?
 - e) Give example of the type of compounds where 3c-4e H-bond may form. Give the orbital overlap diagram.
 - f) Define with an example the non-equivalent hybridization.
 - g) What is an intrinsic semiconductor? Give an example.

[Turn over]

~~b)~~ What is thermite mixture?

i) What will happen when rutile is heated with carbon and chlorine at 900°C ?

2. Answer any **two** questions:

$5 \times 2 = 10$

a) i) Give a flow chart diagram of the extraction of platinum from the anode slime of nickel extraction.

ii) How do you purify impure nickel? 3+2

~~b)~~ ~~i)~~ Construct the Qualitative MO energy level and interaction diagram of CO molecule.

ii) Compare the bond orders and spin multiplicities of CO and NO, NO^- and NO^+ . 3+2

~~c)~~ ~~i)~~ Compare and contrast between Schottky and Frenkel defect.

ii) Predict the geometry of $[\text{TeF}_5]^-$. 3+2

d) i) In liquid and gas phases, all P-F lengths of PF_5 are same, while in crystals they are different.— Explain.

ii) Analyse the trend of the thermal stabilities of BeCO_3 , CaCO_3 , SrCO_3 and BaCO_3 . 3+2

3. Answer any two questions:

10×2=20

- a) i) What is Kapustinski expression of lattice energy? Discuss the importance of it.
- ii) Predict the geometries of SF₄ and OSF₄. Explain.
- iii) Why does KCl adopt the rock salt structure in spite of a radius ratio is greater than 0.732? Given r(K⁺) in C.N.6 = 1.38 Å in C.N.8 = 1.51 Å, r(Cl⁻)=1.81 Å. Madelung constant for NaCl and CsCl structures are 1.748 and 1.763 respectively. 4+2+(2+2)
- b) i) Construct the MO diagram of the H₂O molecule. Calculate the bond order.
- ii) What is band theory? Explain with an example.
- iii) Analyse the formation of n-type semiconductor. 4+3+3
- c) i) Calculate the dipole moment of CH₃OH using law of parallelogram, where O-H and O-Me bond moments respectively are 1.53 and 1.16D.

ii) What is F centres in a lattice? Give examples of metal deficient lattice defects.

iii) Boiling points of H_2 , D_2 , T_2 respectively are 20, 23 and 25 K. Explain.

4+4+2

1:3

Fe

Al
