

U.G. 3rd Semester Examination-2021

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
- Calcium fluoride is neither linear nor bent. Why?
 - What is Lewis-Langmuir concept?
 - Calculate the void space in BCC lattice.
 - Name two important ores of Titanium with appropriate chemical composition.
 - What are the differences between ores and minerals?
 - BH_4^- and NH_4^+ are isolobal. Explain.
 - What is δ -bond?
 - Calculate the formal charges of two nitrogen atoms in N_2O .

2. Answer any **two** questions: 5×2=10
- What is zone refining technique? Name two ores that can be concentrated by froth -flotation process. What is monel metal? 3+1+1=5
 - What are the limitations of radius ratio rule? Why CsCl lattice is more stable than NaCl? 3+2= 5
 - What are the differences between wurtzite and zinc blend structure? The experimental lattice energy of SnO_2 is $-11595.5 \text{ KJmol}^{-1}$. Find the heat of formation of SnO_2 from following data:
 $D(\text{O}_2)=454.3\text{KJmol}^{-1}$, $S(\text{Sn})=291.6\text{KJmol}^{-1}$,
 $E(\text{O}_2^-)=635.9\text{KJmol}^{-1}$, $I(\text{Sn}^{4+})=8991.4\text{KJmol}^{-1}$
2+3=5
 - Why crystals possessing CsCl structure change to NaCl structure upon heating? The dipole moment of H_2O is $6.17 \times 10^{-30} \text{ Cm}$. The HOH bond angle is 104° and O-H bond distance is 96pm. Calculate the percent ionic character of O-H bond. 2+3=5
3. Answer any **two** questions: 10×2=20
- Explain the errors involved in Bond-Lande equation.

[Turn over]

- ii) Calculate the value of Madelung constant A for CaF_2 . (Given -ionic radius of $\text{Ca}^{2+} = 0.99\text{\AA}$, $\text{F}^- = 1.36\text{\AA}$, $n = 7$ and $U_0 = -2550 \text{ KJmol}^{-1}$).
- iii) Draw the MO diagram of CN^- and calculate its bond order. $4+3+3=10$
- b) i) Draw the schematic diagram for Ni extraction by Mond's process and mention the chemical reaction involved in it.
- ii) What are the differences between calcination and roasting?
- iii) What is smelting? How will you choose the suitable flux for a smelting process? Explain with an example. $4+2+4=10$
- c) i) What are the basic criteria for linear combination of atomic orbitals?
- ii) Two Sigma orbital cannot form a Pi bond. Explain.
- iii) Draw the resonance diagram of N_2O and HN_3 molecules.
- iv) B_2 is paramagnetic while C_2 is diamagnetic. Explain.
- v) The bond energies of H_2^+ and He_2^+ are almost equal. Explain. $2+2+2+2+2=10$

- d) i) State Bent's rule. Explain the structure of PCl_3F_2 using this rule.
- ii) How chemical forces affect melting point and boiling point?
- iii) What do you mean by inclusion compound?
- iv) What do you mean by Perovskite lattice? $(2+2)+4+2=10$
