

2023

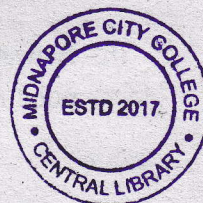
3rd Semester Examination

CHEMISTRY (Honours)

Paper : C 6-T

[Inorganic Chemistry - II]

[CBCS]



Full Marks : 40

Time : Two Hours

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

Group - A

1. Answer any *five* questions : 2×5=10

- (a) What is the probable energy source of sun?
- (b) How age of rocks can be determined?
- (c) Write down the limitations of radius ratio rule with an example.
- (d) Calculate the bond orders of CN^- and O_2^- .
- (e) Arrange the following compounds with increasing order of their dipole moment. NH_3 , NF_3 , NCl_3 .
Explain the order.

P.T.O.

(2)

- (f) CD_4 has slight lower boiling point than CH_4 . — Explain.
- (g) Why $HgCl_2$ is colourless but HgI_2 is deep red in colour?
- (h) Between $NaCl$ and $CuCl$, which has higher melting point and why?

Group - B

2. Answer any *four* questions :

5×4=20

- (a) (i) Predict the structures of $NOCl$ and ICl_2^+ .
- (ii) KHF_2 can easily be formed whereas $KHCl_2$ does not — Explain.
- (iii) Calculate the lattice energy of $Mg(ClO_4)_2$ using Kapustinskii equation. Radii of Mg^{2+} and ClO_4^- ions are 86 pm and 226 pm, respectively. $K = 1.214 \times 10^5$ kJ unit. 1+2+2
- (b) (i) How mass defect is related to binding energy? 1+2+2
- (ii) Why packing fraction may be positive or negative whereas mass defect cannot.
- (iii) Calculate the average binding energy per nucleon in 3_2H (mass = 3.016030μ) and 1_1H (mass = 3.016050μ) 1½+1½+2



(3)

- (c) (i) Explain why Be shows electrical conductivity.
- (ii) U-238 cannot be commonly used as nuclear fuel — Explain.
- (iii) What do you mean by nuclear isomerism? 2+2+1
- (d) (i) 1 gm of ${}^{226}Ra$ emits 11.6×10^{17} α particles per year. Calculate the value of the Avogadro number. ($t_{1/2} = 1590$ year).
- (ii) With the help of MO theory calculate the bond order of NO.
- (iii) What do you mean by δ-bond? 2+2+1
- (e) (i) Although oxygen shows high second electron affinity value, MgO is well known. Explain.
- (ii) Suggest reasonable crystal structure of CaF_2 and TiO_2 from the following radii (pm)
- $Ca^{2+} = 126, F^- = 119, Ti^{4+} = 74.5, O^{2-} = 126.$
- (iii) The melting point of $AgCl$ is $445^\circ C$ whereas in case of KCl it is $776^\circ C$; Although the radii of K^+ and Ag^+ are almost same. Explain. 1½+1½+2



(4)

- (i) Draw the molecular orbital (MO) energy level diagram of NO molecule.
- (ii) NO is more reactive than N_2 . Explain.
- (iii) Explain the ligating behaviour of NO. 2+2+1

Group - C

3. Answer any *one* question :

10×1=10

- (a) (i) Define Frenkel and Schottky defects in solid. Cite example for each defects.
- (ii) What do you mean by receptor-guest interaction?
- (iii) What is artificial radioactivity? Give an example.
- (iv) Write down the hazards of radiation and how this can be prevented? 3+2+2+3
- (b) (i) Calculate electron gain enthalpy (-EA) of chlorine from the following ΔH data (kJ mol⁻¹):
- $D_{Cl_2} = 242, I_{Na} = 494, \Delta H_{sub}(Na) = 109,$
 $\Delta H_f^0(NaCl) = -414, r_{Na^+} + r_{Cl^-} = 281$ pm in NaCl.
- (ii) Explain the bonding of $[Re_2Cl_8]^{2-}$ in the light of MO theory.

(5)

- (iii) Among $MgCO_3$ and $CaCO_3$ — which is thermally more stable and why?
- (iv) What are the differences between ion-dipole interaction and induced dipole interaction? 3+4+1+2

