B.Sc./3rd Sem (H)/CHEM/22(CBCS)
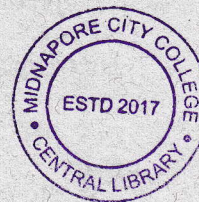
2022

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

Answer any *five* questions.   2×5=10

1. The dipole moment of carbon monoxide molecule is smaller than expected — Explain.

2. HgI_2 is less soluble in water than $HgCl_2$ — Explain.

3. Melting point of $AgCl$ is 455°C while that of KCl is 776°C though the radii of K^+ and Ag^+ ions are comparable — Explain.

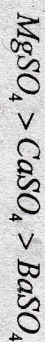4. Write down the Kapustinskii equation for lattice energy and mention the importance of this equation.

P.T.O.

(2)

5. What do you mean by receptor-guest interaction.

6. Cite two examples where the VSEPR theory fails to predict the shape of a molecule.

7. Explain the following solubility trend :

$$MgSO_4 > CaSO_4 > BaSO_4$$

8. How can you correlate the colour of CdS with Band theory?

Group - B

Answer any *four* questions.   5×4=20

9. (a) What is radioactive equilibrium?

(b) What do you mean by ion-dipole and dipole-dipole interaction?   2+3

10. (a) Distinguish between nuclear fission and nuclear spallation reaction.

(b) Half life of one radio-element is 231 minute. How long would it take for 9/10th fraction decay of the element?   2+3

11. (a) Which type of semiconductor is produced when antimony is added with Germanium? Explain its function.

(b) PH_3 is more volatile than NH_3 — Explain.   3+2

12. Construct the MO diagram for H_2O molecule. Calculate the bond order.   4+1

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(3)

13. (a) Discuss 'Frenkel defect' in solid.

(b) NO_2^+ is linear but NO_2 is bent — Explain the fact using MO theory?   3+2

14. (a) Explain induced dipole interaction with an example.

(b) From the view point of MO theory, explain why BeH_2 is a linear molecule.   2+3

Group - C

Answer any *one* question.   10×1=10

15. (a) Using VSEPR theory predict the shape of $XeOF_4$.

(b) Calculate the lattice energy of Na^+Cl^-, when the Madelung constant for $NaCl$ is 1.74759, Born exponent is 9 and the radii of Na^+ and Cl^- ions are 0.96Å and 1.76Å respectively.

(c) Distinguish between intrinsic and extrinsic semiconductors with examples.

(d) Write notes on :

Hazards of radiation and safety measures.   2+3+3+2

16. (a) What are *n*-type and *p*-type semiconductors? Give examples.

(b) Explain why O_2 is paramagnetic but O_2^{2-} is diamagnetic.
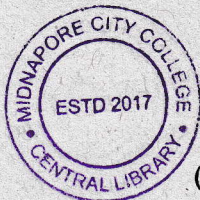
(4)

(c) Explain the different bond angles of PX_3 ($X = Cl$, Br, I) by VSEPR theory.

(d) Use the following data to calculate the lattice energy of calcium oxide. You must write all thermochemical equations for the steps of the cycle.

The enthalpy of formation of calcium oxide (solid) = – 636 kJ/mole.

The enthalpy of sublimation of calcium = + 192 kJ/mole.

First ionization energy of Ca = + 590 kJ/mole.

Second ionization energy of Ca = + 1145 kJ/mole.

The enthalpy of dissociation of $O_2(g)$ = + 494 kJ/mole.

First electron affinity of $O(g)$ = – 141 kJ/mole.

Second electron affinity of $O(g)$ = + 845 kJ/mole.

3+2+2+3