

448/Chem.

UG/3rd Sem/CHEM(H)CC-06-T/19

U.G. 3rd Semester Examination - 2019

CHEMISTRY

[HONOURS]

Course Code : CHEM(H)CC-06-T

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: $2 \times 5 = 10$
- How many atoms are present in the unit cell of end-centred cubic lattice and face-centred cubic lattices?
 - In which type of stoichiometric crystal defect, the density of the crystal does not change and why?
 - Give example of molecules or ions with Sp^3d and d^3s hybridizations.
 - He_2 does not exist- Explain why.
 - Define lattice energy and hydration energy.
 - What is Madelung Constant? What is its significance?

[Turn over]

g) Show the type of hybridisation of the core element in POCl_3 .

h) Why lithium halides (LiCl , LiBr & LiI) do not obey radius ratio rule?

2. Answer any two questions: $5 \times 2 = 10$

a) i) Discuss briefly on the perovskite structure.

ii) Find out the limiting value of radius ratio for tetrahedral co-ordination. $2+3$

b) Write down the name and formula of important ores of Titanium and nickel. How Titanium metal is purified by Van-Arkel-de Boer process? $2+3$

c) What are intrinsic and extrinsic semiconductors? Using band theory explain the conductivity of metals and semiconductors. $2+3$

d) i) The $\angle \text{HoH}$ bond angle in H_2O molecule is 104.5° whereas $\angle \text{HSH}$ angle in H_2S molecule is 92° — Explain.

ii) Write a brief account of hydrogen bonding in biological systems. $2+3$

3. Answer any two questions: $10 \times 2 = 20$

- a) i) Draw the molecular orbital diagram of CO and N_2 . Then explain why CO acts as a good π -acidic ligand and stabilize the low oxidation state of the metal atom whereas N_2 does not.
- ii) Differentiate between the Zinc blende and Wurtzite structures. $(2+2+3)+3$
- b) i) What type of crystal defect is expected in ZnO on heating?
- ii) State and explain the position of lone pair according to Bent's rule.
- iii) What are the common ores of uranium? Discuss the methodology for extraction of uranium from one of its ore. $2+2+(2+4)$
- c) i) What are tetrahedral and octahedral voids?
- ii) Explain why electrical conductivity of metal decreases with rise of temperature but the reverse occurs with semiconductors.

- iii) Define fluxional molecule and discuss
Berry pseudorotation with reference to
TBP geometry. 3+3+(2+2)
- d) i) Calculate the limiting value of radius ratio
for an ionic crystalline solid when the
co-ordination number is 6.
- ii) What is Mond's process?
- iii) What type of crystal defect is expected
in FeO?
- iv) $MfCO_3$ is thermally less stable than
 $CaCO_3$ – explain with the help of Fajan's
rule. 4+2+2+2
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