B.Sc. Semester-III Examination, 2022-23

CHEMISTRY [Honours]

Course ID : 31412 **Course Code : SH/CHE/302/C-6**

Course Title : Inorganic Chemistry-II

Time : 1 Hour 15 Minutes Full Marks : 25

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: 1×5=5

   a) Write down the limitations of radius ratio rule.

   b) Give example of a species having δ-bond.

   c) State the hybridisation of S atom in SOF_4.

   d) Which halide ion has the lowest polarizability?

   e) Compare the bond order of NO with that of NO^+.

   f) Why is iodine more soluble in water in presence of KI?

   g) Identify 'X' and 'Y' in the reactions:

      i) $_{14}Si^{27} \rightarrow X +_{+1} e^0$;

      ii) $_7N^{14} + Y \rightarrow {}_8O^{17} +_1 H^1$

   h) Compare the melting points of the following pairs:

      i) KCl and AgCl;

      ii) TiCl and $TiCl_3$.

2. Answer any **two** questions: 5×2=10

   a) i) Calculate the limiting radius ratio for CsCl type of lattice.

      ii) Formation of Mg^{2+} from Mg and O^{2-} from O_2 are both endothermic. But, MgO is a stable ionic compound. Justify. 3+2

   b) i) In a mineral, ratio of mass of Pb^{206} and U^{238} is 0.45. Find the age of the mineral. Given: Half life of U^{238} is 4.5×10^9 years.

      ii) Distinguish between nuclear spallation and nuclear fission. 3+2

   c) i) O_2 is paramagnetic but O_2^{2-} is diamagnetic – explain on the basis of MOT.

      ii) Compare the bond angles of NH_3 and PH_3. 3+2

   d) i) $SnCl_4$ is a low boiling liquid but $SnCl_2$ is a high melting solid– comment.

      ii) Arrange the hydrogen halides in increasing order of their boiling points. Explain the order. $2\frac{1}{2}+2\frac{1}{2}$

3. Answer any **one** question: $10\times1=10$

a) i) CF_4, SF_4 and XeF_4 have comparable molecular formula but their shapes are different. Explain with the help of VSEPR theory.

ii) The equatorial $\angle FSF$ angle is 101^o in SF_4 while it is 115^o in SOF_4.– Explain.

iii) When does an ionic compound become soluble in a solvent? Explain in terms of energetics.

iv) Between BF_3 and NF_3, which one has dipole moment and why? 3+3+2+2

b) i) Draw the Nuclear Binding Energy (NBE) curve and mention its important characteristics.

ii) The isotopic mass of $_1H^2$ and $_2He^4$ are 2.01410 and 4.00260 amu, respectively. Calculate the quantity of energy (in Joules) liberated when 2 moles of $_1H^2$ undergo fusion to form 1 mole of $_2He^4$.

iii) Draw the MO energy diagram of CO_2.

iv) The conductivity of Ge is enhanced when trace amount of As is added to it. Explain.

3+3+2+2

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