

2020

CHEMISTRY — HONOURS

Paper : CC-6

(Inorganic Chemistry)

Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.***Question no. 1** is compulsory and answer **any eight** questions from the rest.

1. Answer **any ten** questions : 1×10
- Mention one use of NaOCl.
 - State any two factors affecting the ionization potential value of an atom.
 - Give one example of a noble gas clathrate.
 - What is inorganic rubber?
 - Give IUPAC name of $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$.
 - Arrange the following ions in the order of increasing size : Be^{2+} , Cl^- , S^{2-} , Na^+ , Mg^{2+} .
 - Which allotrope-form of carbon has the lowest energy?
 - Give two examples of interstitial hydride.
 - Name two chelate complexes encountered during gravimetric estimation.
 - What are silanes?
 - ' ASO_4^{3-} is oxidising but PO_4^{3-} is not'— due to what phenomenon?
 - Give the relation between electron affinity of $X(g)$ atom and ionization potential of $X(g)$ ion.
2. (a) Explain the basis of Pauling's electronegativity scale.
 (b) Why does phosphorus acid act as a reducing agent? 3+2
3. (a) Show the possible coordination sites of the following ligands :
 SCN^- , $\text{S}_2\text{O}_3^{2-}$, NO_2^-
 (b) Which compounds are known as 'silicone oil'? 3+2
4. (a) Justify : Zr and Hf often coexist in nature and their separation is difficult.
 (b) State with equations what happens when XeF_4 is treated with aq. NaOH. 3+2

Please Turn Over

5. (a) The interatomic distance in chlorine molecule is 1.98 \AA . Calculate the Allred–Rochow electronegativity.
- (b) Electron affinity of SF_5 is very high while that of SF_6 is only modest. — Justify. 3+2
6. (a) What is meant by ionic radii? How do they differ from atomic radii?
- (b) Electron affinity of nitrogen is an endothermic process. — Explain. 3+2
7. (a) Give the structure of diborane and explain the nature of bonding in it.
- (b) Why cyanogen is a pseudohalogen? 3+2
8. (a) Compare the catenation properties of C, Si and Ge in their compounds.
- (b) By Slater's rule, show that when Fe^{2+} is reduced, electron enters in the 3d orbital rather than 4s orbital. (Atomic No. of Fe = 26) 3+2
9. (a) Why Boron Nitride is called 'inorganic graphite'?
- (b) Acetylacetonone forms a square planar complex with Cu(II). Draw the structure of the complex showing formal charge on the complex. 3+2
10. (a) What are interhalogens? On the basis of hybridisation, mention the structures of different types of interhalogen compounds.
- (b) Draw the structures of all the stereoisomers of $[\text{CoCl}_2(\text{en})_2]\text{Cl}$. 3+2
11. (a) What are chelates? Why chelates show extra stability?
- (b) Give the procedure of preparing a S–N compound. 3+2
12. (a) Aqueous solution of a pink coloured compound having the empirical formula $\text{CoCl}_3 \cdot 5\text{NH}_3 \cdot \text{H}_2\text{O}$ gives 3 moles of AgCl on titration with AgNO_3 . The pink solid loses the water molecule to give the purple solid having the same ratio of $\text{NH}_3 : \text{Cl} : \text{Co}$ as that of original compound. Deduce the structure of the two octahedral complexes in the light of Werner's theory.
- (b) How do freons damage the environment? 3+2
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