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

(a) Mention one use of NaOCl.

(b) State any two factors affecting the ionization potential value of an atom.

(c) Give one example of a noble gas clathrate.

(d) What is inorganic rubber?

(e) Give IUPAC name of $[Co(NH_3)_3(NO_3)_3]$.

(f) Arrange the following ions in the order of increasing size : Be^{2+}, Cl^-, S^{2-}, Na^+, Mg^{2+}.

(g) Which allotrope-form of carbon has the lowest energy?

(h) Give two examples of interstitial hydride.

(i) Name two chelate complexes encountered during gravimetric estimation.

(j) What are silanes?

(k) 'ASO_4^{3-} is oxidising but PO_4^{3-} is not'— due to what phenomenon?

(l) 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 :

$$SCN^-,\ S_2O_3^{2-},\ NO_2^-$$

(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

5. (a) The interatomic distance in chlorine molecule is $1{\cdot}98\,\text{Å}$. 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) Acetylacetone 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 $[CoCl_2(en)_2]Cl$. 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 emperical formula $CoCl_3.5NH_3.H_2O$ 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 $NH_3 : Cl : Co$ 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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