2021

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) Out of P and S whose 1st ionisation potential will be higher?

(b) What will be effective nuclear charge (z^*) on a 3p electron of Cl atom?

(c) What happens when borax is heated strongly?

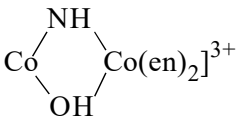
(d) Arrange the following ions in the order of increasing size : H^-, F^-, Cl^-, Br^-.

(e) Give molecular formula of Potassium Iron(III)hexacyanoferrate(II).

(f) What will be the shape of thionyl chloride?

(g) Among SF_4, SF_5 and SF_6, which compound has minimum electron affinity?

(h) Comment on the oxidation state of Tl in TlI_3.

(i) Write IUPAC name of 

(j) In which direction the following reaction will proceed in gas phase?

$Xe + He^+ \rightleftharpoons Xe^+ + He$

(k) Give two examples of siloxanes.

(l) Give one example of purely inorganic optically active compound.

2. (a) The interionic distance of $Mg^{2+} - O^{2-} = 257.4$ pm. Calculate the Pauling univalent radii of Mg^{2+} and O^{2-}.

(b) Perdisulphates are strong oxidising agents and can be used in analytical processes. Explain with an example. 3+2

3. (a) P, Q, R are the elements of same period in the periodic table. From their 1st and 2nd ionisation energy table, identify them as alkali metal, alkaline earth metal and non-metal. Justify your answer.

	P	Q	R
I_1	17.4	5.39	6.11
I_2	35.0	75.6	11.87

(I_1, I_2 in kJ/mole)

(b) Electron affinity of chlorine is 349 kJ/mole. How much energy in kJ is released when 1g of chlorine is converted completely into $Cl^-(g)$ ions? 3+2

4. (a) Discuss the hydrolytic trends of CCl_4 and $SiCl_4$.

(b) Give all the geometrical isomers with their IUPAC names of the following : $[Ru(py)_3Cl_3]$. 3+2

5. (a) Complete the reactions and balance in each case :

(i) $ClF_5 + AsF_5 + KrF_2 \rightarrow$

(ii) $XeF_4 + KI \rightarrow$

(iii) $SF_4 + XeF_4 \rightarrow$

(b) Sn^{4+} is stable whereas Pb^{4+} is highly oxidizing. Explain. 3+2

6. (a) ClF_3 falls under which class of compounds? What will be its structure? How polyhalides can be obtained from it?

(b) N – atoms of phosphazenes are weakly basic.— Justify. 3+2

7. (a) Calculate the electronegativity of chlorine in Mulliken's scale and hence find out the electronegativity of the same in Pauling's scale.

Given : Electron affinity of chlorine = 4·0 eV per atom. Ionisation energy of chlorine = 13·0 eV per atom.

(b) Discuss bonding of XeF_4. 3+2

8. (a) What is polymer? What do you understand by the term 'Inorganic Polymer'? How it differs from organic polymers?

(b) Inorganic benzene is more reactive than benzene. Prove it with examples. 3+2

9. (a) How will you generate perxenate ion from XeO_3? Xenon fluoride compounds should not be handled in glass apparatus. Why?

(b) Molar conductance (in $ohm^{-1}cm^2mol^{-1}$) at 0.001 (M) concentration of $CoCl_3 \cdot 4NH_3$, $CoCl_3 \cdot 5NH_3$ and $CoCl_3 \cdot 6NH_3$ complexes are 98, 261 and 426 respectively. Rationalise these in the light of Werner's theory. 3+2

10. (a) How does electronegativity vary with (i) hybridization (ii) screening effect of orbitals?

(b) Mention various allotrops of S and identify its most stable allotropic form. 3+2

11. (a) Discuss structure and bonding in phosphazene.

(b) Stable form of oxygen is O_2 while that of sulphur is S_8. Explain. 3+2

12. (a) Explain :

(i) Gold generally forms auride ion.

(ii) Thermal stability of $BeCO_3$ and $MgCO_3$ are different.

(b) Justify very high melting point of boron and very low melting point of mercury. 3+2
