

2013

CHEMISTRY

(Major)

Paper : 4.2

Full Marks : 60

Time : 2½ hours

*The figures in the margin indicate full marks
for the questions*

1. Answer the following questions : 1×7=7

- (a) I_2 is not soluble in water, but it is soluble in KI solution. Give reasons.
- (b) What is the styx number of B_4H_{10} structure?
- (c) Other alkali metals form superoxide but lithium does not form. Give reasons.
- (d) Which ionic compound of aluminium is used as coagulant and precipitant in treating both drinking water and sewage?
- (e) Give one example of a stabilized alkali metal anion.

- (f) Among the transition elements, which has the highest density?
- (g) Anhydrous CuSO_4 is colourless but aqueous solution of CuSO_4 is blue. Give reasons.

2. Answer the following questions : 2×4=8

- (a) Describe the action of XeF_2 on (i) H_2O and (ii) H_2 .

Or

The gaseous XeF_6 molecule does not have a static structure. Explain this statement.

- (b) Give the structural representation of $\text{Si}_3\text{O}_9^{6-}$ and $\text{Si}_6\text{O}_{18}^{12-}$.
- (c) What is inert pair effect? Why inert pair effect is more prominent for the heaviest element in a group?
- (d) Name and draw structure of one **hexadentate** ligand.

3. (a) How is it possible to form interhalogen compounds? Explain the structure and bonding in ClF_3 and I_3^- . 1+4=5

(3)

- (b) Give one method of preparation of borazine. In what respect it is similar to benzene? Explain using structural representation. Give one reaction which differentiate it from benzene.

2+2+1=5

Or

For S_4N_4 , answer the following :

1+1+1+2=5

- (i) One method of preparation of it
- (ii) One reaction where the heterocyclic ring is retained
- (iii) One reaction where smaller ring is formed
- (iv) At least four resonance structures of the molecule

- (c) How can $FeCl_3$ be prepared? Why does aqueous solution of ferric chloride become acidic on long standing? Mention one use of ferric chloride each in inorganic analysis and organic preparation.

1+2+2=5

Or

How many oxides of vanadium are known? Give preparation, properties and uses of V_2O_5 .

2+3=5

4. (a) (i) Describe the method of extraction of nickel from its ore. 6
- (ii) The hydration energy of group 2 metals are much greater than group 1 metals and among group 2 metals beryllium has the maximum. Give reasons to justify this statement. 2+2=4

Or

- (i) What is the principle of precipitation of Na^+ and K^+ ions from aqueous solution? Explain using appropriate reaction, the detection of K^+ and Na^+ ions from their solution in qualitative analysis. 2+3=5
- (ii) Describe the method of extraction of gold from its ore. How is lead separated if present with gold? 4+1=5
- (b) (i) How can you explain the following properties of metals? 5
- Brightness, malleability, catalytic activity, semiconductor property and ability to form coordination compound

- (ii) Although zinc has no incompletely filled up d orbitals, how is it possible for zinc to form complex compounds? Discuss the stereochemistry of coordination compounds of zinc. 2+3=5

Or

- (i) Discuss the gradual trend of solubilities of hydroxides and sulphates of alkaline earth metals. 2+3=5
- (ii) How are alkali metals generally characterised? What are different oxides formed by alkali metals? Give a brief account of their stability. 2+1+2=5
- (c) (i) Give IUPAC names of the following: 2
 $\text{Na}[\text{PtCl}_3(\text{NH}_3)]$, $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$
- (ii) How can the compound $\text{CoCl}_3 \cdot 4\text{NH}_3$ be represented as told in Werner's theory? How many ions will it produce in aqueous solution? 2+1
- (iii) Why are transition metals capable of showing variable oxidation state? Give a brief description of stable and unstable oxidation states of V, Cr, Mn and Fe. 1+4=5

(6)

Or

- (i) Why tetrahedral complexes do not show geometrical isomerism? Give a description of geometrical isomerism in square planar complexes of the type Ma_2b_2 and $M(ab)_2$ with examples. $1+2+2=5$
- (ii) What are π -acceptor ligands? Give examples. Write one method of preparation of $Fe(CO)_5$. Discuss its structure and bonding. Does it satisfy 18-electron rule? Show with calculation. $1+1+2+1=5$
