

## B.Sc. 4th Semester (Honours) Examination, 2019

## Subject : Chemistry

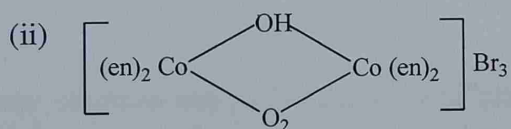
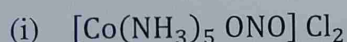
## Paper : CC-9

Time: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer *any five* questions from the following: 2×5=10

- (a) What is the function of limestone and coke in the smelting of haematite?
- (b) Write the name of two ores of lead and galena.
- (c) Draw the molecular structure of peroxomonosulphuric acid.
- (d) Why does carbon show greater tendency for catenation in comparison to silicon?
- (e) What do you mean by chelate effect?
- (f) Write down the IUPAC name of the following:

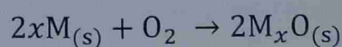
(g) How does CFC deplete  $\text{O}_3$  layer?

(h) Which of the complexes

- (i)  $[\text{Cr}(\text{edta})]^-$
- (ii)  $[\text{Ru}(\text{en})_3]^{2+}$  and
- (iii)  $[\text{Pt}(\text{dien})\text{Cl}]^+$  are chiral?

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

- (a) (i) What is Ellingham diagram? Write two characteristic features of Ellingham diagram. What will be the nature of slope in Ellingham diagram for the following reaction?



- (ii) What type of bonding is present between xenon and water in xenon clathrate?

(1+2+1)+1=5

- (b) (i) What are phosphazines? Draw the resonating structures of cyclotriphosphazine with special emphasis on the nature of bonding. (1+3)+1=5
- (ii) Which process is used for purification of titanium? (1+3)+1=5
- (c) (i) Aqueous solution of anhydrous  $\text{CuSO}_4$  is blue while its ammonical solution is deep blue. — Explain. Give one example of an optically active coordination compound which is purely inorganic in nature. (2+1)+2=5
- (ii) Write down the principle of hydrometallurgy. (2+1)+2=5
- (d) (i) How  $\text{P}_4$ ,  $\text{P}_4\text{O}_6$  and  $\text{P}_4\text{O}_{10}$  are related structurally? (2+2)+1=5
- (ii) 'Polythiazyl compound shows electrical conductivity'. — Explain.
- (iii) Name the products at the anode when molten  $\text{ICl}$  is electrolysed. 2+2+1=5

3. Answer *any two* questions from the following: 10×2=20

- (a) (i) 'Thallos ( $\text{Tl}^+$ ) compounds are more stable than thallic ( $\text{Tl}^{3+}$ ) compounds'. — Why? 10×2=20
- (ii) On the basis of VSEPR theory, predict the structures of  $\text{XeO}_2\text{F}_2$ ,  $\text{XeO}_3\text{F}_2$  and  $\text{XeOF}_4$ .
- (iii) ' $\text{SO}_4^{2-}$  shows different ligational modes to form coordination complexes'. — Elucidate with proper examples.
- (iv) Draw the possible isomers of  $[\text{Co}(\text{en})(\text{NH}_3)_2\text{BrCl}]^+$ . Predict which of them would be optically active. 2+3+2+(2+1)=10
- (b) (i) What do you mean by inner metallic complex? Give one example where the idea of formation of inner metallic complex of the first order has been applied in analytical chemistry.
- (ii) How is hydrate isomerism different from coordination isomerism?
- (iii)  $[\text{Cr}(\text{en})_2\text{Cl}_2]\text{Cl}$  may be found in two forms, one is violet and the other is green. On reaction with oxalate ion the violet species produces its corresponding oxalate derivative, while the green does not. Explain the result.
- (iv) How is  $\text{ClO}_2$  prepared? Give its reaction with water. (2+1)+2+2+(2+1)=10
- (c) (i) Outline the principle of zone refining. Which metals are purified by it?
- (ii) Write the Van-Arkel Boer process for the purification of Zirconium.
- (iii) What are pyroxene and amphibole? Illustrate structurally.
- (iv) Why are inter-halogen compounds more reactive than halogens except fluorine? (3+1)+2+2+2=10

- (d) (i) Write the name of a fullerene other than  $C_{60}$  and justify your choice.
- (ii) Distinguish between  $3c-2e$  and  $3c-4e$  bonds with concrete example.
- (iii) Describe the bonding on N atom in  $N_2F_2$  and  $N_2F_4$ .
- (iv) Why is the  $\pi$  bonding in borazine different from that in benzene? How does it affect the reactivity of borazine? Give one specific example. 3+2+2+(2+1)=10
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