



# WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2022

## CEMACOR09T-CHEMISTRY (CC9)

### INORGANIC CHEMISTRY-III



Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**Answer any *three* questions taking *one* from each unit**

#### Unit-I

1. (a) Define the following with example: 1×4 = 4  
Alloy, Mineral, Ore and Slag
- (b) What does roasting mean in metallurgy? 2
- (c) Describe briefly the extraction of Ti metal from its ore by Kroll process. 4
  
2. (a) What do you mean by parting process? Describe briefly how Gold metal can be obtained from the mixture by parting process. 1+3
- (b) Consult the Ellingham diagram and determine if there are conditions under which Aluminium might be able to reduce MgO? 3
- (c) In some modern process of hydrometallurgy, the beneficiation and conservation are carried out in one step. Give examples. 3

#### Unit-II

3. (a) Compare and Contrast the properties of B and Al considering the following points: 5
  - (i) Elemental states
  - (ii) Hydrides
  - (iii) Halides.
- (b) The fluorocarbons are remarkably chemically inert. — Comment. 2
- (c) Depict the structural features of Diborane. Explain the reactivity of Diborane as a Lewis acid with reference to ammonia and amines. 3
- (d) Give example of a three dimensional silicate and on the basis of its structure mention its use. 3
- (e) Cyanogen is a pseudohalogen. — Justify. 2
- (f) Suggest a method of preparation of XeO<sub>2</sub>F<sub>2</sub> and also draw its structure. 2
- (g) What happens when 3
  - (i) Ferric chloride solution is added gradually to a sodium thiosulphate solution.
  - (ii) Silver nitrate is added to a concentrated solution of ammonium persulphate.

4. (a) Predict and explain the order of the 'tendency of polymerisation' of the following oxyanions: 3  
 $\text{SO}_4^{2-}$ ,  $\text{ClO}_4^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{SiO}_4^{4-}$
- (b) Amongst inert gases, Xenon is most suitable to form chemical compounds — Explain. 2
- (c) Discuss the structure and bonding of  $(\text{SN})_x$  [ $x = 4$ ]. 3
- (d) State two evidences of chemical reaction to establish that  $\text{SCN}^-$  is a pseudohalide. 2
- (e) Write down the structures of trimeta-phosphoric acid and tripoly-phosphoric acid. Hence, comment on the basicities of the two acids. 2
- (f) Why fluorocarbons are very stable and not easily oxidisable? 2
- (g) What are interhalogens? On the basis of hybridization, mention the structures of different types of interhalogen compounds. 3
- (h) Give the structure of cyclic trimetasilicate ion. Give an example to show that hydrazine behaves as a reducing agent. 3

### Unit-III

5. (a) How would you show that the thiocyanate ion acts as an ambidentate ligand? 2
- (b) Write down the structures of different isomeric forms of  $[\text{Cr}(\text{ox})_3]^{3-}$ . 2
- (c) How many isomers are possible for  $[\text{Co}(\text{NH}_3)(\text{OH})_2\text{Cl}_3]^{2-}$ ? 2
- (d) How will you distinguish between the following pairs of isomers? 2+2
- (i)  $[\text{Co}(\text{NH}_3)_6] [\text{Cr}(\text{NO}_2)_6]$  and  $[\text{Cr}(\text{NH}_3)_6] [\text{Co}(\text{NO}_2)_6]$
- (ii)  $[\text{Cr}(\text{NH}_3)_6] [\text{Cr}(\text{NO}_2)_6]$  and  $[\text{Cr}(\text{NH}_3)_4(\text{NO}_2)_2] [\text{Cr}(\text{NH}_3)_2(\text{NO}_2)_4]$
6. (a) Molar conductance at a dilution of 1024 litres of  $\text{PtCl}_4 \cdot 2\text{NH}_3$ ;  $\text{PtCl}_4 \cdot 3\text{NH}_3$ ;  $\text{PtCl}_4 \cdot 6\text{NH}_3$  are 7, 97 and 520  $\text{Ohm}^{-1}\text{cm}^2$  respectively. Rationalise these data in the light of Werner's theory. 3
- (b) Acetyl acetone is a potential ligand that forms a square planar complexes with Cu(II). Draw the structure of the complex and predict the formal charge on the complex. 2
- (c) Metal chelates are more stable than non-chelated complexes. — Comment. 3
- (d) Write the IUPAC name of  $[(\text{SCN})_3(\text{H}_2\text{O})_2\text{Cr}-\text{OH}-\text{Co}(\text{NH}_3)_5](\text{SO}_4)$  and the formula of pentaammineazidocobalt(III) sulphate. 2

**N.B. :** Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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