'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2022

CC13-CHEMISTRY

INORGANIC

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
All symbols are of usual significance.

Answer any *four* questions from the following 10×4 = 40

1. (a) Give the name and chemical formula of the yellow precipitate obtained during the confirmatory test of potassium ion. 2

   (b) Why Pb(II) ion is tested in both group-I and group-II cations in qualitative inorganic analysis? 2

   (c) What do you mean by interfering acid radicals? Why is it necessary to remove interfering acid radicals before group-III analysis? — Explain. 1+2

   (d) What is common ion effect? Explain with proper example. 3

2. (a) What are chemical reactions involved in chromyl chloride test? Write the chemical equations. What are the limitations of this test? 3+1

   (b) (i) Why lead sulphate ($PbSO_4$) is soluble in ammonium acetate? 2+2

   (ii) Why the group-II centrifugate is boiled off with few drops of conc. HNO_3 before proceeding for group-III?

   (c) How borate or boric acid is removed during group analysis? 2

3. (a) What happen when Friedel-Crafts acylation reaction is performed on ferrocene? 2

   (b) When ferrocene is treated with excess acylating agent it gives 1,1′-diacyl product, whereas during similar alkylation reaction it provides 1,2-dialkyl product. — Explain. 3

   (c) Describe the structure and bonding of Zeise's salt. Give two evidences in favour of the occurrence of back bonding in this compound. 3+2

4. (a) Write down the role of Ziegler-Natta catalyst in polymerization of ethene. 3

   (b) Write down the products of ferrocene when it is treated with 2

   (i) *n*-BuLi and (ii) HCHO and $NHMe_2$

(c) The observed V–C bond length in $[V(CO)_6]$ and $[V(CO)_6]^-$ are 200 pm and 193 pm respectively. — Explain. 3

(d) Why Rh catalyst shows better efficacy than Co-catalyst during hydroformylation reaction. 2

5. (a) Define organometallic compounds and classify these compounds on the basis of bond types. 1+3

(b) Write down the reaction and mechanism of Wacker oxidation reaction. 4

(c) Using $18e^-$ rule determine the values of *m*, *n* and metal present in the following examples: 2

(i) $[(\eta^6 - C_6H_6)_m Cr(CO)_n]$

(ii) $[(\eta^5 - C_5H_5)M(C_2H_4)_2]$

6. (a) Draw the structure of $Mn_2(CO)_{10}$. 2

(b) What is trans effect? — Explain. How can you synthesize any two isomer of $[Pt(Br)(Cl)(NH_3)(Py)]$ from $PtCl_4^{2-}$. 2+4

(c) What do you mean by thermodynamic and kinetic stability? 2

7. (a) Explain the aromaticity of ferrocene. 2

(b) Define the term hapticity with proper examples. 2

(c) Explain synergistic effect in metal carbonyl compounds using VBT. 3

(d) Using 18 electron rule find the number of M-M bond in the following compounds: 3

(i) $Fe_2(CO)_9$ (ii) $Mo_2(Cp)_2(CO)_6$

8. (a) How Infrared spectra is used in order to identify the different binding modes of carbonyl group? 3

(b) Why group-II basic redical's sulphides are precipitated in acidic medium but sulphides of group-IV elements are precipitated in alkaline medium? — Explain. 3

(c) Write down the confirmatory test of following acid radicals: 2+2

(i) NO_3^- (ii) SO_4^{2-}

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