5 SEM TDC CHM M 3 (N/O)

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(November)

CHEMISTRY

(Major)

Course : 503

(Inorganic Chemistry—II)

The figures in the margin indicate full marks
for the questions

(New Course)

Full Marks : 48
Pass Marks : 14

Time : 2 hours

1. Select the correct answer from the following :

1×5=5

(a) The oxidation states of metal atoms in halide and oxide clusters have

   (i)   low formal oxidation states +1, 0, −1

   (ii) high formal oxidation states +2 to +3

   (iii) low formal oxidation states +3 to +5

   (iv) None of the above

(2)

(b) Bromocresol is an example of

    (i)   redox indicator

    (ii) neutralization indicator

    (iii) metal ion indicator

    (iv) adsorption indicator

(c) $Co(CO)_3$ is isolobal with

    (i) CH_2^+

    (ii) CH_2

    (iii) CH

    (iv) CH_3

(d) $C_{54}H_{45}ClP_3Rh$ is

    (i)   Vaska's compound

    (ii) Wilkinson's catalyst

    (iii) Cupferron

    (iv) Zeise's salt

(e) 4-(4-nitrophenylazo) resorcinol is mainly used for determining the presence of

    (i)   Ca in solution

    (ii) Mg in solution

    (iii) Na in solution

    (iv) Li in solution

(3)

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

    (a) Outline the conditions necessary for isolobality of two molecular fragments.

    (b) Give an example of reaction in which $HCo(CO)_4$ is used as catalyst.

    (c) Give the classification of metal cluster compounds.

    (d) Write the preparation of a cobalt nitrosyl compound.

3. Answer any *three* questions :   3×3=9

    (a) Define oxidative addition and reductive elimination reactions with examples.

        1½+1½=3

    (b) Draw the reaction path for hydrogenation of olefin with the help of Wilkinson's catalyst.

    (c) What is 18-electron rule? Examine the 18-electron rule in the following compounds :   1+½×4=3

        (i) $Co_2(CO)_8$

        (ii) $Mn(CO)_6$

        (iii) $Fe_2(CO)_9$

        (iv) $Fe(CO)_2 (\alpha\text{-}C_5H_5) (\pi\text{-}C_5H_5)$

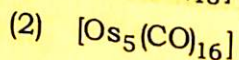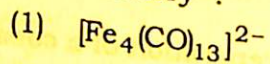   (d) Discuss the structure and bonding of anion of Zeise's salt.

4. Answer the following questions : $4 \times 2 =$

   (a) Explain the structure and bonding of ferrocene. (Give emphasis on orbital diagram, orbital symmetry and energy.)

   (b) (i) Outline the PSEP theory.

   (ii) Predict the structures of the following clusters in the light of PSEP theory :

   (1) $[Fe_4(CO)_{13}]^{2-}$

   (2) $[Os_5(CO)_{16}]$

5. Answer any *two* questions : $3 \times 2 =$

   (a) Outline the synthesis of a low-nuclearity carbonyl cluster. Discuss the structure of the cluster. $1+2=$

   (b) What are nitrosyl complexes? Give the preparation of nitrosoferrous sulphate.

   (c) Give a common discussion for structure and bonding of metal nitrosyl compound.

6. Answer any *two* questions : $3 \times 2 =$

   (a) Discuss about the nature and type of indicator used in the titration of—

   (i) strong acid and weak base;

   (ii) strong acid with strong base.

   (b) Define accuracy, precision and mean deviation.

(Continued)

   (c) Analysis of a sample of $CaCl_2$ gave the following percentage values for Ca content :

   10·08, 10·12, 10·21, 10·16, 10·09

   10·14, 10·18, 10·11, 10·14, 10·07

   Calculate the standard deviation.

   (d) Write a note on adsorption indicator.

7. Discuss the uses of the following reagents in inorganic analysis (any *three*) : $2 \times 3 = 6$

   (a) Magneson

   (b) 1,10-phenanthroline

   (c) 8-hydoxyquinoline

   (d) Salicylaldoxime

   (e) Dithizone

(Old Course)

Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. Select the correct answer from the following : $1 \times 5 = 5$

   (a) The total electron count of a cluster is $12n + 2(n + 1)$. The structure will be

   (i) hypo (ii) arachno

   (iii) nido (iv) closo

(Turn Over)