

2013

(November)

CHEMISTRY

(Major)

Course : 503

(Inorganic Chemistry—II)

Full Marks : 48

Pass Marks : 19

Time : 3 hours

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

1. Select the correct answer from the following :

1×5=5

(a) Which of the following does not belong to organometallic compounds?

(i) CH_3MgBr

(ii) $\text{Li}[\text{BPh}_4]$

(iii) $(\text{C}_5\text{H}_5)_2\text{Ca}$

(iv) $\text{B}(\text{OCH}_3)_3$

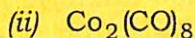
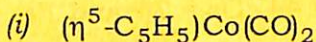
- (b) $\text{Mn}(\text{CO})_5$ is isolobal with
- (i) $\text{Cr}(\text{CO})_5$
 - (ii) $\text{Co}(\text{CO})_4$
 - (iii) $\text{Mn}(\text{CO})_4$
 - (iv) $\text{Fe}(\text{CO})_4$
- (c) EAN of $\text{Fe}(\text{CO})_2(\text{NO})_2$ is
- (i) 34
 - (ii) 35
 - (iii) 36
 - (iv) 38
- (d) The brown-ring test for nitrate is based on the formation of the complex $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$. The oxidation state of iron in the complex is
- (i) 1
 - (ii) 6
 - (iii) 4
 - (iv) 3
- (e) Which of the following is a metal ion indicator?
- (i) Congo red
 - (ii) Calcon
 - (iii) *p*-Nitrophenol
 - (iv) Methyl orange

2. Answer the following questions : 2×5=10

- (a) What do you mean by hapticity of a ligand in organometallic compound? Illustrate with two examples.
- (b) How will you detect bridging and terminal CO in $\text{Fe}_2(\text{CO})_9$?
- (c) What are metal clusters? How are they generally classified?
- (d) Explain why two NO groups can substitute three carbonyl groups from metal carbonyl compounds.
- (e) Explain the terms 'accuracy' and 'precision'.

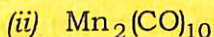
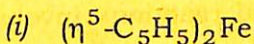
3. Answer any *three* questions from the following : 3×3=9

- (a) What is 18-electron rule? State whether this rule is obeyed or not in the following compounds : 3



- (b) How will you prepare the following?

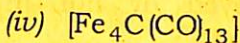
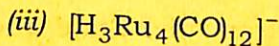
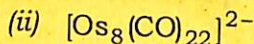
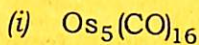
$1\frac{1}{2} \times 2 = 3$



- (c) Explain oxidative addition reaction with the help of Vaska's compound. 3
- (d) Discuss the bonding in Zeise's salt in the light of DCD model. 3
- (e) What is synergic effect? Discuss how this effect is observed in metal carbonyls. 3

4. Answer any *three* questions from the following : $3 \times 3 = 9$

- (a) Give the synthesis of a carbonyl cluster containing three iron atoms and discuss its structure. $1 + 2 = 3$
- (b) Predict the structure of the following in the light of PSEPT (any *three*) : $1 \times 3 = 3$



[Given, Ru = 44, Os = 76 and Fe = 26]

- (c) Explain how nitric oxide can form metal complexes as (i) 3-electron donor, (ii) 2-electron donor and (iii) 1-electron donor. Give one example of each. 3
- (d) Give the chemical reactions involved in the preparation of sodium nitroprusside and explain its structure. $1 + 2 = 3$

5. Answer any *three* questions from the following : 3×3=9

(a) What are determinate errors? How can they be minimized? 1+2=3

(b) Explain the action of diphenyl amine indicator in titrating ferrous ion with potassium dichromate in acidic medium. 3

(c) What types of indicator will you use in titration of (i) a strong acid with strong base and (ii) a strong acid with weak base? Explain. 1½+1½=3

(d) Analysis of a sample of ferric oxide gave the following percentage values for the iron content :

7.08, 7.12, 7.21, 7.16, 7.09, 7.14,
7.18, 7.11, 7.14 and 7.07

Calculate the standard deviation. 3

6. Write the structures of the following organic reagents and mention one use of each (any *four*) : 1½×4=6

(a) Salicylaldoxime

(b) 1-Nitroso-2-naphthol

(c) Diphenylcarbazide

(d) Cupferron

(e) Dithizone
