

MAY 2012

P/ID 40128/PCHH

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Time : Three hours

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

All questions carry equal marks.

Each answer should not exceed 50 words.

1. How do carbonyls stabilize metals in their low oxidation state?
2. Give the EAN for  $\text{Co}_2(\text{CO})_8$ .
3. What is an OXAD reaction?
4. Why does 1,10-phenanthroline favour MLCT transition?
5.  $\text{CuCl}$  is colourless whereas  $\text{CuCl}_2$  is green. Why?
6. Is  $\text{H}_2^+$  esr active? If yes draw the spectrum.
7. Recording of  $^{15}\text{N}$  NMR spectrum requires more time than  $^1\text{H}$  NMR. – Why?

8. What is Doppler broadening in Mossbauer spectroscopy?
9. How many IR bands are observed for N<sub>2</sub>O?
10. What is PESIS and what are the radiations used in the study?

PART B — (4 × 20 = 80 marks)

Answer ALL questions.

All questions carry equal marks.

Each answer should not exceed 250 words.

11. (a) (i) Discuss the MO approach to the structure of ferrocene. (10)
- (ii) What is fluxional behaviour? Explain with suitable example. (10)

Or

- (b) (i) Write notes on polymer bound Catalysts . (10)
- (ii) Discuss the Wacker process with a mechanistic pathway. (10)

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12. (a) (i) Discuss the use of Ir spectra in the structural analysis of metal carbonyls. (10)
- (ii) With a suitable diagram, explain the working of a Faraday balance. (10)

Or

- (b) (i) Explain as to how a square planar  $\text{NiL}_4$  complex can be differentiated from an octahedral  $\text{NiL}_6$  complex with the electronic spectra. (10)
- (ii) Discuss the use of Gouy balance in the determination of magnetic moment of compounds. (10)
13. (a) (i) What are NMR shift reagents? Explain with suitable example. (10)
- (ii) What is EFG? How is the covalent nature of a bond investigated with NQR? (10)

Or

- (b) (i) Relate the MB spectrum of  $\text{Fe}_3(\text{CO})_{12}$  with its structure. (10)
- (ii) Discuss the use of NQR in the structural study of group III halides. (10)

14. (a) (i) Write on g factor and deduce the free electron g value from the relevant equation. (10)
- (ii) Arrange the N1s binding energies for  $[\text{Ni}(\text{en})_2(\text{NH}_3)\text{NO}_2]\text{NO}_3$  in an increasing order with suitable explanation. (10)

Or

- (b) (i) State Koopman's theorem. Discuss the conditions under which the theorem breaks down. (10)
- (ii) Discuss the esr spectrum of vanadyl acetyl acetonate with suitable diagram. (10)
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