

(6 pages)

Reg. No. :

Code No. : 8161

Sub. Code : C 32 C

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2011.

Third Semester

Chemistry

INORGANIC CHEMISTRY – III

(For those who joined in July 2008 and afterwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

1. What is photoredox reaction? Give an example.
2. In the electronic spectrum of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$, all the bands are weak. Why?
3. N, N-dimethyl acetamide in CCl_4 absorbs at 1662 cm^{-1} whereas the carbonyl group in acetone gives an IR absorption band at 1715 cm^{-1} . Why?

4. In Mössbauer spectra, the isomer shift for the spin-free Fe (II) is greater than that for the spin-free Fe (III). Explain.
5. Predict the number of ESR spectral lines for a Co (II) and Cr (II) complex.
6. Sketch the ESR spectrum of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ and interpret.
7. What is the significance of ion-selective electrodes used in titration?
8. What are the basic principles of thermogravimetry and electrogravimetry?
9. Discuss the principle of TGA.
10. Convert the following:
 - (a) 50% transmission into absorbance
 - (b) 0.5% absorbance into % transmission.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, Choosing either (a) or (b).

11. (a) Write briefly on the photosubstitution reactions of coordination compounds.

Or

- (b) Derive the term states for d^2 configuration.

Page 2

Code No. : 8161

12. (a) Explain how Raman spectroscopy is used to study carbonyl compounds.

Or

- (b) Explain UPS of O_2 and N_2 molecules.

13. (a) What are fluxional molecules? Explain how they can be studied.

Or

- (b) Establish the fluxional behaviour of bis - (cyclopentadienyl) - mercury with NMR technique.

14. (a) What are the precautions to be taken in the case of thermobalance?

Or

- (b) What is Nernst equation? What should be the minimum potential difference between two half-reactions so that a sharp end point will be obtained in a titration involving the two half-reactions?

15. (a) How will you determine vitamin B_2 by fluorimetry?

Or

- (b) Describe the principle and applicability of the different types of spectrophotometric titration curves.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) How are the Orgel diagrams different from Tanabe-Sugano diagrams? Draw the Tanabe-Sugano diagrams for a d^6 complex and explain the possible transitions.

Or

- (b) (i) Discuss the importance of the terms internal conversion and intersystem crossing in photochemistry.

- (ii) Write the photochemical reactions involved in solar energy conversion.

17. (a) State Koopmann's theorem and explain its significance in photoelectron spectroscopy. What are the drawbacks of the theorem?

Or

- (b) Discuss the changes and trend in the IR active NO stretching frequencies of $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$, $[\text{Mn}(\text{CN})_5\text{NO}]^{3-}$ and $[\text{Cr}(\text{CN})_5\text{NO}]^{4-}$, observed at 1939, 1725 and 1515cm^{-1} respectively.

18. (a) (i) Write an account on temperature independent paramagnetism.
- (ii) Explain the kinetics of rearrangement reactions as applied to NMR.

Or

- (b) The EPR technique provides conclusive evidence for the presence of covalency in the Metal-Ligand bonding. Justify the above statement.
19. (a) Discuss the basis of amperometric titrations. Illustrate by taking suitable examples.

Or

- (b) What is electrogravimetry? With a neat diagram describe the electrolysis at constant applied voltage technique.

20. (a) Compare and contrast nephelometry and turbidimetry with examples.

Or

- (b) Describe the TGA behaviour of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.
-