(6 pages) **Reg. No. :** .....

Code No. : 7419 **Sub. Code : ZCHM 32**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023

Third Semester

Chemistry – Core

SPECTRAL METHODS – I, ORGANO METALLIC AND ANALYTICAL METHODS

(For those who joined in July 2021 – 2022 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following shift leads to the decreased intensity of absorption?

   (a) Hypochromic

   (b) Hyperchromic

   (c) Hypsochromic

   (d) Bathochromic

2. The ground state of d^2 configuration is _____

   (a) $^3F_2$ (b) $^3F_3$

   (c) $^2D_1$ (d) $^2D_0$

3. In ESCA process, the photon ejects which of the following?

   (a) 1s electron (b) 1p electron

   (c) 2s electron (d) 2p electron

4. Auger electron spectroscopy involves the irradiation of the surface to be analysed with a beam of electrons of energy in the _____ range.

   (a) 1–2 KeV (b) 2–4 KeV

   (c) 4–8 KeV (d) 1–8 KeV

5. Which of the following is the neutral complex which follows the 18- electron rule?

   (a) $(\eta^5 - C_5H_5)Fe(CO)_2$

   (b) $(\eta^5 - C_5H_5)2Mo(CO)_3$

   (c) $(\eta^5 - C_5H_5)_2Co$

   (d) $(\eta^5 - C_5H_5)2Re(\eta^6 - C_6H_6)$

6. The oxidation state of iron in ferrocene is

(a) +1 (b) +2

(c) +3 (d) +4

7. The reaction in which both oxidation number and coordination increases is called ————————

(a) Oxidative addition

(b) Insertion

(c) Oligomerisation

(d) Reductive elimination

8. Synthesis gas is a mixture of ————————

(a) $CO + N_2$ (b) $CO + CO_2$

(c) $CO + H_2$ (d) $N_2 + H_2$

9. In thermogravimetric analysis, the result obtained appear as a ————————

(a) Continuous chart

(b) Continuous parabola

(c) Continuous circular positions

(d) Discontinuous chart

10. Differential scanning colorimetry is used to measure ————————

(a) specific heat

(b) electrical coductivity

(c) impact energy

(d) Thermal expansion

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) What is Orgel diagram?

Or

(b) What are charge transfer spectra?

12. (a) Explain the application of Koopmans theorem.

Or

(b) State the principle of Auger electron spectroscopy.

13. (a) Discuss Structure of metal nitrosyls.

Or

(b) Write notes on metal alkyne complexes.

14. (a) Explain Tolman Catalytic loop.

Or

(b) Explain hydrofromylation reaction.

15. (a) Explain principles of thermogram of $CuSO_4 \cdot 5H_2O$.

Or

(b) Explain Principle of Differential thermal analysis.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Explain determination of absolute configuration of complexes from ORD and CD.

Or

(b) Discuss Optical isomerism in octahedral complexes.

17. (a) Explain shake-up and shake-off processes.

Or

(b) Explain vertical and adiabatic transitions in photo electron spectroscopy.

18. (a) Discuss structure of trinuclear carbonyl complexes.

Or

(b) Discuss synthesis, structure and bonding in beryllocene.

19. (a) Compare homogeneous catalysis and heterogeneous catalysis.

Or

(b) What is Wilkinson's catalyst? Write its role in organic synthesis.

20. (a) Explain the Characteristic features of DTA CURVES. Explain the factors affecting DTA CURVES.

Or

(b) Explain the principle and applications of Atomic absorption spectroscopy.

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