(6 pages)

Reg. No. : .....

Code No. : 5419 **Sub. Code : ZCHM 32**

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

Third Semester

Chemistry – Core

SPECTRAL METHODS – I ORGANO METALLIC AND ANALYTICAL METHODS

(For those who joined in July 2021 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 transitions are of weak intensities and lie in the visible region?
   (a) $n \rightarrow n^*$ (b) $\sigma \rightarrow \sigma^*$
   (c) $\pi \rightarrow \pi^*$ (d) $n \rightarrow o^*$
2. Which of the following is an application of electronic spectroscopy?
   (a) Detection of impurities
   (b) Control of purification
   (c) Study of kinetics of the chemical reaction
   (d) All of the mentioned
3. The energy required to remove an electron from the highest occupied atomic orbital is known as _____
   (a) Ionization energy
   (b) Kinetic energy
   (c) Binding energy
   (d) Vibrational energy
4. The PES of H_2O gives _____ peaks
   (a) 3 (b) 2
   (c) 1 (d) 4
5. Which of the following is not considered as an organometallic compound?
   (a) Ferrocene (b) Cis-platin
   (c) Ziese's salt (d) Grignard reagent
6. _____ carbonyl is not Stable
   (a) $U(CO)_6$ (b) $Cr(CO)_6$
   (c) $Ni(CO)_4$ (d) $Fe(CO)_5$
7. Wilkinson's catalyst is
   (a) Ni (b) $[(C_6H_5)_3P]_3RhCl$
   (c) $LiAlH_4$ (d) Fe_2O_3

8. Which of the following is correct about Wilkinson's catalyst?
   (a) It is an ionic complex
   (b) It is a paramagnetic complex.
   (c) It is a square planar complex.
   (d) It is a tetrahedral complex.
9. Thermal analysis is defined as _____
   (a) Measurement of concentration of materials as a function of temperature
   (b) Measurement of solubility of materials as a function of temperature
   (c) Measurement of physical properties as a function of temperature
   (d) Measurement of line positions of crystals as a function of temperature
10. What are the two main techniques for thermal analysis?
    (a) FTG AND DGG
    (b) MSP AND FCT
    (c) TGA AND DTA
    (d) TSA AND DGF

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write a note on selection rule of electronic transitions of d^2 ion.

    Or

    (b) Write briefly about Tanabe Sugano diagrams.

12. (a) Explain briefly about types of PES.

    Or

    (b) Explain briefly about PE spectra of oxygen molecule.

13. (a) Write briefly about synthesis of metal complexes with alkyl systems.

    Or

    (b) Write a note on synthesis and reactions of ferrocene.

14. (a) Write briefly about insertion reactions.

    Or

    (b) Write briefly about Fischer Tropsch process.

15. (a) Write the principles of TGA.

Or

(b) Write the steps involved in emission spectroscopy based on plasma sources.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Give a detailed account on Electronic spectra of lanthanide and actinide complexes

Or

(b) Write the explanations involved in effect of solvent polarity on CT spectra.

17. (a) Discuss the application and limitation of Koopman's theorem.

Or

(b) Discuss the principle involved in ESCA.

18. (a) Discuss the structure of trinuclear and tetranuclear carbonyls.

Or

(b) Discuss the structure and bonding in beryllocene.

19. (a) Discuss hydrogenation and hydro formylation reactions.

Or

(b) Ziegler–Natta polymerization and mechanism of stereo regular polymer synthesis.

20. (a) Discuss the steps in Thermometric titrations.

Or

(b) Discuss about principle and applications of spectrofluorimetry.

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