

(6 pages)

5554/MC4

MAY 2006

Paper IV — ANALYTICAL CHEMISTRY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

UNIT I

1. (a) IR stretching frequency of CO group in acetophenone is 1680 cm^{-1} and for acetone is 1715 cm^{-1} . Rationalize. (2)

(b) Butadiene has longer wavelength of UV absorption than ethylene. Account. (2)

2. (a) With examples explain shielding and deshielding effects in NMR. (6)

Or

(b) Write a short note on first order spectra and non first order spectra. (6)

3. (a) (i) Explain the various factors which are affecting the chemical shift values in ^{13}C NMR spectroscopy. (5)

(ii) Explain the principles involved in UV-visible spectroscopy. (5)

Or

(b) Write notes on the following :

(i) Double irradiation technique.

(ii) Broad band decoupling technique.

(iii) Off resonance decoupling technique.

(3+3+4)

UNIT II

4. (a) Differentiate circular birefringence and circular dichroism. (2)

(b) Name the commonly used adsorbents in column chromatography. What criteria is followed for its choice? (2)

5. (a) Give the schematic diagram of a GLC apparatus and the sequence of processes involved in separation. (6)

Or

(b) Explain the importance of isotopic abundance in Mass Spectra. (6)

6. (a) (i) Describe the main factors involved in adsorption chromatography. (5)

(ii) What is meant by fragmentation? Describe the fragmentation in alkylbenzenes. (5)

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(b) (i) Illustrate octant rule with 3-methylcyclohexanone. (5)

(ii) With suitable examples discuss Mc Lafferty rearrangement. (5)

UNIT III

7. (a) Explain the term kinetic current in polarography. (2)

(b) What are the advantages of potentiometric acid-base titrimetry? (2)

8. (a) What is meant by diffusion current? Discuss the factors influencing it. (6)

Or

(b) Write a note on theories of hydrogen overvoltage (6)

9. (a) (i) Give a brief account of cyclic voltammetry. (5)

(ii) How are amperometric titrations carried out? What are the advantages and disadvantages of amperometric titrations? (5)

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(b) (i) Explain the construction and working of calomel electrode. (5)

(ii) Give a concise account of liquid membrane electrodes. (5)

UNIT IV

10. (a) Explain the difference between variance and standard deviation. (2)

(b) Mention any two methods of selecting a cell. (2)

11. (a) Differentiate the following :

(i) Accuracy and precision.

(ii) Mean and Median.

(iii) Absolute error and relative error. (3 × 2)

Or

(b) Write a program using FOR...NEXT loop to calculate the molecular formula of given ten compounds containing carbon, hydrogen and oxygen. (6)

12. (a) (i) Write a note on matrix operation in BASIC. (5)

(ii) Compare functions and subroutine with example for each. (5)

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[P.T.O.]

(b) (i) What are the criteria for the rejection of analytical data? (4)

(ii) Write a short note on significant figures. (6)

UNIT V

13. (a) What is DTA? How is the thermogram got in DTA? (2)

(b) Explain the basic principle of electro dialysis. (2)

14. (a) Discuss the complimentary nature of TGA and DTA with any three suitable examples. (6)

Or

(b) What are the sources of NO_x pollution? How are they controlled? (6)

15. (a) (i) Explain the use of IR in environmental pollution studies. (6)

(ii) How is dissolved oxygen determined?(4)

Or

(b) (i) How is iron determined colourimetrically? (4)

(ii) How is trace of lead in a ferrous alloy determined by atomic absorption spectroscopy? (6)