

(6 pages)

Reg. No. :

Code No. : 20626 E Sub. Code : ESCH 41

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Chemistry

Skill Enhancement Course

INSTRUMENTAL METHODS OF CHEMICAL
ANALYSIS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A solution contains 30 g of sodium chloride (molar mass = 58.44 g/mol) dissolved in 500 g of water. Calculate the molality of the solution
- (a) 0.52 mol/kg (b) 1.03 mol/kg
(c) 1.44 mol/kg (d) 2.05 mol/kg

2. Choose the sum of 8 numbers whose mean is 40 from the following :

- (a) 5 (b) 40
(c) 320 (d) 400

3. Which part of the instrument is used to break large mass of liquid into small drops in atomic absorption spectroscopy?

- (a) Atomiser (b) Chopper
(c) Burner (d) Lamp source

4. Identify the light source used in the atomic absorption spectroscopy

- (a) Tungsten lamp
(b) Xenon mercury arc lamp
(c) Hydrogen or deuterium discharge lamp
(d) Hollow cathode lamp

5. Which part of the UV instrumentation is used to isolate the radiation of the desired wavelength from wavelength of the continuous spectra?

- (a) Monochromator (b) Radiation source
(c) Recorder (d) Mercury lamp

6. Identify the wave number region of near infrared spectrometer
(a) 4000-200 cm^{-1} (b) 200-10 cm^{-1}
(c) 4000-12500 cm^{-1} (d) 50-1000 cm^{-1}
7. Pick out the equation used to interpret the experimental data in cyclic voltammetry
(a) Nerst equation
(b) Ilkovic equation
(c) Boltzmann equation
(d) Bragg's equation
8. Choose the purpose of supporting electrolyte in polarography
(a) To minimize the diffusion current
(b) To minimize the migration current
(c) To increase the convection current
(d) To increase the residual current
9. Specify the spraying reagent in paper chromatography among the following
(a) Concentrated HCl
(b) NaCl solution
(c) CuSO_4 solution
(d) Ninhydrin solution

Page 3 Code No. : 20626 E

10. Calculate the Rf value if the distance travelled by solvent is 10 cm and distance travelled by component is 5
(a) 50 (b) 0.5
(c) 2 (d) 0.2

PART B — (5 × 5 = 25 marks)

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

11. (a) Distinguish between moles and molality. Discuss with suitable examples.
Or
(b) Examine the importance Average deviation and Standard deviation.
12. (a) Discuss instrumentation of atomic absorption spectroscopy.
Or
(b) Describe briefly the method of background correction in atomic absorption spectroscopy.

Page 4 Code No. : 20626 E

[P.T.O.]

13. (a) State and explain the Beer-Lambert's law and its validation.

Or

(b) Discuss the basic principles of UV-Vis. Spectroscopy.

14. (a) Discuss the instrumentation of Polarography.

Or

(b) Explain the principle of TGA and DTA.

15. (a) Analyse the development of chromatograms in chromatography technique.

Or

(b) Analyse the importance of Rf value in chromatography.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Describe carefully the Q-test which is applied for rejection or retention of an anomalous result with a suitable example.

Or

(b) What is meant by the term confidence limit? How is it determined? Mention its importance.

Page 5 Code No. : 20626 E

17. (a) Discuss the basic principles and significance of Atomic absorption spectroscopy.

Or

(b) Describe briefly the techniques of atomisation and sample introduction in Atomic absorption spectroscopy.

18. (a) Explain the principles and instrumentation in Infrared Spectroscopy.

Or

(b) Discuss briefly how UV-Vis. Spectroscopy is helpful in geometrical isomers and ketoenol tautomers with suitable examples.

19. (a) Assess the applications of TGA and DTA in the analysis of calcium acetate and calcium oxalate.

Or

(b) Analyse the instrumentation of TGA and DTA.

20. (a) Examine the principle of solvent extraction and the various factors affecting it.

Or

(b) Analyse principles of electrophoresis and TLC.

Page 6 Code No. : 20626 E