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Reg. No. :

Code No. : 20386 E Sub. Code : ESCH 41

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 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. The SI unit of density is

(a) kg/m^2 (b) kg/m

(c) kg/m^3 (d) kg/cm^2

2. Errors refer to the differences between

(a) Measured values and assumed values

(b) Measured values and adjusted values

(c) Measured values and known values

(d) Measured values and accepted values

3. The temperature range of Air-acetylene flame is

(a) 2600-2800°C (b) 1800-2000°C

(c) 2300-2400°C (d) 1800-2200°C

4. Background correction is used in AAS to provide

(a) Exact values

(b) Similar values

(c) Corrected values

(d) Accurate and receivable values

5. The Beer Lambert law is used to determine the

(a) Pressure (b) Concentration

(c) Refractive index (d) (a) and (b)

6. Maleic acid belongs to

(a) Optical isomer

(b) Geometrical isomer

(c) Both (a) and (b)

(d) None of the above

7. Which one of the following factor can affect TGA
- (a) Heating rate
 - (b) Sample preparation
 - (c) Sample homogeneity
 - (d) All the above
8. The advantage of polarography method is
- (a) Low sensitivity
 - (b) Can be used to determine simple thermal reactions
 - (c) High sensitivity
 - (d) None of the above
9. R_f value is defined as
- (a) $R_f = \frac{\text{Distance travelled by the compound}}{\text{Distance travelled by the solvent}}$
 - (b) $R_f = \frac{\text{Distance travelled by the solvent}}{\text{Distance travelled by the compound}}$
 - (c) $R_f = \frac{\text{Distance travelled by the solute}}{\text{Distance travelled by the compound}}$
 - (d) $R_f = \frac{\text{Distance travelled by the compound}}{\text{Distance travelled by the solute}}$

10. Which technique is used to separate and analyse mixtures of DNA, RNA and proteins
- (a) Paper chromatography
 - (b) TLC
 - (c) Electro phoresis
 - (d) HPLC

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Define the following:
- (i) Molality
 - (ii) Molarity
 - (iii) Normality
 - (iv) Percentage by weight.
- Or
- (b) Discuss on significant figures.

12. (a) Elaborate the basic principles of AAS instrumentation.

Or

- (b) How will you estimate the trace level of metal ions from water samples?

13. (a) How will you validate the beer-Lambert's law?

Or

- (b) Discuss on Keto-Emol tautomers.

14. (a) List out the factors affecting TGA/DTA.

Or

- (b) Write the principle of cyclic voltammetry.

15. (a) Write a note on the classification of separation and purification techniques.

Or

- (b) Explain Elution mechanism of separation.

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PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Define the following

(i) PPB

(ii) PPM

(iii) Density

(iv) Specific gravity.

Or

- (b) (i) Elaborate type of errors. (6)

(ii) Define standard deviation. (2)

17. (a) Explain :

(i) Choice of flame (4)

(ii) Burner designs. (4)

Or

- (b) Discuss the sources of chemical interferences and their removal in atomic absorption spectroscopy.

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18. (a) Describe the basic principles and instrumentation of UV-visible spectrometry.

Or

- (b) Discuss the basic principles and instrumentation of infrared spectroscopy.

19. (a) How will you analyse silver nitrate and calcium oxalate using thermal analytical methods?

Or

- (b) Account on the principle and instrumentation of polarography.

20. (a) Explain:

- (i) TLC (4)
(ii) Paper chromatography. (4)

Or

- (b) How will you prepare a column for chromatography and elaborate on the choice of adsorbents?