

**2025/TDC (CBCS)/ODD/SEM/  
CHMDSE-501T/439**

**TDC (CBCS) Odd Semester Exam., 2025**

**CHEMISTRY**

**( 5th Semester )**

Course No. : CHMDSE-501T

**( Analytical Methods in Chemistry )**

*Full Marks : 50*

*Pass Marks : 20*

*Time : 3 hours*

*The figures in the margin indicate full marks  
for the questions*

**UNIT—I**

**1. Answer any *three* of the following questions :**

**1×3=3**

- (a) What is *F*-test?
- (b) What is meant by absolute error?
- (c) What do you mean by sampling?
- (d) Which test is used for rejection of an outlier?

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2. Answer any *one* of the following questions : 2
- (a) What is *t*-test? What is its significance?
  - (b) Explain the term confidence level.
3. Answer any *one* of the following questions : 5
- (a) Define accuracy and precision. Explain the difference between them with suitable examples. 2+3=5
  - (b) What is *Q*-test? The data obtained for chloride analysis in a sample are reported in mg as 22.4, 20.4, 22.5, 20.8, 24.5, 25.5 and 10.4. Test whether the outlier can be accepted or rejected at 95% confidence limit. (Given  $Q_{\text{tab}} = 0.568$  for  $N = 7$  at 95% CL). 2+3=5

### UNIT—II

4. Answer any *three* of the following questions : 1×3=3
- (a) What is spin selection rule?
  - (b) Name one commonly used detector in UV-vis spectroscopy.
  - (c) What is the fingerprint region in IR spectroscopy?
  - (d) What is the main advantage of double beam IR spectrometer over single beam?

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5. Answer any *one* of the following questions : 2

(a) Give one application of Beer-Lambert law. Why does Beer-Lambert law fails at high concentration? 1+1=2

(b) What are meant by selection rules? Give the selection rule for IR spectroscopy. 1+1=2

6. Answer any *one* of the following questions : 5

(a) Discuss the basic principle of UV-visible spectroscopy. Explain Job's method for determination of metal complexes. 2+3=5

(b) Discuss the basic principle and instrumentation of IR spectroscopy.

### UNIT—III

7. Answer any *three* of the following questions :

1×3=3

(a) What is an atomizer?

(b) Name two interferences commonly used in AAS.

(c) What is nebulizer?

(d) What is flame emission spectroscopy?

8. Answer any *one* of the following questions : 2

(a) Name two commonly used atomization techniques used in AAS.

(b) Give two applications of AAS in environmental analysis.

9. Answer any *one* of the following questions : 5

(a) Discuss the role of background correction in flame atomic absorption spectroscopy for accurate determination of trace level metal ion.

(b) Discuss the basic principles and instrumentation of AAS.

#### UNIT—IV

10. Answer any *three* of the following questions :

1×3=3

(a) Mention two uses of TGA.

(b) Mention one advantage of conductometric titration over indicator titration.

(c) Name the electrode pair commonly used in pH-metric titration.

(d) What type of curve is obtained for conductometric titration for strong acid vs. strong base?

11. Answer any *one* of the following questions : 2
- (a) Why does the pH rise sharply near the equivalence point for a weak acid-strong base titration?
  - (b) Discuss the principle of potentiometric titration.
12. Answer any *one* of the following questions : 5
- (a) Compare conductometric titration and pH-metric titration in terms of principle and application.
  - (b) Discuss the principle of TGA. Explain the techniques for quantitative estimation of Ca and Mg from their mixtures with the help of TGA.

### UNIT—V

13. Answer any *three* of the following questions :  
1×3=3
- (a) Define the batch method of solvent extraction.
  - (b) What is an eluent?
  - (c) What is meant by development of a chromatogram?
  - (d) What is ion-exchange chromatography?

14. Answer any *one* of the following questions : 2

- (a) Give two applications of solvent extraction in analytical or industrial chemistry.
- (b) Define retention factor ( $R_f$ ) in chromatography. Define chelation. 1+1=2

15. Answer any *one* of the following questions : 5

- (a) Discuss the difference between adsorption chromatography and partition chromatography. Compare TLC and HPLC in terms of principle, efficiency and application. 2+3=5
- (b) Give an account of various techniques of solvent extraction.

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