TDC (CBCS) Odd Semester Exam., 2023

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

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SECTION—A

Answer *fifteen* questions, selecting any *three* from each Unit : 1×15=15

UNIT—I

1. What is sampling?

2. How is absolute error related to relative error?

3. What is standard deviation?

4. If the value of F in F-test is less than the critical value, what does it signify?

UNIT—II

5. What is the absorption range of UV-visible spectroscopy?

6. What do you mean by selection rule in spectroscopy?

7. Name the radiation sources used in IR spectroscopy.

8. What type of molecular transitions is probed by IR spectroscopy?

UNIT—III

9. With what material is the hollow cathode lamp constructed in AAS?

10. What is the function of monochromator in AAS?

11. What is flame emission spectroscopy?

12. Give an example of fuel-oxidant mixture used in AES.

UNIT—IV

13. Define pH.

14. What is thermogravimetry?

15. Sketch the plot obtained when a mixture of strong and weak acids undergoes conductometric titration against strong base.

16. What is cell constant?

UNIT—V

17. What is the main purpose of solvent extraction in chemical processes?

18. Give one example each for polar and non-polar solvents.

19. Define partition coefficient.

20. Fill in the blank :
Paper chromatography is an example of _____ chromatography.

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SECTION—B

Answer *five* questions, selecting *one* from each Unit : 2×5=10

UNIT—I

21. Differentiate accuracy from precision.

22. Explain the term 'confidence interval'.

UNIT—II

23. How can you distinguish keto-enol tautomers by UV-visible spectroscopy?

24. What is the fingerprint region in IR spectroscopy? Why is it so called? 1+1=2

UNIT—III

25. What is sputtering in AAS?

26. Write the principle of AES.

UNIT—IV

27. Discuss thermogram in TGA.

28. Write the differences between end point and equivalence point in a titration.

UNIT—V

29. Write the principle of TLC.

30. Explain the role of chelating agent in solvent extraction.

SECTION—C

Answer *five* questions, selecting *one* from each Unit : 5×5=25

UNIT—I

31. *(a)* What is a *Q*-test? 2

(b) The analysis of a calcite sample yielded CaO percentage of 55·95, 56·00, 56·04, 56·08 and 56·23. The last value appears anomalous. Should it be retained or rejected at 95% confidence interval ($Q_{critical}$ at 95% confidence interval is 0·71)? 3

32. *(a)* What is meant by normal distribution? What are the characteristics of normal distribution? 1+2=3

(b) How will you minimize determinate errors in a chemical analysis? 2

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UNIT—II

33. *(a)* Discuss the basic principle of UV-visible spectroscopy. 2

(b) Briefly describe the instrumentation of a double-beam UV-visible spectrophotometer. 3

34. *(a)* What is IR spectroscopy? Write the principle of IR spectroscopy. 1+2=3

(b) Discuss the sampling techniques used in IR spectroscopy. 2

UNIT—III

35. Explain the basic principle of AAS. What is the importance of calibration curve in AAS? 3+2=5

36. *(a)* Define interferences in AAS. 1

(b) Discuss the different types of chemical interferences encountered in AAS along with their suitable remedies. 4

UNIT—IV

37. *(a)* What is potentiometric titration? 1

(b) Explain the principle of potentiometric titration. 2

(c) Mention some applications of potentiometric titration. 2

38. Discuss the principle and instrumentation of TGA. 2+3=5

UNIT—V

39. *(a)* What are cationic and anionic exchangers? 2

(b) Write the working principle of ion-exchange chromatography. 3

40. *(a)* Explain the countercurrent extraction method in solvent extraction. What is the primary advantage of this method? 2+1=3

(b) Mention some applications of solvent extraction. 2

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