

2023/FYUG/ODD/SEM/
CHMSEC-101T/095

FYUG Odd Semester Exam., 2023
(Held in 2024)

CHEMISTRY

(1st Semester)

Course No. : CHMSEC-101T

(Separation Techniques)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

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

SECTION—A

Answer *fifteen* as directed, selecting *three* from
each Unit : 1×15=15

UNIT—I

1. Name two common organic solvents used in solvent extraction process.
2. What is distribution coefficient?

(2)

3. Impure sample of naphthalene can be purified by _____.

(Fill in the blank)

4. Which class of compounds is often purified by steam distillation?

- (a) Alkanes
- (b) Alcohols
- (c) Halogens
- (d) Anilines

(Choose the correct option)

UNIT—II

5. Define stationary phase and mobile phase in chromatography.

6. Give two uses of column chromatography.

7. How are chromatography classified based on mechanism of separation?

8. What do you mean by locating agent?

UNIT—III

9. What is ion-exchange chromatography?

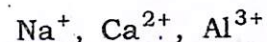
10. Give one example each of cation exchanger and anion exchanger.

24J/534

(Continued)

(3)

11. Arrange the following ions in order of capacity to undergo exchange reaction :



12. What are zeolites?

UNIT—IV

13. Define ore with an example.

14. What are gangue and slag?

15. Which of the following is not an ore of iron?

- (a) Hematite
- (b) Magnetite
- (c) Bauxite
- (d) Limonite

(Choose the correct option)

16. What is copper matte?

UNIT—V

17. Which of the following reagents is used to separate a mixture of *p*-nitrotoluene and *p*-anisidine?

- (a) Sodium hydroxide
- (b) Sodium bicarbonate
- (c) Hot ethanol
- (d) All of the above

(Choose the correct option)

24J/534

(Turn Over)

(4)

18. What is the locating agent for amino acids in paper chromatographic separation?
19. What are the stationary and mobile phases in paper chromatography?
20. Name two commonly used adsorbents in thin-layer chromatography (TLC).

SECTION—B

Answer five questions, selecting one from each
Unit : $2 \times 5 = 10$

UNIT—I

21. Write the principle of solvent extraction. Name the apparatus used in this process.
 $1\frac{1}{2} + \frac{1}{2} = 2$

22. What are the differences between simple distillation and fractional distillation?

UNIT—II

23. What is retention factor? How is it calculated?
 $1 + 1 = 2$

24J/534

(Continued)

(5)

24. Discuss the frontal development of chromatography.

UNIT—III

25. What are the characteristics of cation and anion exchanger?
26. What are the advantages and limitations of ion-exchange chromatography?

UNIT—IV

27. Discuss froth floatation process for the concentration of copper pyrites.
28. What are meant by calcination and roasting of ore?

UNIT—V

29. How would you separate a mixture of benzoic acid and *p*-toluidine using common laboratory reagent?
30. What are the differences between ascending and descending paper chromatography?

24J/534

(Turn Over)

(6)

SECTION—C

Answer *five* questions, selecting *one* from each

Unit : $5 \times 5 = 25$

UNIT—I

31. (a) What are chelates? Discuss the mechanism of extraction by chelation. $1+2=3$
(b) Write a short note on batch extraction. 2
32. (a) Write briefly the principle of purification by crystallization. What are the criteria for the selection of solvent for crystallization? $1\frac{1}{2}+1\frac{1}{2}=3$
(b) Describe briefly the method of separation of acetone and water from their mixture by fractional distillation. 2

UNIT—II

33. (a) What is chromatography? Discuss the basic principle of column chromatography. $1+2=3$
(b) What is HPLC? What advantages does it offer over other chromatographic method? $1+1=2$

(7)

34. (a) Discuss the mechanism of separation in adsorption chromatography. $2\frac{1}{2}$
(b) Describe the procedure of thin-layer chromatography. $2\frac{1}{2}$

UNIT—III

35. Discuss the principle and mechanism of ion-exchange chromatography. $2+3=5$
36. (a) Discuss the process of separation of lanthanides by ion-exchange chromatography. 3
(b) How is demineralization of water done using ion-exchange column? 2

UNIT—IV

37. Describe the extraction and purification processes of iron from haematite ore mentioning the chemical reactions involved in the blast furnace. 5
38. What is the important ore of aluminium? Describe the different steps involved in the metallurgy of aluminium from that ore. $1+4=5$

UNIT—V

39. Describe the steps involved in developing a chromatogram during separation of two sugar mixtures using ascending paper chromatography (from sample application to visualization of separated spots). What are the factors affect this separation process? 4+1=5
40. Describe the principle and process of separation of a mixture containing *p*-nitrobenzoic acid and *p*-aminobenzoic acid using their solubility differences. 2+3=5
