

2026

6th Semester Examination (CCFUP : NEP)

CHEMISTRY

Paper : MDSE 2-T

(Single Core Major Elective-2)

Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

(Analytical Methods in Chemistry)

Group - A

Answer any *five* questions : $2 \times 5 = 10$

1. Why KBr pellet is used to measure infrared spectroscopy (IR) in solid state?
2. Why does the optimum flow rate increase with decreasing particle size of the stationary phase in chromatography?
3. What is meant by BOD and COD values in water analysis?

P.T.O.



(2)



4. What is meant by t-test?
5. What are systematic and random errors?
6. Write down two applications of HPLC.
7. Explain the terms 'resonance line' and 'atomic fluorescence'.
8. Distinguish between cation exchange resin and anion exchange resin.

Group - B

Answer any *four* questions : $5 \times 4 = 20$

9. Describe the physical and chemical composition of soil with suitable examples. How is the pH of soil determined? $2.5 + 2.5$
10. Establish the mathematical relationship between Absorbance and Transmittance. Draw the graph of Absorbance versus Concentration. Discuss the possible causes responsible for the deviation from Lambert-Beer's law. $2 + 1 + 2$
11. Discuss the causes of water contamination and explain how water quality is assessed using BOD and COD. $2 + 3$
12. Explain the basic principle of thermogravimetric analysis (TGA). Explain the stepwise dehydration and decomposition reactions observed in TGA analysis of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. $2 + 3$

(3)

13. Why is a hollow cathode lamp used in AAS? What is meant by the cold-vapour technique in AAS? Explain why no-flame is required in this method and mention its analytical applications. $1.5 + 1.5 + 1 + 1$

14. (a) The result of a quantitative analysis is 46.59g compared with the accepted value of 46.75g. What is the relative error in parts per thousand?

(b) Define the terms 'accuracy' and 'precision'. $2 + 3$

Group - C

Answer any *one* question : $10 \times 1 = 10$

15. (a) What is meant by 'extraction by chelation' and 'extraction by solvation'?
- (b) What do you mean by R_f value? Is its value fraction or not?
- (c) Why are chelating agents important in metal ion extraction?
- (d) Differentiate between mobile and stationary phase in TLC.
- (e) Differentiate between Gas-Solid Chromatography (GSC) and Gas-Liquid Chromatography (GLC). $2 + 2 + 2 + 2 + 2$



(4)

16. (a) Which of the following compounds are IR inactive and why?



(b) How do you determine the composition of metal complexes using Job's method?

(c) Compare between single and double beam IR instrument.

2+5+3



(5)

OR



(Inorganic Materials of Industrial Importance)

Group - A

Answer any *five* questions :

2×5=10

1. Why is gypsum added to cement?
2. What are siloxanes?
3. What is triple superphosphate?
4. Mention two differences between organic and inorganic polymers.
5. Define borosilicate glass.
6. Explain nitriding process used in steel industry.
7. What is hydrometallurgy?
8. What is zone refining?

Group - B

Answer any *four* questions :

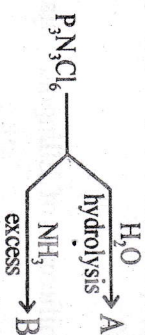
5×4=20

9. (a) How do you prepare Ni from $\text{Ni}(\text{CO})_4$ using Mond's process?
- (b) Explain the significance of Ellingham diagram in metallurgy.

2+3

(6)

10. (a) What is borazole? Why is it called inorganic benzene?
(b) Differentiate between roasting and calcination.
11. (a) Discuss the theory of setting and hardening of Portland cement.
(b) What is the composition of German silver alloy?
12. (a) Write down the structure and bonding of phosphazenes.
(b) Differentiate between silicate and non-silicate glass.
13. (a) Explain desulfurization in steel manufacture.
(b) Describe the manufacturing process of one nitrogenous fertilizer.
14. (a) What are the advantages of biofertilizers over chemical fertilizers?
(b) Give the products A and B :



(c) What is copper matte?

2+2+1

(7)

Group - C

Answer any **one** question : 10×1=10

15. (a) Why is carbon used for reduction of ZnO ?
(b) Continuous use of chemical fertilizers leads to the loss of fertility of soil — Explain.
(c) Describe manufacture process of common soda lime glass with a neat flow diagram.
(d) Write down the principle of vapour phase refining.
(e) Write the structure of the product formed —
- $$(\text{CH}_3)_3\text{SiCl} \xrightarrow{\text{hydrolysis}} ?$$
16. (a) Copper can be extracted by hydrometallurgy but not zinc — Explain.
(b) Describe the preparation, structure and uses of silicones.
(c) Write a short note on coloured glass.
(d) Write down the composition of portland cement.
(e) What is stainless steel?

2+3+2+2+1

