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# B.M.S COLLEGE FOR WOMEN AUTONOMOUS 

BENGALURU - 560004
SEMESTER END EXAMINATION - SEPTEMBER- 2023
B.Sc in Chemistry - $\mathbf{2}^{\text {nd }}$ Semester

## ANALYTICAL, PHYSICAL AND ORGANIC CHEMISTRY - PAPER II (NEP Scheme 2021-22 onwards F+R)

Course Code: CHE2DSC02
QP Code:2014
Duration: $21 / 2$ Hours
Max. marks: 60

## Instructions: 1. The Question Paper has three Parts. Answer all the Parts.

2. Write the chemical equations and diagrams wherever necessary.
PART-A

Answer any FIVE of the following questions. Each question carries TWO marks.

1. What is a metal ion indicator? Give an example.
2. Define the limit of detection (LOD) in Analytical chemistry.
3. Mention the electrophiles involyed in sulphonation and nitration of benzene.
4. What is meant by ipso substitution? Give an example.
5. Define molar refraction.
6. Calculate the most probable velocity of oxygen molecules at 300 K . (Given $\mathrm{R}=8.314 \mathrm{JK}^{-1} \mathrm{~mol}^{-1}$ ).
7. State the law of constancy of interfacial angle.
PART - B

Answer any FOUR of the following questions. Each question carries FIVE marks. (5X4=20)
8. Describe the determination of temporary hardness of water.
9. (a) Explain the factors influencing precipitation.
(b) Mention any two organic reagents used in gravimetry.
10. (a) Explain $\mathrm{S}_{\mathrm{N}} \mathrm{Ar}$ mechanism with a suitable example.
(b) Mention the role of chlorine atom in chlorobenzene towards electrophilic substitution
reactions.
11. (a) Define (i) Collision frequency; (ii) mean free path of gas molecules
(b) What is meant by compressibility factor?
12. (a) Describe the elucidation of structure of benzene using Parachor values.
(b) State the law of corresponding states.
13. (a) 0.676 g of an organic compound of molar mass $152 \mathrm{~g} \cdot \mathrm{~mol}^{-1}$ when dissolved in 40 g of acetone raised the boiling point of acetone from 329.3 K to 329.5 K . Calculate the ebullioscopic constant of acetone.
(b) What is meant by osmotic pressure of a solution?

## PART - C

Answer any THREE of the following questions. Each question carries TEN marks.
(3X10=30)
14. (a) Define co-precipitation.
(b) Draw the precipitation titration curve and indicate the equivalence point in the titration.
(c) Explain the Mohr's method of precipitation titrimetry.
(d) What is meant by figures of merit? Mention any two types for figures of merit.
15. (a) With energy profile diagram explain the mechanism of $\mathrm{S}_{\mathrm{N}} 1$ reaction.
(b) Explain the orienting influence of - OH group in phenol towards electrophilic substitution reactions.
16. (a) Describe Cagniard de la Tour method to determine the critical temperature and critical pressure of a gas.
(b) Describe the determination of Viscosity of a liquid using Ostwald's viscometer.
(c) What is Joule Thomson effect?
17. (a) Describe the Beckmann method of determination of molar mass of a solute.
(b) What are (i) simple extraction and (ii) multiple extractions? Why multiple extractions are more beneficial?
(c) What is benzyne? Give the mechanism of generation of benzyne.
18. (a) Benzoic acid distributes itself between water and toluene as follows:

| Concentration of benzoic acid in <br> water $c_{1}(\mathrm{~g} / \mathrm{L})$ | 0.75 | 0.98 | 1.48 |
| :--- | :---: | :---: | :---: |
| Concentration of benzoic acid in <br> toluene $c_{2}(\mathrm{~g} / \mathrm{L})$ | 12.1 | 20.6 | 48.5 |

Show that benzoic acid exists as a dimer in toluene.
(b) Derive Bragg's equation, $n \lambda=2 d \sin \theta$.
(c) Find the Miller indices for a crystal plane, which cut the crystallographic axes at ( $2 a, 3 b, 2 c$ ).

