

CHEMISTRY-III

Paper-CC-3 / MCC-4 : B23-CHE-301

Time allowed : 3 Hours]

[Maximum Marks : 40

Note : Attempt five questions in all, selecting **one** question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all questions:

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| (i) What is inorganic benzene? | 1½ |
| (ii) Define catenation. | 1½ |
| (iii) What is the effect of dilution on molar conductance and specific conductance of an electrolyte solution? | 2 |
| (iv) R and S stand for ? | 1½ |
| (v) Draw energy profile diagram of S_N1 reaction with suitable example. | 1½ |

UNIT-I

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|---|---|
| 2. (a) Explain structure and bonding in diborane $[B_2H_6]$. | 3 |
| (b) What are carbides? Discuss interstitial carbides. | 3 |
| (c) Draw and discuss the structure of XeF_4 . | 2 |

3. (a) Compare acidic character of the followings:
 HClO , HClO_2 , HClO_3 and HClO_4 . 3
- (b) Why NaOH is stronger base than Ba(OH)_2 ? 2
- (c) Draw and explain cyclic silicates. 3

UNIT-II

4. (a) Define Kohlrausch's Law and explain its three applications. 3
- (b) Define Handerson Hazel equation for buffer solutions. 3
- (c) The equivalent conductivity of an N/10 solution of a monobasic acid is $45 \text{ Ohm}^{-1} \text{ cm}^2$ and at infinite dilution it is $380 \text{ Ohm}^{-1} \text{ cm}^2$. Calculate the dissociation constant of the acid. 2
5. (a) Write a note on Calomel electrode. 3
- (b) Explain potentiometric titration using glass electrode. 2
- (c) Can a solution of 1 M copper sulphate be stored in a vessel made of Nickel metal? Given that: 3

$$E^\circ_{\text{Ni}, \text{Ni}^{2+}} = 0.25 \text{ Volt and } E^\circ_{\text{Cu}, \text{Cu}^{2+}} = 0.34 \text{ Volt.}$$

UNIT-III

6. (a) What are terminal and non-terminal alkynes? Give one example of each. 3
- (b) Explain Kolbe's electrolytic reaction to synthesis acetylene. 2

- (c) Write hydroboration followed by oxidation of 2-butyne reaction as electrophilic addition reaction of alkynes. 3
7. (a) What do you mean by metamerism? Give two examples. 2
- (b) Distinguish between enantiomers and diastereomers with suitable examples. 3
- (c) Write the keto-enol forms of acetoacetic ester and pentane-2,4-dione. 3

UNIT-IV

8. (a) Explain Huckel's rule of aromaticity. 2
- (b) Write the mechanism of nitration of benzene using nitrating mixture. 3
- (c) What do you understand by the term 'Orientation'? Explain with example, how in aromatic compounds further substitution is governed by the nature of substituent already present in the ring? 3
9. (a) Write and explain Williamson's synthesis reaction. 2
- (b) Arrange the following halides in reactivity order towards nucleophilic substitution reaction:
 CH_3F , CH_3Cl , CH_3Br and CH_3I . 2
- (c) Why aryl halides are less reactive than alkyl halides towards nucleophilic substitution reaction? 2
- (d) Give the elimination addition mechanism of conversion of chlorobenzene into aniline. 2

**THERMODYNAMICS & STATISTICAL
PHYSICS**

Paper-CC-3/MCC-4 : B23-PHY-301

Time allowed : 3 Hours]

[Maximum Marks : 50

Note : Attempt five questions in all, selecting one question from each unit. Question No. 1 is compulsory. All questions carry equal marks. The symbols have their usual meaning.

Compulsory Question

1. Attempt all questions: $5 \times 2 = 10$
- (i) State first law of Thermodynamics. What are limitations of first law of Thermodynamics?
 - (ii) How does the Clausius-Clapeyron equation explain the change in boiling point with pressure?
 - (iii) Difference between Statistical Probability and Priori Probability.
 - (iv) Write the factors which determine the Thermodynamics Probability of a macrostate.
 - (v) Distinguish between classical and quantum statistics.

UNIT-I

2. (a) State and prove Carnot's theorem. 7
(b) What is the difference between Joule-Thomson effect and Adiabatic cooling? 3
3. (a) Define Entropy. Show that change in Entropy over a reversible cycle is always zero. 5
(b) What is Adiabatic demagnetisation? 3
(c) Calculate the change in Entropy when 10 gram of ice at 0°C is converted into water at the same temperature. 2

UNIT-II

4. (a) Derive Clausius-Clapeyron's equation: 8
$$\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$$

(b) Calculate the specific heat of saturated steam from second latent heat equation. Given: 2
 $L = 22.7 \times 10^5 \text{ J Kg}^{-1}$, $T = 373 \text{ K}$, $\frac{dL}{dT} = 2688 \text{ J Kg}^{-1} \text{ K}^{-1}$,
 $C_1 = 4242 \text{ J Kg}^{-1} \text{ K}^{-1}$. Explain the meaning of negative value obtained.
5. (a) Draw and explain P-T Phase diagram of water. What is Triple point. 5
(b) Explain the four Thermodynamical function. 5

UNIT-III

6. (a) Prove that Entropy of a system is proportional to the logarithm of probability of that system. Identify K. 6

- (b) Discuss the common approach in dealing with M-B, B-E and F-D statistics. 4
7. (a) Using Maxwellian speed distribution, derive expression for: Most probable speed, Average speed and Root mean square speed of molecule. 8
- (b) Find the temperature at which the average speed of molecule of nitrogen gas is $1/\sqrt{7}$ times the average speed of oxygen gas molecules at 300K. 2

UNIT-IV

8. (a) Explain Dulong and Petit Law. Give discrepancy of Dulong and Petit's model for specific heat of solids. 8
- (b) Show that Maxwell-Boltzmann distribution is the limiting case of Bose Einstein distribution. 2
9. (a) Using B-E distribution law, derive Planck's law for black body relation. 6
- (b) Comparison of Maxwell-Boltzmann, Bose Einstein and Fermi Dirac statistics. 4

OPERATING SYSTEM

Paper-CC-3 / MCC-4 : B23-CSE-301

Time allowed : 3 Hours]

[Maximum Marks : 50

Note : Attempt five questions in all, selecting one question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all questions:

- (i) What is Real Time and Time Sharing operating system?
- (ii) Define Semaphores.
- (iii) Write characteristics of Multi user operating system.
- (iv) Define process and its states.

UNIT-I

- 2. (a) Define Operating system, its structure.
- (b) Discuss Multi-programming versus Multi-processing.
- 3. (a) What is concept of process management?
- (b) Discuss Inter-Process Communication.

UNIT-II

- 4. What is CPU scheduling, explain Multiple Processor Scheduling.

5. (a) Discuss critical section problem, give reference to Dining Table Problem.
(b) Explain Deadlock Prevention, Avoidance and Deadlock Recovery.

UNIT-III

6. Explain Partitioning, Swapping and Contiguous Memory Allocation.
7. Write note on the following:
 - (a) Demand Paging.
 - (b) Discuss Page Replacement Algorithms.

UNIT-IV

8. What is Disk Scheduling? Explain Disk Scheduling Algorithms.
9. Write note on the following:
 - (a) Discuss types of File and operations on a File.
 - (b) Explain structure and operations on Sequential File.