



Paper ID : 260798

Subject Code: KAS202

Roll No:

BTECH

(SEM. II) THEORY EXAMINATION 2025-26

CHEMISTRY

TIME: 3 HRS

M.MARKS: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

2x10 = 20

(a)	Mention the rules for LCAO method for the formation of molecular orbitals	CO-1	K2
(b)	What is Schottky defect in solids?	CO-1	K2
(c)	What is rotational spectroscopy? Mention one of its applications.	CO-2	K2
(d)	What is meant by wave length in vibrational spectroscopy?	CO-2	K2
(e)	How much rust ($\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) will be formed when 100 kg of iron have completely rusted away?	CO-3	K2
(f)	What are the advantages of phase rule?	CO-3	K2
(g)	Why does hard water consume a lot of soap?	CO-4	K2
(h)	What is meant by calorific value of coal? Distinguish between gross and net calorific values.	CO-4	K2
(i)	Classify the polymers on the basis of stereochemistry.	CO-5	K2
(j)	Differentiate between thermosetting and thermoplastic polymers.	CO-5	K2

SECTION B

2. Attempt any *three* of the following:

10 x 3 = 30

(a)	Draw molecular orbital diagrams and calculate bond order for (i) N_2 (ii) CO .	CO-1	K2
(b)	Describe the theory and selection rules of vibrational (IR) spectroscopy. Explain why IR spectroscopy cannot detect homonuclear diatomic molecules like N_2 or O_2 .	CO-2	K2
(c)	Derive the Nernst equation for a concentration cell. Calculate the EMF of a concentration cell at 298 K when the concentrations of the electrolyte are 0.1 M and 0.01 M.	CO-3	K3
(d)	Define hardness of water. Explain the types of hardness. A 50 mL water sample requires 10 mL of 0.01M EDTA solution for complete titration. Calculate the total hardness of water in terms of CaCO_3 (mg/L).	CO-4	K3
(e)	Write a short note on (i) conducting polymer (ii) biodegradable polymer.	CO-5	K3

P.T.O.

SECTION C

3. Attempt any *one* part of the following:

10 x 1 = 10

(a)	What are liquid crystals? Explain the classification of liquid crystals, namely nematic, smectic, and cholesteric liquid crystals and mention their important applications.	CO-1	K3
(b)	On the basis of band theory, differentiate between conductors, semiconductors and insulators.	CO-1	K3

4. Attempt any *one* part of the following:

10 x 1 = 10

(a)	(i) Predict possible electronic transitions in following compounds: CH_3CHO , $\text{CH}_3\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{CH}=\text{CH}_2$ and $\text{CH}_3\text{CH}=\text{CHCH}=\text{CHCH}_3$. Explain different types of absorption and intensity shifts in UV-visible spectroscopy.	CO-2	K3
(b)	Explain Stokes and Anti-Stokes Raman scattering in detail. What are the advantages and limitations of Raman Spectroscopy?	CO-2	K3

5. Attempt any *one* part of the following:

10 x 1 = 10

(a)	(i) Explain the mechanism of hydrogen evolution and oxygen absorption in electro chemical corrosion. (ii) Discuss any three methods of corrosion control.	CO-3	K2
(b)	Explain the phase rule. Apply the Gibbs phase rule to the one-component water system and analyze the significance of triple point and critical point with the help of a neat phase diagram.	CO-3	K3

6. Attempt any *one* part of the following:

10 x 1 = 10

(a)	Explain construction and working of Bomb calorimeter. A coal has the following composition by weight C = 90%, O = 3.0%, S = 0.5 %, and N = 0.5% and ash = 2.5%. Net calorific value of the coal was found to be 8490.5 kcal/kg. Calculate the percentage of hydrogen and gross calorific value of coal.	CO-4	K4
(b)	Explain ion-exchange process for softening of water. What are the limitations of this process?	CO-4	K3

7. Attempt any *one* part of the following:

10 x 1 = 10

(a)	Write the preparation, properties and uses of the following: (i) Decron (ii) Neoprene (iii) Buna-N (iv) Nylon-66 (v) Nylon-6	CO-5	K2
(b)	Give the preparation and properties of Grignard reagent.	CO-5	K3