Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III EXAMINATION – WINTER 2025

Subject Code:3130506 Date:12-12-2025

Subject Name: Applied Chemistry

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Write a short note on Magnetic Properties of the substances.	**03**
	(b)	Outline the followings: Specific rotation, Optical activity, Diasteromer and Enantiomer.	**04**
	(c)	Show that Depression in freezing point is colligative property. 45 g of ethylene glycol ($C_2H_6O_2$) is mixed with 600 g of water (Given: K_f of water = 1.86 K kg mol^{-1}). Calculate (i) the freezing point depression and (ii) the freezing point of the solution	**07**
Q.2	**(a)**	Explain the fission of a covalent bond.	**03**
	(b)	Summarize the importance of Resonance effect with suitable examples.	**04**
	(c)	What are reactive intermediates? Outline the structure, properties, stability and significance of Carbocations, Carboanion and Carbenes.	**07**
		OR	
	(c)	Discuss the organic reactions mechanisms of Acylation, Nitration, Sulphonation and Alkylation of toluene.	**07**
Q.3	**(a)**	Define wave function and write its significance.	**03**
	(b)	Explain the conformational isomerism in n-butane.	**04**
	(c)	Explain the hybridization, describe the bonding in molecules using hybridization concept (make use of suitable examples).	**07**
		OR	
Q.3	**(a)**	Interpret Heisenberg Uncertainty Principle	**03**
	(b)	Discuss the two methods of resolution of racemic mixtures.	**04**
	(c)	Outline the phase diagram of the Ferric chloride-water system and explain its salient features.	**07**
Q.4	**(a)**	Define: Glass Transition Temperature, Liquid Crystal and viscoelasticity.	**03**
	(b)	The heat of combustion of methane is -890.65kJ mol-1 and heat of formation of CO_2 and H_2O are -395.5kJ mol-1 and 286.0kJ.mol-1 respectively. Calculate the heat of formation of methane. (R=8.314J/K/ mol).	**04**
	(c)	What is the half-life period of a reaction? Derive the equation for first order reaction.	**07**

OR

Q.4	**(a)**	Explain the followings by taking suitable examples. i) Heat of transition *and* ii) Heat of neutralization.	**03**
	(b)	A first order reaction is 10% completed in 20 minutes. How long will it take to be 70% complete?	**04**
	(c)	Explain mathematical expression for the rate constant of the second order reaction.	**07**
Q.5	**(a)**	Write a short note on the Nano Composites.	**03**
	(b)	Write down the properties and uses of insulators.	**04**
	(c)	Explain the principle, instrumentation and applications of SEM.	**07**

OR

Q.5	**(a)**	Write down the properties and uses of Silicates.	**03**
	(b)	Explain the principles of Florescence spectroscopy	**04**
	(c)	Explain the principle, instrumentation and applications of PSA.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code: 3130506 **Date: 26-11-2024**

Subject Name: Applied Chemistry

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Write applications of applied chemistry in the service of society.	**03**
	(b)	Explain optical activity by taking tartaric acid as example.	**04**
	(c)	Write notes on: Viscosity, Depression in freezing point, Molarity, Osmosis, Hybridization, Enthalpy, Electronegativity.	**07**
Q.2	**(a)**	Describe following terms: Phase, component, degree of freedom	**03**
	(b)	Explain following terms: Order of stability for free radicals, Intermediate of chlorination of benzene, Markovnikov's rule, Inductive effect	**04**
	(c)	Recognize the type of reaction and support the explanation with mechanism for Synthesis of Methyl alcohol from methyl chloride.	**07**
		OR	
	(c)	Write difference between SN1 and SN2 reactions with detailed mechanism.	**07**
Q.3	**(a)**	Explain: Zeolites, Nanocomposites, Glass transition temperature	**03**
	(b)	Write detailed discussion on Molecular orbital theory with example.	**04**
	(c)	What is phase rule? Explain phase diagram of one component system taking example of water.	**07**
		OR	
Q.3	**(a)**	What is Heisenberg uncertainty principle?	**03**
	(b)	A first order reaction is 20 % completed in 10 minutes. Calculate the time taken for the reaction to go to 80 % completion.	**04**
	(c)	Explain two component silver-lead system with appropriate diagram and details.	**07**
Q.4	**(a)**	Compare and contrast between Enantiomers and diastereomers.	**03**
	(b)	Explain sp3 hybridization with structure bonding and shape of **CH_4, NH_3, H_2O**.	**04**
	(c)	What is first order of reactions? Derive rate law for the first order of reaction, also writes the unit of rate constant.	**07**
		OR	
Q.4	**(a)**	Give details of Schrodinger Wave Equation.	**03**
	(b)	Define: Molecularity of reaction, rate law, E-Z isomers, R-S Configuration	**04**

(c) Vishnu synthesized nitrobenzene from benzene in applied chemistry lab. Help him in solving following details: **07**

(i) Chemical Reaction
(ii) Recognizing type of mechanism (name only)
(iii) Intermediate formed
(iv) Spectroscopic characterization

Q.5 **(a)** Elaborate engineering applications of ceramics, refractories and insulators. **03**

(b) Explain following terms: (i) Florescence, (ii) Heat of combustion (iii) Exothermic reactions (iv) Shielding effect **04**

(c) The equation for the calculation is as following: **07**

$$C_4H_{10}O_{(l)} \rightarrow C_4H_{8(g)} + H_2O_{(g)}$$

Calculate the enthalpy change, in kJ mol^{-1}, by using the data given below and also write the statement of law governing this.

$$4C_{(s)} + 5H_{2(g)} + \tfrac{1}{2}O_{2(g)} \rightarrow C_4H_{10}O_{(l)} \quad \Delta H = -335 \text{ kJ mol}^{-1}$$

$$4C_{(s)} + 4H_{2(g)} \rightarrow C_4H_{8(g)} \quad \Delta H = -17 \text{ kJ mol}^{-1}$$

$$H_{2(g)} + \tfrac{1}{2}O_{2(g)} \rightarrow H_2O_{(g)} \quad \Delta H = -242 \text{ kJ mol}^{-1}$$

OR

Q.5 **(a)** What is surface characterization? Suggest few methods for the same. **03**

(b) What is Hess's law? Explain its applications. **04**

(c) Write principle of Mass spectroscopy also give details of instrument and its specific applications. **07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2023

Subject Code:3130506 Date:16-01-2024

Subject Name:Applied Chemistry

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Show the measurement of Boiling point Elevation.	**03**
	(b)	Define: Reaction rate, Molecularity of a reaction, Enantiomers & Specific rotation.	**04**
	(c)	Explain with principle, instrumentation of mass spectroscopy.	**07**
Q.2	**(a)**	Explain the E and Z designation of Geometrical isomers.	**03**
	(b)	Define Term: Molality, Dipole Moment, Carbenes, Heterolytic fission.	**04**
	(c)	Give the types of Organic reaction and discuss Electrophilic Substitution reaction.	**07**
		OR	
	(c)	Describe the optical activity of Lactic acid and Tartaric acid.	**07**
Q.3	**(a)**	Derive Schrodinger Wave Equation.	**03**
	(b)	Discuss SP^2 Hybridization with suitable example.	**04**
	(c)	Explain the Molecular Orbital Theory.	**07**
		OR	
Q.3	**(a)**	Give the application of XRD.	**03**
	(b)	Determine ΔH of the reaction: $C(s) + 2H_2(g) \rightarrow CH_4(g)$ from the following data: (i) $C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.7$ kJ (ii) $H_2(g) + ½\ O_2(g) \rightarrow H_2O(l)$ $\Delta H = -285.7$ kJ (iii) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ $\Delta H = -890.3$ kJ	**04**
	(c)	Draw the phase diagram of Ferric chloride-Water system. Describe its importance.	**07**
Q.4	**(a)**	Elaborate zero order reaction with suitable example.	**03**
	(b)	Define: Phase, Eutectic point, heat of neutralization, Exothermic reaction.	**04**
	(c)	Draw the phase diagram of one component system and discuss its salient features.	**07**
		OR	
Q.4	**(a)**	Discuss Pseudo order reaction.	**03**
	(b)	A solution of H_2O_2 when titrated against $KMnO_4$ solution at different time intervals gave the following results:	**04**

T(minutes)	**0**	**10**	**20**
Vol. of $KMnO_4$ used for 10 ml H_2O_2	23.8 ml	14.7 ml	9.1 ml

Selecting the above data, show that the decomposition of H_2O_2 is a first order reaction.

(c) Explain mathematical expression for the rate constant of the second order reaction. **07**

Q.5 **(a)** Write a note on zeolite. **03**

(b) Discuss the classification of ceramics with their general properties. **04**

(c) Describe each section of Transmission Electron Microscope. **07**

OR

Q.5 **(a)** What are liquid crystals and types? Give its uses. **03**

(b) Write a note on Insulators with their uses. **04**

(c) Explain the principle, instrumentation of Nuclear magnetic resonance spectroscopy. **07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3130506 Date:22-02-2023

Subject Name:Applied Chemistry

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define molarity and molality.	**03**
	(b)	Explain the importance of nan-composites.	**04**
	(c)	Differentiate between S_N1 and S_N2 reactions. Give one example of each.	**07**
Q.2	**(a)**	Identify *ortho-, para*-directing groups; -CN, $-NH_2$, -OH, $-NO_2$, -COOH, $-CH_3$.	**03**
	(b)	Explain Beer-Lambert law.	**04**
	(c)	Draw the phase diagram of Zinc-Cadmium system. Describe its importance.	**07**
		OR	
	(c)	Derive the expression for a first order reaction.	**07**
Q.3	**(a)**	Differentiate between nematic phase and smectic phase.	**03**
	(b)	Suggest a method for resolution of racemic mixture.	**04**
	(c)	Explain the optical isomerism in lactic and tartaric acid.	**07**
		OR	
Q.3	**(a)**	Differentiate between refractories and insulators.	**03**
	(b)	Suggest a suitable bonding theory to explain paramagnetic behavior of O_2.	**04**
	(c)	Explain the shape of NH_3 and SF_4 on the basis of hybridization and VSEPR theory.	**07**
Q.4	**(a)**	State basic principle of mass spectroscopy.	**03**
	(b)	State Hess's Law of constant heat summation, its importance in thermo-chemistry.	**04**
	(c)	SEM is powerful tool to study the surface of a material. Explain its principle, instrumentation and applications.	**07**
		OR	
Q.4	**(a)**	Calculate the mole fraction of methanol, if its 16 g is dissolved in 36 g water.	**03**
	(b)	Enthalpy of combustion of carbon to carbon dioxide is –393.5 J/mol. Calculate the heat released upon formation of 22 g of CO_2 from carbon and oxygen gas.	**04**
	(c)	Derive Bragg's equation; $n\lambda = 2d \sin\theta$.	**07**
Q.5	**(a)**	Denote E and Z isomers in but-2ene.	**03**
	(b)	Explain generation, stability and fate of a carbocation.	**04**
	(c)	Give reason: (a) High order reactions are uncommon. (b) Zeolites act as shape selective catalysts.	**07**
		OR	
Q.5	**(a)**	What is glass transition temperature?	**03**
	(b)	Explain generation of a benzyne in elimination-addition mechanism of S_NAr reactions.	**04**
	(c)	Derive Schrödinger wave equation and explain the importance of ψ.	**07**

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