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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Chemical Engineering **Duration: 3 hrs.**

Course Code: 19CY3DCMCA **Max Marks: 100**

Course: Materials Chemistry and Applications

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		What is lattice energy? Derive Born-Lande equation for the calculation of lattice energy of solids.	*CO1*	*PO1*	**7**
	b)		Discuss the molecular orbital theory. Elaborate on the formation of N_2 molecule on the basis of MOT.	*CO1*	*PO1*	**7**
	c)		What is hydrogen bonding? Discuss Inter- and Intra-molecular hydrogen bonding with examples.	*CO1*	*PO1*	**6**
			OR			
2	a)		What are dispersion (London) intermolecular forces? Discuss why Cl_2 is a gas, Br_2 is a liquid and I_2 is a solid.	*CO1*	*PO1*	**7**
	b)		Explain the band theory of solids. On the basis of band theory discuss the conductivity in semiconductors.	*CO1*	*PO1*	**7**
	c)		Calculate the minimum values of radius ratio for coordination number 3.	*CO1*	*PO1*	**6**
			UNIT - II			
3	a)		What are stoichiometric crystals? Explain the various defects in stoichiometric crystals.	*CO1*	*PO1*	**7**
	b)		X-rays with wavelength 1.54 Å are reflected from the (1 1 0) planes of a cubic crystal with unit cell dimensions a = 6 Å. Calculate the Braggs' angle, θ for the first order reflection.	*CO2*	*PO2*	**7**
	c)		What is neutron diffraction? List out the differences between X-ray and neutron diffraction.	*CO2*	*PO2*	**6**
			OR			
4	a)		What are miller indices? Compute the miller indices for a plane intersecting at x = ¼ a, y = 2b, and z = ½ c.	*CO2*	*PO2*	**7**
	b)		Derive Braggs' equation for diffraction of X-rays by crystals.	*CO1*	*PO1*	**7**
	c)		List out the differences between SEM and TEM.	*CO2*	*PO2*	**6**

			UNIT - III			
	5	a)	Discuss the mechanism of an acid catalyzed reaction by taking a suitable example.	*CO1*	*PO1*	**7**
		b)	Explain the reactant and the product selectivity of zeolite catalysts with suitable examples.	*CO3*	*PO3*	**7**
		c)	Differentiate catalytic poisons from inhibitors with appropriate examples.	*CO1*	*PO1*	**6**
			OR			
	6	a)	What is steam reforming? Explain the role catalyst in steam reforming.	*CO2*	*PO2*	**7**
		b)	Write the general formula of zeolites. Discuss a method of preparation of zeolites.	*CO1*	*PO1*	**7**
		c)	Discuss the functions of catalytic converter used in automobiles.	*CO3*	*PO3*	**6**
			UNIT - IV			
	7	a)	The dissociation of NH_4Cl in a closed vessel is represented by following equilibrium, $NH_4Cl(s) \rightleftharpoons NH_4Cl(g) \rightleftharpoons NH_3(g) + HCl(g)$, Identify number of phases and components.	*CO1*	*PO1*	**7**
		b)	Discuss isothermal transformation (TTT) curves for eutectoid steel.	*CO2*	*PO2*	**7**
		c)	State Gibbs phase rule. Discuss: (i) triple point, and (ii) eutectic system.	*CO1*	*PO1*	**6**
			OR			
	8	a)	Explain the single component iron phase diagram.	*CO1*	*PO1*	**7**
		b)	What are ferrous alloys? Explain the properties and applications of the common ferrous alloys.	*CO2*	*PO2*	**7**
		c)	What is condensed phase rule? Explain its significance.	*CO1*	*PO1*	**6**
			UNIT - V			
	9	a)	What are ceramics? What are the raw materials used for the manufacturing of ceramics?	*CO2*	*PO2*	**7**
		b)	Outline the composition and applications of (i) polycarbonate glass, and (ii) optical glass.	*CO1*	*PO1*	**7**
		c)	Discuss the classifications of lubricants with examples.	*CO1*	*PO1*	**6**
			OR			
	10	a)	Discuss the manufacturing of soda glass.	*CO1*	*PO1*	**7**
		b)	Discuss the mechanism of action of lubricants.	*CO2*	*PO2*	**7**
		c)	Outline the general properties and applications of ceramics.	*CO1*	*PO1*	**6**

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