U.S.N.										

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

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 22CY3ESMCA **Max Marks: 100**
Course: Materials Chemistry and applications **Date: 19.05.2023**

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

UNIT - I

1	a)	Depict the molecular energy level diagrams for CO and CO^+. Remark on their stabilities.	**08**
	b)	Discuss the effect of hydrogen bonding on the physical properties of compounds. Why ice floats on water?	**06**
	c)	Illustrate the application of Born-Haber cycle to calculate the lattice energy of NaCl. Comment on the difference in lattice energies of NaCl and MgO.	**06**

UNIT - II

2	a)	Describe the microscopic analysis of samples using TEM along with its construction. Mention its other applications.	**08**
	b)	Calculate the glancing angle for the first order diffraction when a beam of X - rays of wavelength 0.154 nm is diffracted by (111) plane of a cubic crystal with a lattice constant 0.35 nm.	**06**
	c)	What are point defects? Elaborate on metal excess defect.	**06**

OR

3	a)	Why X-rays are used for studying crystal structure? Derive Braggs' equation for the diffraction of X-rays by crystals.	**08**
	b)	Bring out the differences between amorphous and crystalline solids.	**06**
	c)	What are miller indices? Deduce the miller indices for the planes with the intercepts (i) (1a, 2b, 3c) and (ii) (1/2 a, ∞b, 2c).	**06**

UNIT – III

4	a)	Justify that zeolite catalysts offer reactant and product selectivity with suitable examples.	**08**
	b)	Discuss the mechanism of acid catalysed reaction by taking an appropriate example.	**06**
	c)	Describe the role of catalysts used in stream reforming and cracking.	**06**

UNIT – IV

5	a)	Sketch and explain the phase diagram of iron -iron carbide system.	**08**
	b)	What are azeotropes? Justify that ethanol-water system represent an azeotrope	**06**
	c)	Explain (i) critical solution temperature and (ii) Lever rule	**06**

OR

6	a)	What is reduced phase rule? Sketch the phase diagram of lead-tin system.	**08**
	b)	Discuss the applications of Nernst distribution law.	**06**
	c)	Compute the partition coefficient between water and hexane if the concentration of solute in the aqueous phase is 3.8 M and in hexanne phase 6.5 M. Highlight the applications of partition coefficient.	**06**

UNIT – V

7	a)	Justify: Glass is regarded as a special class of industrial materials. Describe the manufacturing of soda glass.	**07**
	b)	What are alloys? Discuss the properties and applications of various brasses.	**06**
	c)	Define viscosity index. A lubricating oil has same viscosities as that of standard naphthenic acid and paraffinic oils at 210 ˚F. Their viscosities at 100˚F are 445s, 630s and 380 s respectively. Find the viscosity index of the lubricating oil. Comment on the quality of lubricating oil based on its viscosity index.	**07**

******