U.S.N.										

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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 22CY3ESMCA **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.

UNIT - I

1	a)	Explain secondary bonding with examples. Derive an expression for ion-dipole interaction.	**07**
	b)	What are non -bonding electrons in molecular orbital theory? With a molecular orbital energy level diagram, calculate the bond order of nitric oxide (NO) using molecular orbital theory.	**07**
	c)	What is lattice energy of ionic solids? Sodium and potassium hydroxides are generally more soluble than magnesium and aluminum hydroxide, discuss.	**06**

UNIT - II

2	a)	What is neutron diffraction? Differentiate X-ray diffraction from neutron diffraction.	**07**
	b)	What are non-stoichiometric crystals? Discuss the different types of defects in them.	**07**
	c)	What are Miller indices? Draw (110) plane in a face centered cubic lattice.	**06**

OR

3	a)	A monochromatic X-ray beam of wavelength 0.71 Å undergoes second order Braggs reflection from the plane (2 1 0) of cubic crystal at a glancing angle of 64°. Calculate the lattice constant.	**07**
	b)	Explain the construction, working and applications of Transmission electron microscopy.	**07**
	c)	Discuss various types of surface defects.	**06**

UNIT – III

4	a)	Elaborate the mechanism of a base catalyzed reaction. Justify that the base catalyzed ester hydrolysis is not reversible.	**07**
	b)	What is the function of catalytic converter in IC engine? Explain the role of catalysts used in them.	**07**
	c)	Discuss with an example, applications of phase transfer catalysts.	**06**

UNIT – IV

5	a)	Sketch and discuss Iron-Iron carbide phase diagram.	**07**

b) Discuss any one application of Nernst distribution law. A solid X is added to a mixture of benzene and water. After shaking well and allowing to stand, 20 mL of the benzene layer was found to contain 0.1 g of X and 100 mL of water layer contained 0.2 g of X. Calculate the value of distribution coefficient. **07**

c) With temperature-composition phase diagrams explain (i) high boiling azeotrope and (ii) low boiling azeotrope. **06**

OR

6 a) What is eutectic temperature? Sketch and discuss lead-tin phase diagram. **07**

b) What is critical solution temperature? Explain phase diagram of phenol-water system. **07**

c) When benzoic acid was shaken with mixtures of water and benzene at a constant temperature, the following results are obtained, **06**

Concentration of acid in benzene (C_1)	0.24 g/L	0.55 g/L	0.93 g/L
Concentration of acid in water (C_2)	0.015 g/L	0.022 g/L	0.029 g/L

Prove that benzoic acid exists as dimer in benzene layer.

UNIT – V

7 a) What are non-ferrous alloys? Elaborate on composition, properties, and applications of (i) copper alloys, (ii) Nickel alloys. **07**

b) What are roles of lubricants? Discuss the fluid film mechanism of action of lubricants. **07**

c) Discuss the composition, properties and applications of borosilicate and soda glass. **06**

****