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

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CY3DCMCA **Max Marks: 100**
Course: Materials Chemistry and Applications **Date: 21.09.2023**

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)	Define ionization energy. How does it vary in a period and a group? Explain why the first ionization energy of Na is lower than that of Mg.	**05**
	b)	Explain the band theory of solids. On the basis of band theory explain conductors and insulators.	**05**
	c)	Depict the molecular orbital energy level diagram for N_2 molecule. Calculate bond order for N_2^+ and N_2^- species.	**05**
	d)	Derive Born-Lande equation for the calculations of lattice energy of ionic solids.	**05**

UNIT - II

2.	a)	Derive Bragg's equation for the diffraction of X-rays by crystals.	**05**
	b)	A beam of X-rays of wavelength 0.071nm is diffracted by {110} planes of cubic crystal with lattice constant (a) of 0.28nm. Find the glancing angle (Θ) for the second-order diffraction.	**06**
	c)	Discuss briefly construction and working of scanning electron microscope.	**05**
	d)	Discuss metal excess defects in ionic crystals.	**04**

UNIT - III

3.	a)	Explain the following terms with a suitable example i) positive catalyst ii) catalytic poison iii) catalytic promoters.	**06**
	b)	Discuss the mechanism of acid catalyzed ester hydrolysis.	**04**
	c)	Define enzyme catalysis with an example. Discuss its mechanism.	**05**
	d)	What are organometallic complexes? Discuss their industrial relevance with an example.	**05**

OR

4.	a)	Discuss the mechanism of base catalyzed reaction by taking an appropriate example.	**05**

	b)	Describe autocatalytic reactions with an example.	**05**
	c)	Zeolites are a type of shape selective catalysts. Justify the statement w.r.t reactant and product selectivity in zeolites with a suitable example for each.	**05**
	d)	Justify the need of the catalytic convertor in automobiles.	**05**

UNIT - IV

5.	a)	State the Gibb's phase rule. With the help of suitable example, explain the following terms: i) Degree of freedom ii) Component.	**06**
	b)	Mention composition and applications of any two copper alloys.	**04**
	c)	What are alloy steels? What are the significances of various alloying elements in steels?	**05**
	d)	Mention the composition and applications of any two nickel alloys.	**05**

OR

6.	a)	What are non-ferrous alloys? Explain the properties and applications of any two non-ferrous alloys.	**05**
	b)	Explain the phase diagram for lead-Tin system.	**05**
	c)	Discuss the following terms i) Condensed phase rule ii) Eutectic mixture	**05**
	d)	Elaborate on alloys used for high temperature applications.	**05**

UNIT - V

7.	a)	What are ceramics? Elaborate on their properties and applications.	**05**
	b)	Give the classification of lubricants with examples.	**05**
	c)	Explain the manufacture of soda glass?	**05**
	d)	Discuss the properties and applications of polycarbonate glass.	**05**

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