

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, November 2017
B. Tech. in Chemical Engineering, Semester V

Roll No.....

CHE 505: Chemical Engineering Materials

Time: 3.00 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1 Objective type (1 marks each)

10

- i. How many atoms are there in HCP crystal structure
(a) 8 (b) 6 (c) 4 (d) None of these
- ii. Lattice diffusion is caused by
(a) Grain Boundaries (b) Screw dislocations
(c) Point imperfections (d) None of these
- iii. What is the maximum solubility of carbon in iron at room temperature?
(a) 0.02 wt.% (b) 0.8 wt.% (c) 2.1 wt.% (d) None of these
- iv. The length of unit cell of a FCC metal crystal is 250 pm. Calculate the radius of an atom of the metal.
- v. The interstitial solid solution of carbon in γ iron is called
(a) Cementite (b) ferrite (c) austenite (d) pearlite
- vi. Poisson's ratio refer to the ratio of
(a) Modulus of elasticity & modulus of rigidity
(b) Longitudinal strain to lateral strain
(c) Engineering strain to true strain
(d) Lateral strain to Longitudinal strain
- vii. Examples of line defects are
(a) Vacancies (b) Dislocations (c) Twins (d) Stacking faults
- viii. Draw the planes (121) and (111)
- ix. In the Phase diagram, the curve below which the alloy is in the solid state for all compositions is called_____.
- x. Thermoplastics are plastics that can be
(a) remolded (b) cannot be remolded
(c) not affected by heat (d) repeated heating permitted for these

Q.2	Short answer type questions (2.5 marks each)	10
i.	Define the Space lattice and Unit cell with neat diagram and its parameters.	
ii.	In a Bragg's experiment, the reflection of X-rays was found at 30° . The lattice spacing of plane $1.87 \text{ \AA}$. The 2nd order reflection. Calculate the wavelength.	
iii.	Give the classification of polymers on the basis of Tacticity.	
iv.	Explain the Planer and Linear densities with formulas.	
Q.3A	A piece of copper originally 305 mm long is pulled in tension with a stress of 276 MPa . If the deformation is entirely elastic, what will be the resultant elongation?	5
Q.3B	What do you mean by Line defect? Explain the Edge dislocation with diagram.	5
Q.4A	Draw a stress strain diagram for ductile material and explain different parts of the curve in detail.	5
Q.4B	A metal crystallizes in a FCC structure and has a density of 11.9 g cm^{-3} . If the radius of the metal atom is 138 pm , calculate the atomic mass of the metal.	5
Q.5A	What is Glass transition temperature for polymers? Explain its significance.	5
Q.5B	What is Liver rule? Drive the relation to find out the fractions of solid and liquid phases in a binary alloy using Liver rule with suitable diagram.	5
Q.6A	Derive the equation to find out the crystal spacing between two parallel planes.	5
Q.6B	Draw the Ni - Cu phase diagram and through this explain the Liquidus, Solidus and Tie line.	5
Q.7A	What is atomic packing factor? Calculate the atomic packing factor for HCP structure.	5
Q.7B	Write short notes on: (i) Burger circuit (ii) Frankel and Schottky defects	5
	OR	
Q.7B	What do you mean by number average and weight average molecular weight of polymers?	5
Q.8	What is Solid solution? Explain the Substitutional and interstitial solid solution with suitable examples and figures.	10
	OR	
Q.8	Draw and explain different points in a eutectic phase diagram of lead - tin alloy.	10
Q.9	A cylindrical specimen of Ni alloy having an elastic modulus of 207 GPa and an original diameter of 10.2 mm will experience only elastic deformation when a tensile load of 8900 N is applied. Compute the maximum length of specimen before deformation if the maximum allowable elongation is 0.25 mm .	10
	OR	
Q.9	Explain the following with proper diagrams. (a) Grain Boundaries (b) Tilt boundaries (c) Twin Boundaries	10
Q.10	What are the different Phases of Iron? Draw the Iron carbon phase diagram and explain all the salient features of the diagram.	10