

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, November 2016
B. Tech. in Chemical Engineering, Semester V

Roll No.....

CHE505: 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.
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Q.1 Objective type (1 marks each)

10

- i. Draw the plane (100) and (112) in cubic system.
- ii. The number of vacancies in a crystal _____ with decrease in temperature (decreases/increases)
- iii. In edge dislocation, Burgers vector is _____ to the dislocation line. (Parallel/ Perpendicular).
- iv. Fick's law describes flow of atoms caused by
(a) temperature gradient (b) electric potential gradient
(c) concentration gradient (d) electric field gradient
- v. Iron at room temperature has
(a) BCC structure (b) FCC structure (c) HCP structure
(d) none of the above
- vi. Thermosetting plastics are plastics that can be
(a) remolded (b) cannot be remolded
(c) not affected by heat (d) repeated heating permitted for these
- vii. Cast iron normally contains
(a) 1 to 1.5 percent carbon (b) 2 to 4 percent carbon
(c) less than 1 percent carbon (d) none of these
- viii. In the Phase diagram, the curve above which the alloy is in the liquid state for all compositions is called _____.
- ix. Write the relation of atomic radius and edge length in case of BCC and FCC.
- x. The coordination number in FCC structure is
(a) 6 (b) 8 (c) 12 (d) 10

Q.2 Short answer type questions (2.5 marks each)

10

- i. What do you mean by Stress and Strain?

- ii. X-ray of wavelength $1.65\text{\AA}$ strike at an angle 22.5° . Assuming that $n=1$, calculate the spacing between the planes responsible for reflection?
- iii. Explain the term Poisson's Ratio.
- iv. Explain the term Austenite and cementite in iron carbon system.
- Q.3A Define the Burger vector? Explain the Screw dislocation with diagram. 5
- Q.3B Draw different types of Unit cell in cubic system? Calculate the atomic packing factor for FCC structure. 5
- Q.4A What is diffusion? Explain steady state diffusion. 5
- Q.4B A BCC element of density 10.3 gm/cm^3 has a cell edge of 314 pm . Calculate the atomic mass of the element. (Avagadro's No. $N_A = 6.023 \times 10^{23}\text{ mol}^{-1}$). 5
- Q.5A What is Hook's law? Explain Young's modulus, bulk modulus and modulus of rigidity. 5
- Q.5B What do you mean by Vacancy? Explain the Frankel defect in ionic crystals with diagram. 5
- Q.6A Explain the term glass transition temperature for polymers. 5
- Q.6B What is a TIE line? Explain the Liver rule through suitable phase diagram. 5
- Q.7A Derive the Bragg's equation to calculate the distance between two parallel planes of a crystal. 5
- Q.7B What is polymer? Give the classification of polymers on the bases of structure. 5
- OR
- Q.7B Explain the TTT diagram for steel and give its salient features. 5
- Q.8 What is Elastic and Plastic deformation? Explain the Slip and Twinning in plastic deformation. 10
- OR
- Q.8 Explain in details the principal and working of optical microscopy. 10
- Q.9 What is Solid solution? Explain the Substitutional and interstitial solid solution with suitable examples and figures. 10
- OR
- Q.9 A tensile stress is to be applied along the long axis of a cylindrical brass rod that has a diameter of 10 mm . Determine the magnitude of the load required to produce a $2.5 \times 10^{-3}\text{ mm}$ change in diameter if the deformation is entirely elastic. Given The Poission's ratio for brass is 0.34 and modulus of elasticity is 97 GPa . 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