


VIT[®]

 Vellore Institute of Technology
 (Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test - I
Winter Semester (2023-24)

Programme Name & Branch	: B.Tech
Course Code	: BCHE206L
Course Name	: Material Science and Engineering
Faculty Name(s)	: Shankar Raman Dhanushkodi
Class Number(s)	: VL2023240501190
Slot	: C2+TC2
Date of the Exam	: 13/02/2024 AN
Exam Duration	: 90 minutes
General instruction(s): Answer all Questions	
Maximum Marks: 50	

Q.No.	Question	Max Marks
1	(a) Draw the force and potential energy curves that depicts The dependence of repulsive, attractive, and net forces on interatomic separation for two isolated atom (5 Marks) (b) Zinc has five naturally occurring isotopes: 48.13% of ^{64}Zn, with an atomic weight of 64 amu; 27.90% of ^{66}Zn, with an atomic weight of 66 amu; 4.60% of ^{67}Zn, with an atomic weight of 67 amu; 18.75% of ^{68}Zn, with an atomic weight of 67.925 amu; and 0.62% of ^{70}Zn, with an atomic weight of 69.925 amu. Calculate the average atomic weight of Zn. (5 Marks)	10
2.	(a) Show for the body-centred cubic crystal structure that unit cell edge length a and atomic radius, R is related through $a = 4R/\sqrt{3}$ (5 Marks) (b) For the HCP crystal structure, show that the ideal c/a ratio is 1.633. (5 Marks)	10
3.	Write short notes on surface and volume defect in crystallography <i>see</i>	10
4.	(a) Draw (01 1 1) and (2 1 1 0) planes in a hexagonal unit cell? (4 Marks) (b) For BCC iron, compute (a) the interplanar spacing and (b) the diffraction angle for the (220) set of planes. The lattice parameter for Fe is 0.35 nm. Assume that monochromatic radiation having a wavelength of 0.2 nm is used, and the order of reflection is 1 (6 Marks)	10
5.	The diffusion coefficients for copper in aluminum at 500°C and 600°C are 4.8×10^{-14} and $5.3 \times 10^{-13} \text{ m}^2/\text{s}$, respectively. Determine the approximate time at 400°C that will produce the same diffusion result (in terms of concentration of Cu at some specific point in Al as a 15-h heat treatment at 600°C. <i>with</i>	10