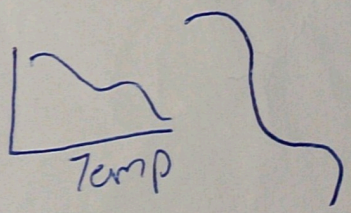
VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

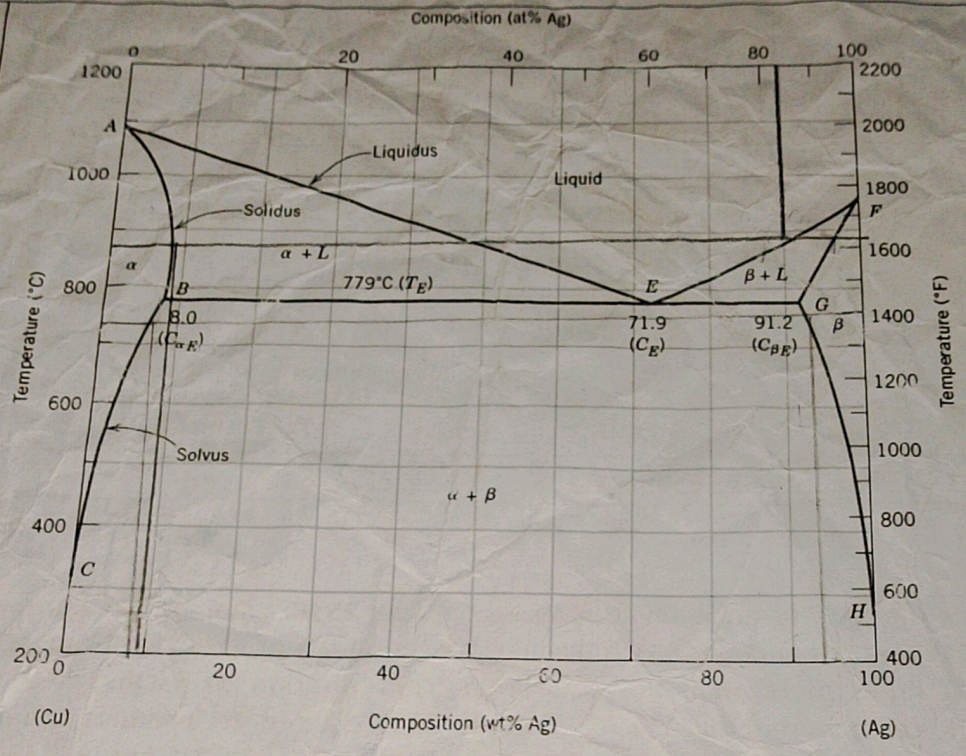
Continuous Assessment Test -II (CAT-II) Winter Semester (2022-23)

Course Name & code	:	**BCHE 206L - Material Science and Engineering**
Programme Name & Branch	:	**B.Tech (Chemical Engineering)**
Class Number	:	**VL202230501327**
Slot	:	**B1+TB1**
Faculty Name	:	**Dr. K.Sivagami**
Exam Duration	:	**90 min** **Maximum Marks: 50 Marks**

General instruction(s): Assume wherever data necessary

Q.No	Question	Max Marks
1.	Calculate the concentration of vacancies in copper at 25 °C. What temperature will be needed to heat treat copper such that the concentration of vacancies produced will be 1000 times more than the equilibrium concentration of vacancies at room temperature? Assume that 20,000 Calories are required to produce a mole of vacancies in copper. The lattice parameter of FCC copper is 0.36151 nm.	10 (7)
2.	a) Within a cubic unit cell, sketch the following directions: (i) [111] (ii) [212] (iii) [102] **(6 Marks)** b) What do you mean by Frenkel and Schottky defect? Give example for both the defects. **(4 Marks)**	10 (6)
3.	i)For a copper-silver alloy of composition 25 wt% Ag-75 wt% Cu and at 775°C (1425°F) do the following: (Same figure as given below). (a)Determine the mass fractions of primary α and eutectic micro constituents. (b) Determine the mass fraction of eutectic α. **(6 Marks)** ii) Discuss the relationship between modulus of elasticity and temperature for thermoplastic polymer. List out the possible phase transformation in polymers. **(4 Marks)**	10 (5)
4.	A 90 wt% Ag-10 wt% Cu alloy is heated to a temperature within the β + liquid phase region. If the composition of the liquid phase is 85 wt% Ag, determine: (Figure below) (a) The temperature of the alloy (b) The composition of the β phase (c) The mass fractions of both phases	10 (6)





5.

i) A cylindrical specimen of a nickel alloy having an elastic modulus of 207 GPa and an original diameter of 10.2 mm experiences only elastic deformation when a tensile load of 8900 N is applied. Compute the maximum length of the specimen before deformation if the maximum allowable elongation is 0.25 mm **(6 Marks)** 10

ii) List out eutectic - peritectic and eutectoid reactions in solid solutions with examples **(4 Marks)**

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