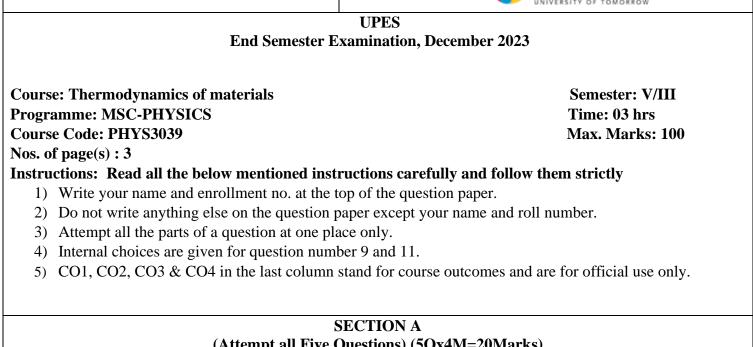
Name:

**Enrolment No:** 



	(Attempt all Five Questions) (5Qx4M=20Marks)		
S. No.		Marks	CO
Q 1	A system consists of gaseous H <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> O and CO <sub>2</sub> where amount of CO <sub>2</sub> is specified and equilibrium constant for the reaction $2H_2(g)+O_2(g) \rightleftharpoons 2H_2O(g)$ is known. Find the number of degrees of freedom.	4	CO1
Q 2	Suppose we know that $\Delta G^0 = +200$ J/mol for the reaction A (g) + B(s) $\rightarrow$ C (g) at 25°C. $\Delta$ H and $\Delta$ S of the reaction are 20 kJ/mol and 66.44 J/K/mol respectively. Calculate the temperature at which the reaction will be spontaneous.	4	CO1
Q 3	Explain the Fick's law.	4	CO2
Q 4	Draw and compare the phase diagram of water and CO <sub>2</sub> .	4	CO2
Q 5	A liquid has vapour pressure of 1200 mmHg at 293 K and heat of vaporization is 41 kJ/mole. Calculate the boiling point of the liquid. Given: $R = 8.314$ J/K/mol.	4	CO3
	SECTION B		
	(Attempt all Questions; internal choice is given for question number 9) (4Qx10M=	40 Marks	)
Q 6	(a) Draw and discuss the phase diagram of one component system which exist in two polymorphs.	6+4	CO2
	(b) Derive all the Maxwell's thermodynamic equation using Euler's reciprocity theorem.	0+4	02
Q 7	(a) Draw and label the phase diagram of FeCl <sub>3</sub> -H <sub>2</sub> O system.	5+5	CO2



	(b) Check whether the following reaction is spontaneous at 25 °C and 1000 °C $C(s) + H_2O(l) \rightarrow CO(s) + H_2(g)$ . Given that $\Delta H$ and $\Delta S$ are 31400 Cal/mol and 32 Cal/deg at 25 °C.		
Q 8	<ul><li>(a) Explain Hume Rothery rules with suitable examples.</li><li>(b) What are the advantages and experimental evidences of two metals forming a solid solution?</li></ul>	10	CO3
Q 9	<ul><li>(a) Define peritectic temperature with a suitable example. Draw and label a phase diagram of a two-component system which undergoes peritectic reaction.</li></ul>		
	OR	5+5	CO3
	Draw and discuss the phase (T-C) diagram of a liquid vapour system.		
	(b) State Raoult's law and Henry's law. Under what conditions the two laws behave similar? Draw a P-C diagram for an ideal liquid-vapour system. OR		
	Derive the Gibbs-Duhem equation.		
	SECTION-C		
Q10	<ul> <li>(Attempt all Questions; internal choice is given for question number 11) (2Qx20M=</li> <li>(a) What is simple eutectic system? Draw a phase diagram for a simple eutectic</li> </ul>	40 Marks	5)
QIU	system. Show how to use the Lever rule to find the ratio of number of moles of solid and liquid present in a two-component solid-liquid equilibrium system.	8+12	CO4
	(b) Derive Clausius - Clapeyron Equation.		
Q 11	(a) Explain Kirkendall effect and kinetics of defect diffusion.		
	OR	10+10	CO4
	Calculate the entropy change for transformation $I_2(s, 1 \text{ atm}, 298 \text{ K}) \rightarrow I_2(v, 1 \text{ atm}, 457 \text{ K})$ , Given that: $\Delta H_{\text{fus,m}} = 15.68 \text{ kJ/mole}$ at the melting point 113.6°C, $\Delta H_{\text{vap,m}} = 25.52 \text{ kJ/mol}$ at the boiling point 184°C.		
	$C_{p,m}(I_2,s) = 54.6+13.4 \times 10^{-4} \text{ T Joule/mole/K}, C_{p,m}(I_2, l) = 81.5 \text{ Joule/mol/K}$		
	(b) Draw a well labelled triangular phase diagram of water-chloroform-acetic acid system and explain the various regions in it.		
	<b>OR</b> Draw the phase diagram for a solid solution. Using Lever rule derive an expression for the relative amount of solid and liquid phases.		