

Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

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Fourth Semester B.E. Degree Examination Biochemical Thermodynamics

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Explain the following terms: i) System & Surroundings ii) Homogeneous system & heterogeneous system iii) Closed System & open system	L1	6
	b	Define the first law of thermodynamics. Derive mathematical relation for flow process	L3	10
	c	Briefly explain zeroth law of thermodynamics	L3	4
OR				
Q.02	a	Explain Carnot principle	L2	10
	b	Schematically represent the working of heat engine & heat pump. Explain how their efficiencies are evaluated	L3	6
	c	Differentiate between reversible & irreversible process	L2	4
Module-2				
Q. 03	a	Explain PVT behaviour of pure fluids	L2	10
	b	Find the second & third virial coefficients of the van der waals equation when expressed in the form of $(P+a/V^2)(V-b) = RT$	L2	10
OR				
Q.04	a	One kilo mole CO ₂ occupies a volume of 0.381 m ³ at 313 . compare the pressure given by i) Ideal gas equation ii) Van der waals equation Take the Van der waals constants to be $a = 0.365 \text{ Nm}^4/\text{mol}^2$ and $b = 4.28 \times 10^{-5} \text{ m}^3/\text{mol}$	L3	6
	b	Define compressibility factor. What is the principle of corresponding states?	L1	6
	c	Define: i) The heat of reaction ii) The standard heat of reaction iii) The standard heat of formation iv) The standard heat of combustion	L2	8
Module-3				
Q. 05	a	Differentiate between reference properties, energy properties & derived properties	L1	6
	b	Using the relationship between C _p and C _v , show that $C_p - C_v = \beta^2 VT/K$	L3	10
	c	Prove that $C_p - C_v = R$ for ideal gas.	L3	4
OR				

Q. 06	a	Show that decrease in Work function & Gibbs free energy represents maximum work & net useful work respectively in a reversible isothermal process	L3	10
	b	Explain fugacity co-efficient. Discuss effect of temperature on fugacity	L2	10
Module-4				
Q. 07	a	Derive Gibbs Duhem equation	L2	10
	b	Explain consistency test for VLE data	L2	10
OR				
Q. 08	a	Define chemical potential. Explain the effect of temperature & pressure on chemical potential.	L2	10
	b	Explain Lewis Randall rule & Henry's law	L2	10
Module-5				
Q. 09	a	Derive van't Hoff equation.	L2	10
	b	Write a short note on: i) factor affecting equilibrium constant ii) coupled reactions & energy rich compound	L2	10
OR				
Q. 10	a	Show that equilibrium constant & std. free energy change is given by $\Delta G^0 = -RT \ln K$	L3	10
	b	Explain the feasibility of chemical reaction	L2	4
	c	A gas mixture containing 3 mol CO ₂ , 5 mol H ₂ & 1 mol water is understanding the following reaction: CO ₂ + 3H ₂ → CH ₃ OH + H ₂ O CO ₂ + H ₂ → CO + H ₂ O Develop expressions for the mole fraction of the species in terms of the extent of reaction.	L3	6

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.