PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS), MARGAO-GOA

POGIL WORKSHEET

THERMODYNAMICS OF FREE RADICAL POLYMERISATION Class: S. Y. B. Sc. Semester: IV

Su	Subject: Chemistry Paper: CHE-IV. E-6 Polymer an	d Colloid	Science
Gi	Free radical polymerization proceeds through three steps. Gibbs free energy change is used to predict the feasibility of a process. Prerequisites: Chemical Thermodynamics, Chemical equilibrium, Polymerisation	Chemical	kinetics
1.	1. State the three steps involved in free radical polymeriza	tion.	
2.	2. State the symbols for Enthalpy, Entropy and Gibbs free	energy?	
3.	3. Are the above functions State functions? Justify your an	swer.	
4.	4. Identify the relation between Gibbs free energy and entl	nalpy?	
5.	5. Comment on the heat involved in initiation and propaga	tion steps	s.

6.	Predict Gibbs free energy change (ΔG_p) for polymerization process is ΔH_p is heat of polymerization and ΔS_p is entropy of polymerization.
7.	If E_p is energy of activation of polymerization and E_{dp} is energy of activation of depolymerization, predict value of heat of polymerization.
8.	Is heat of polymerization positive or negative? Justify your answer.
9.	Is entropy of polymerization positive or negative? Justify your answer.
10.	. Will Gibbs free energy change (ΔG_p) be positive or negative? Justify your answer.

2. Ceiling temperature (T_c) is a temperature as	t which the network
	i wnich ine polymerizat
reaches equilibrium.	
What happens at this temperature in term	ns of rate and Gibbs f
energy change (ΔG_p) for polymerization?	
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3. Derive an expression for Ceiling temperature	
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ADDITIONAL QUESTIONS

14. Calculate entropy of polymerization for following monomers using Heat of polymerization and Ceiling temperature values.

No.	Monomer	$\Delta H_{p (kJ.mol^{-1})}$	T _c (°C)
1.	α-Methylstyrene	- 35.2	61
2	Methyl methacrylate	- 54.5	220
3	Propylene	- 69.1	300

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