



# INDIAN INSTITUTE OF INFORMATION TECHNOLOGY UNA [HP]

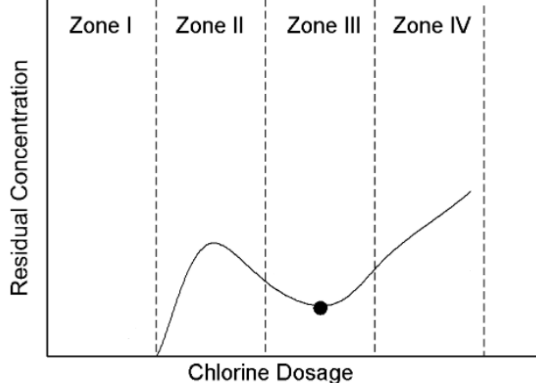
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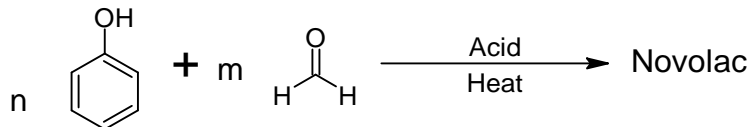
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**AY 2021-22**  
**SCHOOL OF COMPUTING**  
**CURRICULUM: IIITUGCSE20**  
**Cycle Test – I**  
**14-02-2022**

<b>Degree</b>	B. Tech.	<b>Branch</b>	CSE
<b>Semester</b>	First		
<b>Subject Code &amp; Name</b>	CYC102: Engineering Chemistry		
<b>Time: 60 Minutes</b>	<b>Answer All Questions</b>	<b>Maximum: 20 Marks</b>	

Sl.No.	Question	Marks
1.a	Explain alkalinity of water cannot be due to the simultaneous presence of $\text{OH}^-$ , $\text{CO}_3^{2-}$ and $\text{HCO}_3^-$ ions.	(1)
1.b	Two liters of water obtained from the bore well near IIIT, Una gave the following analysis for salts: $\text{FeSO}_4 = 30.4$ mg; $\text{CaSO}_4 = 13.6$ mg; $\text{MgCl}_2 = 38$ mg; $\text{Ca}(\text{HCO}_3)_2 = 32.4$ mg; $\text{Mg}(\text{HCO}_3)_2 = 14.6$ mg; $\text{NaCl} = 11.7$ mg. Find out the total hardness of water in ppm units, giving temporary and permanent hardness assuming the atomic masses of Fe = 56, Ca = 40, Mg = 24 and Na = 23.	(2)
1.c	Chlorination is the most used process to disinfect drinking water. The typical residual chlorine curve is divided into four distinctive Zones. Explain the chemical process taking place in each part of the curve given in <b>Fig.1</b> .  <p style="text-align: center;"><b>Fig.1 Break point chlorination curve</b></p>	(2)
2.a	What are the specification of drinking water according to World Health Organization ?	(1)
2.b	What are the phosphate used in conditioning of alkaline water, weakly alkaline water and acidic water? Also, discuss the role of pH in phosphate conditioning?	(2)
2.c	Analysis of water gave the following results: $\text{H}_2\text{SO}_4 = 196$ mg/L, $\text{MgSO}_4 = 24$ mg/L, $\text{CaSO}_4 = 272$ mg/L and $\text{NaCl} = 25$ mg/L. Water is to be supplied to the town of the population of one lakh only. The daily consumption of water is 50 litre per head. Calculate the cost of lime and soda required for the softening of hard water for the month of January 2022, if the cost of lime is Rs. 5.00 per kg and cost of soda is Rs. 10.00 per kg.	(2)

3.a	What is emulsion polymerization? Give its detailed mechanism.	(1)										
3.b	What is glass transition temperature ( $T_g$ )? Out of the following pairs of polymers identify the one with higher $T_g$ and why? (i) Polypropylene or polystyrene (ii) Polyethylene or poly(p-xylylene) (iii) Polypropylene or poly(vinyl alcohol)	(2)										
3.c	Consider a polystyrene sample with distribution of molecular weights as reported in Table 1. Calculate the number average molecular weight ( $M_n$ ), the weight average molecular weight ( $M_w$ ), the polydispersity index (PDI) and degree of polymerization (DP) of the sample. <b>Table.1 Molecular weight distribution of polystyrene sample</b> <table><tr><th>M range (g/mol)</th><th>Ni</th></tr><tr><td>0-10000</td><td>5500</td></tr><tr><td>10000-20000</td><td>4000</td></tr><tr><td>20000-30000</td><td>6700</td></tr><tr><td>30000-40000</td><td>1700</td></tr></table>	M range (g/mol)	Ni	0-10000	5500	10000-20000	4000	20000-30000	6700	30000-40000	1700	(2)
M range (g/mol)	Ni											
0-10000	5500											
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30000-40000	1700											
4.a	Explain the factors affecting the chemical resistivity of polymers.	(1)										
4.b	Outline the mechanism of acid catalyzed reaction to produce phenol-formaldehyde resin when phenol is in excess. <div></div>	(2)										
4.c	An exhausted zeolite softener was regenerated by passing 150 L of sodium containing 100 g/L of NaCl. Calculate the quantity of water having hardness of 500 ppm have been softened by zeolite bed.	(2)										
	****GOOD LUCK****											