Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2153611 **Date:05/05/2017**

Subject Name: Green Chemistry for Technologists

Time:02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1		**Short Questions**	**14**
	1	What is Green Chemistry?	
	2	What are auxiliaries?	
	3	Explain atom economy.	
	4	What is catalysis?	
	5	Cold process of synthesis of phenol.	
	6	What is TAML™ activator.	
	7	Suggest alternate greener solvent for hexane.	
	8	Give two examples of polymer from renewable source.	
	9	Explain Envirogluv™.	
	10	Explain Environmental effects of Hg.	
	11	Two main qualities of Green catalyst.	
	12	Explain design for degradation or persistent pollutants.	
	13	Pick two green solvents among:2-Propanol, pyridine, Methanol, Dioxane	
	14	Explain Envirogluv™ Pollution through Lead.	
Q.2	**(a)**	Elaborate less hazardous chemical synthesis.	**03**
	(b)	Define 'Process Intensification'. Elaborate with suitable examples.	**04**
	(c)	How green solvents are different form organic solvents. How difficulties associated with organic solvents can be removed by green solvents.	**07**
		OR	
	(c)	Explain twelve principles of Green Chemistry, with suitable examples.	**07**
Q.3	**(a)**	Provide conventional and green route for synthesis of aniline (one each).	**03**
	(b)	Elaborate use of catalysts in green chemistry principles. Give suitable examples for the same.	**04**
	(c)	Write an elaborate note on "Green Chemistry for sustainable development".	**07**
		OR	
Q.3	**(a)**	How sonochemistry is associated with green chemistry, explain?	**03**
	(b)	Why does industry need Green Chemistry?	**04**
	(c)	Ethanol may be synthesized by following two routes (in presence of catalyst):	**07**

I. $CH_2{=}CH_2 + H_2O \longrightarrow C_2H_5OH$

II. $C_6H_{12}O_6 \longrightarrow C_2H_5OH + CO_2$

What is the % atom economy of both the reactions?
Which route is to be considered greener for the production of Ethanol in your opinion, give reasons of your answer?

Q.4	**(a)**	Write a note on microwave reactions.	**03**
	(b)	Explain principle of reduced derivatization.	**04**

	(c)	Write an elaborate note on solvent free organic synthesis as a versatile tool in green chemistry, citing suitable examples.	**07**

OR

Q.4	**(a)**	Explain safer chemicals design, with examples.	**03**
	(b)	Provide green route for the synthesis of Ibuprofen.	**04**
	(c)	Compare and contrast, classical vs greener routes for manufacturing of hydrogen peroxide.	**07**
Q.5	**(a)**	Write a note on minimization of pollution via greener routes of synthesis.	**03**
	(b)	Calculate atom economy of butyl bromide in the following reaction:	**04**

$$\mathbf{CH_3CH_2CH_2CH_2OH + NaBr + H_2SO_4 \longrightarrow C_4H_9Br + NaHSO_4 + H_2O}$$

	(c)	Define ionic liquids. Why they are considered as green? Give three examples of chemical reactions where ILs have been utilized.	**07**

OR

Q.5	**(a)**	How hydrazine is being manufactured via greener routes?	**03**
	(b)	How green chemistry is different from general chemistry?	**04**
	(c)	Are supercritical fluids green in nature? Elaborate your answer with the help of CO_2.	**07**

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