Total number of printed pages: **PG/1st Semester/PGET1109**

2022

Waste to Energy Conversion

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Answer the short questions	2 x 5 = 10
	i)	Define hazardous waste.	
	ii)	What do you mean by teratogenic agents?	
	iii)	What are radioactive waste?	
	iv)	Distinguish between aerobic and anaerobic composting.	
	v)	Define mutagenesis.	
	b)	Fill in the blanks: i)Chlorinated aliphatic hydrocarbon production is an example of _____. ii) Municipal Solid Wastes are _____ . iii)Toxicity Characteristic Waste is abbreviated by code name_____. iv) Radioactive waste is a result of activities like _____ .	4
	c)	Write short notes: i)Characteristics of K-list waste ii)Biological waste management	2x3= 6
2	a)	Give the schematic diagram for anaerobic composting. Explain the four steps of anaerobic digestion of MSW.	4+5 = 9
	b)	Name the six characteristics of the waste because of which any waste can be classified as hazardous waste (regardless of their concentration limits).	6
	c)	Match the following: **Group A** **Group B**	5

		i) Biodegradable (a) Toxic and corrosive ii) Lipids (b) Degradation process is slower iii) Radioactive waste (c) products CO_2, H_2O & CH_4 iv) Non-biodegradable (d) Paper waste v) Carbohydrates based wastes (e) calorific value is 38000 kcal/kg	
3.	a)	What are biochemical waste?	4
	b)	A landfill area of (150 m x 100 m) is available for handling 25 years' municipal solid waste (MSW) for a town of 5,00,000 people. Out of the total landfill area only 80% is actually available for land fill and other is used for auxiliary services. Assuming that average per capita MSW discard per year in town is 0.05 tonne, landfill density is 500 kg/m^3, and that the 15 percent of the actual landfill cell volume is used for soil cover, estimate (i) the landfill lift in one year. (i) number of years for which the land fill can be used if the landfill can't be increased beyond 25 m.	3+3 =6
	c)	What are radioactive wastes? Give the classification of radioactive wastes.	2+3 =5
	d)	Write short notes on i)Ultimate analysis of solid waste ii)Proximate analysis of solid waste	1x5 = 5
4.	a)	Give the following answers	2 x5 =10
		i) Define solid waste as per EPA. ii) What are the classes of solid waste? iii) What are various types of listed hazardous wastes? Define. iv) What are the various sources of HW? v) Give the explanation of codes T, H, I, C, E for solid wastes.	
	b)	Give a brief explanation about medical waste incineration method with proper schematic diagram.	6
	c)	How to estimate the moisture content of municipal solid waste? Give the mathematical expression for determination of moisture content of solid waste.	2+2 = 4

5.	a)	What are chemical characteristics of solid waste? Explain briefly.	6
	b)	What is incineration of solid waste? What are advantages of incineration?	2+ 4= 6
	c)	What are the major factors affecting incineration? Explain briefly. Give proper schematic diagram for controlled air incineration.	2+ 3+3= 8
6.	a)	Define sanitary landfill of MSW. What are the advantages of sanitary landfill?	2+6 =8
	b)	Give the Salvato's recommendation for sanitary landfill estimation with mathematical expression.	6
	c)	Give a suitable diagram for modern sanitary landfill of MSW.	4
	d)	Distinguish between incineration and landfill?	2
7		Write short notes on (any five):	4x5= 20
	a)	F-list solid waste	
	b)	Density of MSW	
	c)	Calorific value of MSW	
	d)	Permeability of waste	
	e)	Size of waste constituents	
	f)	Radioactive solid waste	

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