MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (BIOTECHNOLOGY) END-SEMESTER MAKE UP EXAMINATION, JUNE/JULY 2024 SUBJECT: INTRODUCTION TO BIOFUELS AND BIOPOLYMERS (BIO 5052)

REVISED CREDIT SYSTEM ANSWER ALL QUESTIONS

MAX. MARKS: 50

Q. No.	Questions	Μ	CO/ CLO	LO	РО	BL
1A	What are the key characteristics and benefits of third-generation biofuels, and how do they differ from first- and second-generation biofuels?	4	1	7, 13	2,7	4
1B	What are some emerging and advanced biofuels, and how do they contribute to sustainability and environmental goals compared to conventional biofuels?	4	1	7, 13	2,7	3
1C	What are the key stages or processes considered in the life cycle of biofuels during an LCA?	2	1	2,7,13	3,7	3
2A	Are there any by-products or co-products generated during the bioethanol production process, and how can they be utilized?	3	2	2,7,13	3,7	4
28	Determine ethanol fermentation efficiency for the corn (15 percent moisture; 70 percent starch on dry basis) in laboratory. Assume that in this experiment we prepared a mash having 30 percent total solids on dry basis and after 72 h of fermentation, analysis of the final liquid sample by high pressure liquid chromatography (HPLC) showed an ethanol concentration of 13.1 g/L. Data: 1 kg glucose will produce 0.511 kg ethanol. 1 bushel (bu) of corn=56 pounds (lb) or 25.40 kg. The specific gravity of ethanol at 20°C is 0.79 kg/L. The hydrolysis of starch to produce glucose can be expressed by the following equation and its conversion factor is 1.111: $(C_6H_{10}O_5)_n + nH_2O \rightarrow nC_6H_{12}O_6$ Ethanol fermentation using glucose as substrate can be expressed by the following equation: $C_6H_{12}O_6 \rightarrow 2 C_2H_5OH + 2 CO_2$	4	2	2,7	3,7	4
2C	What are some emerging technologies or advancements in the production process of biodiesel that aim to improve efficiency and reduce environmental impact?	3	2	1,2,7	1-3	3
3A	How does biohydrogen production compare to other renewable energy technologies in terms of efficiency and cost?	4	3	2,7,13	1-3	2

3B	Determine theoretically the gas composition (% carbon dioxide and % methane) when digesting fat $(C_{57}H_{104}O_6)$. Data: Buswell equation: $C_cH_hO_oN_nS_s + \{(4c - h - 2o + 3n + 2s)/4\} H_2O + \{(4c - h + 2o + 3n + 2s)/8\} CO_2 + \{(4c + h - 2o - 3n - 2s)/8\} CH_4 + nNH_3 + sH_2S$	3	3	1,2,7	1-3	4	
3C	How does anaerobic digestion contribute to biomethane production?	3	3	1,2,7	1-3	4	
4 A	A polymer has the following molar mass distributionNumber of moleculesMolecular weight (g/mol)505000756000Calculate the Number average molecular weight (Mn) and Weight average molecular weight (Mw).a) Number-Average Molecular Weight: $M_n = \frac{\sum c_i}{\sum c_i/M_i}$ b) Weight-Average Molecular Weight: $M_w = \frac{\sum_i N_i M i^2}{\sum_i N_i M i}$	5	4	2,7,13	2,3	4	
4B	Are bioplastics biodegradable? What factors determine their biodegradability?	3	4	2,7,13	2,3	2	
4 C	Write a short note on natural biopolymer Lignin.	2	4	2,7,13	2,3	2	
5A	How does the incorporation of flame retardants and crosslinkers in biopolymers affect their properties and applications?	4	5	2,7,13	2,3	2	
5B	How do biopolymers find their applications in packing and textile industries?	3	5	2,7,13	2,3	4	
5C	What are the environmental benefits of biopolymers compared to synthetic polymers?	3	5	2,7,13	2,3	4	
CO: Course Outcome; BL: BLOOM TAXONOMY LEVEL: 1-Remember, 2-Understand, 3-Application, 4-Analysis, 5-Evaluation, 6-Creation							