

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI- 86
(For candidates admitted during the academic year 2016 – 17 & thereafter)

B. Voc. DEGREE EXAMINATION, APRIL 2024
SUSTAINABLE ENERGY MANAGEMENT
FOURTH SEMESTER

COURSE : ALLIED CORE
PAPER : MICROBIAL FUEL CELLS
SUBJECT CODE : 16VS/VA/MF45
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

ANSWER ALL QUESTIONS

(30x1 = 30)

I. Choose the correct answer

1. What is the main function of a Microbial Fuel Cell?
a. To generate electricity through the use of bacteria b. To clean waste water
c. To produce biofuels d. To purify air
2. Which type of microorganisms are commonly used in Microbial Fuel Cells?
a. Algae b. Fungi c. Bacteria d. Protists
3. What type of material is typically used as the anode in a Microbial Fuel Cell?
a. Carbon b. Platinum c. Gold d. Silver
4. What is the role of the cathode in a Microbial Fuel Cell?
a. To provide oxygen for the bacteria,
b. To act as a fuel source for the bacteria,
c. To act as a barrier between the anode and the environment,
d. To generate electricity
5. The standard emf is _____ for hydrogen-oxygen fuel cells.
a. 3.96 V b. 1.23 V c. 0.58 V d. 2.54 V
6. What is the main goal of research in Microbial Fuel Cells?
a. To increase the efficiency of the cells
b. To develop new types of bacteria for use in the cells
c. To reduce the cost of production,
d. All of the above
7. What is the main limitation of using Microbial Fuel Cells as a source of renewable energy?
a. They require large amounts of water
b. They are only suitable for small scale power generation
c. They are dependent on specific types of bacteria
d. They produce a significant amount of waste
8. How does the efficiency of a Microbial Fuel Cell compare to other forms of renewable energy?
a. It is less efficient b. It is more efficient
c. It is equally efficient d. It is dependent on the type of bacteria used
9. How do microbial fuel cells used in wastewater treatment?
a. in reducing the pH level
b. in utilizing the contaminants to produce energy
c. in volume reduction
d. removing the black color from the waste water
10. MFC is finding its application in _____
a. Bioproduction b. Biosensors c. Biomass d. None of the above.

II. Fill in the blanks

11. A _____ is a device that generates electricity by a chemical reaction.
12. Around 700C to 1000C _____ fuel cell works.
13. A _____ is a device that converts chemical energy to electrical energy by the action of microorganisms.
14. _____ are defined as those substances which alter the rate of reaction.
15. In a _____ chamber of MFC, the protons and electrons are recombined. The level of oxygen (O₂) is reduced to water, It uses Pt as a catalyst.
16. In an MFC the bacteria oxidize the organic matter to produce _____.
17. _____ proves to be an ideal solution to the long lasting question of wastewater management.
18. Storage of hydrogen and transportation of hydrogen are the main disadvantages in _____ Fuel cells and also these types of fuel cells are costly.
19. In a cathode $O_2 + 4H^+ + 4e^- \longrightarrow$ _____?
20. In an electrochemical experiment, the three fundamental variables are _____, _____ and time.

III. State True or False

21. Microbial Fuel Cells is an Renewable Energy Source.
22. Oxygen is the basic fuel in a Fuel Cell.
23. Most Fuel Cells are having 60% to 80% Energy Efficiency.
24. Michael Cressé Potter managed to generate electricity from *Saccharomyces cerevisiae* in the year 2000.
25. Microbial fuel cells rely on living biocatalysts to facilitate the movement of electrons throughout their systems instead of the traditional chemically catalyzed oxidation of a fuel at the anode and reduction at the cathode.

IV. Answer in a sentence or two

26. Write one important disadvantage of fuel cells.
27. Name the two types of catalysts used in MFCs.
28. List any two important features of Life Cycle Assessment of a fuel cell.
29. Write any two names of the bacteria used in Microbial Fuel cells.
30. What are the byproducts of Fuel cells?

SECTION – B**Answer any SIX questions:****(6x5=30)**

31. Write in brief about the low temperature fuel cells.
32. List the Safety issues that one has to think about when they are using Fuel Cells.
33. Discuss about the Fuel cell modeling in short.
34. Tell about the classification of Microbial Fuel cells.
35. How does Biohydrogen is produced using MFCs?
36. Draw a I-V Curve and explain how it is used to study the Fuel cells.
37. Write in short about the uses of Microbial Fuel cells as Biosensors.
38. Write in short about the uses of Microbial Fuel cells in wastewater treatment.

SECTION – C**Answer any TWO questions:****(2x20=40)**

39. Justify the need of fuel cells and tell about its history and types of fuel cells in detail.
40. Explain in detail how to charge Fuel cell charge and write in brief about the flow of current and transport in electrode and electrolyte.
41. Elaborate the In-situ and ex-situ characterization techniques used to evaluate Microbial Fuel Cells.
42.
 - a. Argue how does Microbial Fuel cells are having more advantages than the traditional Fuel cells.
 - b. Explain the principle, components, construction and working of MFCs.
