(7 pages) **Reg. No. :** .....

Code No. : 7687 **Sub. Code : WMBE 41**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2025.

Fourth Semester

Microbiology

Elective VI – BIO ENERGY

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. Biomass is used in the production of
   (a) fibres
   (b) chemicals
   (c) transportation fuels
   (d) biochemicals

2. Bioenergy is the energy obtained from _____
   (a) Coal (b) Natural Gas
   (c) Alcohol (d) Biomass

3. Which of the following are the types of bioenergy?
   (a) Animal energy and chemical energy
   (b) Solar energy and nuclear energy
   (c) Fossil fuels and solar energy
   (d) Animal energy and biofuels

4. Which is a main raw material for biodiesel production?
   (a) Vegetable Oil (b) Animal Fat
   (c) Natural Gas (d) Coal

5. What is the production method of Biodiesel
   (a) Esterification (b) Saponification
   (c) Hydrogenation (d) None of the above

6. What are the advantages of biodiesel than fossil fuel
   (a) Ecofriendly (b) Renewable
   (c) Reduced emission (d) All the above

7. The production of bio ethanol is by fermenting the _____ and starch components.

(a) Acid (b) Milk

(c) Sugar (d) Alcohol

8. The bio ethanol is subjected to rectification to remove _____

(a) Sugar (b) Enzymes

(c) Yeast (d) Impurities

9. The bio ethanol obtained in the fermentation process has _____ purity.

(a) 99% (b) 99.2%

(c) 99.4% (d) 99.7%

10. Which of the following is a substrate for biogas production?

(a) Municipal and residential waste

(b) E-waste

(c) Metallic waste

(d) Gaseous effluents

11. Which of the following is a preferred substrate for biogas production? Note that TS stands for total solids.

(a) Less than 1% TS

(b) 20-40% TS

(c) 1-5% TS

(d) 5-10% TS

12. Which among the following is the best sources for methane production?

(a) Metallic scrap (b) E-waste

(c) Plastic waste (d) Water hyacinth

13. Which of the following supplies maximum amount of hydrogen gas?

(a) Natural gas

(b) Anaerobic Digestion

(c) Wastewater treatment

(d) Electrolysis

14. Which of the following use hydrogen as fuel?

(a) Fossil fuels (b) Anerobic digestion

(c) Fuel cells (d) Cooking

15. How is hydrogen gas produced from fossil fuels?

(a) Partial oxidation of methane

(b) Electrolysis

(c) Evaporation

(d) Biomass gasification

PART B — (5 × 4 = 20 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

16. (a) What is bioenergy? Give its importance.

Or

(b) What are the resources found in India as biomass for bioenergy?

17. (a) Illustrate transesterification process.

Or

(b) Determine lipid extraction from the source of biodiesel.

18. (a) Characterize microorganisms of bioethanol production.

Or

(b) Assess the method of biomass pretreatment for ethanol production.

19. (a) Explain the uses of biogas.

Or

(b) What are the composition of Biogas? Explain.

20. (a) Characterize Spirulina.

Or

(b) Describe microbial fuel cell.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

21. (a) Write an essay on bioenergy.

Or

(b) How biomass becomes bioenergy?

22. (a) Illustrate biomass conversion of biodiesel.

Or

(b) Determine the biodiesel from microorganism.

23. (a) Write a detailed note on conversion starch to ethanol.

Or

(b) Assess the role of enzymes in bioethanol production.

24. (a) Give a brief note on the biogas bottling technology.

Or

(b) Write an essay on biogas from microorganisms.

25. (a) Give a short note on cultivation of seaweeds.

Or

(b) Explain commercialized microalgal production.
