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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY

HMM 3422: ENVIRONMENTAL MICROBIOLOGY

DATE: APRIL 2024

TIME: 2 HOURS

INSTRUCTIONS:

- (i) The paper consists of **Three** Sections
- (ii) Section A: Multiple Choice Questions
- (iii) Section B: Short Answer Questions
- (iv) Section C: Long Answer Questions

SECTION A MULTIPLE CHOICE QUESTIONS (20MARKS)

1. Which of the following is an example of an environmental microorganism?
 - a) E. coli in the human gut
 - b) Staphylococcus aureus in a hospital
 - c) Algae in a freshwater pond
 - d) Candida albicans in the human mouth
2. What is the primary role of microorganisms in the environment?
 - a) Disease-causing agents
 - b) Decomposition of organic matter
 - c) Production of antibiotics
 - d) Food spoilage
3. How do microorganisms contribute to nutrient cycling in the environment?

- a) By consuming nutrients and storing them in their cells
 - b) By releasing nutrients through metabolic processes
 - c) By converting nutrients into energy for their own growth
 - d) By producing enzymes that break down nutrients
4. What is the significance of microbial diversity in the environment?
- a) It has no impact on ecosystem functioning
 - b) It increases the risk of disease outbreaks
 - c) It enhances ecosystem stability and resilience
 - d) It decreases the efficiency of nutrient cycling
5. Which of the following is an example of a microbial symbiotic relationship in the environment?
- a) Pathogenic bacteria causing disease in a host
 - b) Microorganisms competing for limited resources
 - c) Nitrogen-fixing bacteria living in the root nodules of legumes
 - d) Antibiotic-resistant bacteria emerging in response to drug use
6. How do microorganisms contribute to bioremediation?
- a) By producing toxic chemicals that degrade pollutants
 - b) By physically removing pollutants from the environment
 - c) By metabolizing and breaking down pollutants
 - d) By preventing the release of pollutants into the environment
7. What is the role of microorganisms in wastewater treatment?
- a) They add nutrients to the water
 - b) They remove pollutants through physical filtration
 - c) They break down organic matter and remove pathogens
 - d) They increase the turbidity of the water
8. Which of the following is an example of a microbial adaptation to extreme environments?
- a) Formation of biofilms on surfaces
 - b) Production of antibiotics
 - c) Synthesis of pigments for UV protection
 - d) Consumption of organic matter for energy

9. How do microorganisms influence the global carbon cycle?
- By producing carbon dioxide through respiration
 - By sequestering carbon through photosynthesis
 - By converting carbon into organic matter through decomposition
 - By releasing carbon from fossil fuels
10. What is the role of microorganisms in the nitrogen cycle?
- They convert nitrogen gas into a usable form for plants
 - They release nitrogen into the atmosphere through respiration
 - They consume nitrogen compounds for energy
 - They fix nitrogen into organic compounds through photosynthesis
11. How do microorganisms contribute to the production of greenhouse gases?
- By consuming greenhouse gases and reducing their levels
 - By releasing greenhouse gases through metabolic processes
 - By converting greenhouse gases into organic matter
 - By sequestering greenhouse gases in their cells
12. What is the role of microorganisms in the cycling of sulfur in the environment?
- They convert sulfur dioxide into sulfuric acid
 - They consume sulfur compounds for energy
 - They release sulfur into the atmosphere through respiration
 - They convert organic sulfur into inorganic sulfur compounds
13. How do microorganisms contribute to the degradation of pollutants in soil and water?
- By physically removing pollutants through adsorption
 - By breaking down pollutants into less harmful compounds
 - By neutralizing pollutants through chemical reactions
 - By preventing the accumulation of pollutants in the environment
14. What is the significance of microbial communities in the environment?
- They increase the risk of disease outbreaks
 - They compete for limited resources
 - They enhance ecosystem functioning and stability
 - They decrease the efficiency of nutrient cycling

15. Which of the following is an example of a microbial indicator of water quality?
- a) E. coli
 - b) Staphylococcus aureus
 - c) Candida albicans
 - d) Salmonella enterica
16. How do microorganisms contribute to the formation of soil?
- a) By physically breaking down rocks and minerals
 - b) By secreting enzymes that break down organic matter
 - c) By binding particles together to form aggregates
 - d) By releasing nutrients through metabolic processes
17. What is the role of microorganisms in the cycling of phosphorus in the environment?
- a) They convert phosphorus into a usable form for plants
 - b) They release phosphorus into the atmosphere through respiration
 - c) They consume phosphorus compounds for energy
 - d) They fix phosphorus into organic compounds through photosynthesis
18. How do microorganisms contribute to the degradation of petroleum hydrocarbons?
- a) By physically removing hydrocarbons from the environment
 - b) By converting hydrocarbons into less toxic compounds
 - c) By neutralizing hydrocarbons through chemical reactions
 - d) By preventing the release of hydrocarbons into the environment
19. What is the role of microorganisms in the cycling of trace metals in the environment?
- a) They release trace metals into the atmosphere through respiration
 - b) They consume trace metals for energy
 - c) They convert trace metals into organic compounds through photosynthesis
 - d) They transform and transport trace metals in ecosystems
20. How do microorganisms contribute to the degradation of pesticides and herbicides?
- a) By physically removing pesticides and herbicides from the environment

- b) By breaking down pesticides and herbicides into less toxic compounds
- c) By neutralizing pesticides and herbicides through chemical reactions
- d) By preventing the accumulation of pesticides and herbicides in the environment

SECTION B: SHORT ANSWER QUESTIONS (40 Marks)

1. Describe criteria for selecting a good bacterial indicator of fecal pollution (6 Marks)
2. Differentiate between extreme cold environments with extreme hot environments (6 Marks)
3. Briefly describe five characteristics of Hyperthermophiles (5 marks)
4. Describe the meaning of the term Endolith (4 Marks)
5. With the aid of a sketch, briefly describe the microbial growth within different environments (4 Marks)
6. Describe five types of microbial habitats (5 Marks)
7. Describe environmental and biological factors affecting Biodegradation (4 Marks).
8. Describe six Advantages of Bioremediation (6 Marks)

SECTION C: LONG ANSWER QUESTIONS (40 MARKS)

1. Describe procedure for microbiological quality analysis of water (20 Marks)
2. Giving specific diseases they cause and their symptoms, discuss different types of bacteria Found in Surface Water (20 Marks)

