

# MODEL ANSWER

B.Sc. (Hons.) Agriculture

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

## SEMESTER END EXAMINATION

Semester : I (NEW)

Academic Year : 2018-2019

Course No. : MIBO - 111

Title : Introductory Microbiology

Credits : 1 + 1 = 2

Day & Date :

Time :

Total Marks : 40

### SECTION "A"

**Q. 1** Define microbiology. Enlist important branches of microbiology and write scope and importance of microbiology in agriculture with suitable examples.

**Ans** Microbiology : It is the branch science which deals with study of microorganisms.

(1 marks)

Important branches of microbiology

(1 marks)

a) Mycology- Study of fungi

b) Bacteriology – Study of bacteria

c) Phycology – Study of Algae

d) Virology – Study of Viruses

e) Nematology – Study of Nematodes

f) Protozoology – Study of Protozoa

Scope & Importance in agriculture

(2 marks)

(Very short description on below listed points with suitable examples is expected)

a) Biological Nitrogen fixation

b) Decomposition of organic matter

c) Biochemical Cycling of elements

d) Animal husbandry and Dairy technology

e) Microbes as tools for Biological Research. f) Microbes as Bio-Control agents.

g) Production of Bio fertilizers h) Biodegradation of Agrochemicals and Pollutants.

**Q. 2** Write one important contribution of following Scientists (ANY FOUR)

a) S. A. Waksman

b) N. V. Joshi

c) Louis Pasteur

d) J. B. Boussingault

e) B. Frank

f) P. A. Millardet

**Ans** a) S. A. Waksman : Discovered an antibiotic Streptomycin. Published the book "Principles of soil microbiology". Proved soil as the richest source of antagonistic organisms like actinomycetes

b) N. V. Joshi : Isolated and identified different species of Rhizobia from legumes

c) Louis Pasteur : Disproved theory of spontaneous generation, prepared vaccine against rabies/hydrophobia, pasteurization technique or any other contribution as per standard books.

d) J. B. Boussingault : Stated that legumes can fix atmospheric nitrogen and thereby increase nitrogen content in soil.

e) Frank : Discovered actinomycete 'Frankia' inducing nodulation in roots of non-legumes. Coined term Mycorrhiza

f) Prof. Millardet : Discovered Bordeaux mixture for the control of downy mildew of grapes

(Any one contribution of any four scientist is expected for 0.5 mark each)

**Q. 3** Draw a neat and labeled diagram of typical bacterial cell. Explain in brief bacterial growth curve

**Ans** 1) Diagram of typical bacterial cell (2 marks)

2) Write in detail about growth curve in bacteria

Short description on lag phase, log phase, stationary phase and death phase along with a diagram showing different growth phases is expected. (2 marks)

**Q. 4** Write in brief about generalized and specialized transduction (2 marks for each)

**Ans** a) **Generalized transduction-** A fragment of bacterial DNA is accidentally incorporated into a new phage particle during viral replication and thereby transferred to another bacterial cell. Generalized transduction like conjugation and transformation is also useful for mapping of bacterial genes. (2 marks)

b) **Specialized transduction—**In this, certain temperate phages can transfer only specific genes from one bacterial cell to another. In this the bacterial DNA/genes are limited to one or a few genes lying adjacent to prophage. Significance of transduction in short is expected (2 marks)

**Q. 5** Illustrate with suitable diagram the nitrogen cycle

**Ans** Diagram of nitrogen cycle (2 marks)

Brief description on various steps involved in nitrogen cycle like proteolysis, ammonification, nitrification, nitrate reduction and denitrification along with microbes involved in each step is expected. (2 marks)

**Q. 6** Define rhizosphere. State the factors affecting rhizosphere microflora and write about effect of soil pH and soil moisture.

**Ans** **Rhizosphere :** Region of soil which is subjected to the influence of plant roots OR biologically active root zone is known as rhizosphere. (1 marks)

**Factors affecting :** Soil type, soil moisture, soil amendment and fertilizers, soil  $pH$ , proximity of roots with soil, plant species, age of plant, root exudates (1 marks)

Short description about effect of soil pH and soil moisture is expected (2 marks)

**Q. 7** Define bio-fertilizers and enlist their types. Enlist various methods of their application and write in short about seed dressing and seedling root dip.



Ans

1) **Definition-** Bio-fertilizers are microbial inoculants or carrier based preparations containing living or latent cells of efficient strains of nitrogen fixing, phosphate solubilizing and cellulose decomposing microbes intended for seed or soil application and designed to improve soil fertility and plant growth by increasing the number and biological activity of beneficial soil microbes. (1 marks)

2) **Types :** *Rhizobium* inoculant, *Azotobacter* inoculant, *Azospirillum* inoculant, BGA, PSM, Mycorrhizal fungi, composting cultures and sulphur oxidizing microbes etc. (1 marks)

3) **Methods of application :** 1) Slurry method 2) Seed treatment 3) Pelleting of seed 4) seedling root dip 5) Soil application 5) Sugarcane set inoculation 6) BGA application 7) *Azolla* application (1 marks)

**Short description for seed and seedling root dip application methods.** (1 marks)

**Q. 8 Write short note on the following (ANY TWO) (4 marks for any two)**

**Ans** a) **Silage production---** material used for silage preparation, filling of silage pit, microbes involved and opening of pit a short description on these points is expected

b) **Bio-fungicides-** Importance of *Trichoderma*, mode of action and examples of fungal pathogens controlled is expected

c) **Bio-degradation of organic matter**—composition of organic matter like cellulose, hemicellulose, lignin, protein, chemical reactions during their degradation and microbes involved a short description is expected

d) **Bio-gas production-** principle reactions like hydrolysis, acid formation and methane production along with substrates used, chemical reactions and microbes involved in that a short description is expected

**Q. 9 Give scientific names of any four edible mushroom species and write in brief the cultivation practices of oyster mushroom on the following aspects**

a) substrate b) bed filling and spawn run c) harvesting

**Ans** **Scientific Names-** *Pleurotus sajor-caju*, *Pleurotus florida*, *Agaricus bisporius*, *Hypsizygus ulmarious* or any other names of edible mushroom. (1 marks)

1. **Substrate-** paddy straw, wheat straw, finger millet straw, soyabean leaves and other substrate used for cultivation of oyster mushroom.
2. **Methods of spawning** like layer/thorough spawning, method of bed filling, optimum temperature ranges during spawn run, opening of the bed and care to be taken after opening of bed
3. **Harvesting procedure and packing**

Short description on above points is expected.

( 3 marks )

**Q. 10** Define biological nitrogen fixation. Write in brief about types of BNF with suitable examples

**Ans** Biological nitrogen fixation : Is the enzymatic process of reduction of atmospheric nitrogen into ammonia. OR Definition of biological nitrogen fixation as per standard book. (1 mark)

Short information on symbiotic, asymbiotic and associative type of nitrogen fixation with the microorganisms involved is expected. (3marks)

#### SECTION "B"

**Q. 11** State true or false

**Ans.**

1. True
2. True
3. False
4. False

**Q. 12** Fill in the blanks

**Ans.**

1. Anton Van Leeuwenhoek
2. Cyanobacteria
3. Stanley Prusiner
4. Lophotrichous