## UPES
### End Semester Examination, May 2023

**Course:** Agricultural Microbiology and Plant Pathology
**Semester: IV**
**Program: Integrated BSc-MSc Microbiology**
**Duration: 3 Hours**
**Course Code: HSMB2017**                                  **Max. Marks: 100**
**Instructions: Read Questions Carefully**

| S. No. | Section A<br><br>Short answer questions/ MCQ/T&F<br>(20Qx1.5M= 30 Marks) | Marks | COs |
|---|---|---|---|
| Q1 | Citrus canker disease is caused by:<br>A. *Erwinia* spp.<br>B. *Pseudomonas* spp.<br>C. *Xanthomonas* spp.<br>D. None of the above | 1.5 | CO4 |
| Q2 | The following obligately requires a plant host for diazotrophy:<br>A. *Rhizobium*<br>B. *Frankia*<br>C. *Bradyrhizobium*<br>D. All of the above | 1.5 | CO2 |
| Q3 | The fungal partner in ectomycorrhizal class belongs to:<br>A. Basidiomycetes<br>B. Ascomycetes<br>C. Zygomycetes<br>D. All of the above | 1.5 | CO3 |
| Q4 | Which of the following evolved most recently:<br>A. Arbuscular mycorrhiza<br>B. Ectomycorrhiza<br>C. Ericoid mycorrhiza<br>D. Endomycorrhiza | 1.5 | CO3 |
| Q5 | The function of leghemoglobin in root nodules is for:<br>A. Protection of Hydrogenase<br>B. Protection of Oxygenase<br>C. Protection of Nitrogenase<br>D. All of the above | 1.5 | CO3 |

| Q6 | Common causative agent of Fire Blight disease affecting apples are:<br>    A. *Erwinia amylovora*<br>    B. *Xanthomonas* spp.<br>    C. *E coli*<br>    D. *Bacillus subtilis* | **1.5** | **CO4** |
|---|---|---|---|
| Q7 | Why is crop rotation necessary?<br>A. To increase the fertility of soil<br>B. To increase the quantity of minerals<br>C. To reduce the quantity of proteins<br>D. To plough various types of crops | **1.5** | **CO1** |
| Q8 | The lower Gangetic plain is characterized by humid climate with high temperature throughout the year. Which one among the following pairs of crops is most suitable for this region?<br>A. Paddy and Cotton<br>B. Wheat and Jute<br>C. Paddy and Jute<br>D. Wheat and Cotton | **1.5** | **CO1** |
| Q9 | Golden rice is a genetically modified crop where incorporated gene is meant for biosynthesis of:<br>    A. Vitamin E<br>    B. Vitamin D<br>    C. Vitamin C<br>    D. Vitamin A | **1.5** | **CO4** |
| Q10 | Aerobic oxidation of ammonia to nitrite and nitrate in soils is called:<br>    A. Nitrification<br>    B. Ammonification<br>    C. De-ammonification<br>    D. Ammonia Oxidation | **1.5** | **CO3** |
| Q11 | The biomarker gene most widely used to study the ecology of nitrogen-fixation is:<br>    A. nifH<br>    B. nifD<br>    C. nifA<br>    D. nifG | **1.5** | **CO2** |
| Q12 | The thermal conductivity of soil depends on:<br>    A. Texture<br>    B. Moisture<br>    C. Organic matter content<br>    D. All of the above | **1.5** | **CO1** |
| Q13 | Which group of microbes increases phosphate solubility?<br>    A. *Azotobacter*<br>    B. *Pseudomonas and Thiobacillus*<br>    C. *Rhizobium*<br>    D. *Clostridium* | **1.5** | **CO2** |

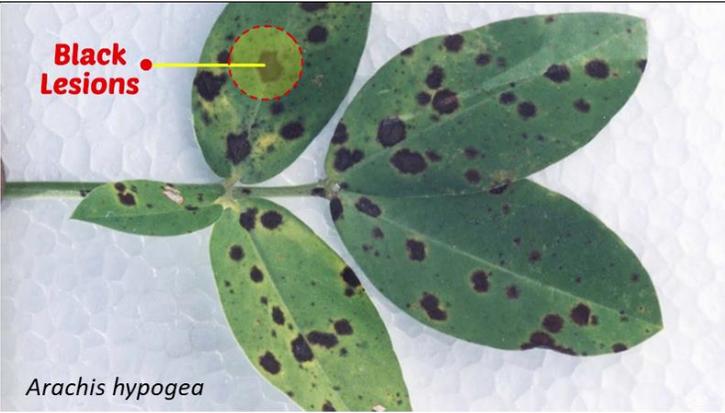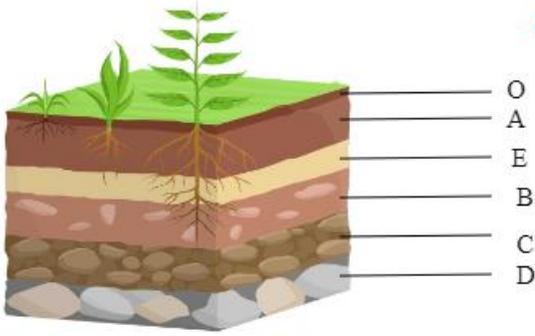| Q14 | Which of the following possess all three different types of Nitrogenase: <br> A. *Azotobacter vinelandii* <br> B. *Pseudomonas stutzeri* <br> C. *Rhizobium leguminosarum* <br> D. All of the above | 1.5 | CO2 |
|---|---|---|---|
| Q15 | In response to Fe limitation, many plant associated bacteria produce: <br> A. Ionophores <br> B. Pneumatophores <br> C. Siderophores <br> D. Haemtaophores | 1.5 | CO3 |
| Q16 | The correct stoichiometric equation representing Biological Nitrogen fixation is: <br> A. $N_2 + 8H^+ + 8e^- + 16\ ATP \rightarrow 2NH_3 + H_2 + 16ADP + 16\ P_i$ <br> B. $N_2 + 4H^+ + 4e^- + 8\ ATP \rightarrow NH_3 + 1/2H_2 + 8ADP + 8\ P_i$ <br> C. $2N_2 + 12H^+ + 12e^- + 32\ ATP \rightarrow 6NH_3 + H_2 + 34ADP + 34\ P_i$ <br> D. $N_2 + H^+ + e^- + 8\ ATP \rightarrow NH_3 + H_2 + 8ADP + 8\ P_i$ | 1.5 | CO2 |
| Q17 | The three different types of Nitrogenase are: <br> A. Mo nitrogenase, V nitrogenase, Fe nitrogenase <br> B. Mo-Fe nitrogenase, V-Fe nitrogenase, Fe nitrogenase <br> C. Mo-Fe nitrogenase, Mo-V nitrogenase, Fe nitrogenase <br> D. Mo-V nitrogenase, V nitrogenase, Fe nitrogenase | 1.5 | CO2 |
| Q18 | Wood wide web represents the underground network of microbes that connects trees. These microbes are: <br> A. Bacteria <br> B. Cyanobacteria <br> C. Mycorrhizae <br> D. Lichens | 1.5 | CO3 |
| Q19 | The black soil is also known as: <br> A. Bhangar <br> B. Humus <br> C. Crystalline <br> D. Regur | 1.5 | CO1 |
| Q20 | What kind of soil is most suitable for growing cashew nuts: <br> A. Black soil <br> B. Red laterite soil <br> C. Alluvial soil <br> D. Clayey loam | 1.5 | CO1 |

## Section B
### (4Qx5M=20 Marks)

| Q 1 | What are PGPM bacteria? Briefly list some key PGPM characteristics. | **5** (1+4) | **CO2** |
|---|---|---|---|
| Q 2 | What is integrated nutrient management (INM)? Briefly state the importance of biofertilizer as a component of INM. | **5** (2+3) | **CO2** |
| Q 3 | What are the key microbial metabolic processes involved in organic matter degradation during biogas production. | **5** | **CO5** |
| Q 4 | A. What are GM crops? <br> B. Briefly state the mode of action of Bt toxin with a schematic diagram? | **5** (1+4) | **CO4** |

## Section C
### (2Qx15M=30 Marks)

| Q 1 |  | 15 <br><br> (2+5+4 +4) | CO5 |
|---|---|---|---|
| | A. Identify the method of composting in above image. <br> B. Explain briefly the principle behind composting in above image. <br> C. How does C:N ratio and temperature affect this process of composting? <br> D. What are the advantages and disadvantages of this process of composting? | | |
| Q2 |  | 15 <br><br> (2+4+6 3) | CO3 |
| | A. Identify the plant-microbial association in above image? <br> B. How is this association important for soil and crop productivity? <br> C. Briefly explain the steps involved in above plant-bacterial interactions with a schematic diagaram. <br> D. If a soil is enriched in readily bioavailable N, reason how it may affect this association? | | |

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| | **Section D** (2Qx10M=20 Marks) | | |
| **Q1** |   *Arachis hypogea*  A. Identify the disease in *A hypogea* as seen in above image.  B. What is the causative organism?  C. Briefly explain the symptoms and disease cycle.  D. What are the control options for this pathogen? | **10**  (1+2+4 +3) | **CO4** |
| **Q2** |   The above picture represents a typical soil profile:  A. What do these labels O – D represent in above figure?  B. Briefly explain the characteristics and importance of O and A for crop productivity.  C. Which label represents the zone of illuviation?  D. What is the difference between illuviation and elluviation? | **10**  (3+3+1 +3) | **CO1** |