


Name:			
Enrolment No:			
UPES End Semester Examination, May 2023 Course: Environmental & Agricultural Microbiology Semester: II Program: MSc Microbiology Duration: 3 Hours Course Code: HSMB7031 Max. Marks: 100			
Instructions:			
S. No.	Section A	Marks	COs
	Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)		
Q 1	The region where the soil and root make contact is designated as: A. Rhizosphere B. Lithosphere C. Hydrosphere D. Xerosphere	1.5	CO1
Q2	The correct stoichiometric equation representing Biological Nitrogen fixation is: A. $N_2 + 8H^+ + 8e^- + 16 ATP \rightarrow 2NH_3 + H_2 + 16ADP + 16 P_i$ B. $N_2 + 4H^+ + 4e^- + 8 ATP \rightarrow NH_3 + 1/2H_2 + 8ADP + 8 P_i$ C. $2N_2 + 12H^+ + 12e^- + 32 ATP \rightarrow 6NH_3 + H_2 + 34ADP + 34 P_i$ D. $N_2 + H^+ + e^- + 8 ATP \rightarrow NH_3 + H_2 + 8ADP + 8 P_i$	1.5	CO5
Q3	Which of the following in sewage treatment removes suspended solids? A. Tertiary treatment B. Primary treatment C. Secondary treatment D. Sludge treatment	1.5	CO6
Q4	Organic matter (humus) is an important part of soil as: A. It helps to improve water infiltration B. It can break down organic pollutants C. It converts nitrogen in the air into nitrates used by plants D. It is rich in nutrients, which is important for fertility	1.5	CO1
Q5	The following is a promising biocontrol agent against multiple plant pathogens: A. <i>Aspergillus flavus</i> B. <i>Penicillium notatum</i> C. <i>Trichoderma</i> spp. D. <i>Fusarium oxysporum</i>	1.5	CO1

Q6	Flooded rice paddies are one of the major biogenic sources of atmospheric: A. Nitrogen B. Methane C. Carbon-dioxide D. All of the above	1.5	CO5
Q7	Anoxygenic photosynthesis is characterized by: A. Utilization of reduced electron donors like H ₂ S, Fe (II) etc. B. Photolysis of water C. Generation of Oxygen D. All of the above	1.5	CO5
Q8	The act of replenishing TCA cycle intermediates that have been extracted for biosynthesis is called: A. Anaplerosis B. Catabolism C. Anabolism D. None of the above	1.5	CO5
Q9	Causative agent of Crown Gall is: A. <i>Agrobacterium tumifaciens</i> B. <i>Xanthomonas campestris</i> C. <i>Erwinia amylovora</i> D. <i>E coli</i>	1.5	CO1
Q10	Which of the following group of viruses generally attack plants? A. Retroviruses B. Riboviruses C. Rheoviruses D. Enteroviruses	1.5	CO1
Q11	Which of the following is the most influential factor affecting soil formation? A. Parent material B. Organisms C. Time D. Climate	1.5	CO1
Q12	In which condition do organic acids cause iron to be transported downward through the soil profile? A. Salinisation B. Podzolisation C. Laterisation D. Gleying	1.5	CO1
Q13	At a high pH which essential elements become insoluble and unavailable to plants? A. Boron and Phosphorus B. Boron and Iron C. Copper and Zinc D. Phosphorus and Magnesium	1.5	CO1

Q14	Which fertilizer produces acidity in soil: A. Ammonium sulfate B. Sodium nitrate C. Calcium ammonium nitrate D. Calcium nitrate	1.5	CO1
Q15	Microorganism involved in conversion from nitrite to nitrate: A. <i>Nitrosomonas</i> B. <i>Nitrobactor</i> C. <i>Pseudomonas</i> D. <i>Bacillus</i>	1.5	CO1
Q16	Signaling molecules produced by Rhizobia during initiation of symbiosis with legume plants are: A. Nod factors B. Nif factors C. Flavones D. Leghemoglobin	1.5	CO2
Q17	The most accurate method for quantifying diazotrophic flux of soil microbes and plants is by performing: A. Acetylene reduction assay B. Ammonia production test C. NifH gene expression assay D. ¹⁵ N isotope dilution method	1.5	CO2
Q18	The symbiotic association of fungi and roots of higher plants is known as: A. Lichen B. Mycorrhiza C. Rhizosphere D. Endophytes	1.5	CO4
Q19	Which nutrient influence the nodule formation and nitrogen fixation in soil? A. pH B. N C. P D. All of the above	1.5	CO2
Q20	What is the term used to describe the process by which one microbe kills or inhibits the growth of another microbe? a. Antagonism b. Symbiosis c. Mutualism d. Commensalism	1.5	CO4

Section B
(4Qx5M=20 Marks)

Q 1	A. Define Eh. B. Explain how changes in Eh-pH can control soil microbial metabolism.	5 (1+4)	CO1
Q2	A. What are PGPR? B. Write down the different characteristics of PGPR.	5 (2+3)	CO2
Q3	A. What are mycorrhizae? B. Write down the differences between ectomycorrhizae and endomycorrhizae? C. What are Tree Wide Web?	5 (1+3+1)	CO2
Q4	A. What is DNRA? B. State the importance of DNRA in soil biogeochemistry and fertility.	5 (3+2)	CO5

Section C
(2Qx15M=30 Marks)

Q 1

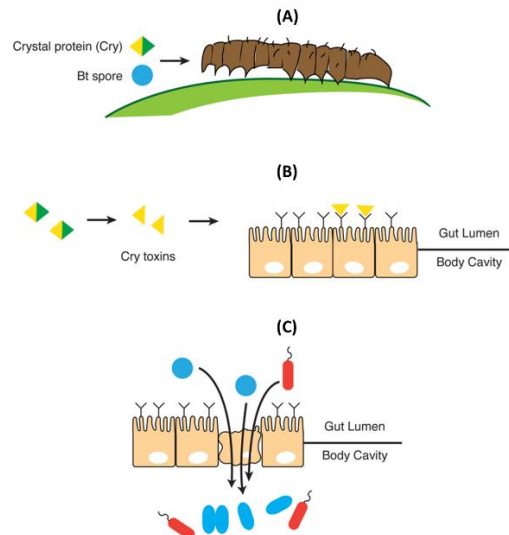


15
(2+4+6+3)

CO6

- Identify the type of Pollution.
- What are the different in-situ techniques used for microbial remediation of above pollution?
- Describe key features of bacterial metabolic pathways involved in remediation.
- State different factors affecting microbial remediation of above pollutants.

Q 2



15
(1+6+6+2)

CO3

- What does the above figure represent?
- State the mode of action in (A), (B) and (C) as seen in above figure.
- Write down the steps involved in the recombinant production of Cry toxin with help of a schematic diagram.
- Comment on evolved resistance and secondary pests.

Section D
(2Qx10M=20 Marks)

Q 1	A. What are cable bacteria? B. Give two examples of their natural habitat? B. Explain how does cable bacteria conserves energy with the help of a schematic diagram? C. What are the potential applications of cable bacteria?	10 (1+2+5+2)	CO5
Q2	Bacteria isolated from a soil sample on Nutrient Agar medium represented a tiny fraction (<1%) of the total bacterial population enumerated by direct microscopy. A. What is the discrepancy between culturable plate counts and total counts referred to as? B. Why are most Bacteria not culturable? C. Describe briefly the strategies that can be adopted to increase culturability of soil bacteria.	10 (2+4+4)	CO4