



UNIVERSITY WITH A PURPOSE

**UNIVERSITY OF PETROLEUM AND ENERGY  
STUDIES**

**End Semester Examination, December 2021**

**Course: Biofertilizers and bioremediation**

**Program: M.Sc. Microbiology**

**Course Code: HSMB 80007P**

**Semester: III**

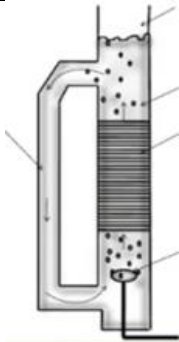
**Duration: 03 hrs.**

**Max. Marks: 100**

**Instructions:**

<b>SECTION A</b> <b>(Type the answers in test box)</b>		<b>(20Q x1.5M= 30 Marks)</b>	<b>CO</b>
MCQs or Fill in the blanks		<b>1.5</b>	
Q1	Which is not an indigenous microbe used for bioremediation? A)Piscirikettsis salmonis B)E. coli C)Phanerochaete sordida D)Pseudomonas aeruginosa E)Deinococcus radiodurans	<b>1.5</b>	<b>CO3</b>
Q2	Ananda Chakrabarty received the first U.S. patent for a GM organism. This organism was: A)A transgenic mouse expressing the growth hormone gene B)Dolly the cloned sheep C)Cloned E. coli D)The GloFish E)Pseudomonas engineered to degrade petroleum	<b>1.5</b>	<b>CO3</b>
Q3	Which cleanup approach involves removing groundwater or soil from its natural setting to allow for bioremediation? A)In situ bioremediation B)Ex situ bioremediation C)Bioaugmentation D)Phytoremediation E)None of these choices	<b>1.5</b>	<b>CO3</b>
Q4	Which of the following is incorrectly matched? (a) Alnus – <i>Frankia</i> (b) Alfalfa – <i>Rhizobium</i> (c) Nitrogen fixer – <i>Anabaena</i> (d) Mycorrhiza – <i>Rhodospirillum</i>	<b>1.5</b>	<b>CO2</b>
Q5	Which of the following is not a biofertilizer? (a) Mycorrhiza (b) <i>Rhizobium</i> (c) <i>Agrobacterium</i> (d) <i>Nostoc</i>	<b>1.5</b>	<b>CO2</b>
Q6	Which of the following is a nitrogen fixer in the root nodules of <i>Alnus</i> ?	<b>1.5</b>	<b>CO2</b>

	<p>(a) <i>Clostridium</i></p> <p>(b) <i>Bradyrhizobium</i></p> <p>(c) <i>Azorhizobium</i></p> <p>(d) <i>Frankia</i></p>		
Q7	<p>Which of the following is a pair of biofertilizers?</p> <p>(a) <i>Salmonella</i> and <i>E.coli</i></p> <p>(b) <i>Rhizobium</i> and grasses</p> <p>(c) <i>Nostoc</i> and legume</p> <p>(d) <i>Azolla</i> and BGA</p>	1.5	CO2
Q8	<p>Which of the following is an endomycorrhiza?</p> <p>(a) <i>Rhizobium</i></p> <p>(b) <i>Agaricus</i></p> <p>(c) <i>Glomus</i></p> <p>(d) <i>Nostoc</i></p>	1.5	CO2
Q9	<p>Pick the correct statement</p> <p>(a) legumes do not fix nitrogen</p> <p>(b) legumes fix nitrogen independent of bacteria</p> <p>(c) legumes fix nitrogen through bacteria in their roots</p> <p>(d) legumes fix nitrogen through bacteria in their leaves</p>	1.5	CO2
Q10	<p>Which element is required during nitrogen fixation?</p> <p>(a) Mn</p> <p>(b) Mo</p> <p>(c) Zn</p> <p>(d) Cu</p>	1.5	CO2
Q11	<p>Nitrogen fixation is</p> <p>A) Nitrogen ® Ammonia</p> <p>B) Nitrogen® Nitrates</p> <p>C) Nitrogen® amino acids</p> <p>D) Both A and B</p>	1.5	CO2
Q12	<p>Algae can be used as green manure. Which algae would this be?</p>	1.5	CO2
Q13	<p>Azotobacter and <i>Bacillus polymyxa</i> are</p> <p>A) Decomposers</p> <p>B) Nonsymbiotic nitrogen fixers</p> <p>C) Symbiotic nitrogen fixers</p> <p>D) Pathogenic bacteria</p>	1.5	CO2

Q14	Crop rotation is carried out for  A) Increasing acidity of soil  B) Decreasing fertility of soil  C) Increasing fertility of soil  D) All the above	1.5	CO2
Q15	Expand POPs.	1.5	CO3
Q16	VAM is a) Endomycorrhizza b) Ectomycorrhizza c) Root associated BGA d) Nodulating fungi	1.5	CO2
Q17	Arrange these in order of nitrogen fixation. Cyanobacteria > Rhizobium> Azolla >Azotobacter > Azospirillum.	1.5	CO2
Q18	Name one international tradename of rhizobial inoculants.	1.5	CO2
Q19	Name one microbe involved in anaerobic degradation of toluene.	1.5	CO3
Q20	Name two commercial PSMs.	1.5	CO2
<b>SECTION B (Scan and upload)</b>		(4Qx5M=20 Marks)	CO
Q	Short Answer Type Question (5 marks each)	5M	
Q1	What are carrier based inoculants? Briefly describe role of an ideal carrier.	5M	CO1
Q2	List out advantages of biopesticide over chemical pesticide. Can biopesticide replace organic pesticide completely?	5M	CO1
Q3	Give an account of how and why methane utilization occurs in nature.	5 M	CO3
Q4	See the following diagram and write what is it used for?  	5M	CO3
<b>SECTION C (Scan and upload)</b>		(2Qx15M=30 Marks)	CO
<b>Two case studies 15 marks each subsections</b>			
Q1	In gulf of Mexico, fish and aquatic animals started dying; suddenly some biologicals were added to rescue the system. Given this answer the following: 1) What according to you has happened? (2M)	15 M	CO4

	<p>2) A seemingly looking chemical was added first. What could this be? Name few examples. (3M)</p> <p>3) What approaches can be taken to resolve this problem? (4M)</p> <p>4) What organisms are responsible for such revivals and what are metabolic pathways involved? (6M)</p>		
Q2	<p>A plant was growing very well in Uttarakhand and suddenly after few years; its yield started to decrease:</p> <p>(i) What can be the possible biological and abiotic factors responsible for it? (4M)</p> <p>(ii) What are bio fertilizers, can they be used to rescue this plant? (7M)</p> <p>(iii) Name few rhizosphere microorganisms and their role in plant growth. (4M)</p>	15 M	CO4
	<p><b>SECTION- D</b> <b>(Scan and upload)</b></p>	(2Qx10M=20 Marks)	CO
	<p>Long Answer type Question</p>		
Q1	<p>(i) Give an account of degradation of halo-organic compounds in nature with focus on patchwork evolution.</p>	10 M	CO3
Q2	<p>(ii) a) What is BT toxin? How does it work? (6M)</p> <p>(iii) b) Name viral biocontrol agents and their application (4M)</p>	10 M	CO1