CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

III Semester of M. Sc. (Microbiology) Examination, November 2018

Course code & Name: MI 823 & Environmental Microbiology

Date: 23/11/2018 Day: Friday Time: 1:30 P.M. To 2:00 P.M. Maximum Marks: 20

MCQ

Important Instructions:

- Tick the correct answer and it should be written in question paper itself.
- Use of non-programmable calculator is allowed.

Q - I	Choose the correct answer for the fo	llowing questions.	20
1.	The following is a cultivation-indep	pendent fingerprinting technique that is used for	01
	sequence-specific separation of PCR-	amplified 16S rRNA genes in polyacrylamide gels	
	containing a linear gradient of DNA denaturants.		
	(i) T-RFLP	(ii) ARISA	
	(iii) DGGE	(iv) Phylochip	
2.	Which of the following is a water-sampling device that is used for obtaining seawater 0 samples at specific depths for microbiological and geochemical studies?		01
	(i) Andersen 6-STG sampler	(ii) AGI-30 sampler	
	(iii) Hollow-stem auger	(iv) Niskin sampler	
3.	In an activated sludge process, the overgrowth of following filamentous bacteria results in 0 unsatisfactory floc formation/settling known as sludge bulking.		01
	(i) Cyrptococcus neoformans	(ii) Sphaerotilus natans	
	(iii) Geotrichum candidum	(iv) Giardia lamblia	
4.	<i>Agrobacterium tumefaciens</i> transfers T-DNA into the host plant genome and stimulates the transformed plant cells to produce amino acid and sugar derivatives called that are utilized as nutrients by the bacterium.		01
	(i) Nod factors	(ii) Flavonoids	
	(iii) γ-butyryl lactones	(iv) Opines	

5.	In a microbial habitat, the sum of th microbial species to live and reproduce	e environmental factors that affect the ability of a	01
	(i) Niche	(ii) P/R ratio	
	(iii) Guild	(iv) Homeostasis	
6.	The microbe-microbe interaction between <i>Myxococcus xanthus</i> and <i>Escherichia coli</i> can be classified as		01
	(i) Commensalism	(ii) Predation	
	(iii) Syntrophism	(iv) Mutualism	
7.	Red tide, a type of toxin producing harmful algal bloom (HAB) is caused by overgrowth of <i>Alexandrium</i> spp. that belongs to group of marine eukaryotic phytoplanktons.		01
	(i) Diatoms	(ii) Dinoflagellates	l
	(111) Coccolithophores	(1V) SAR11	
8.	The following microbial diversity measure is used to characterize the equitability of species abundance in a sample unit.		01
	(i) Species richness	(ii) Species evenness	
	(iii) Gamma (γ) diversity	(iv) All of them	
9.	Microarrays prepared by affixing rRNA gene–targeted oligonucleotide probes to a glass 01 surface in a known pattern are called		01
	(i) ARDRA	(ii) GeoChip	
	(iii) SNP array	(iv) PhyloChip	
10.	The attachment of <i>Rhizobium</i> to root hairs involves specific bacterial protein called (and host plant lectins.		01
	(i) Leghemoglobin	(ii) Nitrogenase	
	(iii) Muropeptide	(iv) Rhicadhesin	
11.	The following method utilizes an in device to optically trap and physica population for subsequent growth in pu	werted light microscope and a micromanipulation ally isolate single microbial cells from a mixed are cultures.	01
	(i) CARD-FISH	(ii) FISH-MAR	
	(iii) Laser tweezers	(iv) ARISA	
12.	Starved cells of <i>Dictyostelium</i> produce chemical stimulus to attract neighboring (cells and eventually aggregate into motile masses of cells called slugs.		01
	(i) Volatile fatty acids (VFAs)	(ii) N-acyl homoserine lactones (AHLs)	
	(iii) Autoinducer-2	(iv) Cyclic adenosine monophosphate (cAMP)	
13.	Organomercurials formed by methylation of mercury in environment results into th following.		01
	(i) Bioaccumulation	(ii) Demethylation	
	(iii) Volatilization	(iv) All of them	
14.	The following molecule protects micro	bes from metal toxicity by sequestering metal ions.	01
	(i) Metallothioneins	(ii) MerT protein	
	(iii) CadA protein	(iv) None of them	
15.	A microorganism producing the following compound is more suitable for biodegradation of hydrocarbon, as it helps to emulsify hydrocarbons.		01

	(i) Siderophore	(ii) Biostimulant	
	(iii) Biosurfactant	(iv) Biopesticide	
16.	The following is a heme containing, H2O2 dependent oxidase, involved in lignin modification.		01
	(i) MnP	(ii) LiP	
	(iii) Laccase	(iv) All of them	
17.	Introduction of air into the saturated ground water is called	zone below the water table for bioremediation of	01
	(i) Bioventing	(ii) Biosparging	
	(iii) Bioaugmentation	(iv) Aeration	
18.	During dechlorination of pollutants by microorganisms, the chloride is replaced by the following atom		01
	(i) Fluoride	(ii) Hydrogen	
	(iii) Oxygen	(iv) Nitrogen	
19.	The following process allows complete oxidation of solid waste. 0		01
	(i) Incineration	(ii) Gasification	
	(iii) Pyrolysis	(iv) All of them	
20.	The following term describes the chemical breakdown of a substance to smaller molecules 0 caused by microbes or enzymes.		01
	(i) Bioaccumulation	(ii) Mineralization	
	(iii) Biodegradation	(iv) Biotransformation	

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III Semester of M. Sc. (Microbiology) Examination, November 2018

Course code & Name: MI 823 & Environmental Microbiology

Date: 23/11/2018 Day: Friday Time: 2:00 P.M. To 4:30 P.M. Maximum Marks: 50

Instructions:

1. Section I and II must be attempted in TWO ANSWER SHEET.

- 2. Make suitable assumptions and draw neat figures wherever required.
- 3. Use of non-programmable calculator is allowed.
- 4. Show necessary calculations.

SECTION -I			
Q –	II Answer the following questions as directed (answer any five).	20	
1.	Enlist the various abiotic factors impacting microbial diversity and explain the possible responses of microbial communities to sudden environmental disturbances.	04	
2.	Explain the cultivation-independent microbial community profiling using DGGE method.	04	
3.	Explain the hierarchical organization within a microbial community by giving example of an ecosystem.	04	
4.	Explain the phylogenetic FISH and CARD-FISH methods to study microbial communities.	04	
5.	Explain the process of root nodule formation in the symbiotic association of nitrogen- fixing <i>Rhizobium</i> with leguminous plants.	04	
6.	Explain the following microbe-microbe interactions citing one suitable example: (i) Commensalism (ii) Amensalism	04	
7.	Explain the microbial community analysis using T-RFLP method.	04	
SECTION - II			
Q-II	I (A) Answer briefly (answer any four).	12	
1.	Give an overview of environmental biosensors.	03	
2.	Describe the activated sludge process for wastewater treatment.	03	
3.	Describe the sequential reactions in the anaerobic digester.	03	
4.	Explain the process of biofilm formation.	03	
5.	Explain the Shannon's (H') and Simpson's (D) microbial diversity indices.	03	
Q-II	I (B) Write a short note on the following (answer any four).	08	
1.	Soil sampling devices.	02	
2.	Biodegradation of halogenated aliphatics.	02	
3.	Phytoremediation.	02	
4.	In situ biorestoration of ground water.	02	
5.	Succession of microbial community during composting.	02	
Q-II	I (C) Discuss briefly (answer any two).	04	
1.	Effect of sequestration and aging on bioremediation of polluted sites.	02	
2.	Potential fates and transformations of mercury in the soil environment.	02	
3.	The role of monooxygenases in biodegradation of xenobiotic pollutants.	02	

Q-III (D) Discuss briefly (answer any one).		04
1.	The transport mechanisms involved for biodegradation of hydrocarbon under aerobic and anaerobic conditions.	04
2.	Abiotic and biotic factors affecting the chemical speciation and bioavailability of metals in the environment.	04
Q-III (E) Justify the following statements.		
1.	High vapour pressure should be avoided while bioventing for the restoration of vadose region.	01
2.	Alkanes having 10 to 24 carbon atoms (C_{10} - C_{24}) are usually the easiest to be metabolized by microorganisms.	01