Answer Key – Microbiology Paper III held on 2 May 2019

OPTION A

Q.I A.		**Define the following:**	**(05)**
	i)	Thermocline- the transition zone from epilimnion to hypolimnion	
	Ii)	Commensalism – an association between two species in which one is benefitted while the other is neither harmed nor benefitted	
	Iii)	Wort - - Malted barley is mashed for the production of aqueous fermentation medium,containing fermentable sugars, amino acids and other nutrients prepared by solubilising malt components through action of endogenous hydrolytic enzymes is known as wort	
	Iv)	Prebiotics are defined as non-digestible food ingredients that beneficially affect the host by selectively Stimulating the growth or activity or both, of one or limited number of bacteria in the colon which can improve host's health.for example lactulose, lacitol, fructo-oligosaccharides, pyrodextrins and inulin.	
	v)	Adulterant : A base substance added or a substance removed to reduce quality of the original product	
Q.1 B.		**State whether the following statements are true or false:**	**(05)**
	i)	Cells of a genetically uniform population sometimes do not have similar phenotypic attributes - True	
	Ii)	*Bifidobacterium* species can be isolated from the large intestine of humans & animals - True	
	Iii)	Fermentation of Black tea is performed using lactic cultures - False	
	Iv)	*Salmonella* produces symptoms very similar to staphylococcal poisoning - True	
	v)	Stromatolites are structures found in chloroplasts - False	
Q.I C.		**Give one example for each of the following:**	**(05)**
	i)	Reporter genes –green fluorescent ptn (GFP), luciferase, antibiotic resistance genes, lac Z, etc	
	Ii)	Fungi used to produce Miso **-** Aspergillus oryzae	
	Iii)	Lactic Cultures used in the production of Cottage cheese - Lactococcus lactis and Leuconostoc citrovorum	
	Iv)	Chlorinated hydrocarbons used to control insects: DDT, TDE, Aldrin, Dieldrin	
	v)	Non-discrete microorganisms – any fungus showing mycelial growth	
Q.I D.		**Select the most appropriate alternative:**	**(05)**
	i)	_____ is a carcinogenic mycotoxin (ergot, **aflatoxin**, botulinum toxin)	
	Ii)	Soil particles having a diameter of 0.001 mm are classified as _____ (sand, **clay**, silt)	
	Iii)	_____ is NOT a stable isotope (^{12}C, ^{13}C, **^{14}C**)	

	Iv)	_____are known to be produced by lactic acid bacteria a) Patulins b**) <u>Bacteriocins</u>** c) enterotoxins	
	v)	_____ is an organism used in the synthesis of l-lysine a) **<u>Corynebacterium glutamicum</u>** b) Lactobacillus mesenteroides c) Streptococcus cremoris	
Q.2		**Answer any two of the following:**	(20)
	i)	Discuss the traditional wine fermentation process - Bibek Ray- Page No 196	
	Ii)	Write a note on practical rules for good sanitation – Mudambi 202	
	Iii)	Justify: Eukaryotic cells originated through endosymbiosis, and have characteristics of both Bacteria and Archaea – Brock 375-376	
Q.3 A.		**Answer any three of the following:**	**(18)**
	i)	Justify several genera of Yeasts are used in food fermentation - Ref Bibek Ray Page No 126	
	Ii)	Discuss production of soya products using micro-organisms - Bibek Ray Page No 208	
	Iii)	Discuss the Beneficial Effects of Probiotics - Bibek Ray Page No 197-198	
	Iv)	Write a note on use of microbes in the production of vitamins and amino acids- Bibek Ray 189-191	
	v)	Discuss 4 important steps involved in coffee fermentations - Waites and morgan Page No 203- 208	
	vi)	Write a note on varieties of microorganisms used as Single Cell Proteins Waites and morgan Page no 179-181, 194-198	
Q.3 B.		**Do as directed (any two)**	**(02)**
	i)	Explain what are sourdough breads Sourdough breads are made by using a stable mixture of heterofermentative LAB , Primarily Lactobacillus sanfranciscensis add a characteristic Bite to the bread Improve Texture, and prevent spoilage, Its made using inoculums of last batch of breads	
	ii)	Name two *Pediococcus* species used as starter cultures in food fermentations - Pediococcus pentosaceus, Pediococcus acidilactici, Pediococcus halophilus,	
	iii)	Give 2 important properties of Probiotics Resistance to pH and bile salts, adhesion and colonization competitive exclusion of pathogens, immune regulation safety sensory assessment	
	iv)	Define the term ale – It is a kind of beer made from barley but the method of production varies as compared to normal beer.	
Q.4 A.		**Answer any three of the following:**	**(18)**
	i)	Justify "All water that comes in contact with food should meet bacteriological standards for drinking water." Ans. : Frazier page 451-452	

	Ii)	Discuss Prevention of food adulteration Act of India. Ans.: Mudambi page 213	
	Iii)	How does the Consumer Guidance society protect the consumer? Ans.: Mudambi page 223	
	Iv)	What are the general biological methods for waste disposal? Ans. : Frazier page454-455	
	v)	How would you clean equipment in a food processing plant? Ans.: Frazier 457	
	vi)	Write a short note on botulism. Ans.: Mudambi page 209	
Q.4 B.		**Do as directed (any two):**	**(02)**
	i)	Name a toxin from a plant source. Ans.: Solaine, Caffeine, Phenylethylamine, Cyanogen, Myristicin	
	ii)	What are red tides? Ans.: Red colored plankton proliferate in coastal waters making tides appear red	
	iii)	Give significance of BOD. Ans.: Index used to assess organic matter content and the effect discharged wastewater will have on receiving environment.	
	iv)	Give the full form of GMP Ans.: Good Manufacturing Practice	
Q.5 A.		**Answer any three of the following:**	**(18)**
	i)	Discuss: Significance of oxygenic photosynthesis in evolution –Brock 373 - 374	
	Ii)	What are biofilms? What advantages do they give to the bacteria? Brock 677 - 679	
	Iii)	Comment on: Plants as microbial habitats - Brock - 686	
	Iv)	Write a short note on: Diversity of marine microorganisms - Brock 687-691	
	v)	Describe the microenvironment and the “feast-or- famine” existence of microorganisms in nature– Brock 676 - 677	
	vi)	Justify: SSU rRNA and DGGE analysis are used to identify microorganisms in environmental samples - Prescott and Harley - 661	
Q.5 B.		**Do as directed (any two):**	**(02)**
	i)	According to the subsurface origin hypothesis, where did life originate? – On the ocean floor, much below the earth’s surface, where conditions are less hostile and more stable	
	ii)	Explain the difference between species abundance and species richness Species abundance – the proportion of each species in the ecosystem Species richness- the total number of different species present	
	iii)	Give the full form of LUCA - Last universal common ancestor	

	iv)	Explain the term ‘enrichment culture technique’ – A technique in which the natural environmental niche of an organism is expanded to allow massive growth of an organism	

OPTION B

Q.I A.		**Define the following:**	**(05)**
	i.	**Empirical research -** that which depends upon the experience or observation of phenomena and events.)	
	ii.	**Nanocapsule -** nanovesicular system that exhibit a typical core shell structure in which the drug is confined to a reservoir within a cavity surrounded by a polymer membrane or coating.	
	iii.	**PGPR –** plant growth promoting rhizobacteria that help in plant growth by producing growth factors, growth hormone etc.	
	iv.	**Ultra low volume liquid biopesticide -** formulations with very high concentration of active ingredient which is extremely soluble in crop-compatible liquid	
	v.	**Statistical population -** In statistics, population refers to the total set of observations that can be made.	
Q.1 B.		**State whether the following statements are true or false:**	**(05)**
	i.	Gelatine is hydrolytic product of protein albumin	**False**
	ii.	Biosensors used for military applications detects toxic gases	**True**
	iii.	Experimental research is precise.	**True**
	iv.	Median for the observations which include 2, 5, 3,6,1,8 and 9 is 6.	**False**
	v.	Cyanobacteria are directly cultivated in rice fields.	**True**
Q.I C.		**Give one example for each of the following:**	**(05)**
	i.	Microorganism used to detect concentration of NO_3 *Azotobacter vinelandii*	
	ii.	Synthetic biodegradable polymers PLGA, PLA, PGA, Polyanhydrides, polyphosphazene	
	iii.	Applied research Any relevant example	
	iv.	Solvents suitable for bioremediation Benzene, toluene, xylene, phenol	
	v.	Viral biopesticides Nuclear Polyhedrosis virus, Baculovirus	
Q.I D.		**Select the most appropriate alternative:**	**(05)**
	i.	Dendrimers are synthetic nanostructure ranging from ____ (**10-100**, 10-50, 10-200) A^o in diameter	
	ii.	*Nosema locustae* is a _____ (bacterial, fungal, **protozoal**)	

		biopesticide	
	iii.	ISFET sensor used to measure the change in _____ (enzyme, substrate, ion) concentration.	
	iv.	The publications used for information-yield but not quoted, in the report _____ (**is** , is not, is sometimes) included in the bibliography.	
	v.	*Rhizobium* gives _____ (pink, yellow, **white)** colonies on CRYEMA.	
Q.2 A.		**Answer any two of the following:**	(20)
	i.	Explain the construction and working of different biosensors R.C. Dubey pg 527	
	ii.	Discuss various objectives of research and enlist general characteristics of research. Yogesh Kumar pg 4,7,8	
	iii.	Discuss the various organisms used as biofertilizers TNAU agritech portal pg 2,3	
Q.3 A.		**Answer any three of the following:**	**(18)**
	i.	What are Gold nanoparticles? Give their properties and applications Andrew and Waqar pg 56,57	
	ii.	Enlist the applications of Dendrimers Andrew and Waqar pg 55	
	iii.	Explain the applications of biosensor in medicine, health and Industry R.C. Dubey pg 527	
	iv.	Explain the glucose electrode with suitable diagram and its applications R.C. Dubey pg 523	
	v.	Discuss the mechanism of quorum sensing in bacteria. Prescott 8/e pg 185,186	
	vi.	What are biofilms? What types of surfaces on living organisms can provide site for biofilm formation? Prescott 8/e pg 183,	
Q.3 B.		**Do as directed: (any two)**	**(02)**
	i.	Give the full form of AHL N-acyl homoserine lactone	
	ii.	Give the applications of nanogel Andrew and Waqar pg 55	
	iii.	Write any two properties of nanoparticle influencing their interaction with biomolecules and cell Andrew and Waqar pg 39	

	iv.	Write any one example of substrate assay by enzyme electrode biosensor Urea, amino acid, glucose,	
Q.4 A.		**Answer any three of the following:**	**(18)**
	i.	Write a note on desirable characteristics of an investigator. Yogesh Kumar pg 12	
	ii.	Discuss writing of preliminary section of a research report with respect to title page, preface/ acknowledgement and table of content. Yogesh Kumar pg 246,247	
	iii.	Explain the need of a research abstract and enlist salient features of a good abstract. Yogesh Kumar pg 258	
	iv.	Briefly discuss the content of a research paper. Yogesh Kumar pg 259,260	
	v.	Write a note on role of histogram and bar diagram in data presentation. Yogesh Kumar pg 276,282	
	vi.	State and explain P.M. Cook' definition of research and briefly comment on function of research. Yogesh Kumar pg 3-5	
Q.4 B.		**Do as directed: (any two)**	**(02)**
	i.	Sampling is a major problem in (action/ **fundamental**) research. Choose the correct alternative.	
	ii.	State any one reason for writing research report. Any one of the following 1) The research work is done for the benefit of human being, therefore, it must be communicated,. 2) It encourages other persons to take up some problem for further investigation. • 3) It may suggest some new problems for further studies. 4)The research report is also necessary for giving shape and form to the investigation and solidifying it. 5) It is needed for providing a clear picture of research method, sample and techniques used in conducting the research work. 6) The research report is meant for popularizing the new contributions in the discipline	
	iii.	Define bibliography. The bibliography is a list of the printed sources utilized in the research work. The publications used for information-yield but not quoted in the report may also be included in the bibliography.	
	iv.	Define-mode that value of the observation which occurs most frequently or is	

		repeated maximum number of times.	
Q.5 A.		**Answer any three of the following:**	**(18)**
	i.	Give the advantages and limitation of bioremediation Shilpi Sharma pg 208	
	ii.	What are the different methods of applying liquid biofertilizer TNAU agritech portal pg 5	
	iii.	Discuss production of *Trichoderma* as biopesticide. TNAU agritech portal pg10	
	iv.	Give a brief account of developmental methods applied in bioremediation. Shilpi Sharma pg 207	
	v.	How would you produce *Azolla* biofertilizer? TNAU agritech portal pg 12	
	vi.	Discuss the dry formulations of biopesticides Slavic and Tanovic pg 99,100	
Q.5 B.		**Do as directed: (any two)**	**(02)**
	i.	What is ex situ bioremediation? Degradation of waste at high temp in confined environments	
	ii.	Name a plant pesticide and give its mode of action Azadirachtin affects reproductive or digestive system of the pests.	
	iii.	Give an example of phosphate solubilizing fungus Penicillium, Aspergillus	
	iv.	*Trichogamma* is a _____ (bacterium, fungus, **insect**)	