SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF MEDICAL ELECTRONICS

QUESTION BANK

VII SEMESTER

Agri,EEE,AI&DS,CYS

1910705 – MICROBIOLOGY

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UNIT I – INTRODUCTION TO MICROBIOLOGY

Classification and nomenclature of microorganisms, microscopic examination of microorganisms: Light, Fluorescent, Dark field, Phase contrast, and Electron microscopy.

PART – A

Q.No	Questions	CO's	BT Level	Competence
1	Define the microorganism classification groups Protozoa & Slime moulds.	CO1	BTL1	Remembering
2	Identify the significance of Algae & Bacteria classification biological groups.	CO1	BTL1	Remembering
3	List the different sources for microorganism names.	CO1	BTL1	Remembering
4	Differentiate between classification and nomenclature.	CO1	BTL2	Understanding
5	Write the various biological groups used for microorganism classification.	CO1	BTL1	Remembering
6	Show the various taxonomic ranks used for classification.	CO1	BTL2	Understanding
7	Enlist some cellular microorganisms based on clinical purpose.	CO1	BTL1	Remembering
8	When to use initials during naming the microorganisms?	CO1	BTL1	Remembering
9	Enumerate various rules used in nomenclature.	CO1	BTL1	Remembering
10	Categorize the steps used to name subspecies and serovars.	CO1	BTL2	Understanding
11	Examine the nomenclature used during the naming of microorganism using binary names.	CO1	BTL2	Understanding
12	Employ the significance of classification of microorganism in clinical practice.	CO1	BTL2	Understanding
13	Articulate the principal types of viruses causing human disease.	CO1	BTL1	Remembering
14	Inspect the various direct methods used for identification of bacteria.	CO1	BTL1	Remembering
15	Categorize various indirect methods used for identification of bacteria.	CO1	BTL1	Remembering
16	Explain the importance of microscopy identification method.	CO1	BTL2	Understanding
17	Indicate the significance of the cultural characteristics method.	CO1	BTL2	Understanding
18	Review the kind of information you think that can be provided by microscopic observations of microorganisms.	CO1	BTL2	Understanding
19	How did Pasteur and Tyndall finally settle the spontaneous generation controversy?	CO1	BTL2	Understanding
20	Extend the set of information that you think can be provided by isolating microorganisms from their natural environment and culturing them in the laboratory.	CO1	BTL2	Understanding
21	Why was the belief in spontaneous generation an obstacle to the development	CO1	BTL2	Understanding

	of microbiology as a scientific discipline?			
22	Use the various steps involved in scientific method used to conduct experimental research.	**CO1**	**BTL1**	**Remembering**
23	Illustrate the scientific method used in experimental science. How does a theory differ from a hypothesis? Why is it important to have a control group?	**CO1**	**BTL2**	**Understanding**
24	Criticize Koch's postulates. What is a pure culture? Why are pure cultures important to Koch's postulates?	**CO1**	**BTL2**	**Understanding**
	PART – B			
1	(i) Explain the various stages involved in designing and conducting experimental research. (9) (ii) Describe the role of Koch's postulates to demonstrate that mycobacterium tuberculosis is the causative agent of tuberculosis. (4)	**CO1**	**BTL3**	**Applying**
2	Classify the five most important research areas to pursue in microbiology? Give reasons for your choices (13)	**CO1**	**BTL4**	**Analyzing**
3	Indicate the various aspects of resolution, numerical aperture, working distance, and fluorochrome. (13)	**CO1**	**BTL4**	**Analyzing**
4	Report the various rules of nomenclature used during naming of microorganism. (13)	**CO1**	**BTL3**	**Applying**
5	Enlist the parts of a light microscope and describe their functions. (13)	**CO1**	**BTL3**	**Applying**
6	Illustrate the following (i) refraction and refractive index. (5) (ii) focal point. (4) (iii) focal length. (4)	**CO1**	**BTL3**	**Applying**
7	Explain the importance of microscope resolution and numerical aperture with appropriate schematic diagram. (13)	**CO1**	**BTL3**	**Applying**
8	Interpret a method to convert light microscope to a dark field microscope (13)	**CO1**	**BTL4**	**Analyzing**
9	Illustrate the following concept in detail (i) The formation of a micrograph of the protozoan Amoeba proteus using DIC microscope. (6) (ii) The condenser lens system in dark field microscope (7)	**CO1**	**BTL3**	**Applying**
10	State in detail the principle of production of contrast in a phase-contrast microscopy. (13)	**CO1**	**BTL3**	**Applying**
11	Model a microscope with the following details (i) If a specimen is viewed using a 5X objective in a microscope with a 15X eye piece. (7) (ii) Why don't most light microscopes use 30X ocular lenses for greater magnification? (6)	**CO1**	**BTL4**	**Analyzing**
12	Analyze the function of immersion oil. (13)	**CO1**	**BTL4**	**Analyzing**
13	Define and identify various steps and stages involved in staining of microorganisms. (13)	**CO1**	**BTL3**	**Applying**
14	Enumerate the characteristics of light and transmission electron microscopes in a tabular column. (13)	**CO1**	**BTL3**	**Applying**
15	List the limits of microscopic resolution. (13)	**CO1**	**BTL3**	**Applying**

16	Examine an overview of TEM operation and compare it with the operation of light microscope. (13)	**CO1**	**BTL4**	**Analyzing**
17	Inspect the significance of lenses and bending of light and tabulate the common units of measurement used in microscopy. (13)	**CO1**	**BTL4**	**Analyzing**
	PART – C			
1	Identify the working of fluorescence microscope system with a neat diagram. (15)	**CO1**	**BTL3**	**Applying**
2	Infer the specimen shadowing and transmission electron micrograph from the transmission electron microscope system. (15)	**CO1**	**BTL4**	**Analyzing**
3	Under what circumstances would it be desirable to prepare specimens for the TEM by use of negative staining? Shadowing? Freeze-etching? (15)	**CO1**	**BTL4**	**Analyzing**
4	How does the scanning electron microscope operate and in what way does its function differ from that of the TEM? The SEM is used to study which aspects of morphology? (15)	**CO1**	**BTL4**	**Analyzing**
5	Explain the following: (i) Fixation, dye and chromophore. (5) (ii) Basic dye, acidic dye and simple staining. (5) (iii) Differential staining, negative staining, and acid-fast staining. (5)	**CO1**	**BTL3**	**Applying**

UNIT II – MICROBES- STRUCTURE AND REPRODUCTION

Structural organization and multiplication of bacteria, Viruses (TMV, Hepatitis B), Algae(cyanophyta, rhodophyta) and Fungi (Neurospora), Life history of actinomycetes (Streptomyces), Yeast (Saccharomyces), Mycoplasma (M. pneumoniae) and Bacteriophages (T4 phage, lphage)

PART – A

Q. No	Questions	CO's	BT Level	Competence
1	What characteristic shapes can bacteria assume? Describe the ways in which bacterial cells cluster together.	**CO2**	**BTL1**	**Remembering**
2	Label and draw a bacterial cell and label all important structures.	**CO2**	**BTL1**	**Remembering**
3	List the functions of the procaryotic plasma membrane	**CO2**	**BTL1**	**Remembering**
4	Prepare a diagram to represent the schematic of bacterial plasma membrane.	**CO2**	**BTL2**	**Understanding**
5	Write the structure of a gas vacuole to its function.	**CO2**	**BTL2**	**Understanding**
6	Illustrate how cell wall structure and sugar content are used to classify the actinomycetes	**CO2**	**BTL2**	**Understanding**
7	Interpret seven steps are involved in the infection process and pathogenesis of bacterial diseases?	**CO2**	**BTL1**	**Remembering**
8	Mention the significance of nucleocapsid, capsid, icosahedral capsid, helical capsid.	**CO2**	**BTL2**	**Understanding**
9	Enumerate the major properties of the genus Streptomyces.	**CO2**	**BTL1**	**Remembering**
10	Inspect the importance of gapped DNA in hepadnavirus.	**CO2**	**BTL2**	**Understanding**
11	Separate three ways in which Streptomyces is of ecological importance.	**CO2**	**BTL2**	**Understanding**
12	Articulate the reproductive technique in Cyanophyta & Rhodophyta.	**CO2**	**BTL2**	**Understanding**
13	Identify the `general properties of actinomycetes.	**CO2**	**BTL2**	**Understanding**
14	Indicate with appropriate label and draw the helical model of TMV.	**CO2**	**BTL2**	**Understanding**

15	Recognize the process involved in reproduction of the virus.	**CO2**	**BTL2**	**Understanding**
16	Categorize the yeast and mold based on their differences.	**CO2**	**BTL2**	**Understanding**
17	Describe the various types of reproduction fungi.	**CO2**	**BTL1**	**Remembering**
18	Review the various stages in lifecycle of Saccharomyces cerevisiae.	**CO2**	**BTL2**	**Understanding**
19	Prepare a table with various cellular organelles in a yeast cell.	**CO2**	**BTL2**	**Understanding**
20	Interpret different characteristics of neurospora genus of ascomycete fungi.	**CO2**	**BTL2**	**Understanding**
21	Point out the morphological structure of yeast with a diagram	**CO2**	**BTL2**	**Understanding**
22	Outline the lifecycle of a bacteriophage	**CO2**	**BTL1**	**Remembering**
23	Sketch various stages involved in the assembly of T4 Bacteriophage.	**CO2**	**BTL2**	**Understanding**
24	Analyze the morphological structure of T4 Bacteriophage with a neat diagram	**CO2**	**BTL2**	**Understanding**
	PART-B			
1	(i) Describe a bacterial cell and label all important structure. (7) (ii) Indicate the various functions of prokaryotic structures found in bacteria. (6)	**CO2**	**BTL3**	**Applying**
2	(i) Compare the following terms: nucleocapsid, capsid, icosahedral capsid, helical capsid, complex virus, binal symmetry, protomer, capsomer, pentamer or penton, and hexamer or hexon. (8) (ii) How do pentamers and hexamers associate to form a complete icosahedron; what determines helical capsid length and diameter? (3) (iii) Illustrate the TMV structure with a neat diagram. (2)	**CO2**	**BTL4**	**Analyzing**
3	Explain the importance of the Australian antigen and dane particle in discovery of morphological structure of Hepatitis B. (13)	**CO2**	**BTL3**	**Applying**
4	Write the organization and reproduction of cyanoaphyta. (13)	**CO2**	**BTL3**	**Applying**
5	Predict the cell wall structure and sugar content are used to classify the actinomycetes. Include a brief description of the four major wall types (13)	**CO2**	**BTL4**	**Analyzing**
6	Illustrate the following with a neat diagram (i) The Fluid Mosaic Model of Membrane Structure (5) (ii) The Structure of a Polar Membrane Lipid. (4) (iii) Bacterial membranes. (4)	**CO2**	**BTL3**	**Applying**
7	Show three ways in which Streptomyces is of ecological importance. Why do you think Streptomyces spp. produce antibiotics? (13)	**CO2**	**BTL4**	**Analyzing**
8	Name the various the major properties of the genus Streptomyces. (13)	**CO2**	**BTL3**	**Applying**
9	Interpret the morphological significance of suborder streptomycineae. (13)	**CO2**	**BTL3**	**Applying**
10	Explain in detail the various stages in binary fission reproduction method with neat diagram. (13)	**CO2**	**BTL3**	**Applying**
11	Describe the various types of bacteriophages. (13)	**CO2**	**BTL3**	**Applying**
12	Enumerate the significance of different stages in cell cycle of E coli. (13)	**CO2**	**BTL3**	**Applying**
13	Review the cell reproduction cycle of mycoplasma. (13)	**CO2**	**BTL3**	**Applying**

14	Illustrate the relationship between Mycoplasma genome size and growth requirements. (13)	**CO2**	**BTL3**	**Applying**
15	Categorize the various stages involved in the life cycle of the yeast Saccharomyces. (13)	**CO2**	**BTL4**	**Analyzing**
16	Analyze the Asexual reproduction in the fungi and some representative spores with diagrammatic illustrations. (13)	**CO2**	**BTL4**	**Analyzing**
17	Examine the morphology of t4 phage with a neat diagram. (13)	**CO2**	**BTL4**	**Analyzing**
	PART – C			
1	Analyze the various stages in the life cycle of the Bacteriophage. Describe briefly the lytic and lysogenic cycle. (15)	**CO2**	**BTL4**	**Analyzing**
2	Describe the endocytic pathway and the three routes that deliver materials to lysosomes for digestion.Which type of endocytosis does not deliver ingested material to lysosomes? (15)	**CO2**	**BTL4**	**Analyzing**
3	Write the significance of the following (i) Rough & smooth EPR. (5) (ii) Golgi apparatus. (5) (iii) Mitochondria. (5)	**CO2**	**BTL3**	**Applying**
4	Illustrate the structure of the nucleus. What are euchromatin and heterochromatin What is the role of the pores in the nuclear envelope? (15)	**CO2**	**BTL3**	**Applying**
5	What is meiosis, how does it take place, and what is its role in the microbial life cycle? (15)	**CO2**	**BTL3**	**Applying**

UNIT III - MICROBIAL NUTRITION, GROWTH AND METABOLISM

Nutritional classification of microorganisms based on carbon, Energy and electron sources . Definition of growth, Balanced and unbalanced growth, Growth curve and different methods to quantify bacterial growth:(counting chamber, viable count method, counting without equipment),Different media used for bacterial culture (defined, complex, selective, differential, enriched),The mathematics of growth-generation time, Specific growth rate.

PART – A

Q. No	Questions	CO's	BT Level	Competence
1	Define heterotroph and autotroph.	**CO3**	**BTL1**	**Remembering**
2	What are nutrients? On what basis are they divided into macroelements and trace element.	**CO3**	**BTL2**	**Understanding**
3	What are the six most important macroelements? How do cells use them?	**CO3**	**BTL2**	**Understanding**
4	What are growth factors? What are vitamins?	**CO3**	**BTL1**	**Remembering**

5	How can humans put to use a microbe with a specific growth factor Requirement?	**CO3**	**BTL2**	**Understanding**
6	Illustrate the growth factors that microorganisms produce industrially.	**CO3**	**BTL2**	**Understanding**
7	Why do you think amino acids, purines, and pyrimidines are often growth factors, whereas glucose is not?	**CO3**	**BTL2**	**Understanding**
8	Mention the two pathways function during the procaryotic cell cycle.	**CO3**	**BTL1**	**Remembering**
9	How does the procaryotic cell cycle compare with the eucaryotic cell cycle?	**CO3**	**BTL2**	**Understanding**
10	Tabulate the sources of carbon, energy, and electrons.	**CO3**	**BTL2**	**Understanding**
11	Categorize two trace elements. How do cells use them?	**CO3**	**BTL2**	**Understanding**
12	Review the four phases of the growth curve in a closed system.	**CO3**	**BTL2**	**Understanding**
13	Differentiate the principles of turbidity and microbial mass measurement.	**CO3**	**BTL2**	**Understanding**
14	Inspect the role of ATP in metabolism.	**CO3**	**BTL2**	**Understanding**
15	Analyze the equations for the endergonic or exergonic reactions.	**CO3**	**BTL2**	**Understanding**
16	Do living cells increase entropy within themselves? Do they increase entropy in the environment?	**CO3**	**BTL2**	**Understanding**
17	What are cardinal temperatures?	**CO3**	**BTL1**	**Remembering**
18	Infer the significance between the dilution rate and maintenance energy	**CO3**	**BTL2**	**Understanding**
19	Mention the importance of growth rate rise with increasing temperature and then fall again at higher temperatures.	**CO3**	**BTL2**	**Understanding**
20	Indicate the significance of growth in living organisms.	**CO3**	**BTL2**	**Understanding**
21	Estimate the generation or doubling time and the mean growth rate constant.	**CO3**	**BTL2**	**Understanding**
22	Interpret the phenomenon of entropy and enthalpy.	**CO3**	**BTL1**	**Remembering**
23	Employ a generalized method to write equation for a redox reaction.	**CO3**	**BTL2**	**Understanding**
24	Show the significance of energy cycle and ATP's role in it.	**CO3**	**BTL2**	**Understanding**
	PART – B			
1	Review the ways in which microorganisms are classified based on their requirements for energy, carbon, and electrons. (13)	**CO3**	**BTL4**	**Analyzing**
2	Indicate the nutritional requirements of the major nutritional groups and give some microbial examples of each. (13)	**CO3**	**BTL3**	**Applying**
3	Explain facilitated diffusion, active transport, and group translocation in terms of their distinctive characteristics and mechanisms. (13)	**CO3**	**BTL3**	**Applying**
4	Describe the significance of measurement of cell numbers. (13)	**CO3**	**BTL3**	**Applying**
5	Distinguish between turbidity and microbial mass measurement. (13)	**CO3**	**BTL3**	**Applying**
6	Examine the concept of membrane filtration procedure (13)	**CO3**	**BTL3**	**Applying**
7	Interpret the concept of specific growth rate and apply it to a real-time scenario. (13)	**CO3**	**BTL4**	**Analyzing**
8	Predict functional importance between chemostat and turbidostat continuous	**CO3**	**BTL4**	**Analyzing**

	culture system. (13)			
9	Analyze the influence of solutes and water activity on growth. (13)	**CO3**	**BTL4**	**Analyzing**
10	State in detail the effect of pH on microbial growth. (13)	**CO3**	**BTL3**	**Applying**
11	List the different phases of microbial growth curve in a closed system. (13)	**CO3**	**BTL3**	**Applying**
12	Analyze the overall schema of metabolism. (13)	**CO3**	**BTL4**	**Analyzing**
13	Describe the flow of carbon and energy in an ecosystem. (13)	**CO3**	**BTL3**	**Applying**
14	Categorize the laws of thermodynamics with appropriate interpretations. (13)	**CO3**	**BTL4**	**Analyzing**
15	Illustrate the importance of loss of viability caused in a irreparable cell. (13)	**CO3**	**BTL3**	**Applying**
16	Break down the process of counting and identifying microorganisms in natural Environments. (13)	**CO3**	**BTL4**	**Analyzing**
17	Apply the principle the cell-cell communication within microbial populations. (13)	**CO3**	**BTL3**	**Applying**
	PART – C			
1	Model the growth rates in microorganisms by fitting exponential and linear curves. Use appropriate test data to simulate the results. From the simulated data use conservative approach to Compute generation time of the microorganisms. (15)	**CO3**	**BTL4**	**Analyzing**
2	Explain the structure and classification aspects of enzymes with emphasis on lock and key model of enzyme function. (15)	**CO3**	**BTL3**	**Applying**
3	Apply the following environmental factors on the growth rate (i) Temperature. (5) (ii) Oxygen Concentration. (5) (iii) Pressure. (5)	**CO3**	**BTL3**	**Applying**
4	Illustrate different approaches and methods used to quantify bacterial growth. (15)	**CO3**	**BTL4**	**Analyzing**
5	Enlist different media used for bacterial culture. (15)	**CO3**	**BTL3**	**Applying**

UNIT - IV CONTROL OF MICROORGANISMS

Physical and chemical control of microorganisms, Definition of sterilization, Dry and moist heat, Pasteurization, Tyndalization, Radiation, Ultrasonication, Filtration. Disinfections sanitization, Antiseptics sterilants and fumigation. Mode of action and resistance to antibiotics, Clinically important microorganisms.

PART – A

Q. No	Questions	CO's	BT Level	Competence
1	Mention the significance of sterilization and sterilant.	CO4	BTL2	Understanding
2	Define disinfection and disinfectant.	CO4	BTL1	Remembering
3	Describe the principles of sanitization, antisepsis and antiseptic.	CO4	BTL1	Remembering
4	How one decides whether microorganisms are actually dead?	CO4	BTL2	Understanding
5	Employ graphically the pattern of microbial death.	CO4	BTL2	Understanding
6	Illustrate the significance of population size and composition.	CO4	BTL2	Understanding
7	Recognize the concepts of chemotherapy, germicide, bactericide and bacteriostatic.	CO4	BTL1	Remembering
8	State the significance of heat in controlling microbial growth.	CO4	BTL2	Understanding
9	Outline the phenomenon of thermal death time.	CO4	BTL1	Remembering
10	Categorize the approximate conditions for moist heat killing.	CO4	BTL2	Understanding
11	Point out the importance of dry heat sterilization	CO4	BTL2	Understanding
12	Examine the importance of filtration in controlling microbial growth.	CO4	BTL2	Understanding
13	Inspect the use of chemical agents in control of microbial growth.	CO4	BTL2	Understanding
14	Indicate the importance of depth filters and membrane filters	CO4	BTL2	Understanding
15	Examine the advantages and disadvantages of ultraviolet light and ionizing Radiation.	CO4	BTL2	Understanding
16	Analyze the significance of pasteurization in the past for death of infants.	CO4	BTL2	Understanding
17	Interpret the need of phenol coefficient test.	CO4	BTL2	Understanding
18	How can low temperatures be used to control microorganisms?	CO4	BTL2	Understanding
19	Why is boiling milk over prolonged periods not a desirable method for controlling spoilage and spread of milk-borne pathogens?	CO4	BTL2	Understanding
20	What three things one must do when operating an autoclave to help ensure success?	CO4	BTL1	Remembering
21	Infer the Dans Z values for some food-borne pathogens.	CO4	BTL2	Understanding
22	Express the longitudinal cross section of a typical autoclave showing some of its parts and the pathway of steam in a schematic representation.	CO4	BTL2	Understanding
23	Interpret the activity levels of selected germicides	CO4	BTL2	Understanding
24	Prepare a schematic design of an EtO sterilizer.	CO4	BTL2	Understanding

PART – B				
1	Explain the various microbial control methods in an hierarchical tree structure. (13)	**CO4**	**BTL3**	**Applying**
2	Complete the pattern of microbial death and fit the assessment with an exponential curve. (13)	**CO4**	**BTL3**	**Applying**
3	Review the various aspects of use of heat as physical methods in control of microbial growth. (13)	**CO4**	**BTL4**	**Analyzing**
4	Examine the significance of a membrane filters in sterilization process. (13)	**CO4**	**BTL3**	**Applying**
5	Indicate the sterilization process used in automatically controlled autoclave system (13)	**CO4**	**BTL3**	**Applying**
6	Illustrate the following conditions influencing the effectiveness of antimicrobial agents (i) Concentration. (5) (ii) Duration of exposure. (4) (iii) Local environment. (4)	**CO4**	**BTL3**	**Applying**
7	Review the working principle of UV treatment system for disinfection of water. (13)	**CO4**	**BTL4**	**Analyzing**
8	Interpret the use of following physical methods in control of microbial growth (i) Radiation. (7) (ii) Low temperatures. (6)	**CO4**	**BTL3**	**Applying**
9	Apply the working principle of sterilization system during the onset of ionization radiation. (13)	**CO4**	**BTL3**	**Applying**
10	State in detail the various universal precautions for microbiology Laboratories. (13)	**CO4**	**BTL4**	**Analyzing**
11	Recognize the functioning of an ethylene oxide sterilizer. (13)	**CO4**	**BTL3**	**Applying**
12	Describe the operation of a biological safety cabinet. (13)	**CO4**	**BTL3**	**Applying**
13	Name the use of phenolics and alcohols in control of microbial growth. (13)	**CO4**	**BTL3**	**Applying**
14	Categorize the various tests involved to check the effectiveness of antimicrobial agent. (13)	**CO4**	**BTL4**	**Analyzing**
15	Examine the working principle of dry heat incineration. (13)	**CO4**	**BTL4**	**Analyzing**
16	Inspect different steps in the mechanism of antimicrobial resistance to antibiotics. (13)	**CO4**	**BTL4**	**Analyzing**
17	Analyze the use of heavy metals and sterilizing gases in control of microbial Growth. (13)	**CO4**	**BTL4**	**Analyzing**

PART –C				
1.	Explain various different systems that use heat as a physical method to control microbial growth. (15)	**CO4**	**BTL3**	**Applying**
2.	Describe the structures of some frequently used disinfectants and antiseptics and explain their significance. (15)	**CO4**	**BTL3**	**Applying**
3.	Recognize the use of following chemical agents in microbial control (i) Sterilizing gases. (10) (ii) Chemotherapeutic agents. (5)	**CO4**	**BTL4**	**Analyzing**
4.	Integrate various different systems that use filtration and radiation as a physical method to control microbial growth. (15)	**CO4**	**BTL4**	**Analyzing**
5.	Suppose hospital custodians have been assigned the task of cleaning all showerheads in patient rooms in order to prevent the spread of infectious disease. What two factors would have the greatest impact on the effectiveness of the disinfectant the custodians use? Explain what that impact would be. Also briefly describe about other conditions. (15)	**CO4**	**BTL4**	**Analyzing**

UNIT V - INDUSTRIAL MICROBIOLOGY

Microbes involved in preservation (Lactobacillus, bacteriocins), Spoilage of food and food borne pathogens (E.coli, S.aureus, Bacillus, Clostridium). Industrial use of microbes (production of penicillin, alcohol, vitamin B-12); Biogas; Bioremediation (oil spillage leaching of ores by microorganisms, pollution control); Biofertilizers, Biopesticides. Biosensors.

PART – A

Q. No	Questions	CO's	BT Level	Competence
1	What steps are usually taken to purify drinking water?	**CO5**	**BTL1**	**Remembering**
2	Why is chlorination, although beneficial in terms of bacterial pathogen control, of environmental concern?	**CO5**	**BTL2**	**Understanding**
3	Which important waterborne pathogens are not controlled reliably by chlorination?	**CO5**	**BTL1**	**Remembering**
4	Interpret the significance of coagulation.	**CO5**	**BTL2**	**Understanding**
5	Show the various steps involved in water purification process.	**CO5**	**BTL2**	**Understanding**
6	Illustrate the various criteria required for "ideal" indicator organism.	**CO5**	**BTL2**	**Understanding**
7	Define coliform. How does this definition relate to presumptive, confirmed, and completed tests?	**CO5**	**BTL2**	**Understanding**
8	In what type of environment is it better to use fecal enterococci rather than fecal coliforms as an indicator organism? Why?	**CO5**	**BTL2**	**Understanding**

9	Why has the defined substrate test with ONPG and MUG been accepted as a test of drinking water quality?	**CO5**	**BTL2**	**Understanding**
10	Differentiate the various metrics used to assess water quality.	**CO5**	**BTL2**	**Understanding**
11	Differentiate between coliforms and fecal coliforms in the laboratory.	**CO5**	**BTL2**	**Understanding**
12	Outline the advantages and disadvantages of membrane filters for microbiological examinations of water.	**CO5**	**BTL2**	**Understanding**
13	Categorize the components that should limit the reactions in a BOD test.	**CO5**	**BTL2**	**Understanding**
14	Identify the components in excess and limiting at the end of incubation period	**CO5**	**BTL2**	**Understanding**
15	Inspect the factors that can lead to a nitrogen oxygen demand (NOD) in water.	**CO5**	**BTL2**	**Understanding**
16	Analyze the parameters that can be monitored in a modern, large-scale industrial fermentation.	**CO5**	**BTL2**	**Understanding**
17	Select the minerals can contribute to eutrophication	**CO5**	**BTL1**	**Remembering**
18	Review the critical limiting factors are used in the penicillin and streptomycin fermentations.	**CO5**	**BTL2**	**Understanding**
19	Describe the major uses for biopolymers and biosurfactants.	**CO5**	**BTL1**	**Remembering**
20	Use alternative definitions for the term biodegradation.	**CO5**	**BTL1**	**Remembering**
21	Illustrate the components that should not limit reaction rates in a BOD test.	**CO5**	**BTL1**	**Remembering**
22	What are biosensors and how do they detect substances?	**CO5**	**BTL1**	**Remembering**
23	Illustrate the significance of GMP Schedule M.	**CO5**	**BTL2**	**Understanding**
24	Categorize the five main components of good manufacturing practice.	**CO5**	**BTL2**	**Understanding**
	PART – B			
1	Indicate the various steps involved in water purification steps with a neat Diagram. (13)	**CO5**	**BTL3**	**Applying**
2	Enlist different stages involved in the multiple-tube fermentation test. (13)	**CO5**	**BTL3**	**Applying**
3	Enumerate the different metrics used to evaluate the quality of water. (13)	**CO5**	**BTL3**	**Applying**
4	State the significance of major steps in primary, secondary, and tertiary treatment of wastes. (13)	**CO5**	**BTL3**	**Applying**
5	Analyze the steps of organic matter processing that occur in anaerobic Digestion. Mention the significance acetogenesis step. (13)	**CO5**	**BTL4**	**Analyzing**
6	Illustrate the following with a neat diagrams (i) Constructed Wetland for Wastewater Treatment. (7) (ii) The Conventional Septic Tank Home Treatment System. (6)	**CO5**	**BTL3**	**Applying**
7	Recognize the working principle of industrial stirred fermenters. (13)	**CO5**	**BTL3**	**Applying**
8	Infer the following products of industrial microbiology (i) Antibiotics. (7) (ii) Amino acids. (6)	**CO5**	**BTL4**	**Analyzing**

9	Analyze the alternate methods for mass culture. (13)	**CO5**	**BTL4**	**Analyzing**
10	Recognize the phenomenon of stimulating biodegradation. (13)	**CO5**	**BTL3**	**Applying**
11	Explain in detail the following (i) Metal Bioleaching. (4) (ii) Biopesticides. (4) (iii)Bio augmentation. (5)	**CO5**	**BTL3**	**Applying**
12	Analyze the the significance of a subsurface engineered bioremediation System. (13)	**CO5**	**BTL4**	**Analyzing**
13	Categorize the components used to design a biosensor used in industrial microbiology. (13)	**CO5**	**BTL4**	**Analyzing**
14	Inspect the phenomenon of phytoremediation with a neat diagram. (13)	**CO5**	**BTL4**	**Analyzing**
15	Show the major organic acids produced by microbial processes. (13)	**CO5**	**BTL3**	**Applying**
16	Interpret the major microbial products and processes of Interest in Industrial Microbiology. (13)	**CO5**	**BTL3**	**Applying**
17	Practice and use the growth of microorganisms in an industrial setting. (13)	**CO5**	**BTL3**	**Applying**
	PART C			
1	Integrate different sectors in a waste water treatment process to build a aerobic secondary sewage treatment. (15)	**CO5**	**BTL4**	**Analyzing**
2	Employ appropriate principle used for recombinant vaccine production. (15)	**CO5**	**BTL3**	**Applying**
3	Recognize the Streptavidin-Biotin binding systems and enumerate the various application of such systems. (15)	**CO5**	**BTL3**	**Applying**
4	Inspect the mode of action of the Bacillus thuringiensis toxin. (15)	**CO5**	**BTL4**	**Analyzing**
5	Describe the use of microorganisms in the fields of industrial microbiology and Biotechnology. (15)	**CO5**	**BTL3**	**Applying**


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