QUESTION BANK C1 C2

SEMESTER-I

COURSE 1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Theory	Credits: 3	3 hrs/week

I. Course Objectives:

1. To understand the historical development of microbiology, major contributions of key scientists, microbial classification systems, and the scope of microbiology.
2. To learn the general characteristics of bacteria, Archaea, Actinomycetes, and Viruses including the replication of Bacteriophage T2 and HIV.
3. To comprehend the general characteristics of microalgae, focusing on key genera like *Chlorella*, *Dunaliella*, and *Spirulina*.
4. To gain knowledge on general characteristics of fungi, with special emphasis on *Saccharomyces* and *Aspergillus*.
5. To understand the general characters and importance of protozoa, with focus on representative genera like *Amoeba* and slime molds.

II. Course Outcomes: On completion of this course students will be able to

1. Explain the important historical milestones, describe classification systems, differentiate prokaryotic and eukaryotic microorganisms, and list applications of microbiology.
2. Explain the general characters and significance of prokaryotic microorganisms and viruses, and describe the replication mechanisms of Bacteriophage T2 and HIV.
3. Describe the general characters and applications of microalgae and explain their economic importance.
4. Describe morphology of fungi, reproductive mechanisms and explain the economic importance of fungi.
5. Explain the general characters of protozoa and their significance in ecosystems, medicine, and scientific research.

III. Syllabus of Theory:

Unit 1: History and classification of Microbiology 10hrs

1.1Development of microbiology as a discipline, Spontaneous generation vs. biogenesis, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming, Ivanowsky.

1.2Systems of classification: Binomial Nomenclature; Whittaker's five kingdom Classification; Carl Woese's three kingdom classification systems, Concept of Species, Taxa, and Strain; Brief note on Bergey's Manual of Systematic Bacteriology; Difference between prokaryotic and eukaryotic microorganisms; Definition and scope of Microbiology: Applications of Microbiology.

Unit 2: Prokaryotic microorganisms and Viruses 10hrs

2.1.General characteristics of bacteria and archaea: distribution, occurrence, morphology, reproduction and economic importance.
2.2.General characteristics of Viruses with emphasis on discovery of viruses, Nature and definition of viruses, morphology, reproduction and a brief note on Cultivation of Viruses
2.3General features of Viral Replication; Structure and multiplication of Bacteriophage T2 and HIV

Unit 3: Microalgae 8hrs
3.1.General characteristics of algae: occurrence, morphology, habitat, ecological distribution, photosynthetic pigments, food reserves, reproduction and role in aquatic ecosystems
3.2.Morphology, reproduction, ecological significance and applications of a) Chlorella (Chlorophyceae) and b) Spirulina (Cyanophyceae).
3.3.Economic Importance of Microalgae: Biofertilizers, Biofuels, Pharmaceuticals, Food supplements, Wastewater treatment, Carbon dioxide sequestration, algal polysaccharides.

Unit 4: Fungi 9hrs
4.1 Habitat, distribution, nutritional requirements, fungal cell ultra- structure, fungal wall, Outline classification of Fungi
4.2.Important Microfungi: Morphology and structure, reproduction and applications of a) Saccharomyces (Ascomycota – Yeast) and b) Aspergillus (Ascomycota)
4.3.Economic importance of fungi: in agriculture, food, industry, medicine.

Unit 5: Protozoa 8 hrs
5.1 General Characteristics of Protozoa: Morphology, Nutrition, reproduction, Habitat and ecological role
5.2.Important Protozoa: Morphology, locomotion, nutrition, reproduction, Ecological role of a)Amoeba and b) Slime Molds
5.3.Economic Importance of Protozoa (in ecosystems, waste management, soil fertility, research and Protozoa as pathogens).

IV. Reference Books:

a. Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). *Introductory Mycology*. John Wiley, New York.
b. Ali-Shtayeh, M. S., Jamous, R. M., & Yaghmour, R. M.-R. (1998).
    i. *Mycology manual*. An-Najah National University.
c. Becker, E. W. (2007). *Microalgae in Biotechnology*. Cambridge University Press.
d. Bessey, E. A. *Morphology and Taxonomy of Fungi*. Vikas Publishing House Pvt. Ltd., New Delhi.
e. Bold, H. C., & Wynne, M. J. (1985). *Introduction to the Algae: Structure and Reproduction* (2nd ed.). Prentice-Hall.
f. Deacon, J. W. (2006). *Fungal Biology* (4th ed.). Blackwell Publishing.
g. Funder, H. F. (1968). *Practical mycology: Manual for identification of fungi*.

McGraw- Hill.
h. Garrity, G. M. (Ed.). (2011). *Bergey's Manual of Systematic Bacteriology* (2nd ed.). Springer.
i. Hausmann, K., & Bradbury, P. C. (2002). *Protistology* (2nd ed.). E. Schweizerbart'sche Verlagsbuchhandlung.
j. Jain, A., Agarwal, J., & Venkatesh, V. (2019). *Microbiology practical manual* (1st ed.). Elsevier India.
k. Kumar, H. D., & Singh, H. N. *A Textbook on Algae* (Macmillan International College Edition).
l. Lee, R. E. (2008). *Phycology* (4th ed.). Cambridge University Press.
m. Madigan, M. T., Martinko, J. M., Bender, K., Buckley, D., & Stahl,
j. D. (2021). *Brock Biology of Microorganisms* (16th ed.). Pearson Education.
n. Maheshwari, D. K. (2002). *Practical microbiology*. S. Chand Publishing.
o. Mehrotra, R. S., & Aneja, K. R. *An Introduction to Mycology*. New Age International Press, New Delhi.
p. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2009). *Microbiology: Concepts and Applications* (6th ed.). McGraw-Hill Education.
q. Prescott, L. M., Harley, J. P., & Klein, D. A. (2005). *Microbiology*
    i. (6th ed.). McGraw- Hill Education.
r. Sambamurty, V. S. S. (2010). *A Textbook of Algae*. I.K. International Publishing House Pvt. Ltd.
s. Tortora, G. J., Funke, B. R., & Case, C. L. (2020). *Microbiology: An Introduction* (13th ed.). Pearson Education.
t. Webster, J., & Weber, R. (2007). *Introduction to Fungi* (3rd ed.). Cambridge University Press.

2. Co- Curricular Activities
3. Arrange guest lectures, to provide insights into the latest advancements and emerging trends in bacteriology and virology.
4. Conduct hands-on microscopy workshops using to observe eukaryotic microorganisms
5. Organize field trips to natural habitats, such as forests, ponds, or marine environments, where eukaryotic microorganisms thrive.
6. Arrange culturing workshops where students can learn how to isolate and culture eukaryotic microorganisms in the laboratory.

SEMESTER-I

COURSE 1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY
Practical Credits: 1 2 hrs/week

I. Course objectives:

1. To learn preparation of culture media and techniques for isolation, identification, and preservation of fungi and algae.
2. To observe vegetative and reproductive structures of key fungal genera through slide preparations.
3. To study host-pathogen interaction and slime mold structures.

II. Laboratory/Field exercises:

1. Study of viruses (Bacteriophage, TMV and HIV) using micrographs
2. Preparation of Potato Dextrose Medium.
3. Isolation and identification of pathogenic and non-pathogenic fungi.
4. Study of host-pathogen interaction.
5. Study of the vegetative and reproductive structures of following genera through temporary and permanent slides: *Mucor, Saccharomyces, Penicillium, Agaricus* and *Alternaria*
6. Purification and preservation of pure cultures of common algae and fungi.
7. Observe prepared slides of slime mold structures.

C1 : QUESTION BANK

Unit	S.No		Marks
Unit 1	1	Essay on Contributions of Louis Pasteur & Alexander fleming.	8
	2	Describe Whittaker's five kingdom Classification.	8
	3	Difference between prokaryotic and eukaryotic microorganisms;	8
	4	Write Applications of Microbiology.	8
Unit 2	1	General characteristics of bacteria, occurrence, morphology, reproduction and economic importance.	8
	2	General characteristics of Archaea, occurrence, morphology, reproduction and economic importance.	8
	3	Explain General characteristics of Virusess, morphology, reproduction.	8
	4	General features Bacteriophage T2, Structure and multiplication.	8
Unit 3	1	General characteristics of algae: occurrence, morphology, habitat, ecological distribution, photosynthetic pigments, food reserves, reproduction and role in aquatic ecosystems.	8
	2	Describe Morphology, reproduction, ecological significance and applications of Chlorella (Chlorophyceae).	8
	3	Explain Morphology, reproduction, ecological significance and applications of Spirulina (Cyanophyceae).	8
	4	Illustrate the Economic Importance of Microalgae.	8
Unit 4	1	Explain Habitat, distribution, nutritional requirements, fungal cell ultra- structure, fungal wall.	8
	2	Describe Outline classification of Fungi.	8
	3	Summarize the mportant Microfungi: Morphology and structure, reproduction and applications of a) Saccharomyces (Ascomycota – Yeast) .	
	4	Illustrate the Economic importance of fungi: in agriculture, food, industry, medicine.	8
Unit 5	1	Explain the General Characteristics of Protozoa: Morphology, Nutrition, reproduction, Habitat and ecological role .	8
	2	Discuss the Important Protozoa: Morphology, locomotion, nutrition, reproduction, Ecological role of Amoeba.	8
	3	Write Important Protozoa: Morphology, locomotion, nutrition, reproduction, Ecological role of Slime Molds .	8
	4	Illustrate the Economic Importance of Protozoa (in ecosystems, waste management, soil fertility, research and Protozoa as pathogens).	8

OBJECTIVES

UNIT-1

1. Anton van Leeuwenhoek was the first person to observe and describe microorganisms using a _____.(simple microscope)
2. In Binomial Nomenclature, the scientific name of an organism consists of two parts — _____ and _____.(Genus, Species)
3. The standard reference book used for bacterial classification and identification is _____.(*Bergey's Manual of Systematic Bacteriology)*
4. Louis Pasteur proved the theory of spontaneous generation. False (He disproved it through his swan-neck flask experiment.)
5. Prokaryotic cells lack a true nucleus and membrane-bound organelles.(True)

UNIT-2

1. Bacteria reproduce mainly by _____ which is a type of asexual reproduction. (binary fission)
2. The scientist who discovered the first virus (Tobacco Mosaic Virus) was ___ (Dmitri Ivanowsky)
3. The virus that infects bacteria is called a _____.(bacteriophage)
4. Archaea can live in extreme environments such as hot springs and salt lakes.(True)
5. HIV is a DNA virus that infects bacteria.False (HIV is an RNA virus that infects human immune cells.)

UNIT-3

1. The green pigment responsible for photosynthesis in algae is _____.(chlorophyll)
2. Chlorella is a unicellular green alga rich in _____ and often used as a food supplement. → Answer: protein
3. Spirulina belongs to the group _____ and is used in the production of health foods and biofertilizers.(Cyanophyceae)
4. Algae play an important role in aquatic ecosystems by producing oxygen through photosynthesis.(True)
5. Microalgae have no economic importance and are only harmful to the environment. (False)

UNIT-4

1. The cell wall of fungi is mainly composed of _____.(chitin)
2. Saccharomyces (yeast) reproduces asexually by a process called _____.(budding)
3. Aspergillus is used in the industrial production of _____ and organic acids like citric acid.(enzymes)
4. Fungi are autotrophic organisms that can prepare their own food.(False)
5. Some fungi are beneficial in medicine as they produce antibiotics like penicillin.(True)

UNIT-5

1. Amoeba moves and captures food with the help of temporary projections of its body called _____.(pseudopodia)
2. Slime molds show characteristics of both _____ and _____ kingdoms.(fungi, protozoa)
3. Protozoa play an important role in maintaining _____ balance in aquatic ecosystems by feeding on bacteria and small particles.(ecological)
4. Protozoa are multicellular organisms that perform photosynthesis.(False)
5. Some protozoa are useful in scientific research and waste management.(True)

Blue Print for Question Papers

Unit Number	Section-A (Essay/ Split Essay)	Section-B (True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A 5 × 8 = 40 Marks

Essay questions.questions. Draw labelled diagrams wherever necessary.

1. (a) or (b)
2. (a) or (b)
3. (a) or (b)
4. (a) or (b)
5. (a) or (b)

SECTION-B 10 × 1 = 10 Marks

Answer all the following questions.

1. From Unit-1
2. From Unit-1
3. From Unit-2
4. From Unit-2
5. From Unit-3
6. From Unit-3
7. From Unit-4
8. From Unit-4
9. From Unit-5
10. From Unit-5

Model question paper

SECTION-A 5 × 8 = 40 Marks

Essay questions.questions. Draw labelled diagrams wherever necessary.

Unit	S.No		Marks
Unit 1	1a	Essay on Contributions of Louis Pasteur & Alexander fleming.	8
		OR	
	1b	Write Applications of Microbiology.	8
Unit 2	2a	General characteristics of bacteria, occurrence, morphology, reproduction and economic importance.	8
		OR	
	2b	Explain General characteristics of Virusess, morphology, reproduction.	8
Unit 3	3a	General characteristics of algae: occurrence, morphology, habitat, ecological distribution, photosynthetic pigments, food reserves, reproduction and role in aquatic ecosystems.	8
		OR	
	3b	Illustrate the Economic Importance of Microalgae.	8
Unit 4	4a	Explain Habitat, distribution, nutritional requirements, fungal cell ultra- structure, fungal wall.	8
		OR	
	4b	Summarize the mportant Microfungi: Morphology and structure, reproduction and applications of a) Saccharomyces (Ascomycota – Yeast) .	
Unit 5	5a	Explain the General Characteristics of Protozoa: Morphology, Nutrition, reproduction, Habitat and ecological role .	8
		OR	
	5b	Discuss the Important Protozoa: Morphology, locomotion, nutrition, reproduction, Ecological role of Amoeba.	8

SECTION-B 10 × 1 = 10 Marks

Answer all the following questions.

1. Anton van Leeuwenhoek was the first person to observe and describe microorganisms using a _____.
2. Prokaryotic cells lack a true nucleus and membrane-bound organelles.
3. Spirulina belongs to the group _____ and is used in the production of health foods and biofertilizers
4. HIV is a DNA virus that infects bacteria.
5. The green pigment responsible for photosynthesis in algae is _____.
6. Microalgae have no economic importance and are only harmful to the environment.
7. . The cell wall of fungi is mainly composed of _____.
8. Some fungi are beneficial in medicine as they produce antibiotics like penicillin.
9. Amoeba moves and captures food with the help of temporary projections of its body called _____.
10. Some protozoa are useful in scientific research and waste management.

SEMESTER-I

COURSE 2: PRINCIPLES OF BACTERIOLOGY & MICROBIAL TECHNIQUES

Theory Credits: 3 3 hrs/week

I.Course objectives

1. To understand the structure and function of prokaryotic cell components and their response to antibiotics.
2. To learn the key characteristics and ecological significance of Photosynthetic bacteria, Gliding bacteria, Mycoplasma, Fermentative bacteria, and Extremophiles.
3. To equip students with an understanding of microscopy principles, techniques, and staining methods used in microbiology.
4. To gain the knowledge of sterilization, disinfection, and various physical and chemical methods for microbial control.
5. To impart practical knowledge of pure culture techniques, maintenance, preservation methods in microbiology.

II.Course Outcomes: On completion of this course students will be able to:

1. Describe bacterial cell structure and explain effects of antibiotics on the cell wall.
2. Identify and describe the important features of Photosynthetic bacteria, Myxobacteria, Mycoplasma, Fermentative bacteria, Methanogens, and Halobacteria.
3. Gain insights into various microscopy techniques and apply simple and differential staining in bacterial observation.
4. Comprehend the principles, methods, and applications of sterilization and disinfection.
5. Comprehend methods for isolating and preserving pure cultures, and techniques for cultivating anaerobic and viable non-culturable bacteria.

III.Syllabus of Theory:

Unit 1 Cell organization 9 hrs

1.1 Cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili. Cell wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls.

1.2 Cell Membrane: Structure, function and chemical composition of bacterial cell membranes; Differences between eubacteria and archaebacteria;

1.3 Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore; Effect of antibiotics and enzymes on the cell wall: sphaeroplasts, protoplasts, and L-forms.

Unit 2 Type studies of Bacteria and Archaea 9 hrs

2.1.Salient features of: a) Photosynthetic bacteria - Purple bacteria, Green bacteria and Anabaena b) Gliding bacteria - Myxobacteria

2.2.Salient features of a) Miscellaneous bacteria: Mycoplasma; b) Salient features of

Fermentative bacteria
2.3.Salient features of Extremophiles- a) Methanogens and Halobacteria.

Unit 3 Basics of Microscopy hrs

3.1 Light Microscopy: Bright-Field Microscope- Principle, Components, Operation, resolution and Applications; Principle of Dark-field, Phase contrast and fluorescent microscopes.

3.2 Electron microscope: Principle, Components, resolution and Applications of Scanning and Transmission Electron Microscopes.

3.3 Staining Techniques – Types and properties of dyes; Simple and negative staining; Differential staining techniques- Gram staining, spore staining.

3.4 Unit 4 Sterilization and disinfection techniques- 9 hrs

4.1 Definitions of Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Virucide, Bacteriostatic and Bactericidal agent.

4.2 Physical methods of microbial control: Dry heat-Incineration, Hot air oven; Moist heat-Pressure cooker, autoclave; Filter sterilization- laminar air flow, Membrane filter; Radiation methods – UV rays, Gamma rays.

4.3 Chemical methods of microbial control: disinfectants, types and mode of action-alcohols, aldehydes, fumigants, phenols, halogens and heavy metals.

Unit 5 Microbiological techniques 9hrs

5.1 Pure culture isolation: Serial dilution, enrichment culturing technique, plating methods, micromanipulator;

5.2 Maintenance and preservation/stocking of pure cultures: sub culturing, overlaying cultures with mineral oils, lyophilization, sand cultures, storage at low temperature, Culture collection Centers (MTCC, ATCC, DSMZ).

5.3 Cultivation of anaerobic bacteria; Accessing Viable non-culturable bacteria (VNBC).

II. Reference Books:

1. Alcomo, I. E. (2001). *Fundamentals of Microbiology* (6th ed.). Jones and Bartlett Publishers.
2. Beckner, W. M., Kleinsmith, L. J., & Hardin, J. (2000). *The World of Cell* (4th ed.). Benjamin/Cummings.
3. Besty, T., & Koegh, D. C. *Microbiology Demystified*. McGraw-Hill.
4. Black, J. G. (2002). *Microbiology – Principles and Explorations*. John Wiley & Sons Inc., New York.
5. Ghatak, K. L. (2011). *Techniques and Methods in Biology*. PHI Publication.
6. Murphy, D. B. (2001). *Fundamentals of Light Microscopy & Electron Imaging* (1st ed.). Wiley-Liss.

7. Pelczar, M., Chan, E. C. S., & Krieg, N. R. *Microbiology*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
8. Pranav Kumar. (2016). *Fundamentals and Techniques of Biophysics and Molecular Biology*.
9. Prescott, L. M., Harley, J. P., & Klein, D. A. (2002). *Microbiology* (5th ed.). WCB McGraw-Hill, New York.
10. Stainier, R. V., Ingraham, J. L., Wheelis, M. L., & Painter, P. R. *The Microbial World*. Prentice-Hall of India Pvt. Ltd., New Delhi.
11. Tortora, G. J., Funke, B. R., & Case, C. L. (2004). *Microbiology: An Introduction*. Pearson Education, Singapore.

VI. Co-Curricular Activities:

1. Conduct laboratory workshops that allow students to gain hands- on experience in bacterial culture techniques
2. Competition in performing laboratory techniques like staining
3. Artwork with bacteria or fungi in petridish
4. Quiz in identifying microscopic technique in various micrographs

SEMESTER-I

COURSE 2: PRINCIPLES OF BACTERIOLOGY & MICROBIAL TECHNIQUES

Practical Credits: 1 2 hrs/week

I.Course objectives:

1. To gain practical skills in bacterial isolation, pure culture techniques, and visualization using different microscopy methods.
2. To comprehend and perform basic staining techniques, including Gram, simple, and negative staining, and observe bacterial structures such as motility and capsules.
3. To learn sterilization methods for media and glassware and apply aseptic techniques in microbiological experiments.

II.Laboratory/Field exercises:

1. Isolation of bacteria using Winogradsky column and observation
2. Study of bright field, dark field and phase contrast, Electron microscope micrographs to visualize
3. microbial cells.
4. Simple staining & Negative staining.
5. Gram's staining.
6. Observation of motility and capsule in bacteria
7. Determination of bacterial cell size by the technique Micrometry.
8. Sterilization of medium using Autoclave, Sterilization of glassware using Hot Air Oven.
9. Isolation of pure cultures of bacteria by streaking method.
10. Isolation of bacteria from natural habitat by spread and pour plate method (using serial dilution method)

QUESTION BANK- ESSAYS

Unit	S. No.	Question	Marks
I	1	Describe the cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili.	8
	2	Differentiate between eubacteria and archaebacteria.	8
	3	Explain the cytoplasmic components – ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome, plasmids, and endospore.	8
	4	Essay on Effect of Antibiotics and Enzymes on the Cell Wall.	8
II	1	Summarize the salient Anabena.	8
	2	Describe Mycoplasma and gliding bacteria (Myxobacteria).	8
	3	Identify and explain the salient features of fermentative bacteria.	8
	4	Describe and differentiate the salient features of extremophiles – methanogens and halobacteria.	8
III	1	Explain the principle, components, operation, resolution, and uses of a bright-field microscope.	8
	2	Explain and compare the principle, components, operation, resolution, and applications of a dark-field microscope.	8
	3	Perform simple and negative staining techniques.	8
	4	Demonstrate and interpret Gram staining.	8
IV	1	Define sterilization, disinfection, antiseptic, germicide, and sanitizer.	8
	2	Define and classify fungicide, virucide, bacteriostatic, and bactericidal agents.	8
	3	Explain and compare physical methods of microbial control: dry heat, moist heat, filter sterilization, and radiation methods.	8
	4	Describe and analyze chemical methods of microbial control and the mode of action of alcohols, aldehydes, fumigants, phenols, halogens, and heavy metals.	8
V	1	Perform pure culture isolation.	8
	2	Explain methods for maintenance and preservation of pure cultures: subculturing, mineral oils, lyophilization, sand cultures, and low-temperature storage.	8
	3	List and identify major culture collection centers (MTCC, ATCC, DSMZ).	8
	4	Explain and evaluate the cultivation of anaerobic bacteria and the concept of viable but non-culturable bacteria (VBNC).	8

Objectives

UNIT-1

1. The outermost layer that helps bacteria attach to surfaces and protects them from drying is called the _____(glycocalyx.)

2. Gram-positive bacteria have a thick layer of _____ while Gram-negative bacteria have a thin layer of it and an outer membrane. (peptidoglycan)
3. Small, circular, extra-chromosomal DNA molecules found in bacterial cytoplasm are called _____.(plasmids)
4. The bacterial cell membrane is made up of proteins and phospholipids that control the movement of substances. — True
5. Archaebacteria have the same cell wall composition as eubacteria. — False

UNIT-2

1. Purple and green bacteria are photosynthetic bacteria that use instead of chlorophyll _____for photosynthesis.(bacteriochlorophyll)
2. _____ are the smallest free-living bacteria and lack a cell wall, making them resistant to many antibiotics. (Mycoplasmas)
3. _____are extremophiles that produce methane gas as a by-product of their metabolism under anaerobic conditions. (Methanogens).
4. Myxobacteria move by flagella. — False (They move by gliding on surfaces.)
5. Halobacteria live in highly salty environments and contain pigments that help them absorb light for energy. — True

UNIT-3

1. The_____ uses visible light to illuminate the specimen and produce a clear image. (bright-field microscope).
2. In a_____, electrons pass through the specimen to reveal internal structures in great detail.(transmission electron microscope (TEM))
3. In Gram staining, bacteria that retain the crystal violet stain and appear purple are called _____bacteria.(Gram-positive)
4. The dark-field microscope is used to observe living, unstained microorganisms that are difficult to see under a bright-field microscope. — True
5. Fluorescent microscopes use sound waves instead of light to view specimens. — False

UNIT-4

1. _____is the process that completely destroys all forms of microbial life, including spores.(Sterilization)
2. The _____ uses steam under pressure to achieve sterilization of materials. (autoclave)
3. _____act as disinfectants by denaturing proteins and dissolving lipids in microorganisms.(Alcohols)
4. UV rays are a type of radiation used for sterilizing air and surfaces. — True
5. Bacteriostatic agents kill bacteria completely. — False (They only inhibit bacterial growth.)

UNIT-5

1. The _____is commonly used to obtain pure cultures of microorganisms from a mixed population.(streak plate method)
2. _____or freeze-drying is a preservation method where microorganisms are dried under low temperature and vacuum conditions.(Lyophilization)
3. _____grow only in the absence of oxygen.(Anaerobic bacteria)
4. Subculturing is a method used to maintain pure cultures by transferring them to fresh medium. — True

Viable but non-culturable (VBNC) bacteria can easily grow on standard laboratory media. — False

Blue Print for Question Papers

Unit Number	Section-A (Essay/ Split Essay)	Section-B (True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks or 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A 5 × 8 = 40 Marks

Essay questions.questions. Draw labelled diagrams wherever necessary.

6. (a) or (b)
7. (a) or (b)
8. (a) or (b)
9. (a) or (b)
10.(a) or (b)

SECTION-B 10 × 1 = 10 Marks

Answer all the following questions.

11. From Unit-1
12. From Unit-1
13. From Unit-2
14. From Unit-2
15. From Unit-3
16. From Unit-3
17. From Unit-4
18. From Unit-4
19. From Unit-5
20. From Unit-5

MODEL QUESTION PAPER

SECTION-A 5 × 8 = 40 Marks

Essay questions.questions. Draw labelled diagrams wherever necessary.

Unit	S.No		Marks
Unit 1	1a	Describe the cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili.	8
		OR	
	1b	Differentiate between eubacteria and archaebacteria	8
Unit 2	2a	Write ab essay on Anabena	8
		OR	
	2b	Identify and explain the salient features of fermentative bacteria.	8
Unit 3	3a	Explain the principle, components, operation, resolution, and uses of a bright-field microscope.	8
		OR	
	3b	Perform Gram staining .	8
Unit 4	4a	Define sterilization, disinfection, antiseptic, germicide, and sanitizer.	8
		OR	
	4b	Explain and compare physical methods of microbial control: dry heat, moist heat, filter sterilization, and radiation methods.	
Unit 5	5a	Perform pure culture isolation.	8
		OR	
	5b	Explain and evaluate the cultivation of anaerobic bacteria and the concept of viable but non-culturable bacteria (VBNC).	8

SECTION-B 10 × 1 = 10 Marks

Answer all the following questions.

11. The outermost layer that helps bacteria attach to surfaces and protects them from drying is called the _____(glycocalyx.)
12. Archaebacteria have the same cell wall composition as eubacteria. — False
13. _____are extremophiles that produce methane gas as a by-product of their metabolism under anaerobic conditions. (Methanogens).
14. Myxobacteria move by flagella. — False (They move by gliding on surfaces.)
15. _____bacteria.(Gram-positive)
16. The dark-field microscope is used to observe living, unstained microorganisms that are difficult to see under a bright-field microscope. — True
17. _____act as disinfectants by denaturing proteins and dissolving lipids in microorganisms.(Alcohols)
18. UV rays are a type of radiation used for sterilizing air and surfaces. — True
19. _____grow only in the absence of oxygen.(Anaerobic bacteria)
20. Subculturing is a method used to maintain pure cultures by transferring them to fresh medium. — True