Microscopy Techniques

Name	Uses
Light Microscopy	Uses visable light to magnify specimens; helps visualize bacteria and their morphology
Bright-field Microscopy	Common light microscopy technique where bacteria appear dark against a bright background; used for stained bacteria
Phase-contrast Microscopy	Enhances contrast in unstained samples, useful for observing live bacteria and their internal structures
Dark-field Microscopy	Illuminates specimens against a dark background; useful for observing thin, live bacteria
Fluorescence Microscopy	Uses fluorescent dyes that bind to bacterial components; allows identification of specific bacteria using labeled antibodies
Differential Interference Contrast (DIC) Microscopy	Enhances contrast and depth perception in unstained samples; useful for observing bacterial structures in detail
Scanning Electron Microscopy (SEM)	Produces 3D images of bacterial surfaces
Transmission Electron Microscopy (TEM)	Provides detailed images of internal bacterial structures

Bacterial Quantification Techniques

Name	Uses
Optical Density (Turbidity Measurement)	Measures bacterial growth in liquid culture using a spectrophotometer
Counting Chamber	A microscopic grid for estimating bacterial concentration; viable cell counting
CFU Dilution Plating (Serial Dilutions)	A method to count bacteria by diluting and plating them; viable cell counting

Antimicrobial Testing Techniques

Name	Uses
Kirby-Bauer Assay	Tests bacterial susceptibility to antibiotics by measuring zones of inhibition around antibiotic disks
Minimum Inhibitory Concentration (MIC)	Determines the lowest antibiotic concentration that inhibits bacterial growth

Staining Techniques

Name	Uses
Gram Stain	Differentiates bacteria into Gram-positive (purple) and Gram-negative (pink) based on cell wall composition
Simple Stain	Uses a single dye to highlight bacterial shape and arrangement
Negative Stain	Stains the background, leaving bacteria unstained; useful for visualizing capsules
Capsule Stain	Specifically stains the protective capsule around some bacteria, aiding in virulence identification
Acid-fast Stain	Identifies mycobacteria by staining waxy cell walls
Spore Stain	Detects bacterial endospores, which are resistant survival structures

Culture & Media Technqiues

Name	Uses
Culture Media	Provides nutrients for bacterial growth in the lab
Defined Media	Has precisely known chemical compositions; used for studying specific bacterial metabolic needs
Complex Media	Contains unknown amounts of nutrients; commonly used for general bacterial growth
Agar	Solid medium for growing bacterial colonies
Broth	Liquid medium for growing bacteria
T-streak	A technique for isolating pure bacterial colonies from a mixed culture
Spread Plates	Used for counting and isolating bacteria by spreading a diluted sample on an agar plate
Mixed Cultures	Contain multiple bacterial species
Pure Isolates	A single bacterial species obtained from a mixed culture

Bacterial Growth & Metabolism

Name	Uses
Microbial Growth Curve	Describes bacterial population changes over time (lag, exponential, stationary, decline phases)
Exponential Growth & Generation Time	Determines bacterial replication rate under given conditions

Oxygen Requirements & Special Growth Conditions

Name	Uses
Thioglycolate Broth	Used to test bacterial oxygen requirements by creating a gradient from aerobic to anaerobic conditions