

1. Gram Staining

Steps:

Crystal violet → Iodine → Alcohol/Acetone (Decolorization – most important step) → Safranin

Decolorization: Differentiates Gram Positive (GP) from Gram Negative (GN)

Examples:

GP: *Staphylococcus aureus* (clusters), *Streptococcus pyogenes* (chains)

GN: *Escherichia coli* (rods), *Neisseria meningitidis* (diplococci)

Why staph forms clusters?: Division in multiple planes without separation

2. AFB Staining

Why acid fast?: Mycolic acid in cell wall resists decolorization

Methods:

Ziehl-Neelsen (hot)

Kinyoun (cold)

Auramine O (fluorescent)

Examples & Sulphuric Acid Concentration:

M. tuberculosis – 20% H_2SO_4

M. leprae – 5%

Nocardia – 1%

Grading: Scanty to 3+

Sensitivity

AFB smear: 50–60%

CBNAAT: ~90%

3. Common Infections & Causative Agents

Infection	Bacteria	Viruses	Parasites
Meningitis	S. pneumoniae, N. meningitidis	HSV, Enterovirus	—
Pneumonia	S. pneumoniae, Klebsiella	Influenza, SARS-CoV-2	—
UTI	E. coli, Proteus	Adenovirus (rare)	Schistosoma haematobium
PUO	Typhoid, TB, Brucella	CMV, EBV	Plasmodium spp.
Sepsis	E. coli, Staph aureus	HIV, Dengue (severe)	Malaria
Diarrhea	E. coli, Shigella, Vibrio	Rotavirus, Norovirus	Giardia, Entamoeba
Dysentery	Shigella, EHEC	—	Entamoeba histolytica

4. Streptococci Classification

Hemolysis:

Alpha: Partial (green) → S. pneumoniae

Beta: Complete (clear) → S. pyogenes

Gamma: None → Enterococcus

Lancefield grouping (based on C-carb):

Group A – S. pyogenes

Group B – S. agalactiae

Group D – Enterococcus

5. Staphylococcus & MRSA

Diseases: Skin infections, abscesses, pneumonia, osteomyelitis, food poisoning, TSS

MRSA Causes: Nosocomial pneumonia, endocarditis, sepsis

Treatment: Vancomycin, Linezolid

6. Zoonotic Infections

Definition: Infections transmitted from animals to humans

Examples:

Rabies – dogs

Brucellosis – cattle

Anthrax – sheep

Leptospirosis – rats

7. Hosts

Man as Intermediate Host: *Echinococcus granulosus*

Man as Definitive Host: *Taenia solium*, *Ascaris lumbricoides*

8. Vectors

Mosquito – Malaria, Dengue

Sandfly – Leishmaniasis

Tsetse fly – Sleeping sickness

Tick – Lyme disease, Rickettsia

9. Healthcare-Associated Infections (HCAI)

Definition: Infection >48 hrs after hospital admission

Types: CAUTI, VAP, CLABSI, SSI

Pathogens: ESKAPE – *Enterococcus*, *Staph aureus*, *Klebsiella*, *Acinetobacter*, *Pseudomonas*, *Enterobacter*

Precautions: Hand hygiene, PPE, disinfection

Needle Stick Injury: Wash → Report → PEP

Biomedical Waste: Color-coded segregation and disposal

Oncogenic Microbes

Viruses:

HPV – Cervical cancer

HBV/HCV – Hepatocellular carcinoma

EBV – Burkitt lymphoma

Parasites: Schistosoma haematobium – Bladder cancer

Vaccine Preventable Cancers: HPV, HBV

Congenital Infections (TORCH)

Toxoplasma, Rubella, CMV, HSV, HIV, Syphilis

Emerging/Re-emerging Infections

Emerging: SARS-CoV-2, Nipah, Zika

Re-emerging: TB, Dengue, Cholera

Definitions:

Pandemic: Worldwide spread

Epidemic: Sudden regional spike

Endemic: Constant regional presence

Management: Surveillance, isolation, vaccination, public awareness

HIV & STI

PEP (Post Exposure Prophylaxis):

Within 72 hours

TDF + 3TC + DTG x 28 days

STI Causes:

Bacteria – Neisseria, Treponema, Chlamydia

Virus – HSV, HPV, HIV

Parasite – Trichomonas vaginalis

Virus Classification

Arboviruses: Dengue, Chikungunya, Zika

Herpesviridae: HSV-1, HSV-2, VZV, EBV, CMV

DNA viruses: Herpes, Adeno, Pox, Parvo

RNA viruses: Influenza, Rabies, Measles, Hep C

Orthomyxoviruses: Influenza

Paramyxoviruses: Measles, Mumps, RSV

Other High-Yield Questions

Antigenic Drift: Point mutations (seasonal flu)

Antigenic Shift: Reassortment → pandemics

AGE Viruses: Rotavirus, Norovirus

Hematuria Parasite: Schistosoma haematobium

SSPE: Subacute sclerosing panencephalitis – late measles complication

HACEK: Fastidious GNB causing endocarditis

Disinfectant Classification: High, intermediate, low

Spaulding's Classification: Critical, semi-critical, non-critical

Vaccines:

Live – MMR, BCG, OPV

Killed – IPV, Rabies, Hep A

Antimicrobial Susceptibility Testing

KBDD – Kirby-Bauer Disc Diffusion

Stokes – Internal comparison

E-test – MIC

BMD – Broth Microdilution (gold standard MIC)

Vitek – Automated

Resistance Mechanisms

Beta-lactamase production

Altered PBP (e.g., MRSA)

Efflux pumps

Reduced permeability

Gene Transfer Methods: Conjugation, Transduction, Transformation

Toxin-Mediated Diseases

C. diphtheriae – EF-2 inhibition

C. botulinum – Ach inhibition

S. aureus – Superantigens (TSS)

V. cholerae – Increased cAMP → diarrhea

Organism Categories

Anaerobes: Clostridium, Bacteroides

Spore-forming: Bacillus, Clostridium

Capsulated: Klebsiella, S. pneumoniae, H. influenzae

GPC: Staph, Strep

GNC: Neisseria

GNB: E. coli, Pseudomonas

GPB: Bacillus, Listeria

Eye Infections

Bacterial: Staph aureus, Chlamydia

Viral: Adenovirus

Parasitic: Toxoplasma gondii