MEDWAY
ACADEMY
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QUESTION BANK

SEMESTER 3

MSK MODULE

— MICROBIOLOGY —

Lecture 1 - Skin infections

Part 1: MCQs (Choose the correct answer):

1. A 24-year-old male athlete presents with a painful, tender swelling on the back of his neck. Culture of the pus on blood agar shows β-haemolytic colonies of Gram-positive cocci arranged in grape-like clusters, and the organism ferments mannitol on mannitol salt agar. Which of the following is the most likely causative organism?

A. Staphylococcus epidermidis
B. Staphylococcus saprophyticus
C. Staphylococcus aureus
D. Streptococcus pyogenes
E. Propionibacterium acnes

2. Which of the following tests differentiates the genus Staphylococcus from the genus Streptococcus?

A. Coagulase test
B. Catalase test
C. Bacitracin sensitivity
D. Novobiocin sensitivity
E. Mannitol fermentation

3. A 40-year-old surgeon is screened during the investigation of an outbreak of post-operative wound infection caused by Staphylococcus aureus in his theatre. Which of the following is the most important site of carriage of this organism in such carriers?

A. Nasal mucosa
B. Large intestine
C. Conjunctiva
D. Genital tract
E. Gastric mucosa

4. A 20-year-old woman presents with fever, hypotension and a scarlatiniform rash that desquamates, particularly on the palms and soles, followed by multiorgan failure. Which of the following staphylococcal factors acts as a superantigen and is responsible for this condition?

A. Protein A
B. Coagulase
C. Toxic shock syndrome toxin-1
D. Exfoliatins
E. Panton-Valentine leukocidin

5. A 45-year-old diabetic man suffers from repeated staphylococcal abscesses. The isolated organism possesses a surface protein that binds the Fc component of IgG. Which of the following is the most likely consequence of this virulence factor?

A. Inhibition of phagocytosis
B. Conversion of fibrinogen into a fibrin clot
C. Splitting of the epidermal layers
D. Liquefaction of pus
E. Massive release of cytokines from T cells

6. A 3-week-old neonate develops redness and pain followed by diffuse peeling of the epidermis. Which of the following staphylococcal toxins is responsible for this condition and for bullous impetigo?

A. Enterotoxins
B. Coagulase
C. Exfoliatins
D. Protein A
E. Toxic shock syndrome toxin-1

7. A 9-year-old boy presents with initially vesicular skin lesions that erode and form longer-lasting bullae. The isolated organism is a catalase-positive Gram-positive coccus. Which of the following is the most likely causative agent?

A. Streptococcus pyogenes
B. Staphylococcus aureus
C. Staphylococcus epidermidis
D. Corynebacterium xerosis
E. Pseudomonas aeruginosa

8. A 30-year-old man develops a rapidly progressive skin and soft tissue infection caused by a methicillin-resistant strain of Staphylococcus aureus. Which of the following pore-forming toxins is acquired by bacteriophage and is associated with the increased virulence of these strains?

A. Toxic shock syndrome toxin-1
B. Enterotoxin
C. Panton-Valentine leukocidin
D. Exfoliatin
E. Erythrogenic exotoxin

9. A 12-year-old boy presents with bone pain, fever and tissue swelling; radiographs show lytic bone lesions. Culture of the blood yields a coagulase-positive Gram-positive coccus in clusters. Which of the following pathogenicity factors are responsible for this lesion?

A. Cytolysins and coagulase
B. Exfoliatins and enterotoxins
C. Protein A and hyaluronic acid
D. Streptokinase and DNAse
E. Capsule and anthrax toxin

10. A 70-year-old man in the intensive care unit develops a wound infection caused by methicillin-resistant Staphylococcus aureus (MRSA). The resistance of this organism is due to which of the following?

A. Production of penicillinase only
B. An altered penicillin-binding protein
C. Loss of the outer membrane porins
D. Active efflux of the drug outside the cell
E. Methylation of the ribosomal binding site

11. A 58-year-old woman develops a deep surgical site infection, and culture and sensitivity reveal vancomycin-resistant Staphylococcus aureus (VRSA). Which of the following is the drug of choice for this patient?

A. Vancomycin
B. Nafcillin
C. Oxacillin
D. Mupirocin
E. Quinupristin/dalfopristin

12. A 68-year-old woman presents with a chronically discharging wound three months after a hip replacement. Blood cultures grow Gram-positive cocci in clusters that are catalase positive, coagulase negative, urease positive and novobiocin sensitive, and the organism does not ferment mannitol. Which of the following is the most likely organism?

A. Staphylococcus aureus
B. Staphylococcus epidermidis
C. Staphylococcus saprophyticus
D. Streptococcus agalactiae
E. Corynebacterium ulcerans

13. Which of the following best explains the ability of Staphylococcus epidermidis to infect prosthetic devices and intravenous catheters?

A. Production of adherent biofilms
B. Production of coagulase
C. Fermentation of mannitol
D. Production of exfoliative toxins
E. Formation of spores

14. A 6-year-old boy presents with itchy lesions around the nose and mouth that rupture and form honey-coloured crusts. Gram stain of the exudate shows Gram-positive cocci in chains, and the isolate is catalase negative. Which of the following is the most likely causative organism?

A. Staphylococcus aureus
B. Staphylococcus epidermidis
C. Streptococcus pyogenes
D. Propionibacterium acnes
E. Candida albicans

15. A β-haemolytic, bacitracin-sensitive, pyrrolidonyl arylamidase (PYR)-positive Gram-positive coccus in chains is isolated from a skin lesion. Serotyping of this organism is based on which of the following?

A. M protein
B. Capsular hyaluronic acid
C. Protein A
D. Streptolysin O
E. Lipoteichoic acid

16. A 10-year-old boy develops puffiness of the face and haematuria two weeks after a streptococcal skin infection. Which of the following components of Streptococcus pyogenes is antiphagocytic and is associated with acute glomerulonephritis and rheumatic fever?

A. Hyaluronic acid capsule
B. M protein
C. Streptolysin S
D. Streptokinase
E. Hyaluronidase

17. Which of the following products of Streptococcus pyogenes is a haemolysin that is immunogenic and can therefore be detected serologically?

A. Streptolysin O
B. Streptolysin S
C. Hyaluronic acid
D. Streptokinase
E. Hyaluronidase

18. A 7-year-old girl presents with sore throat and fever followed by a blanching “sandpaper” rash that spares the palms and soles, circumoral pallor and a strawberry tongue. Which of the following is responsible for the fever and the rash in this case?

A. Phage-coded erythrogenic exotoxins
B. M protein
C. Streptolysin S
D. Streptococcal DNAse
E. Hyaluronic acid capsule

19. Which of the following spreading factors of Streptococcus pyogenes liquefies pus and allows extension of the lesion?

A. Streptokinase
B. Streptococcal DNAse
C. Hyaluronidase
D. Streptolysin O
E. Coagulase

20. A 55-year-old woman presents with a red, raised, sharply demarcated butterfly-shaped facial rash with dermal pain, oedema, heat and rapid spread. Which of the following is the most likely causative organism?

A. Staphylococcus aureus
B. Streptococcus pyogenes
C. Pseudomonas aeruginosa
D. Bacillus anthracis
E. Corynebacterium xerosis

21. A 17-year-old boy presents with inflammation of the hair follicles and the sebaceous glands of the face (acne vulgaris). Which of the following is the most likely causative organism?

A. Propionibacterium acnes
B. Staphylococcus epidermidis
C. Malassezia species
D. Streptococcus pyogenes
E. Corynebacterium ulcerans

22. A blood culture from a patient with a wound infection and osteomyelitis grows Gram-positive short bacilli that are normal inhabitants of the skin and of the mucous membranes of the respiratory tract. Which of the following is the most likely organism?

A. Corynebacterium species
B. Bacillus anthracis
C. Mycobacterium leprae
D. Staphylococcus saprophyticus
E. Borrelia burgdorferi

23. A 25-year-old man presents with a single painless genital ulcer with a clean base and an indurated edge three weeks after unprotected sexual intercourse. Which of the following is the most likely causative organism?

A. Treponema pallidum
B. Borrelia burgdorferi
C. Human papilloma virus
D. Staphylococcus aureus
E. Rickettsia rickettsii

24. A 28-year-old man presents with a generalized maculopapular rash involving the palms and the soles, generalized lymphadenopathy, patchy hair loss and smooth painless wart-like white lesions on the genitalia. Which of the following is the most likely diagnosis?

A. Primary syphilis
B. Secondary syphilis
C. Congenital syphilis
D. Anogenital warts (condylomata acuminata)
E. Molluscum contagiosum

25. A 30-year-old man returns from a camping trip with an expanding red skin rash with a pale centre on his thigh, followed by pain and swelling of the knee joint. He recalls a tick bite. Which of the following is the most likely causative organism?

A. Rickettsia rickettsii
B. Borrelia burgdorferi
C. Treponema pallidum
D. Bartonella henselae
E. Mycobacterium marinum

26. A 40-year-old man presents with diffuse skin nodules, lion-like facies, loss of the eyebrows and eyelashes and symmetrical sensory loss; nasal scrapings show numerous acid-fast bacilli. Which of the following is characteristic of this form of the disease?

A. Low cell-mediated immunity with a largely Th2 response
B. High cell-mediated immunity with a largely Th1 response
C. A positive lepromin skin test
D. A low bacterial load
E. A few hypoesthetic hairless skin plaques

27. Which of the following statements is correct regarding Mycobacterium leprae?

A. It is a Gram-negative diplococcus
B. It grows rapidly on Sabouraud's dextrose agar
C. It is an obligate intracellular parasite that cannot be cultured in vitro
D. It grows optimally at temperatures above body temperature
E. It is transmitted by the bite of a deer tick

28. A 45-year-old tannery worker presents with a papule on the forearm that progressed to a vesicle and then to a painless necrotic ulcer covered by a black eschar. Culture shows large Gram-positive spore-forming rods, and the colonies show a halo of projections ("medusa head" appearance). Which of the following is the most likely causative organism?

A. Bacillus anthracis
B. Staphylococcus aureus
C. Pseudomonas aeruginosa
D. Streptococcus pyogenes
E. Mycobacterium leprae

29. Which of the following describes the exotoxin of Bacillus anthracis?

A. Protective antigen, lethal factor and edema factor
B. A superantigen that causes fever and rash
C. A pore-forming toxin acquired by bacteriophage
D. Two exfoliative toxins acting on the epidermis
E. An enzyme that converts fibrinogen into fibrin

30. A 35-year-old farmer presents with influenza-like symptoms and a petechial rash that began on the ankles and wrists and then moved to the trunk, following a tick bite. Which of the following is the most appropriate treatment?

A. Doxycycline
B. Vancomycin
C. Nystatin
D. Acyclovir
E. Dapsone and rifampin

31. A 30-year-old woman is found to have cervical intraepithelial neoplasia, and the Pap smear shows koilocytic cells with perinuclear cytoplasmic vacuolization and nuclear enlargement. Which of the following is responsible for the malignant transformation in this case?

A. Viral genes E6 and E7 of serotypes 16 and 18
B. Exfoliative toxins A and B
C. Latency in the dorsal root ganglia
D. Eosinophilic cytoplasmic inclusion bodies
E. Replication of the virus in the cytoplasm

32. Which of the following statements is correct regarding human papilloma virus?

A. It is an enveloped virus with a complex morphology
B. It is a naked virus with circular double-stranded DNA that replicates in the nucleus
C. It has a single serotype, which made eradication possible
D. It replicates in the dermis and produces molluscum bodies
E. It is transmitted only by respiratory droplets

33. A 6-year-old boy presents with multiple small umbilicated wart-like skin lesions. Examination of the central caseous material shows eosinophilic cytoplasmic inclusion bodies. Which of the following is the most likely diagnosis?

A. Molluscum contagiosum
B. Anogenital warts
C. Variola
D. Chickenpox
E. Herpes labialis

34. A 65-year-old man presents with a painful vesicular rash limited to one dermatome of the trunk, preceded by neurologic pain. He gives a history of chickenpox in childhood. Which of the following best explains the pathogenesis of his present condition?

A. Reactivation of a virus latent in the spinal (dorsal root) ganglia
B. Reinfection through respiratory droplets
C. A phage-coded superantigen
D. Deposition of immune complexes in the skin
E. Direct spread from a genital lesion

35. A 25-year-old woman has recurrent painful vesicles on the border of the lip (“cold sores”). Which of the following is the site of latency of the causative virus?

A. Trigeminal sensory ganglia
B. Lumbar or sacral sensory ganglia
C. Mucoepithelial cells
D. Dermal macrophages
E. Regional lymph nodes

36. Which of the following viral skin infections has a single serotype, which made its global eradication in 1979 possible?

A. Variola (smallpox)
B. Molluscum contagiosum
C. Human papilloma virus
D. Herpes simplex virus type 1
E. Varicella-zoster virus

37. A 22-year-old man presents in the summer with multiple hypopigmented scaly patches on the trunk that are only slightly itchy. KOH mount of the skin scales shows yeast clusters and short, curved septate hyphae. Which of the following is the most likely causative organism?

A. Malassezia species
B. Trichophyton species
C. Candida albicans
D. Microsporum species
E. Epidermophyton species

38. A 7-year-old boy presents with scaling patches of the scalp, alopecia and cervical lymphadenopathy. KOH mount of the hair and skin scrapings shows arthroconidia and hyphae. Which of the following is the most appropriate treatment?

A. Oral griseofulvin
B. Topical selenium sulfide
C. Nystatin mouth wash
D. Acyclovir
E. Doxycycline

39. A 3-week-old neonate presents with white patches on the tongue and the buccal mucosa and a red weeping diaper rash. KOH mount shows budding yeasts and pseudohyphae, and the organism forms germ tubes at 37°C in serum. Which of the following is the most likely causative organism?

A. Candida albicans
B. Malassezia species
C. Trichophyton rubrum
D. Staphylococcus epidermidis
E. Propionibacterium acnes

40. A 19-year-old man develops inflamed follicles over the trunk from the neck downwards two days after using a public hot tub, and his burn wound dressing shows blue-green pus with a grape-like odour. Which of the following is the most likely causative organism?

A. Pseudomonas aeruginosa
B. Staphylococcus aureus
C. Streptococcus pyogenes
D. Vibrio vulnificus
E. Eikenella corrodens

Part 2: Essay / Short-Answer Questions:

1. A 4-year-old child presents with erythematous papules around the mouth that ruptured, leaving honey-coloured crusted lesions.

A. List 4 characteristic features of impetigo. **(1 mark)**

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B. Mention the two organisms that commonly cause impetigo and the laboratory test that differentiates between them. **(1 mark)**

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2. Enumerate four pathogenicity factors of Staphylococcus aureus and mention the role of each. (2 marks)

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3. Compare between Staphylococcus aureus and Staphylococcus epidermidis: (1.5 marks)

Point of comparison	**Staphylococcus aureus**	**Staphylococcus epidermidis**
Coagulase test		
Mannitol fermentation		
Characteristic infection		

4. A 70-year-old man develops a post-operative wound infection, and the isolate is reported as methicillin-resistant Staphylococcus aureus (MRSA).

A. What is the mechanism of resistance in MRSA? **(0.5 mark)**

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B. Mention the drug of choice for MRSA and for VRSA. **(0.5 mark)**

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C. Mention the drug used for the topical treatment of staphylococcal skin lesions. **(0.5 mark)**

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5. A 40-year-old woman presents with a rapidly spreading, painful, red raised facial rash with sharply defined edges, associated with dermal oedema and heat.

A. Mention the causative organism and two of its distinguishing laboratory features. **(1 mark)**

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B. List two spreading factors of this organism and mention the role of each. **(1 mark)**

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C. Mention the treatment in a patient allergic to penicillin. **(0.5 mark)**

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6. List two bacteria transmitted from a cat bite and two bacteria transmitted from a human bite (fist fight). (1 mark)

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7. A 45-year-old man working in a tannery presents with a papule on the hand that changed into a vesicle and then into an ulcer with a black eschar.

A. What is your provisional diagnosis and the causative organism? **(0.5 mark)**

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B. Mention the two factors responsible for the pathogenesis of this organism. **(0.5 mark)**

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C. Mention the treatment and the method of prevention. **(1 mark)**

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8. A 30-year-old man presents with a red skin rash with a pale centre on the thigh after a tick bite, followed by arthritis of the knee.

A. What is your provisional diagnosis, the name of the rash and the causative organism? **(1 mark)**

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B. What investigations are done to confirm the diagnosis? (mention 2) **(0.5 mark)**

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C. Mention the treatment. **(0.5 mark)**

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9. Compare between the two forms of leprosy: (1.5 marks)

Point of comparison	**Lepromatous leprosy**	**Tuberculoid leprosy**
Bacterial load		
Cell-mediated immune response		
Lepromin skin test		

Mention the drug therapy of leprosy. **(0.5 mark)**

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10. Give reason for each of the following: (1.5 marks)

– Staphylococcus epidermidis is a common cause of infection of prosthetic devices and intravenous catheters.

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– Nafcillin and oxacillin, rather than penicillin G, are used in staphylococcal infections.

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– Mycobacterium leprae cannot be cultured in vitro.

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11. A 25-year-old man complains of itching, burning and peeling of the skin of the foot, with thickened, discoloured nails.

A. Mention the group of fungi responsible and name three genera included in it. **(1 mark)**

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B. What is the diagnostic finding in the KOH mount of the nail scrapings? **(0.5 mark)**

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C. Mention the treatment. **(0.5 mark)**

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12. A 65-year-old man presents with a painful vesicular rash along one dermatome of the trunk. He gives a history of chickenpox during childhood.

A. Name the causative virus, the present disease and the site of latency of this virus. **(1 mark)**

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B. Mention the disease caused by the primary infection with this virus and the drug used for treatment. **(0.5 mark)**

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13. A 30-year-old woman is investigated for anogenital warts, and her Pap smear shows koilocytic cells.

A. Name the causative virus, the two serotypes most commonly associated with malignancy and the viral genes involved. **(1 mark)**

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B. Mention two methods used to confirm the diagnosis. **(0.5 mark)**

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C. Mention the method of prevention. **(0.5 mark)**

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Part 1: MCQ Answer Key

1 **C** – Staphylococcus aureus Slides 4 & 5 (Gram-positive cocci in grape-like clusters, catalase positive; S. aureus is β-haemolytic on blood agar, coagulase positive and ferments mannitol on mannitol salt agar)

2 **B** – Catalase test Slides 4 & 11 (Staphylococci are catalase positive, while streptococci are catalase negative)

3 **A** – Nasal mucosa Slide 5 (Transmission is by hands, by sneezing from the nasal mucosa (25% of the population are carriers) and through surgical wounds)

4 **C** – Toxic shock syndrome toxin-1 Slides 6 & 7 (TSST-1 is a superantigen; toxic shock syndrome presents with fever, hypotension, a scarlatiniform rash that desquamates on the palms and soles, and multiorgan failure)

5 **A** – Inhibition of phagocytosis Slide 6 (Protein A binds the Fc component of IgG and inhibits phagocytosis)

6 **C** – Exfoliatins Slides 6 & 7 (Exfoliatins are skin-exfoliating toxins involved in scalded skin syndrome (diffuse epidermal peeling) and in bullous impetigo)

7 **B** – Staphylococcus aureus Slides 7 & 34 (Impetigo that is initially vesicular but with longer-lasting bullae and a catalase-positive organism = S. aureus (coagulase and exfoliatins); honey-crusted lesions with a catalase-negative organism = S. pyogenes)

8 **C** – Panton-Valentine leukocidin Slide 6 (The cytolytic (α) toxin, Panton-Valentine leukocidin, forms pores in infected cells, is acquired by bacteriophage and is associated with increased virulence in MRSA strains)

9 **A** – Cytolysins and coagulase Slide 7 (S. aureus is the commonest cause of osteomyelitis (bone pain, fever, lytic bone lesions on imaging) and of septic arthritis; the pathogenicity factors are cytolysins and coagulase)

10 **B** – An altered penicillin-binding protein Slide 9 (MRSA is an important cause of serious nosocomial and community-acquired infections; resistance is due to an altered penicillin-binding protein)

11 **E** – Quinupristin/dalfopristin Slide 9 (Nafcillin/oxacillin are the drugs of choice for penicillinase-producing strains, mupirocin is used topically, vancomycin for MRSA and quinupristin/dalfopristin for VRSA)

12 **B** – Staphylococcus epidermidis Slide 10 (S. epidermidis: catalase positive, coagulase negative, urease positive, novobiocin sensitive and does not ferment mannitol (vs S. aureus); it infects prosthetic devices such as hip implants)

13 **A** – Production of adherent biofilms Slide 10 (It is normal flora of the skin that contaminates blood cultures and infects prosthetic devices and intravenous catheters by producing adherent biofilms)

14 **C** – Streptococcus pyogenes Slides 11, 14 & 34 (Pyoderma/impetigo is a pyogenic skin infection with honey-crusted lesions caused by S. pyogenes, a catalase-negative Gram-positive coccus in chains)

15 **A** – M protein Slide 11 (S. pyogenes (group A) is β haemolytic, bacitracin sensitive and PYR positive, and is serotyped via its M protein)

16 **B** – M protein Slide 12 (M protein is antiphagocytic and is associated with acute glomerulonephritis and rheumatic fever)

17 **A** – Streptolysin O Slide 12 (Streptolysin O is an immunogenic haemolysin/cytolysin, while streptolysin S is not immunogenic; hyaluronic acid is also non-immunogenic)

18 **A** – Phage-coded erythrogenic exotoxins Slides 13 & 14 (Exotoxins A–C (pyrogenic or erythrogenic exotoxins) are phage-coded superantigens that cause the fever and rash of scarlet fever)

19 **B** – Streptococcal DNAse Slide 13 (Streptococcal DNAse liquefies pus and extends the lesion; streptokinase breaks down the fibrin clot and hyaluronidase hydrolyses the ground substance of connective tissue)

20 **B** – Streptococcus pyogenes Slides 14 & 35 (Erysipelas: dermal pain, oedema, heat and rapid spread with a red, raised butterfly facial rash caused by S. pyogenes)

21 **A** – Propionibacterium acnes Slides 15 & 34 (Propionibacterium acnes causes inflammation of the follicles and sebaceous glands (acne vulgaris))

22 **A** – Corynebacterium species Slide 15 (Corynebacteria (diphtheroids) are Gram-positive short bacilli, normal inhabitants of the skin and mucous membranes, causing endocarditis, UTI, bacteraemia, osteomyelitis and wound infections)

23 **A** – Treponema pallidum Slide 16 (Primary syphilis is a localized disease presenting with a painless chancre with a clean, indurated edge; the reservoir is the human genital tract)

24 **B** – Secondary syphilis Slide 16 (Secondary syphilis is a disseminated disease with a maculopapular rash including the palms and soles, condylomata lata, lymphadenopathy and patchy hair loss)

25 **B** – Borrelia burgdorferi Slide 17 (Erythema migrans (bull's eye rash) after a deer tick bite is characteristic of Lyme disease; B. burgdorferi invades the skin and spreads via the bloodstream to the heart, joints and CNS)

26 **A** – Low cell-mediated immunity with a largely Th2 response Slides 18 & 19 (Lepromatous leprosy presents diffusely over the skin with leonine facies, is communicable (high bacterial load) and is characterized by low cell-mediated immunity with a largely Th2 response)

27 **C** – It is an obligate intracellular parasite that cannot be cultured in vitro Slide 18 (M. leprae is an acid-fast, rod-shaped obligate aerobe growing slowly inside macrophages; it is an obligate intracellular parasite with optimal growth at less than body temperature, transmitted by nasal discharge)

28 **A** – Bacillus anthracis Slides 20 & 35 (Cutaneous anthrax: papule → papule with vesicles (malignant pustule) → ulcer with a black eschar (painless, necrotic); the reservoir is animals, skins and soils and transmission is by contact)

29 **A** – Protective antigen, lethal factor and edema factor Slide 20 (Anthrax toxin is an exotoxin consisting of protective antigen, lethal factor and edema factor; the polypeptide capsule (poly D-glutamate) is antiphagocytic and immunogenic)

30 **A** – Doxycycline Slide 21 (Rocky Mountain spotted fever (Rickettsia rickettsii, vector is the tick) is diagnosed clinically and treated with doxycycline, even in children under 8 years)

31 **A** – Viral genes E6 and E7 of serotypes 16 and 18 Slide 24 (HPV malignancy is due to the viral genes E6 and E7; serotypes 16 and 18 are preneoplastic (CIN) and are responsible for more than 70% of cases; koilocytic cells are found in the Pap smear)

32 **B** – It is a naked virus with circular double-stranded DNA that replicates in the nucleus Slide 23 (Papillomavirus: icosahedral nucleocapsid, circular dsDNA, naked, replicates in the nucleus, over 100 serotypes, transmitted by direct contact and fomites)

33 **A** – Molluscum contagiosum Slide 25 (Molluscum contagiosum (poxvirus, replicates in the cytoplasm): single or multiple (<20) benign wart-like tumours, umbilicated, with molluscum bodies (eosinophilic cytoplasmic inclusion bodies))

34 **A** – Reactivation of a virus latent in the spinal (dorsal root) ganglia Slides 22 & 27 (The varicella virus may lie dormant (latent) in the spinal ganglia and reactivate along the dermatomes as shingles (herpes zoster) in later life; treatment is acyclovir)

35 **A** – Trigeminal sensory ganglia Slide 27 (Herpes simplex-1: initial infection is mucoepithelial, latency is in the trigeminal sensory ganglia and the recurrent manifestation is herpes labialis (cold sores))

36 **A** – Variola (smallpox) Slide 26 (Variola has one serotype, making eradication (1979) possible; transmission is by the respiratory route and prevention is by a live attenuated vaccine)

37 **A** – Malassezia species Slides 29 & 30 (Pityriasis (tinea) versicolor is caused by Malassezia spp., a yeast-like fungus that inhibits tyrosinase → hypopigmentation; it is less pruritic than dermatophytes and commoner in summer)

38 **A** – Oral griseofulvin Slides 31 & 32 (Tinea capitis is a dermatophytic infection causing permanent hair loss; treatment is topical imidazole or tolnaftate, but oral imidazole or griseofulvin is used where hairs are infected)

39 **A** – Candida albicans Slide 33 (Candida albicans is dimorphic, forming pseudohyphae and budding yeasts at 20°C and germ tubes at 37°C in serum; it causes thrush in neonates and diaper rash)

40 **A** – Pseudomonas aeruginosa Slides 34 & 35 (Pseudomonas aeruginosa causes hot tub folliculitis (inflamed follicles from the neck down) and cellulitis of burns with blue-green pus and a grape-like odour)

Part 2: Essay Answer Key (with slide references)

1. Impetigo — Slides 7, 14 & 34

- A. Superficial pyogenic skin infection of children, commonest around the mouth and nose; initially vesicular → skin erosion; erythematous papules → bullae; honey-crusted lesions (S. pyogenes) or longer-lasting bullae (S. aureus); highly contagious by direct contact; pathogenicity factors: coagulase and exfoliatins
- B. Streptococcus pyogenes (Gram-positive cocci in chains, catalase negative) and Staphylococcus aureus (Gram-positive cocci in clusters, catalase positive) → the catalase test differentiates them (coagulase test confirms S. aureus)

2. Pathogenicity factors of Staphylococcus aureus (any four) — Slide 6

- Protein A: binds the Fc component of IgG and inhibits phagocytosis
- Enterotoxins: fast acting and heat stable
- Toxic shock syndrome toxin-1 (TSST-1): superantigen → toxic shock syndrome
- Coagulase: converts fibrinogen into a fibrin clot
- Cytolytic (α) toxin, Panton-Valentine leukocidin: pore-forming, acquired by bacteriophage, increased virulence of MRSA strains
- Exfoliatins: skin-exfoliating toxins → scalded skin syndrome and bullous impetigo

3. Staphylococcus aureus vs Staphylococcus epidermidis — Slides 4, 5 & 10

- Coagulase test: S. aureus positive (all other Staphylococcus species are negative) / S. epidermidis negative (also urease positive and novobiocin sensitive)
- Mannitol fermentation: S. aureus ferments mannitol on mannitol salt agar / S. epidermidis does not ferment mannitol
- Characteristic infection: S. aureus → abscesses and mastitis, impetigo, scalded skin syndrome, toxic shock syndrome, surgical infections, osteomyelitis and septic arthritis / S. epidermidis → normal skin flora that contaminates blood cultures and infects prosthetic devices (hip implant, heart valve) and IV catheters by producing adherent biofilms
- N.B. both are Gram-positive cocci in clusters and catalase positive

4. MRSA — Slide 9

- A. Resistance is due to an altered penicillin-binding protein; MRSA is an important cause of serious nosocomial and community-acquired infections
- B. MRSA → vancomycin; VRSA → quinupristin/dalfopristin
- C. Mupirocin for topical treatment (nafcillin/oxacillin are the drugs of choice for penicillinase-producing strains)

5. Erysipelas — Slides 11, 13, 14 & 35

- A. Streptococcus pyogenes (group A Streptococcus): β haemolytic, bacitracin sensitive, PYR positive, catalase negative, serotyped via M protein
- B. Any two: streptokinase (breaks down the fibrin clot); streptococcal DNAse (liquefies pus, extension of the lesion); hyaluronidase (hydrolyses the ground substances of connective tissue)
- C. Beta lactam drugs are the treatment; macrolides are used in the case of penicillin allergy

6. Bacteria transmitted from bites — Slide 36

- Cat bite/scratch: Pasteurella multocida; Bartonella henselae (cat scratches with lymphadenopathy and stellate granulomas)
- Human bites, fist fights: Eikenella corrodens (dog bites: Capnocytophaga canimorsus; rat bites: Streptobacillus moniliformis and Spirillum minus)

7. Cutaneous anthrax — Slides 20, 21 & 35

- A. Cutaneous anthrax (malignant pustule): papule → papule with vesicles → ulcer with a black eschar (painless, necrotic), caused by Bacillus anthracis, a large Gram-positive spore-forming rod
- B. Polypeptide capsule (poly D-glutamate): antiphagocytic and immunogenic; anthrax toxin: an exotoxin consisting of protective antigen, lethal factor and edema factor
- C. Treatment: ciprofloxacin or doxycycline; prevention: toxoid vaccine (diagnosis: Gram stain and culture of blood, serology and PCR)

8. Lyme disease — Slide 17

- A. Lyme disease; erythema migrans (a red skin rash with a pale centre = bull’s eye rash); Borrelia burgdorferi, a spirochete transmitted by a deer tick bite (arthritis is caused by immune complexes)
- B. Serodiagnosis by ELISA (negative early) and Western blot for confirmation
- C. Doxycycline or amoxicillin

9. The two forms of leprosy — Slides 18 & 19

- Bacterial load: lepromatous → high (communicable), presents diffusely over the skin with leonine (lion-like) facies and can be lethal / tuberculoid → low, limited to a few hypoesthetic hairless skin plaques
- Cell-mediated immune response: lepromatous → low CMI with a largely Th2 response / tuberculoid → high CMI with a largely Th1-type response
- Lepromin skin test: negative in the lepromatous form / positive in the tuberculoid form
- Treatment: multiple-drug therapy with dapsone and rifampin (diagnosis: punch biopsy or nasal scrapings with acid-fast stain)

10. Give reason — Slides 9, 10 & 18

- S. epidermidis is normal flora of the skin and infects prosthetic devices and IV catheters by producing adherent biofilms (it also commonly contaminates blood cultures)
- Nafcillin/oxacillin are the drugs of choice because penicillinase-producing strains of S. aureus are widespread
- M. leprae is an obligate intracellular parasite (it grows slowly inside macrophages) with optimal growth at less than body temperature, so it cannot be cultured in vitro

11. Dermatophytic infection of the foot and nails — Slides 29, 31 & 32

- A. The dermatophytes (tineas, also called ringworm): Trichophyton, Epidermophyton and Microsporum; here tinea pedis (athlete's foot) and tinea unguium (ringworm of the nails); itching is the commonest symptom of all tineas
- B. KOH mount of the nail or skin scrapings shows arthroconidia and hyphae
- C. Topical imidazole or tolnaftate (oral imidazole or griseofulvin where hairs are infected or skin contact hurts); keep the areas dry

12. Herpes zoster (shingles) — Slides 22 & 27

- A. Varicella-zoster virus; the present disease is herpes zoster (shingles) appearing along the dermatomes; the virus lies dormant (latent) in the spinal (dorsal root) and trigeminal ganglia
- B. Primary infection causes varicella (chickenpox); treatment is acyclovir

13. Human papilloma virus — Slides 23 & 24

- A. Human papilloma virus (naked, circular dsDNA, replicating in the nucleus, over 100 serotypes); serotypes 16 and 18 are preneoplastic (>70% of cases) through the viral genes E6 and E7
- B. Koilocytic cells (perinuclear cytoplasmic vacuolization and nuclear enlargement) in a Pap smear; in situ DNA probes and PCR to confirm the diagnosis and type the strain
- C. Safe sex and vaccines (treatment: cidofovir, surgical and/or chemical)