MICROBIOLOGY & IMMUNOLOGY – PAST QUESTIONS (2007-19)

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▪ GENERAL BACTERIOLOGY

Bacteria Compared with Other Microorganisms

1. Give differences between virus & bacteria. **[Annual 2007]**

Structure of Bacterial Cells

1. Why is heating required in Ziehl-Neelsen staining method? **[Annual 2008]**
2.
   a) What are plasmids? Give its different types.
   b) Enumerate the function and structures of medical importance whose genes are carried by plasmids. **[Annual 2009]**
3.
   a) Compare the cell walls of gram positive and gram-negative bacteria.
   b) Enumerate any 3 bacteria of medical importance that can't be seen in Gram Stain. Give reason and alternate microscopic approach. **[Supple 2009]**

Growth

1. Explain diagrammatically the four phases of bacterial growth curve. **(2.5) [Supple 2016 held in 2017]**

2. What are the different phases of bacterial growth curve? Give the different cellular events that take place in each phase. **(3) [Annual 2015]**

Genetics

1. With a labelled diagram, explain the process of conjugation. **(3) [Annual 2017]**

2. A highly resistance Pseudomonas strain is isolated from several patients admitted in surgical ward of a private hospital. **[Supple 2015 held in 2016]**
   a) Enlist three mechanisms of transfer of antibiotic resistance genes from one cell to another. **(1.5)**
   b) Explain the process of conjugation with a labelled diagram. **(3.5)**

3. Define mutation. Describe its various types. **[Annual 2011]**
4.
    a) Define mutation. Enumerate three types of possible mutations.
    b) How can genes be transferred from one bacterium to another? **[Annual 2010]**

5. What is gene mutation and what is its clinical significance? **[Annual 2009]**

Normal Flora

1. What do you understand by the term normal flora of the body? Name the members of the normal flora of oropharynx. What is colonization resistance? **[Supple 2013]**

Pathogenesis

1. Enlist six major differences between exotoxins and endotoxins. **(3) [Supple 2018 held in 2019]**

2. Enumerate four major differences between exotoxins and endotoxins. **(2) [Annual 2016]**
3.
    a) Define pathogenicity and virulence.
    b) Name four components an organism must have to be capable to cause an infectious disease. **[Supple 2010]**

Laboratory Diagnosis

1. A 45-year-old patient was diagnosed to have a bacterial infection caused by a microorganism that cannot be cultured in routine culture media. **[Annual 2013]**
    a) Write down the names of atleast 5 such organisms.
    b) How will you diagnose such a case that is culture negative?

Antimicrobial Drugs: Mechanism of Action

2. Define the terms bacteriostatic and bactericidal. **(2) [Annual 2015]**
3.
    a) Name four mechanisms of action of antimicrobial drugs.
    b) Briefly discuss the mechanism acting on bacterial cell wall. **[Supple 2015]**

Antimicrobial Drugs: Resistance

1. MRSA (Methicillin-Resistant Staphylococcus Aureus) is isolated from the wound culture of a patient admitted in surgical ward. Enlist the four major mechanisms that mediate bacterial resistance to drug with one example of each. **(2) [Supple 2018 held in 2019]**

2. Give the four reasons for the failure of drugs to inhibit the growth of bacteria. **(2) [Annual 2017]**

Sterilization & Disinfection

1. Enumerate the different physical methods of sterilization with one example each. **(1.5) [Annual 2018]**

2. A laboratory technician is asked to sterilize instruments used in Operation Theatre to prevent sepsis and Hepatitis B and C infection in patients undergoing delivery. Define sterilization and enlist its physical methods with examples. **(2.5) [Supple 2016 held in 2017]**

3. Give any two mechanisms by which chemical agents kill microorganisms. Give two examples of chemical agents from each category. **[Supple 2013]**

▪ SPECIAL BACTERIOLOGY

Gram-Positive Cocci

1. A 50-year-old female develops a pyogenic infection along the suture line after abdominal surgery. Pus is sent to microbiologist laboratory. A preliminary report of a beta-hemolytic, catalase-positive, gram-positive coccus is given.
   a) What is most likely diagnosis? Briefly discuss three clinically important exotoxins produced by this organism. **(0.5+3)**
   b) Enumerate three types of diseases produced by streptococcus pyogenes with one example for each. **(2) [Annual 2018]**

2. A young, previously fit man presents with one-week history of flu-like illness which has worsened over the past 24 hours. His temperature is 39.5^{o}C with heart rate of 100 and increased respiratory rate. His chest X-ray shows diffuse mottled shadowing in both lung fields. A diagnosis of Community Acquired Pneumonia is made.

a) What specimens will be sent for culture to the microbiology lab? What organisms are the most likely to cause community acquired pneumonia in a young patient? **(1+2)**
b) Cultures were positive for Staphylococcus Aureus. What laboratory characteristics will help to identify this organism? **(2) [Annual 2017]**

3. A 10-year-old boy is brought to pediatrician with complaints of weakness, fever, malaise and passing of low quantity of brownish urine. The urine microscopic examination was positive for RBC casts. Mother gives history of child having a severe attack of sore throat 2-3 weeks back. **[Annual 2012]**
   a) If throat swab of the child was cultured at the time of active throat infection, which organism would have been isolated? **(1)**
   b) Give an account of the toxins and enzymes produced by these bacteria. **(4)**

4. A patient with suspected brain abscess is admitted to the neurosurgery ward. The abscess was drained and the pus was sent for culture and sensitivity. The isolate on the blood agar is beta-hemolytic, gram-positive coccus with positive coagulase and catalase test. **[Supple 2013]**
   a) What is the likely organism? Name any four other typical diseases produced by this organism. **(3)**
   b) Enumerate any two cell wall components or antigens of this organism. Give their importance in pathogenesis. **(2)**

5. A 14-year-old girl develops a rapidly spreading painful, erythematous rash on her leg. The rash was warm and tender and her temperature was 38^{o}C. Gram positive cocci were seen in the aspirate from the lesion. Culture of the aspirate on the blood agar grew colonies surrounded by β-hemolysis. Growth of the organism is inhibited by bacitracin. **[Annual 2010]**
   a) What is your most likely diagnosis? **(1)**
   b) Enumerate the mechanism and prominent clinical features of two immunologic diseases caused by this organism. **(4)**

6. A female infant was delivered by a midwife at home. Within a day she developed meningitis and dies the next day. **[Supple 2010]**
   a) Name two common organisms which are likely to cause this disease. **(2)**
   b) Name three risk factors which increase the chances of a new born acquiring this infection. **(1.5)**
   c) Name three laboratory tests that are helpful in identifying the causative organism. **(1.5)**

Gram-Negative Cocci

1. Discuss lab investigations for diagnosis of Neisseria Gonorrhoeae. **[Annual 2018]**

2. A 25 year od patient was seen in emergency department of hospital with fever, headache and stiffness of neck. His Kernig's sign was positive. There were petechial rashes on his body. **[Supple 2017 held in 2018]**
   a) What is the diagnosis? **(1)**
   b) If it is due to Gram-Negative diplococci, how would the diagnosis be confirmed in pathology laboratory? **(4)**

3. A 20-year-old boy presents with purulent urethral exudate and dysuria for last two weeks. Gram smear of pus discharge shows a large number of Gram-negative intracellular diplococci suggestive of Neisseria Gonorrhea.
   a) Briefly discuss its pathogenesis and name another important sexually transmitted bacterium and the disease produced by it. **(2+1)**
   b) Enlist three clinical complications of this infection seen in women and one in infants. **(2) [Supple 2016 held in 2017]**

4. A 5-year-old child develops high grade fever and headache for last 4-5 days. He is brought to Pediatrics emergency room. On examination, he has neck stiffness. A lumbar puncture is performed. Preliminary report of cerebrospinal fluid (CSF) analysis suggest the diagnosis of acute bacterial meningitis. **[Annual 2015]**
   a) Name the possible organism responsible for disease in him and give its portal of entry. **(2)**
   b) How will you proceed in the laboratory to further confirm the diagnosis and establish the causative organism? **(3)**

5. A 25-year-old female was brought to hospital because of sudden onset of high-grade fever and headache. On examination there is stiffness of neck, irregularly shaped ecchymosis and purpuric flat lesions scattered over body. Her temperature is $40^{o}C$, BP is 40/20 mm Hg, pulse is 140/min. Culture smear of CSF showed gram negative diplococci. **[Supple 2015]**
   a) What is most likely diagnosis and bacteria causing it?
   b) Briefly discuss the pathogenesis of this clinical condition.

6. A patient comes to hospital with complaints of fever, headache, neck rigidity and increased polymorphonuclear neutrophils in his CSF.
   a) What is probable diagnosis?
   b) What lab tests will be used to make a lab diagnosis? **[Annual 2014]**

7. A young fashion designer presents to the urology ward with complaints of creamy yellowish urethral discharge and painful micturition. He is otherwise in good health. Gram stained smear of discharge revealed pus cells with intracellular gram-negative cocci. **[Annual 2012]**
   a) How would you proceed in the lab for identifying this bacterium? Describe systemically. **(3)**
   b) Name other intracellular gram-negative coccus and briefly describe its antigenic structure. **(2)**

8. A young female presented to infertility clinic for workup for her infertility status. Her detailed investigations revealed bilateral fallopian tubal blockade. She gave history of mucopurulent vaginal discharge in the past and history of similar creamy yellowish urethral discharge in her husband. A common bacterial infection is suspected in the couple. **[Supple 2011]**
   a) Name the microorganism responsible for producing this clinical scenario. **(1)**
   b) How would you proceed in the lab to isolate and identify the infecting agent in the urethral discharge of her husband? **(4)**

9. A young fashion designer presents to the outdoor patient department with complaints of painful urination, with discharge of yellowish creamy pus. The gram smear of this discharge was examined which revealed gram negative diplococci within the polymorphonuclear leukocytes. **[Annual 2011]**
   a) How would you proceed for further isolation and identification of this organism? **(2)**
   b) Name the other closely related human pathogen. Describe the role of vaccination for this other organism. **(1+2)**

10. A young female presented to infertility clinic for workup for her infertility status. Her detailed investigations revealed bilateral fallopian tubal blockade. She gave history of mucopurulent vaginal discharge in the past and history of similar creamy yellowish urethral discharge in her husband. A common bacterial infection is suspected in the couple. **[Supple 2011]**
   c) Name the microorganism responsible for producing this clinical scenario. **(1)**
   d) What are the different lab investigations available for confirming this diagnosis? **(4)**

Gram-Positive Rods

1. A 10-year-old male child is brought to the hospital emergency with high grade fever and chills, sore throat, headache, dysplasia and dyspnea. On examination, cervical lymphadenopathy is noted along with greyish white adherent pseudo-membrane over the tonsils. **[Supple 2018 held in 2019]**
   a) What is the most likely diagnosis? Give the mechanism of disease development by this pathogen.
   b) Enlist three complications associated with this disease.

2. A young male develops a large area of gangrenous necrosis on lateral aspect of leg following wound contamination associated with compound fracture during a road traffic accident. A large gas and fluid filled bulla appears producing subcutaneous crepitations close to the area of gangrene. **[Annual 2016]**
   a) Name the causative organism and give the most likely diagnosis. **(2)**
   b) Briefly discuss the pathogenesis of this organism. **(3)**

3. A 4 years old girl is brought to the emergency with history of fever and sore throat for 4 days. Her immunization status is unknown. On examination, she is anxious, tachypneic and ill looking. Her temperature is 38.6^{o}C and her voice is hoarse. Examination of pharynx revealed tonsillar and pharyngeal edema with gray membrane coating the tonsils extending over uvula and soft palate. There is cervical lymphadenopathy and lungs are clear. **[Annual 2015]**
   a) What is most likely diagnosis? Name the causative organism. **(1+1)**
   b) Give the characteristics of causative organism and its toxin. **(1+2)**

4. A patient of acute lymphocytic leukemia with fever and neutropenia develops diarrhea after administration of amoxicillin therapy. What is the most probable causative agent and what disease it can cause? **(5) [Supple 2014]**

5. An unimmunized child of remote village develops fever, sore throat and cervical lymphadenopathy. On examination there is a thick adherent membrane over the tonsils and throat. A provisional diagnosis of sore diphtheria was made.
   a) Name the causative organism of this child's illness? What is its appearance on gram staining? **(2)**
   b) Briefly describe the mechanism of action of toxin produced by this organism. What is the role of antitoxin in the treatment of diphtheria? **(3) [Supple 2013]**

6. A young hostel student was used to eating home canned food. She presented at emergency department complaining of difficulty in speech and swallowing. She soon developed visual problems with diplopia and went into complete bulbar paralysis.

Her respiration also became labored. She admitted eating rancid canned food without heating. **[Annual 2012]**

a) What is the pathogenesis of her illness? **(3.5)**
b) Name the other pathogens belonging to this species of bacteria and diseases produced by each in humans. **(1.5)**

7. A 50-year-old male meets a road side automobile accident resulting in compound fracture of his femur. He was brought to the hospital from his village. Next day he developed foul smelling discharge from the wound, crepitations in the subcutaneous tissue occur. He developed high grade fever and went into shock.
   a) Name the organism responsible for this condition. **(1)**
   b) Give an account of pathogenesis and toxins produced by this organism. **(4)** **[Supple 2012, Supple 2011]**

8. A 60-year-old fell and sustained a deep wound from a rusty nail that penetrated his leg. Although the wound was cleaned, the next morning he developed fever of 102F. his thigh became painful and swollen. In the surgical emergency, he developed crepitus (gas in tissue). The exudates of the wound area revealed gram-positive rods.
   a) What is the most likely causative organism? Name three other members of clostridium species. **(2)**
   b) Give:
      i) the disease caused
      ii) transmission/predisposing factors
      iii) action of toxin of different members of clostridium species. **[Supple 2010]**

9. A 7-year-old girl is brought to pediatrics emergency with fever of 101.5 F, sore throat, malaise, and dyspnea. She has an incomplete vaccination history. Physical examination reveals cervical lymphadenopathy and whitish membrane covering most part of pharynx. **[Annual 2009]**
   a) What is the most likely diagnosis and causative agent?
   b) How does this microorganism cause this presentation?
   c) What growth medium is used to identify this organism and how does it appear on culture?

10. A grandmother in remote village cow dung to the umbilical stump of a new born. Child develops strong muscular spams pronounced arching of back and dies of respiratory failure after a week. **[Annual 2007]**
    a) Name the most likely etiological agent.
       Name other 3 bacterial species of the genus and diseases caused by them.

Gram-Negative Rods Related to the Enteric Tract

1.
   a) How will you diagnose a case of bacillary dysentery in the laboratory?
   b) Enlist four other dysentery causing organisms. **[Supple 2018 held in 2019]**

2. A 65-year-old female presents with dysuria and hematuria. Culture of the urine sample reveals lactose-fermenting gram-negative motile rods. What will be the pathogenesis of urinary tract infection by this organism? What is Hemolytic Uremic syndrome? **(2+1.5) [Annual 2018]**

3. A boy has cramping abdominal pain. He is passing stool containing pus cells and red blood cells. **[Supple 2017 held in 2018]**
   a) Name three microorganisms responsible for exudative disease resulting in the appearance of blood in stool. **(2)**
   b) Give the mechanism of action of Shiga toxin. **(3)**

4. A patient was admitted in a hospital with high grade fever, malaise and constipation. He had bradycardia and hepatosplenomegaly. There was maculopapular rash 'rose spots' on his chest and abdomen. His CBC revealed leukopenia.
   a) What is the most likely diagnosis? **(1)**
   b) Give the laboratory diagnosis of this disease. Mention the specimens more likely to give positive results in the first and second week. Give the serologic tests available to diagnose the cases that present late to the hospital. **(4)**
   [Supple 2017 held in 2018]

5. A 22-year-old male develops high-grade fever with persistent headache and constipation, hepatosplenomegaly, lymphadenopathy and rose spots on abdomen are observed in the second week of infection.
   a) Briefly discuss the pathogenesis of this infection. What can be the possible complications if this patient is left untreated? **(2+0.5)**
   b) Name the gold standard laboratory test for diagnosis of this disease and reaction of this pathogenesis on TSI agar. **(2.5) [Annual 2017]**

6. Nine people from a village in the province of Punjab presents with sudden onset of vomiting and massive watery diarrhea. They observed rice water stools with flecks of mucous. Culture reveals motile gram-negative curved bacilli.

a) Name the most likely pathogen and discuss the mode of action of its enterotoxin (exotoxin) leading to watery diarrhea. **(1+2)**
b) Give the laboratory procedures employed in diagnosing this infection. **(2)**
[Supple 2016 held in 2017]

7. A young male is admitted with a 7-day history of 'step ladder pattern fever' and generalized weakness. Blood culture showed gram negative motile rods. Typhoid fever is suspected. Discuss the laboratory procedures employed in diagnosing this disease. **[Annual 2016]**

8. Several young children in a refuge camp presented with fever, gripping pain with repeated passage of blood and mucous containing stools. The crowded living conditions of the camp suggest person to person contact. Non-motile, gram-negative bacilli producing non-lactose fermenting colonies are isolated on selective media. Based on these findings, **[Supple 2016]**
   a) Which disease are these children suffering from? Name the etiological agent. **(2)**
   b) Briefly discuss the pathogenesis of this infection. **(3)**

9. You are a medical officer at camp for IDPs where an outbreak of diarrhea occurred. Patients complain of excessive watery stools with no bleeding. Gram stain of stool showed curved gram-negative rods. **[Supple 2015]**
   a) Name the most likely diagnosis. Name the causative bacteria.
   b) How it can be further confirmed in lab?
   c) Briefly discuss its pathogenicity.

10. A 30-year-old male comes to hospital with complaints of severe headache, high-grade fever that followed a step ladder pattern. He is constipated. On examination, he has tender abdomen with rose spots. Relative bradycardia is also present.
    a) Name the bacterium responsible for this condition.
    b) What is pathogenesis of this disease? **[Annual 2014]**

11. A young female with cystic fibrosis gets exacerbation of her bronchitis with cough. Abundant mucoid colonies were grown from sputum after 24 hours of incubation which were gram -ve bacilli, oxidase positive and motile.
    a) Describe growth and cultural characteristics of this microorganism. **(2)**
    b) Give the clinical spectrum of infection with this microorganism. **(3)**
    [Supple 2012, Supple 2011]

12. A villager was brought to the emergency department in the state of severe dehydration. He gave history of developing profuse diarrhea without blood, nausea

and vomiting followed by features of fluid loss. Doctor on duty quickly examined his stool specimen microscopically and found curved organisms with classical darting motility. **[Annual 2011]**

a) Describe the lab diagnosis of this disease in a systematic stepwise manner. **(3)**
b) What is the pathogenesis of this disease? **(2)**

13. A previously healthy 12-year-old boy came to the emergency room complaining of worsening bloody diarrhea and abdominal pain for the past 24 hours. He was anuric for 12 hours. His physical examination was unremarkable except for dehydration. His mother does admit to cooking his son a hamburger using meat that has been sitting on the kitchen counter for 'sometime'. Blood examination showed evidence of reduced renal function and lysed blood cells. **[Annual 2010]**
    a) Based on the symptoms and family activities, what organism and strain is the cause of this disease? **(2)**
    b) What unique complications can be caused by this organism? **(3)**

14. A female infant was delivered by a midwife at home. Within a day she developed meningitis and dies the next day. **[Supple 2010]**
    a) Name two common organisms which are likely to cause this disease. **(2)**
    b) Name three risk factors which increase the chances of a new born acquiring this infection. **(1.5)**
    c) Name three laboratory tests that are helpful in identifying the causative organism. **(1.5)**

15. A case of acute abdomen was brought to emergency department and was diagnosed as a case of perforated intestine. Partial resection and ileostomy were carried out. Following that the patient developed peritonitis, high grade fever and went into shock. Discuss pathogenesis of both E. coli and Bacteroides in causing peritonitis after abdominal surgery. **[Annual 2009]**

16. A foreign journalist who recently returned home from trip to Pakistan after preparing report on IDPs of Pakistan goes to physician complaining persistent high fever, malaise, constipation that presided over a week. She recalls that the fever began lowly and then went upto 41^{o}C. PE reveals enlarged spleen and tenderness of abdomen with rose colored spots. **[Supple 2009]**
    a) Which organism is most likely to cause this condition? Name any 3 method to diagnose infection caused by this organism
    b) Associated with this organism, give any 2 virulence factors and their effects.

17. Women of child bearing age are far more prone to UTIs than men because of shortened urethra.
    a) Enlist 2 bacteria in order of frequency which cause UTI in women of child bearing age.
    b) Give 4 risk factors predisposing to UTI. **[Annual 2008]**

18. After recent flooding in a slum area of Faisalabad, there is large influx of patients in the emergency department of DHQ hospital with specimens sent to lab being classical rice water stools.
    a) Name the most likely etiological agent.
    b) Give the pathogenesis and lab diagnosis of this. **[Annual 2007]**

Gram-Negative Rods Related to the Respiratory Tract

1. A 60-year-old man is suffering from Legionnaires' disease after he returns from attending a convention. What is the organism involved and what disease it causes? **(5) [Supple 2014]**

2. A 60-year-old woman has rapid onset of fever of 39^{o}C & productive cough of greenish sputum. She is not immunocompromised. A chest x-ray reveals a left lobar infiltrate. **[Supple 2009]**
    a) Which organism is likely to be isolated on sputum culture? Give its properties on Gram staining and culture.
    b) Associated with this organism, give any 2 virulence factors and their effects.

Mycobacteria

1. A 30-year-old destitute male has cough with blood streaked sputum and 30^{o}C temperature for the last one month. Sputum culture reveals acid fast bacilli and on culture buff colored colonies are found after 21 days.

    a) Briefly describe the clinical spectrum of organs involved in this condition.
    b) In a tabulated form, compare tuberculoid from lepromatous leprosy. **[Supple 2018 held in 2019]**

2. A 34-year-old male presented in OPD with complaints of fever and weight loss over the last two months. He had cough that produced rust color sputum. He was living with roommate positive for tuberculosis about six months ago.
    a) Depending on the host response, describe the two types of lesions produced by this organism. **(2)**
    b) What are different lab investigations available for confirming the diagnosis? **(3) [Annual 2018]**

3. A Pakistani American man visited Pakistan for the first time at 18 years of age. E is living with his grandmother who is on anti-tuberculosis therapy for three weeks. He has not been vaccinated with BCG. If he acquires infection from his grandmother,
   a) Give the pathogenesis and possible outcomes of infection. **(3)**
   b) Name two tests used to diagnose latent tuberculosis. **(2)**
   [Supple 2017 held in 2018]

4. A 68 years old retired school teacher was diagnosed as a case of primary tuberculosis on the basis of a strongly positive tuberculin skin test and cavitation found on the apical region of his left lung on chest X-ray. **[Annual 2017]**
   a) What is the technique and interpretation of tuberculin skin test? **(2)**
   b) describe the cultural characteristics of Mycobacterium Tuberculosis. **(2)**
   c) Name atypical mycobacteria. **(1)**

5. An adult male is presenting with hypopigmented patches on forearm and partial loss of cutaneous sensation in affected areas, presence of thickened ulnar nerve and presence of acid-fast bacilli (AFB) in nasal smears.
   a) What is your diagnosis? What is the causative organism? **(0.5+0.5)**
   b) Name the laboratory diagnostic methods used for detecting Mycobacterium Tuberculosis. **(4) [Supple 2016 held in 2017]**

6. A 34 years old male complains of cough with rusty colored sputum and low-grade evening fever. His chest X-ray reveals opacity on right upper lobe of lung. Routine serum culture reveals normal throat flora. However, acid fast bacilli were seen on ZN smear. **[Annual 2016]**
   a) Briefly discuss two types of lesions produced by this organism. **(2)**
   b) What are MDR (Multi-drug resistant) strains of Mycobacterium tuberculosis? **(1)**

7. Multi-drug resistant strain of Mycobacterium tuberculosis (MTB) is diagnosed in sanitary worker of a public hospital.
   a) What is MDR strain of Mycobacterium tuberculosis? Enlist four clinical manifestations associated with MTB strains. **(2)**
   b) What are the different laboratory investigations available for confirming this diagnosis? **(2) [Supple 2016]**

8.
   a) A 10-year-old child has a primary pulmonary infection with Mycobacterium tuberculosis. What would be the features of tuberculosis in this child? What is the characteristic lesion in the lymph nodes called? **(2)**
   b) Enumerate the constituents of mycobacterial cell wall. Give the importance of each constituent. **(3) [Annual 2015]**

9. Write a short note on tuberculin skin test. **[Supple 2015]**
10. An 18-year-old boy presented in medical OPD with low grade intermittent fever for last several months. He also has malaise, anorexia, history of weight loss and night sweats. On examination a swelling of 2-3 cm on right side of neck is visible. His recent investigations showed Hb: 9.5 g/dl, ESR: 100 mm/hr. **[Annual 2014]**
    a) What is your diagnosis?
    b) Name its causative agent and also enlist tis other types.
    c) What are the investigations used to diagnose this condition?

11. A 60-year-old laborer presents with history of chronic productive cough with occasional bouts of hemoptysis. Chest X-ray reveals a cavitating lesion in the apical region of right lung. Considering it to be a mycobacterial lung infection, a skin test was carried out to support the diagnosis which was strongly positive.
    a) What is the technique and interpretation of skin test? **(2.5)**
    b) Describe the cultural characteristics of this organism. **(2.5) [Annual 2012]**

12. A 55-year-old man as 5-month history of productive weakness and weight loss. There is history of low-grade fever with evening rise in, night sweats and productive cough. X-ray chest reveals pulmonary opacities due to granuloma formation. A sputum specimen when examined contain numerous acid-fast bacilli (AFB).
    a) What is the most probably diagnosis? The patient is most likely to be isolated from which organism? **(2)**
    b) Why certain mycobacteria are known as 'atypical'? What is the basis for their classification? Classify them. **(3) [Supple 2013]**

13. A 20-year-old male presented with a history of low-grade fever with evening rise for the past few months, loss of weight and cough with expectoration. X-ray revealed a cavitary lesion in the apex of right lung. **[Annual 2011]**
    a) Which test can be performed to screen this patient for tuberculosis? **(1)**
    b) Describe the procedure, interpretation and underlying pathogenetic phenomenon in case of a positive test for tuberculosis. **(1+1+2)**

14. A 25-year-old female presents to the gynecology ward for work up on her infertility. Pelvic ultrasound & hysterosalpingography revealed bilateral fallopian tube blockade, small nodules on pelvic peritoneum. A laparoscopic biopsy was taken from peritoneal nodules. It showed caseating granulomatous lesion on histological exam.
    a) What is the possible cause of her infertility based on histological results in biopsy?
    b) What are the different lab investigations available for confirming its diagnosis? **[Supple 2011]**

15. A 34-year-old male arrived at the local health clinic, complaining of fever and weight loss greater than 10% of his body weight in the last month. He also had a cough that produced rust-colored sputum. The physician orders for X-ray chest, sputum examination and a tuberculin test. He was living with a roommate positive for tuberculosis 6 months ago. **[Annual 2010]**
    a) Based on the symptoms and laboratory results, which infectious disease does the patient suffer from? What is the agent? **(2)**
    b) What is tuberculin skin test? **(3)**

16. A 37-year-old women presents with a two-month history of progressive cough, weight loss and fever. X-ray chest shows bilateral cavitary disease suggestive of tuberculosis. Sputum culture grows an acid-fast bacillus that is photochromogen (makes an orange pigment when exposed to light).
    a)
        i) Name mycobacterium other than tuberculosis producing such lesion. **(1)**
        ii) Name another species of photochromogens with the lesion caused by it. **(1)**
    b) How would you perform and interpret tuberculin skin test? **(3) [Supple 2010]**

17. A 32-year-old woman from Sindh presents to dermatologist with the history of 'white spots' on her body. PE reveals multiple, asymmetrically distributed, circular, hypopigmented lesions on her body. The lesions are sharply demarcated with raised erythematous borders and atrophic scaly centers. The lesions are anesthetic and hairless. Biopsy of lesion reveals granuloma formation within nerves.
    a) What is likely diagnosis and causative organism? Give its 3 characteristics.
    b) How does this patient's condition differ from the more serious 'distinct form of disease'? **[Annual 2009]**

18. Each year 3 million people die of tuberculosis and 8 million new cases occur. Approximately one third of world's population is infected by Mycobacterium tuberculosis.
    a) Enumerate any 3 components of cell wall of Mycobacterium tuberculosis and give their functions.
    b) What do you understand by Multi-drug resistant (MDR) strains of M. tuberculosis? how do they develop? **[Supple 2009]**

19. M. tuberculosis has a complex cell wall conferring many properties to the organism.
    a) Why is heating required in the staining process of ZN stain method?
    b) Name 4 complex lipids and properties they confer to M. tuberculosis. **[Annual 2008]**

20. At present, TB is a global emergency acrid to WHO. There are 3 million cases in Pakistan.
    a) Mention 4 factors contributing to this recent disease.
    b) Mention 3 advantages of Direct Observed Therapy (DOT). **[Annual 2007]**

Actinomycetes

1. A microbiologist received an improperly labelled sample that resembles some kind of fluid and source is unknown. Gram staining reveals that the microorganism in fluid is filamentous, gram +ve rod, forming long branching filaments.
    a) What are the 2 most likely bacterial microorganisms?
    b) How are they microorganisms differentiated in lab?
    c) If sample was drained from oral abscess, which 2 organisms are most likely and why? **[Annual 2009]**

Mycoplasma

1. A 50-year-old male presented with the history of fever and bilateral diffused interstitial pneumonia. He has history of renal transplantation two months back for end stage renal disease. What is most likely pathogen & disease it causes? **[Supple 2014]**

2. Tabulate differences between Mycoplasma, Chlamydia and Rickettsiae. **[Supple 2013]**

Spirochetes

1. A 50-year-old man presents with a spreading, non-pruritic, painless, circular red rash with a clear center at the tick-bite site. The rash was accompanied by non-specific 'flu-like' symptoms such as fever, chills, fatigue and headache. He was treated and cured in a few days. Few weeks later, the patient presented with myocarditis, third degree heart block and Bell's palsy. **[Annual 2013]**
    a) What is the most probable diagnosis? **(2)**
    b) How will you diagnose the case in laboratory? **(3)**

2. A 45-year-old homosexual presents with a maculopapular rash notably on the palms and soles. He gives the history of appearance of non-tender shallow penile ulcer which healed spontaneously 12 weeks back.
    a) What is the likely diagnosis and causative agent of this case? **(2)**
    b) Give the microscopic and serological laboratory procedures you will follow for the confirmation of your diagnosis. **(3)**

3.
   c) Classify spirochetes in 3 genera.
   d) Name the organisms and disease caused by each species of genera. **[Annual 2007]**

Chlamydia

1. Draw and label the lifecycle of Chlamydia Trachomatis. **[Annual 2018]**

2. A 24 years old male complains of thin grayish urethral discharge. Gram stain of discharge reveals many neutrophils but no bacteria. Chlamydia trachomatis is suspected. **[Annual 2016]**
   a) Enlist the diseases associated with different immune types of Chlamydia trachomatis. **(1.5)**
   b) Explain the life cycle of Chlamydia. **(2.5)**

3. What is Reiter's syndrome? **(1) [Supple 2016]**

4. Tabulate differences between Mycoplasma, Chlamydia and Rickettsiae. **[Supple 2013]**

Rickettsiae

1. Tabulate differences between Mycoplasma, Chlamydia and Rickettsiae. **[Supple 2013]**

Miscellaneous

1. A diagnosis of septicemia should be considered in patient who are at high risk of bloodstream infection caused secondary to local disease such as urinary tract infection or pneumonia. **[Annual 2013]**
   a) Enumerate the factors predisposing to septicemia.
   b) Give atleast 2 examples of clinical septicemia.

2. Investigations of UTI is common in diagnostic microbiologist lab as UTI are common infections in community.
   a) Name routes of UTIs and organisms commonly associated with each mode of transmission.
   b) What are common causes of sterile pyuria? **[Annual 2013]**

3. Now STDs are amongst the commonest infectious disease worldwide. More than 20 STDs have been identified. The incidence of STDs to rising in last few decades.

a) Name 6 diseases included in list of STDs by WHO
b) Mention 4 reasons attributed to this increase. **[Annual 2008]**

▪ GENERAL VIROLOGY

Structure

1. Draw and label the structure of an enveloped RNA virus with icosahedral symmetry. **[Supple 2015]**
2.
   a) What are the two forms of viral nucleocapsid symmetries? Give atleast one example of each.
   b) Compare viruses and cells. **[Annual 2010]**

3. Give two differences between viruses and bacteria. **[Annual 2010]**
4.
   a) What is the name given to the study of the most common infectious agents?
   b) Give three properties of the infectious agent which make it different from bacteria.
   c) Name infectious particle smaller than this particle. **[Annual 2008]**

Classification of Medically Important Viruses

1. Give four names of DNA and RNA viruses with example of on disease caused by each. **[Annual 2010]**

Pathogenesis

1. Name viruses that can be vertically transmitted. **[Annual 2014]**

Laboratory Diagnoses

1. Enlist five approaches to the diagnosis of viral diseases by the use of any clinical specimens. **(2.5) [Annual 2016]**

▪ SPECIAL VIROLOGY BACTERIOLOGY

DNA Enveloped Viruses

1. A 65 years old woman presents with painful vesicular rash on left side of her back. Smear from the base of vesicle reveals multinucleated giant cells with intracellular inclusions. Name the etiological agents of this disease. Name one other disease caused by this virus. **(1+1) [Annual 2018]**

2. A 70-year-old woman c/o rash on left of her back. Rash is vesicular and restricted to one side of the back. She is being treated with chemotherapy for carcinoma of breast. **[Supple 2013]**
   a) What is the diagnosis?
   b) What is the other disease caused by this virus?
   c) How is this virus transmitted? What is its pathogenesis?

RNA Enveloped Viruses

1. While playing in the street a young boy is attacked by a stray dog and bitten repeatedly on the arms and face. Three weeks later, the boy develops a chance in behavior becoming irritable and agitated. He eventually became comatose and died from respiratory arrest. Give the pathogenesis of disease development in this case. **(1+2) [Supple 2018 held in 2019]**

2. In the month of January, many people developed high grade fever, severe headache and body aches. In the hospital they were diagnosed to have viral pneumonia.
   a) Name the virus responsible. **(1)**
   b) What do you understand by antigenic drift and antigenic shift in these viruses? **(4) [Supple 2017 held in 2018]**

3. A 6-year-old adopted boy was brought to pediatrician with history of fever for few days, ear ache and swollen cheeks. His vaccination status is unknown. On examination, he had tender swelling of parotid glands bilaterally with bilateral cervical lymphadenopathy. Ear and throat examination were normal.
   a) What is the most likely causative agent of this child's disease? **(1)**
   b) Briefly give characteristics of this virus and their impact on its transmission. **(4) [Annual 2015]**

4. A 50-year-old woman visits her physician complaining of feeling unwell with fever, chills, muscle aches, dry cough and sore throat. She has had these symptoms for several days with no significant improvement. There is H/O similar illness in other family members. Physical examination reveals small, tender cervical lymphadenopathy, swollen nasal mucosa and erythematous pharynx.
   a) What is the likely diagnosis? Describe the causative agent.
   b) Although the patient had similar infection in past, why isn't her immune system protecting her from this illness?

c) What characteristic of this microorganism's genome makes deadly epidemic possible? **[Annual 2009]**

5. A 10-year-old boy is bitten by a wild dog while playing in the street.
   a) What disease is this boy at risk of contracting and which organism is the cause?
   b) What are the characteristics of this organism?
   c) How is the disease diagnosed? **[Supple 2009]**

RNA Nonenveloped Viruses

1. Poliomyelitis is diagnosed in three children in a village of Swat. Briefly discuss the pathogenesis and mode of transmission of polio virus. **(2.5) [Annual 2016]**

2. Briefly discuss the pathogenesis of poliomyelitis. **[Annual 2014]**

Hepatitis Viruses

1. Name important diagnostic tests during various stages of Hepatitis B. What are serological findings in a patient with acute Hepatitis B? **(1.5+1.5) [Annual 2018]**

2. Name 3 RNA hepatitis viruses and route of their transmission. **[Supple 2015]**

Human Immunodeficiency Viruses

1. A 32-year-old homosexual, infected with HIV for the last 8 years, now presents with signs and symptoms of immunodeficiency stage.
   a) Give three main mechanisms by which HIV can invade the immune system. **(1.5)**
   b) Name two opportunistic fungal infections associated with AIDS. **(1)**
   c) Enlist the specific tests used in laboratory diagnosis of HIV infection. **(2.5)**
   [Supple 2017 held in 2018, Supple 2016 held in 2017]

2. Briefly discuss the three sages seen during the clinical course of HIV infection. **(3)**
   [Annual 2017]

3. An HIV positive patient has progressed from fatigue, rash, nausea and night sweat symptoms to occasional but define opportunistic infections.
   a) Enlist two opportunistic fungal, 2 viral infections and one malignancy associated with AIDS.
   b) Give the clinical course of disease development in HIV infection.
   [Supple 2015 held in 2016]

4. What are the types of HIV virus and what disease it causes? **[Annual 2010]**

Dengue Virus

1. 10-year-old boy presents with flu like symptoms during recent dengue epidemic. With clinical suspicion of dengue fever, her lab investigations are ordered by house officer on urgent request. **[Annual 2012]**
   a) Is the test request appropriate?
   b) Give an account of lab investigations available for diagnosis in relation to timing of presentation.
   c) How does the host immune response influence the severe form of this disease in the infected person?
2.
   a) Describe clinical spectrum of infection by dengue virus.
   b) How will you confirm diagnosis in laboratory?
   [Annual 2011]
3.
   a) What is pathophysiology of Dengue shock syndrome?
   b) What are the laboratory tests for diagnosis of dengue fever?
   [Annual 2011]

Tumor Viruses

1. Enlist four human tumor viruses with their associated malignancies. **(2) [Supple 2018 held in 2019, Annual 2007]**

2. Enlist two RNA and two DNA human tumor viruses and their associated tumors. **(2) [Annual 2017]**

3. Name 4 viruses associated with development of human cancers. Name also the cancers caused by these viruses. **[Supple 2015]**

▪ PROTOZOA

Intestinal & Urogenital Protozoa

1. After one-week hiking trip in 'Nathia Gali', a third-year medical student presents I medical OPD with severe crampy abdominal pain, fever and passage of scanty stools containing blood and mucous. Stool specimen sent to microbiology laboratory is negative for bacterial pathogens on culture but microscopic examination reveals parasitic organisms with red blood cells inside them.

a) What is the most likely diagnosis? Name the causative organism. **(1+1)**
b) Give the pathogenesis and the infective form of this protozoan parasite. **(2+1) [Annual 2018]**

2. Enumerate 2 parasites which infest human beings through orofecal route of transmission. **[Annual 2014]**

3. A young male presents with severe cramping, abdominal pain, fever and passage of scanty stool containing blood and mucus. A parasitic infection is suspected.
   a) What will be microscopic findings of his fresh stool?
   b) Briefly describe the lifecycle of this parasite. **[Supple 2011]**

4. Name diseases caused by each of the following protozoan and how are they transmitted to humans:
   a) Entamoeba Histolytica
   b) Giardia. **[Supple 2010]**

5. After one week camping in Murree, a 20-year-old medical student presents with abdominal pain, nausea, bloody diarrhea and fever. Stool specimens are sent to laboratory. Bacterial cultures are negative for intestinal pathogenesis but stool examination shows organisms with red blood cells inside them.
   a) What is likely diagnosis? Name the causative agent.
   b) Give the lifecycle of this intestinal protozoa. **[Annual 2009]**
6.
   a) Name 3 protozoan causing intestinal infections
   b) Give pathogenesis and lab diagnosis of Entamoeba Histolytica. **[Annual 2008]**

Blood & Tissue Protozoa

1. A 22-year-old watchman developed episodic spells of fever with chills and rigor occurring every 36-48 hours. On examination, he is anemic and has splenomegaly. His peripheral blood smears show crescentic structures. **[Annual 2017]**
   a) What is your likely diagnosis? **(1)**
   b) How will you diagnose this condition in laboratory? **(2)**
   c) What are the complications of this condition? **(2)**

2. A 30-year-old female experienced sudden onset of fever, shaking chills and profuse sweating. She also has C/O headache and abdominal pain but no nausea, vomiting or

diarrhea. There is no rash, neck stiffness or altered consciousness. Blood smear reveals thrombolites within the RBCs.

a) What is the most likely diagnosis? Name the Plasmodium.
b) Briefly describe the lifecycle of Plasmodium. **[Annual 2013]**

3. Name hemo-flagellates infecting humans. **[Annual 2011]**

4. Describe pathogenesis of Plasmodium Falciparum infection. **[Annual 2011]**

5. A 15-year-old pathan boy presented with history of fever, weight loss, multiple nodules over forearm and dark discoloration of skin. On examination, he had mild splenomegaly and his CBC revealed anemia and thrombocytopenia.
   a) What is your most likely diagnosis?
   b) How will you confirm your diagnosis? **[Annual 2010]**

6. Name disease caused by each of the following protozoan and how are they transmitted to humans:
   a) Trypanosoma Brucei Gambiense
   b) Plasmodium species
   c) Toxoplasma Gondi **[Supple 2010]**

7. A 32-year-old man presents with massive swelling of legs and scrotum. The skin appears thick and scaly in these areas. Previously, patient had episodes of fever associated with inguinal lymphadenopathy but ignored it. His travel history is significant for spending 9 months in tropical areas in the past. What is the likely diagnosis? **[Supple 2009]**

8. A 20-year-old farmer develops periodic bouts of fever with chills & rigors occurring every 36-48 hours. He is anemic and has splenomegaly. His peripheral smear shows crescentic structures.
   a) What is the most likely diagnosis of this complication?
   b) How will you diagnose this case in laboratory? **[Annual 2007]**

▪ HELMINTHS

Cestodes

1. A 40 years old shepherd of sheep presents with upper right quadrant pain and appears slightly jaundiced. A stool exam was negative for ova and parasites but a CT

scan reveals a large 14 cm cyst that appears to contain fluid, in the right lobe of the liver.

a) What is the most likely diagnosis? Name the parasites responsible for this lesion. **(2)**
b) Draw and label its life cycle. **(3) [Annual 2016]**

Trematodes

1. A 25-year-old Egyptian living in Cairo complains of episodes of passing blood in urine. There is no pain or urethral discharge. Physician examination reveals no penile lesions. Urine analysis shows many red cells, no white cells and several large eggs with terminal spine. **[Supple 2015]**
   a) What is the diagnosis and name of causative agent?
   b) Give pathogenesis and pathology of this condition.
   c) How humans acquire this infection?

Nematodes

1.
   a) Diagrammatically explain the lifecycle of the largest intestinal nematode responsible for mechanical obstruction of the intestines together with its two important clinical manifestations.
   b) Enlist two tissue nematodes with their vector. **[Supple 2018 held in 2019]**

2.
   a) Draw and label the lifecycle of Hookworm. **(3)**
   b) What is the cause of microcytic hypochromic anemia in these patients? **(2)** **[Supple 2017 held in 2018]**

3. A 10-year-old malnourished boy is brought to pediatrician with complaints of persistent stomach ache for last two days. Stool examination reveals several typical eggs of Ascaris Lumbricoides. **[Supple 2016 held in 2017]**
   a) Draw and label the lifecycle of this worm. **(2)**
   b) Enlist the pathogenic effects produced by its larval and adult forms. **(3)**

4. A 9-year-old girl severely anemic from a village in Swat is brought to a clinic. Blood examination reveals severe iron deficiency anemia. Her stool examination shows the presence of several parasitic eggs with segmented ovum suggestive of Ancylostoma Duodenale. **[Supple 2016]**

a) Give the cause of iron deficiency anemia associated with Ancylostoma Duodenale and name two other anemia causing parasites. **(2.5)**
b) Draw and label in detail the lifecycle of this parasite. **(2.5)**

5. A 4-year-old boy presented in Pediatric OPD with anal itching. His mother says that he is unable to sleep at night because of scratching of perianal area for past few days. On examination, perianal area reveals erythema and excoriation. A microscopic examination of the sample collected by touching from the perianal region with piece of clear scotch tape is performed. **[Supple 2016]**
   a) What diagnostic findings are likely to be seen on microscopic examination of the sample? **(1)**
   b) Which parasite is responsible for this infection? Briefly give its lifecycle. **(1+3)**

6. Draw and label lifecycle of Ascaris Lumbricoides. **[Annual 2014]**

7. Enumerate 2 parasites which infect human beings thorough orofecal route of transmission. **[Annual 2014]**

▪ MYCOLOGY

Basic Mycology

1. In a tabulated form, enlist four important differences between fungi and bacteria. **(2) [Annual 2018]**
2.
   a) What are four approaches to lab diagnosis of fungal diseases?
   b) How the culture of fungus is carried out? **[Annual 2014]**

3. Name the fungi which cause granuloma formation. **[Annual 2013]**

4. Nearly 300 of 10,000 to 200,000 species (depending on how they are classified) are thought to cause diseases.
   a) What is the study of these organisms known as?
   b) Classify mycoses in four groups. **[Annual 2008]**

5. Mention three laboratory methods for diagnosis of fungal diseases. **[Annual 2007]**

Cutaneous & Subcutaneous Mycoses

1.
   a) Enumerate the three genera of dermatophytes. What is the most likely reason that the infection with dermatophytes is restricted to nonviable skin, hair and nails? **(1+1)**
   b) Enumerate any three skin diseases caused by them, giving the location of lesions and their clinical features. **(3) [Annual 2015]**

2. An 11-year-old girl has pruritic rash on her chest for over 4 weeks. The lesions are round to oval with an inflamed border and clearing in center. **[Supple 2015]**
   a) What is most likely diagnosis?
   b) Name which lab tests can help in diagnosis.
   c) Name 3 most important genera of dermatophytes.

3. A 15-year-old boy presents with several weeks of slowly worsening pruritus of both of his feet. He is otherwise well and taking no medication. On examination, he has bilateral erythematous, dry scaling lesions that are most obvious in the interdigital web spaces and on the soles. There is no bleeding or exudates.
   a) What would most likely be found in a KOH mount of skin scrapings of the affected skin?
   b) What other lab tests can be used to diagnose the case? **[Annual 2013]**

4.
   a) What are the different properties of Candida Albicans?
   b) Write down the lab diagnosis of Candida. **[Supple 2013]**

5. Examination between patient's toes shows severe inflammation and some tissue damage. Microscopic examination of this tissue shows hyphae, macroconidia and microconidia. **[Supple 2010]**
   a) Name the fungal disease seen here and state the general descriptive name for this type of fungus.
   b) Mention the two common fungi which can cause this disease.
   c) Name two laboratory tests which can be used to confirm this diagnosis.

6. An 11-year-old football player complains of itching between his toes. Physical examination reveals pustules on the fingers of both hands and white macerated tissue between the toes. Pustules have been itchy and appeared about 10 days after infection between the toes began. **[Supple 2009]**
   a) What is the most likely diagnosis? Name the 3 genera of Dermatophytes.

b) What tests can help confirm diagnosis?

Systemic Mycoses

1. A 39 years old patient with AIDS, who had atypical tuberculosis infection a year back now develops ulcerating lesion on one side of his tongue. A Giemsa stain of biopsy specimen reveals budding yeasts within macrophages.
   a) Name the causative agent and give its habitat. **(2)**
   b) Briefly discuss the pathogenesis of this fungal infection. **(3)**
   [Supple 2016 held in 2017]

Opportunistic Mycoses

1. A 15-year-old girl has a 3 days history of severe headache, fever and neck rigidity. Lumber puncture done reveals markedly raised lymphocytes and a budding fungal organism with a thick gelatinous capsule.
   a) What is your diagnosis? What steps are taken to reach this diagnosis in the laboratory?
   b) Enlist four opportunistic fungi with one important clinical disease by each.
   [2018 Supple held in 2019]

2. How will you confirm the diagnosis of oropharyngeal candidiasis (thrush) in the laboratory? Enlist two other opportunistic fungi. **(2+1) [Annual 2018]**

3. A female presented to OPD of a hospital. She had white patches on her tongue. It was thought to be due to fungal disease.
   a) What is the patient suffering from? **(1)**
   b) Enumerate the conditions predisposing to such a disease. **(2)**
   c) Give the findings on Gram Stained smear of the specimen from her tongue. **(2)**
   [Supple 2017 held in 2018]

4. A 30 year od known asthmatic patient has started to work in a food industry where molds are used for making bread and fermentation process. After few months, he develops progressive worsening of his asthma symptoms. The sputum examination reveals septate hyphae with dichotomous branching. **[Annual 2017]**
   a) What is the most likely diagnosis? Name the two other clinical presentation of this pathogen. **(1+1)**
   b) Briefly describe the pathogenesis of the disease. **(1)**
   c) How will you diagnose this case in the laboratory? **(2)**

5. Cryptococcus neoformans is suspected in known HIV positive patient presenting with severe vomiting, headache, neck stiffness and delirium. **[Annual 2016]**
   a) How will you diagnose this case in laboratory? **(3)**
   b) Enlist the two other opportunistic fungi and one disease caused by each. **(2)**

6. An elderly poultry worker presents with severe headache, vomiting, neck stiffness and disorientation. Meningitis is suspected. CSF sample reveals several round budding encapsulated yeast cells with a distinct halo around them. **[Supple 2016]**
   a) Name the causative agent and give tis habitat. **(2)**
   b) What laboratory tests can help confirm the diagnosis? **(3)**

7. A 70-year-old male with uncontrolled Diabetes presents with right sided chest pain, fever and cough with purulent sputum, streaked with blood. He also complains of pneumonia. Chest X-ray is suggestive of necrotizing pneumonia. Sputum smear revealed fungal hyphae which were septate and of uniform width with dichotomous branching. **[Annual 2012]**
   a) What will be the morphology of affected lung lobe with this fungal infection?
   b) Describe the pathogenesis of invasive form of this fungal infection.

8. A 50-year-old post-renal transplant patient receiving steroid and immunosuppressive therapy suddenly developed acute pneumonic features with cough, dyspnea, hemoptysis and fever. He was suspected to have developed invasive Aspergillosis.
   a) What is the pathogenesis?
   b) Give an account of verities of clinical presentations with Aspergillus infection. **[Annual 2011]**

9. A 50-year-old patient suffering from AIDS presented with headache, neck stiffness and disorientation. His CSF examination revealed a high lymphocytic count, an increased protein and low glucose level. An India ink preparation of CSF mount was +ve for fungal infection. **[Supple 2011]**
   a) How will you identify this fungus in lab?
   b) Describe the pathogenesis of development of meningitis with this fungal infection.

10. A 35-year-old man who is HIV +ve has had a persistent headache and a low-grade fever (100^{o}F) for past 2 weeks. Budding yeasts with a wide capsule in India ink preparation of spinal fluid are seen. **[Annual 2010]**
    a) What is the most likely diagnosis?

b) What is the mode of transmission?
c) What is the importance of India ink preparation?

11. A patient with diabetes presents in medical OPD with an adherent, white flaky substance on the skin under her breasts. Another female patient who has completed a course of oral antibiotics presents with itching and copious white vaginal discharge, while a third patient with AIDS presents with white exudates on his oral mucosa and soft palate. **[Annual 2009]**
    a) What is likely diagnosis and causative organism in all cases?
    b) Where is the microorganism normally found?
    c) What laboratory tests can help confirm diagnosis?

12. Mention four opportunistic fungi. **[Annual 2007]**

▪ IMMUNOLOGY

Immunity

1. What is function of immune system? Give its different types. **(3)**
   [Supple 2017 held in 2018]

2. Briefly describe the different features/components of innate and adaptive immunity. **(5) [Annual 2015]**

Cellular Basis of Immune Response

1. In tabulated form, give comparison of Th-1 and Th-2 cells. **(2)**
   [Supple 2018 held in 2019]

2. Briefly describe the role of helper T lymphocytes in immune reactions. **[Annual 2011]**

Antibodies

1. Enlist two major functions of immunoglobulins A and E each. **(2) [Annual 2018]**

2. Give the role of IgE immunoglobulins against important helminthic infections. **(1.5)**
   [Supple 2016 held in 2017]

3. Tabulate four important functions of IgG immunoglobulins. **(2) [Annual 2016]**

4. Draw and label the structure of IgM. **[Annual 2013]**

5. An eighteen-month-old male child remained alright during first 6 months of life. He then started having recurrent bacterial infections such as otitis media and pneumonia. Most of these infections were caused by severe extracellular pyogenic organism. On investigation, is immunoglobulin G (IgG) levels were extremely low.
   a) Which immune cells are likely to be deficient in him? Why was he protected against bacterial infection during the first 6 months of life?
   b) Give the pattern of antibody production following initial antigen administration (primary antibody response) and booster injection (secondary antibody response). **[Supple 2013]**

6. A 26-year-old obstetric patient becomes ill during first trimester of pregnancy with fever and lymphadenopathy. She is found to have titer of anti-Toxoplasma Gondi antibodies. She delivers a full-term baby with no apparent signs of in-utero infection. **[Annual 2009]**
   a) The best test to diagnose acute infection in the neonate would be parasite specific ELIS for which isotype (class) of immunoglobulin?
   b) Give any 8 physiochemical/biological properties of this isotype of immunoglobulin.

Complement

1. The complement system plays an important role in defense against microbes. In a flowchart, explain the activation of classical pathway of complement system. **(2) [Annual 2016]**

Antigen-Antibody Reactions in the Laboratory

1. Give the immunological basis of Hemolytic Disease of the Newborn in this patient. **[Supple 2009]**

Hypersensitivity (Allergy)

1. Classify various types of hypersensitivity reactions with their prototypes and briefly give the immune mechanism of any one type. **(2+1) [Supple 2018 held in 2019]**

2. Name the type of hypersensitivity reaction responsible for Rh hemolytic disease of newborn and give the underlying immunological mechanism. **(1+2) [Annual 2018]**

3. Give the pathogenesis of immune-mediated glomerulonephritis. **(2) [Supple 2017 held in 2018]**

4. A 21-year-old girl presented in the dermatology clinic with complaint of a rash on her face. On examination, the dermatologist noticed that the rash has a 'butterfly appearance' and is more pronounced on the nose. On further investigation, she was found to have an abnormal titer of Antinuclear Antibodies (ANAs) and a diagnosis of Systemic Lupus Erythematosus was made. **[Annual 2017]**
   a) What type of hypersensitivity reaction is involved in her condition? **(1)**
   b) What is the underlying mechanism of this hypersensitivity reaction? **(2)**
   c) Give two examples of Type IV hypersensitivity reactions. **(2)**

5. A 7-year-old boy is brought to emergency room complaining of difficulty in breathing. His mother gives history of similar attacks in the past as well and especially in the spring season. There is also a strong family history of severe allergic disorders. Name the type of hypersensitivity reaction and diagrammatically explain sequence of events in this reaction. **(3.5) [Supple 2016 held in 2017]**

6. A 7-year-old child with family history of seasonal allergies develops erythema, itching and swelling of skin immediately after a cutaneous injection of pollen material during patch test. **[Supple 2016]**
   a) What is the type of hypersensitivity reaction involved and prototype disorder? **(1)**
   b) In a tabulated form, enlist the different types of hypersensitivity reactions and give their immune mechanisms. **(4)**

7. A 32-year-old male has a urethral discharge for past week. A culture from discharge of urethra grows Neisseria gonorrhea. He is treated with penicillin G, but within minutes after injection he develops itching and erythema of skin quickly followed by severe respiratory difficulty, wheezing and stridor.
   a) Which type of hypersensitivity reaction is this?
   b) Briefly describe the underlying immune mechanism emphasizing the key immunoglobulins and cell types involved. **[Supple 2015]**
8.
   c) A person develops rashes all over his body after being stung by bee while handling a bee hive to collect honey. Which type of hypersensitivity is this?
   d) What is mechanism for type 4 hypersensitivity? **[Annual 2014]**

9. A patient is suffering from pulmonary tuberculosis. A pathognomonic histological lesion is produced in his lungs.
   a) Which type of hypersensitivity reaction is responsible for producing this lesion?
   b) Describe the mechanism of formation of this lesion. **[Annual 2012]**

10.
    a) What are the mediators of Type 1 hypersensitivity?
    b) Describe the role of mast cells in Type 1 hypersensitivity? **[Supple 2011]**

11. Define hypersensitivity. Give the mechanism of type III hypersensitivity reaction with two examples. **[Annual 2010]**

12. A 10-year-old child from a village is brought to a basic health unit complaining of shortness of breath, wheezing and exertional dyspnea and occasional urticaria. Fecal examination for ova and parasites is positive for numerous golden brown, oval, rough shelled nematodes. Sputum samples are positive for nematode larvae and eosinophilic infiltrates. **[Supple 2010]**
    a) Name the underlying hypersensitivity mechanism for these child's lung symptoms.
    b) Give the immunological basis for this type of hypersensitivity.
    c) What is the beneficial role of IgE?

13. A 28-year-old mother gives birth to her first child. The father is homozygous Rh D positive and the mother is homozygous Rh D negative. The baby is born without any complications but the mother is not given anti-Rh immunoglobulins following the delivery. 18 months later, she delivers another child who is anemic, slightly jaundiced and has an enlarged spleen and liver.
    a) Which type of hypersensitivity best describes this condition?
    b) Give the immunological basis of this condition in this patient.
    c) Give two other examples of this type of hypersensitivity. **[Supple 2009]**

14. Tuberculosis is an important health problem in Pakistan and WHO has declared it as global emergency. **[Annual 2008]**
    a) What is the basis of tuberculin test?
    b) Give four other examples of Type IV hypersensitivity.

Tolerance & Autoimmune Disease

1. A 45-year-old female presented with painless enlargement of thyroid gland. Her serum shows circulating anti-thyroid antibodies. **[Annual 2007]**
    a) What is your most likely diagnosis?
    b) Enumerate 4 organ specific autoimmune diseases.