

S.Y. BIOTECH, SEM-4, CHOICE BASED EXAMINATION
 MEDICAL MICROBIOLOGY
 MODEL ANSWER SET-1

Q 1	Do as directed (Any fifteen)	15
1.	Define indigenous flora: Large a mixed collection of microorganisms adapted to body	
2.	The disease in which patient experiences no symptoms or disease and does not seek medical attention is known as _____ asymptomatic infection?	
3.	State the importance of Keratinase : It is an exoenzyme secreted by fungi as virulence that helps in digesting principle component of skin and hair leading to ring worm infection	
4.	State true or false: Streptolysins is an example of exotoxin: True	
5.	Give one word for: Accumulation of fluid in affected tissue: Edema	
6.	Boil in an example of Localized/skin infection	
7.	Name any one culture medium for isolation of <i>Mycobacterium tuberculosis</i> LJ medium (Lowentsein Jensen medium), Middlebrook medium	
8.	State true or false : Swarming of <i>Proteus species</i> does not occur on MacConkey's agar medium (True)	
9.	Fill in the blank: For treatment of Methicillin Resistant <i>Staphylococcus aureus</i> antibiotic _____ is used. (Vancomycin)	
10.	Name any two virulence factors of <i>Streptococcus pneumoniae</i> : (1.Toxin Pneumolysin 2. Toxin Leucocidin 3. Capsular polysaccharide)	
11.	Enlist any two predisposing factors for Urinary tract infections : (1.Urinary obstruction due to prostatic enlargement 2. Calculi 3. Pregnancy 4. Diabetes)	
12.	Name any one biochemical test employed for identification of <i>S. pyogenes</i> (PYR test, Bacitracin susceptibility test)	
13.	Name pathogen producing Toxic Shock Syndrome Toxin (<i>Staphylococcus auerus</i>)	
14.	State true or false: A nonvenereal infection in the newborn is called gonococcal ophthalmia. (True)	
15.	Name toxin produced by <i>Shigella</i> species. (Ans.Shiga)	
16.	What is Teflon pathogen? <i>T. pallidum</i> has an outer layer of lipids that stimulates little effective immune	

	response, especially from cell-destroying complement reactions. Hence it is called as a "Teflon pathogen."	
17	Causative organism of 'Blue Pus' is -----.(Ans. <i>P. aeruginosa</i>)	
18.	State true or false: Congenital syphilis can be transmitted from mother to foetus.(Ans. True)	
19.	Name one antibiotic for typhoid fever.(Chloramphenicol, quinolones, third generation cephalosporin)	
20.	State true or false: <i>P. aeruginosa</i> produces pigment ,pyoverdin.(Ans. true)	
Q 2 A	There are different patterns of infection observed justify the statement Pattern of infections are many and varied : description of all types of infection with one example of each: 1X8 M Localized, systemic, focal infection, mixed, primary, secondary, acute chronic and asymptomatic / subclinical infection	08
Q 2 B	Discuss mechanism of adhesion by pathogens Definition 1 Mechanisms with examples (4x1.5=6m) 1. Fimbriae 2. Capsule 3. Viral envelopes and spikes 4. Specialized cell hook	07
OR		
Q 2 C	Give a brief account of different portal of exit of a pathogen from its host Discuss any 4 with examples (4x2=8m) 1. Respiratory and salivary portal 2. Skin scales 3. Fecal exit 4. Urogenital tract 5. Removal of blood or bleeding	08
Q 2 D	What is Epidemiology? Discuss the various types on the basis of the frequency of occurrence in a population and area of spread Definition 1M Explanation for the types with an example of each (1.5 X 4=6) 1. Endemic 2. Sporadic 3. Epidemic 4. Pandemic	07
Q 3 A	Elaborate on various enzymes & cell surface structures produced by <i>Staphylococcus aureus</i> which help in it's pathogenesis a. Cell associated polymers- 1. Peptidoglycan cell wall-rigidity, activates complement, induces release of inflammatory cytokines	08

	<p>2. Teichoic acid-facilitates adhesion of cocci to host cell, protects from complement mediated lysis.</p> <p>3. Capsular polysaccharide surrounding cell wall inhibits opsonisation.</p> <p>b. Cell surface proteins</p> <p>1. Protein A- chemotactic, antiphagocytic, anti- complementary effects. Induces platelet damage</p> <p>2. Clumping factor- bound coagulase, responsible for slide coagulase test</p> <p>c. Extracellular enzymes-</p> <p>1. Coagulase - causes clotting of human plasma. Acts with CRF in plasma converting fibrinogen to fibrin. Responsible for tube coagulase test.</p> <p>2. Lipases- they are lipid hydrolases helps <i>S. aureus</i> to infect skin & Subcutaneous tissues.</p> <p>3. Hyaluronidase breaks down the connective tissue</p> <p>4. Staphylokinase (fibrinolysin) , fatty acid modifying enzymes & proteases help in initiation &spread of infection</p> <p>1. protein receptors- <i>S. aureus</i> produce receptors for many mammalian proteins fibronectin, fibrinogen, IgG& C1q-help in adhesion of pathogen to cells & tissues</p> <p>Cell associated polymers- peptidoglycan, teichoic acid, capsular polysaccharide –any two & their role 3 marks-1.5 marks each</p> <p>Cell surface proteins – protein A, clumping factor (bound coagulase) any one & it's role – 1 mark</p> <p>(cell surface structures/polymers 4 marks)</p> <p>Enzymes – any two & their role (4 marks)</p>	
<p>Q 3 B</p>	<p>Give an account on laboratory diagnosis of respiratory infections by <i>S. pneumoniae</i> & it's treatment</p> <p>Sample – sputum</p> <p>Microscopy- Gram stained smear of sputum shows Gram positive cocci in pairs (diplococci)</p> <p>Culture Sputum after homogenisation inoculated on blood agar plates & incubated at 37°C under 5-10% CO₂. After incubation alpha haemolytic colonies appear. Genus <i>Streptococcus</i> is catalase negative.</p> <p>Biochemicals to be performed- Optochin susceptibility test – <i>S. pneumoniae</i> is susceptible to optochin</p> <p>Bile solubility test - <i>S. pneumoniae</i> gives positive bile solubility test.</p> <p>Other tests-</p> <p>1. Quellung test- suspension of pneumococci is mixed with specific antiserum & loopful of methylene blue solution. In presence of homologous antiserum, capsule becomes swollen, sharply delineated & refractile. Can be directly done with sputum.</p> <p>2. Antibodies can be demonstrated by agglutination, precipitation, mouse protection test, Indirect hemagglutination test, radioimmunoassay</p> <p>Treatment-</p>	<p>07</p>

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	<p>1. Penicillin 2. Amoxycillin 3. Erythromycin 4. Tetracycline 5. Vancomycin 6. Cephalosporins (third generation)</p> <p>Lab. Diagnosis (sample- 1 mark, microscopy- 1 mark, culture-2 marks biochemicals- 1 marks) Treatment (2 marks)</p>	
	OR	
Q 3 C	<p>Discuss various virulence factors of <i>Streptococcus pyogenes</i> & their role in its pathogenesis</p> <ol style="list-style-type: none"> 1. Capsule when present inhibits phagocytosis 2. Cell wall composed of outer layer of protein & lipoteichoic acid. Peptidoglycan is responsible for cell wall rigidity. It is pyrogenic, thrombolytic activity. 3. M protein- inhibits phagocytosis, antigenic 4. Hair like pili (fimbria) –important for attachment of Streptococci to epithelial cells. 5. Streptolysin O- antigenic 6. Streptolysin S-responsible for lysis of RBC 7. Pyrogenic exotoxin (erythrogenic, Dick, Scarlatinal toxin)- Induces fever, superantigens, T cell mitogens which induces massive release of inflammatory cytokines causing fever, shock & tissue damage. 8. Streptokinase (Fibrinolysin) –promotes lysis of human fibrin clot therefore breaks down fibrin barrier around lesions & facilitates spread of infection. 9. Deoxyribonucleases (Streptodornase, DNAase) –it helps to liquefy the thick pus & may be responsible for thin serous character of streptococcal exudates. 10. NADase (Nicotinamide adenine dinucleotidase) – antigenic, leucotoxic 11. Hyaluronidase- Breaks down hyaluronic acid of tissues. Helps spread of infection along intracellular spaces. 12. Enzymes like phosphatases, esterases <p>(Virulence factors any 4 & their role in pathogenesis – 2 marks for each virulence factor)</p>	08
Q 3 D	<p>Describe Quantitative & Semiquantitative urine cultures</p> <p>Sample – midstream urine sample</p> <p>Quantitative cultures- In Quantitative cultures, Count of 10,000 or more is considered as significant. In quantitative cultures midstream urine samples gives biphasic distribution of colonies, most specimens containing either less than 100,000 or more than 100,000 bacteria per ml. In presence of active infection in UTI urine will contain 100,000 bacteria or more per ml. This level is therefore considered as significant bacteriuria. Counts of 100,000 bacteria or less per ml are due to contamination during voiding & are of no significance. For quantitative cultures serial tenfold dilutions of urine are tested by pour plate or surface culture methods. As this is too complicated for routine diagnostic work, for which semiquantitative methods are more convenient.</p>	07

	<p>semiquantitative cultures -The most widely used technique employ a standard loop which transfers a fixed, small volume of urine. One loopful of urine is placed on a noninhibitory medium (blood agar) & another loopful on indicator medium (MacConkey). Blood agar gives a quantitative measurement of bacteriuria, while MacConkeys gives presumptive diagnosis of bacterium. The isolates are identified by their properties. This is followed by antimicrobial susceptibility testing.</p> <p>Alternative media - CLED agar</p> <p>(Quantitative cultures – 2.5 marks. Semiquantitative methods- 2.5marks, sample, significant count -1 mark , media – any 2 media 1 mark,)</p>	
Q 4 A	<p>Primary Stage -The initial sign is a small, hard-based chancre, or sore, which appears at the site of infection 10 to 90 days following exposure- on average, about 3 weeks. The chancre is painless, and an exudate of serum forms in the center. In few weeks, this lesion disappears. None of these symptoms causes any distress.</p> <p>Secondary Stage Syphilis</p> <p>Several weeks after the primary stage (the exact length of time varies and may overlap), the disease enters the secondary stage, characterized mainly by skin rashes of varying appearance. The rash is widely distributed on the skin and mucous membranes and is especially visible on the palms and on the soles. The damage done to tissues at this stage and the later tertiary stage is caused by an inflammatory response to circulating immune complexes that lodge at various body sites. Other symptoms often observed are the loss of patches of hair, malaise, and mild fever. A few people may exhibit neurological symptoms. At this stage, the lesions of the rash contain many spirochetes and are very infectious. Secondary syphilis is a subtle disease; at least half of the patients diagnosed with this stage can recall no lesions at all. Symptoms usually resolve within 3 months.</p> <p>Tertiary Stage Syphilis</p> <p>Because the symptoms of primary and secondary syphilis are not disabling, people may enter the latent period without having received medical attention. In up to 25% of untreated cases, the disease reappears in a tertiary stage. This stage occurs only after an interval of many years from the onset of the latent phase.</p> <p>Tertiary, or late-stage, syphilis can be classified generally by affected tissues or type of lesion.</p> <p>7M.</p>	08
Q 4 B	<p>Nosocomial infection -Hospital acquired infection. 1M.</p> <p>Organism produces toxin, virulence factor are hemolysin, leukocidin, proteases</p> <p>Surgery burn infections,urinary tract infections,catheterization can introduce pseudomonas into body. Cystic fibrosis patients are prone to develop fatal infection. 4M.</p>	07

	Gentamicin, carbenicillin	2M
	OR	
Q 4 C	<p>Gonorrheal arthritis, which is caused by the growth of the gonococcus in fluids in joints, Joints commonly affected include the wrist, knee, and ankle. 3M</p> <p>Diagnosis of Gonorrhea</p> <p>Gonorrhea in men is diagnosed by finding gonococci in a stained smear of pus from the urethra. The typical gram-negative diplococci within the phagocytic leukocytes are identified. In woman a culture is taken from the cervix and grown on special media, requires an atmosphere enriched in carbon dioxide. The gonococcus is very sensitive to adverse environmental influences (desiccation and temperature) and survives poorly outside the body. It even requires special transporting media to keep it viable for short intervals before the cultivation is under way. Diagnosis of gonorrhea has been aided by the development of an ELISA that detects <i>N. gonorrhoeae</i> in urethral pus or on cervical swabs within about 3 hours with high accuracy. Other rapid tests now available use monoclonal antibodies against antigens on the surface of the gonococcus. Nucleic acid amplification tests are very accurate for identifying gonococci. 5M.</p>	08
Q 4 D	<p>There are four species of pathogenic <i>Shigella</i>: <i>S. sonnei</i>, <i>S. dysenteriae</i>, <i>S. flexneri</i>, and <i>S. boydii</i>. 2M</p> <p>The toxin responsible is unusually virulent and is known as the Shiga toxin. The infective dose required to cause disease is small, the bacteria are not much affected by stomach acidity. They proliferate to immense numbers in the small intestine, but the primary site of disease is the large intestine. There, the bacteria attach to certain epithelial cells. M cells, membranous cellular ruffles surrounding the cell, take the bacterium into the cell. The bacteria multiply in the cell and soon spread to neighboring cells, producing Shiga toxin that destroys tissue. Dysentery is the result of damage to the intestinal wall.</p> <p>Shigellosis dysentery can cause as many as 20 bowel movements in one day. Additional symptoms of infection are abdominal cramps and fever. <i>Shigella</i> bacteria rarely invade the bloodstream. Macrophages not only fail to kill <i>Shigella</i> bacteria that they phagocytize, but also are killed by them. 5M.</p>	07
Q 5	Write Short notes on any three of the following	15
a	<p>Pattern of transmission in communicable disease</p> <ol style="list-style-type: none"> 1. Direct transmission 1M 2. Indirect transmission 1M 3. Indirect spread by vehicles 1.5M 4. Indirect spread by air borne route 1.M 	5M

	<p>sorbitol, unlike the majority of <i>E. coli</i>. The medium used for screening is Sorbitol MacConkeys medium.</p> <p>Treatment- Intravenous rehydration & monitoring of serum electrolytes. HUS survivors may require kidney dialysis or even transplants.</p> <p>(Source of infection -1 mark, Diseases caused, symptoms, pathogenesis, Name of common serotype – 3 marks, Laboratory diagnosis & treatment 1 mark)</p>	
e.	<p>Virulent serotype of salmonella, <i>S typhi</i> causes typhoid fever.</p> <p><i>s. typhi</i> multiplies in phagocytic cell and are disseminated into multiple organs, eg spleen and liver. Phagocytic cell lyse release organism into blood stream, incubation is 2 to 3 weeks. Patient suffers from high fever and continual headache. Diarrhoea appears during 2nd or 3rd week, then tends to decline. In severe cases ulceration perforation of the intestinal wall can occur. 5M</p>	05

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b	<p>Normal flora of genitourinary tract</p> <ul style="list-style-type: none"> • Region to harbour pathogens: 1M • Principle resident flora examples :1M • Influence of hormonal changes on flora 3M 	
c	<p>Prophylaxis & control of Tuberculosis</p> <ol style="list-style-type: none"> 1. Immunoprophylaxis – BCG vaccine- details – schedule 2. Chemoprophylaxis – administration of antitubercular drugs (usually only isoniazid) to persons with latent tuberculosis (asymptomatic tuberculin positive) & high risk of developing active tuberculosis or to the uninfected exposed to high risk of infection. <p>Isoniazid 5mg/kg daily for 6-12 months usual course</p> <ol style="list-style-type: none"> 3. Adequate nutrition 4. good housing 5. health education 6. Early detection 7. Treatment of cases <p>DOTS</p> <p>(Immunoprophylaxis i.e. BCG vaccine-2 marks, Chemoprophylaxis – 2 marks, other measures/DOTS – 1 mark)</p>	
d	<p>EHEC</p> <p>Enterohemorrhagic <i>E. coli</i>. Also referred as Shiga-toxigenic <i>E. coli</i>, Verotoxigenic <i>E. coli</i>.</p> <p>Disease caused - <i>E. coli</i> strains producing verocytotoxin (VT) or Shiga-like toxin (SLT) can give rise to diarrheal disease ranging in severity from mild diarrhea to fatal hemorrhagic colitis & Hemorrhagic Uremic Syndrome (HUS) particularly in young children & in elderly.</p> <p>Symptoms - It produces inflammation of the colon (Large intestine above the rectum) with profuse bleeding called hemorrhagic colitis. Unlike <i>Shigella</i> these <i>E. coli</i> do not invade intestinal wall but release toxin into intestinal lumen.</p> <p>HUS (Hemorrhagic Uremic Syndrome) is complication which is characterised by blood in urine often leading to kidney failure, which occurs when kidneys are affected by toxin.</p> <p>Pathogenesis -VT attacks on vascular endothelial cells. VTEC also produces diarrhoea in cattle & pigs.</p> <p>Example- <i>E. coli</i> O157:H7 is a typical EHEC serotype. Other serotype O26:H1</p> <p>The disease may be sporadic or as outbreak of food poisoning.</p> <p>Source of infection- contamination of human or animal feces directly or indirectly. Salad vegetables such as radish, alfalfa sprouts in which bacteria are found beneath the skin & the upper tissues. Raw tomatoes, poultry meat products are also possible sources. Washing may not remove the bacteria from such vegetables & only cooking may ensure safety.</p>	