

**MIC501 – MICROBIOLOGY**

ALL OBJECTIVEs &amp; SUBJECTIVEs FROM PAST FILES FOR MID TERM

| : ARHAM ( +923351328979 ) | : AIZA WRITES

**OBJECTIVES**

1. ETO is supplied in: ----- **10 – 20%**
2. Incineration is a: ----- **Dry heat method**
3. X-ray is an example of: ----- **Ionizing radiation**
4. HEPA removes microbes ----- **0.3µm**
5. ... is a strong alkylating agent that kills by heating with functional groups of DNA & proteins to block replication & enzymatic activity. ----- **Ethylene oxide**
6. Hexachlorophene, triclosan, disrupts membrane: ----- **Bisphenols**
7. Asepsis is: ----- **Absence of contamination**
8. Microbial contamination: ----- **Sepsis**
9. Technique that prevent microbial contamination of wounds. ----- **Aseptic surgery**
10. Killing microbes within the host tissues. ----- **Chemotherapy**
11. Steam must contact item's ----- **surface**
12. Reduce spoilage organisms & pathogens is known as: ----- **Pasteurization**
13. Low temperature ... microbial growth:----- **Inhibits**
14. Plasmolysis is caused by: ----- **Osmosis**
15. Which one is non-ionizing radiation ----- **UV rays**
16. membrane filtration removes mcrobes: ----- **0.22µm**
17. Many heat-sensitive items are sterilized by: ----- **Ethylene oxide**
18. EtO is explosive, supplied in a ... concentration with either CO<sub>2</sub>: ----- **1020%**
19. First widely used antiseptic: ----- **Phenol + Phenolics**
20. Phenol & phenolics are effective in ... matter. ----- **Organic**
21. Hot Air method which of the following are present in certain conditions----- **170c,2 hr**
22. Hexa chlorophene,triclosan plasma membrane is an example of----- **bisphenols**
23. Gene transfer from parents to offspring: ----- **Vertically**
24. Transformation observed by Frederick Griffth in: ----- **1928**
25. Transformation can occur in: ----- **Vitro**
26. Uptake of naked DNA by microbes is known as: ----- **Transformation**
27. Conjugation is mediated by: ----- **Plasmid**
28. Plasmids in ... cells have genes that code for sex pili. ----- **G – bacteria**
29. **Requires** direct cell to cell contact. ----- **Conjugation**
30. ... carrying plasmid was first plasmid studied. ----- **Fertility factor**
31. If F factor gets integrated into the chromosome of the recipient cells, the bacterium becomes ----- **High Frequency Of Recombination Cell (Hfr)**.

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32. Can Be Used for gene mapping on the chromosomes. ----- **Conjugation**
33. Transfer of DNA by a virus called ----- **Bacteriophages**
34. Genetically different cells within a clone ----- **Strain**
35. Two kingdom classification was proposed by Carolus Linnaeus in: ----- **1735**
36. To identify all species of life on Earth----- **10 – 100 M**
37. In --five kingdom classification was proposed by pobbert whiltaker--- **1969**
38. After gram staining, gram positive bacteria appear: **Purple (crystal violet)**
39. Slide or specimen is placed on..... **Stage Of Microscope**
40. Kingdom Monera consist of----- **Archea + Bacteria**
41. Which is used for mordant in gram staining?..... **Iodine**
42. The primary stain is used in acid fast staining is ..... **Carbol Fuchsin.**
43. **Aristotle** thought that Simpler invertebrate could arise by spontaneous generation.
44. Light microscope power..... **0.2**
45. **Robert Hooke** First drawing of microbes in ..... **1665.**
46. Which One is the basic dye----- **Methylene Blue**
47. Study Of Microbes..... **Microbiology**
48. Mycobacterium is stained by..... **Acid-Fast Technique.**
49. Microbes also called germs or microorganisms are ... to be seen with unaided eye. **Too small**
50. ... used to be the main feature prior to the advent of molecular biology. **Morphology**
51. Bacteria and archea are two ... groups. **Different**
52. ... are composed of only circular ssRNA. **Viroids**
53. ... are also called satellite viruses. **Virusoids**
54. ... are infectious proteins. **Prions**
55. Linnaeus in ... established system of specific nomenclature. **1735**
56. Each organism has two names, write: **Genus & specific epithet**
57. Genus is ... and epithet is **Capitalized, lowercase**
58. ... is found in large intestine & ... is on skin. **E. Coli, S. aureus**
59. In the presence of ... bacteria grow and change alcohol to acetic acid--- **O<sub>2</sub>**
60. In 1860 Joseph Lister applied ... as treating surgical wounds & hand sanitizing. **Phenol**
61. Isolation of bacteria made possible by ... and .... **Agar & Petri Dish**
62. Archea and bacteria differ in **rRNA**
63. The period from 1857 to 1914 was rightly called as the **Golden Age Of Microbiology**
64. Use of microbes or their enzymes for large scale production of biomolecules: **Industrial microbiology**
65. Using a ... loop, a colony or a drop of broth culture can be smeared into a thin film on a glass slide for making a smear. **Platinum**
66. While drying the smear ... can be used. **Methyl alcohol**



67. A colored ion: **Chromophore**
68. The color is in negative ion: **Acidic dye**
69. Most commonly used for bacteria: **Basic dyes**
70. Only one stain is used ----- **Simple staining**
71. A couple of stains is used: ----- **Differential staining**
72. Oil immersion power of objective lens **100x**
73. Low magnification power of ocular lens: **100x**
74. Ability of the lenses to distinguish between two closely lying objects as separate: **Resolution**
75. Kingdom Monera consist of: **Archea + Bacteria**
76. Which of the following contains mycolic acid?--- **Mycobacterium & Nocardia**
77. Rod shaped bacteria are called: ----- **Bacilli**
78. Energy is required in: ----- **Active transport**
79. Which of the following structure is involved in the locomotion of bacteria? ---**Flagella**
80. Gram positive bacteria produced: ----- **Exotoxins**
81. The basal body of flagellum of gram-positive bacteria consist of ... rings. **-2**
82. 70s ribosome consist of two subunits: ----- **50s & 30s**
83. ... are used for twitching motility. ----- **Pili**
84. Integral proteins are ... in the cell membrane and are ... in water. ----- **Imbedded, Insoluble**
85. Which of the following is not present in bacteria? ----- **Both Histone & Nuclear Membrane**
86. Specialized resting cells: ----- **Endospores**
87. Movement against the concentration gradient: ----- **Active movement**
88. Cytoplasm contains ... percent water. ----- **80%**
89. Which of the following condition in which water moves into the cell? ----- **Hypotonic**
90. Which of the following initiate the spore activation?----- **Heating**
91. Facilitated diffusion is done with the help of: ----- **Integral Proteins**
92. Which is used to transform DNA from bacteria to another? -----**Pili**
93. ... is also called volutin. ----- **Metachromatic Granules**
94. Peripheral proteins are: **Loosely Connected To Plasma Membrane**
95. Magnetosomes are: **Inclusions Of Iron Oxide**
96. Gram negative bacteria has ... rings: ----- **4**
97. Nucleoid & ribosomes are formed: ----- **Spore Core**
98. ... gives structural support. ----- **LPS, Core Polysaccharide**
99. Rat bite fever is caused by: ----- **Spirillum Minus**
100. Bacterial cell wall is made up of: ----- **Peptidoglycan**
101. ... are circular or spherical in shape. ----- **Coccus**
102. A resistant dormant structure within a cell? ----- **Endospore**
103. Some bacteria such as ... have a waxy material in their cell wall. ----- **Mycobacteria**



104. Spirochete are: ----- **Spiral**
105. When a cell is neither bacillus nor coccus and it is intermediate b/w two extremes:----- **Coccobacillus**
106. ... distributed over the entire cell. ----- **Peritrichous**
107. ... is a viscous & gelatinous secretion that surrounds the cells.----- **Glycocalyx**
108. If glycocalyx is organized & firmly attached to the cell. ----- **Capsule**
109. Axial filaments are also called: ----- **Endo-Flagella**
110. Axial filaments are only present in:----- **Spirochete**
111. ... help bacteria to attach to surface before they can secrete biofilm.----- **Fimbriae**
112. ... are hair like structures composed of pilin: ----- **Fimbriae**
113. Peptidoglycan is ... in G-neg cells. ----- **Thin**
114. Peptidoglycan is basically composed of NAG & NAM which are arranged from:----- **65 molecules**
115. G-positive cell wall contain: ----- **Teichoic acid**
116. Plasma membrane of ... has sterols that provide rigidity to the membrane. ----- **Mycoplasma**
117. ... proteins are imbedded in the membrane. ----- **Integral**
118. ... proteins are present outside.----- **Peripheral**
119. Cells called ... organisms are naturally found without the cell wall. --- **L-form**
120. ... breaks the sugar-derived backbone. ----- **Lysozyme**
121. LPS stands for: ----- **Lipopolysaccharides**
122. ... proteins are not static in position and can diffuse laterally & change position in the membrane. -----  
--- **Integral**
123. When cells are placed in ... solution, water moves inside the cells, cause swelling of the cell that results  
in lysis of the cell. ----- **Hypotonic**
124. Passive diffusion is divided into ... groups. ----- **2**
125. ... is a diffusion through a semi-permeable membrane that allows some molecules to pass through but  
others not. ----- **Osmosis**
126. ... proteins are called transporter or permeases.----- **Integral**
127. O<sub>2</sub> & CO<sub>2</sub> are examples of:----- **Simple diffusion**
128. If cells are placed in hypertonic solution, water will come out of the cells & shrink that results in: -----  
----- **Plasmolysis**
129. Bacteria have circular ..., although there are few that have linear dsDNA.----- **DsDNA**
130. Streptomycin attach to: ----- **30s**
131. Inclusions of iron oxide act like magnet: ----- **Magnetosomes**
132. Pili are ... than fimbriae.----- **Longer**
133. Pili is used for attachment: ----- **DNA transfer: conjugation (sex pili) + Twitching motility + Gliding motility + All**
134. Most important structure in Prokaryotes: ----- **Cell Wall**
135. In bacteria pathogenicity caused by: ----- **Cell wall**
136. Bacteria with no flagella: ----- **Atrichous**



137. Lipid A: endotoxin part of LPS causes: ----- **Fever, Vasodilation, Shock**
138. Cell wall of archaea behave like: ----- **Negative Bacteria**
139. Movement with the concentration gradient with no energy expenditure: ----- **Passive Movement**
140. Simple diffusion is a type of: ----- **Passive Diffusion**
141. Activated movement can also use ... too. ----- **Facilitated Diffusion**
142. Which of the following pH is acidic? ----- **All (acidity < 7)**
143. Bacteria get nitrogen from? ----- **All (Decomposing Proteins, NH<sub>4</sub><sup>+</sup> Ions, Nitrates, Gaseous N<sub>2</sub>, Nitrogen Fixation)**
144. Which of the following is the characteristic of coenzyme? ----- **All (Act As Electron Carriers + Receive Electrons From Nutrients + Donate Electrons To Other Molecules In Subsequent Reactions)**
145. Bacteria get sulfur from? ----- **All (Sulfate Ions, Hydrogen Sulfide, Sulfur Containing Amino Acids)**
146. Which of the following is the physical source/requirement of growth? ----- **All (Temperature + Ph + Osmotic Pressure)**
147. O<sub>2</sub> has no effect on: ----- **Aerotolerant Aerobes**
148. Bacteria get phosphorus from: ----- **Phosphate Ions**
149. Bacteria utilize oxygen for: ----- **Aerobic Respiration**
150. Which of the following is used to maintain the desired pH? ----- **Buffer**
151. Photoautotrophs use ... as a source of energy.--- ----- **Light**
152. NADH & FADH<sub>2</sub> during Kreb's cycle oxidized via ETC & generate ATP molecules: -- **36 or 38**
153. Bacteria need ... for the synthesis of protein & nucleic acids. --- **Nitrogen**
154. Which of the following compounds are needed for nucleic acid synthesis? ----- **Sulfur & phosphorus**
155. Which of the following group of microbes strictly need oxygen for growth? ----- **Obligate aerobes**
156. Which of the following is hyperthermophile in nature? ----- **Archaea**
157. Removal & gain of electrons from an atom:----- **Redox reaction**
158. Helicobacter pylori is a: ----- **Aerotolerant Aerobe**
159. Biological oxidations involve the loss of hydrogen atoms they are also called ... **Reactions.**
160. Biological oxidations involve the loss of hydrogen atoms they are also called ... reactions.----- **Dehydrogenation**
161. All organic compounds have: ----- **Carbon**
162. Cold loving bacteria: ----- **Psychrophiles**
163. Chemoheterotrophs use carbon from: ----- **Proteins, Carbohydrates, Lipids**
164. Removal of electrons: ----- **Oxidation**
165. Aerobes that require O<sub>2</sub> in low amounts are: ----- **Microaerophiles**
166. Besides water, ... is the most important requirement for bacterial growth. ----- **Carbon**

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167. Oxidation of glucose to pyruvic acid with the production of some ATP and energy-containing NADH is known as: ----- **Glycolysis**
168. Microorganisms that use light as a source of energy: ----- **Photoautotrophs**
169. Which of the following is used for catalase test? ----- **Hydrogen Peroxide**
170. Which of the following is anoxygenic: ----- **Rhodopseudomonas**
171. Chemoautotrophs use carbon from: ----- **CO<sub>2</sub>**
172. NADH & FADH are oxidized during: ----- **ETC (Electron Transport Chain)**
173. Optimum pH for molds & yeast: ----- **5 to 6**
174. During glycolysis ... molecules of pyruvic acid are produced. ----- **2**
175. Structural backbone for living matter: ----- **Carbon**
176. Optimum temperature of psychrotrophs: ----- **20-30°C**
177. Optimum temperature of mesophiles: ----- **37°C**
178. ... is an example of obligate aerobes. ----- **Mycobacterium Tuberculosis**
179. Most organisms grow b/w: ----- **6.5 & 7.5 pH**
180. A nutrient material that supports the growth of microbes: ----- **Culture medium**
181. Microbes introduced into a culture medium: ----- **Inoculum**
182. Agar liquefies at 100°C & solidifies at: ----- **40**
183. ... was the first to develop pure culture technique. ----- **Robert Koch**
184. Nutrients are rich in: ----- **Hydrogen**
185. Most common carb energy source: ----- **Glucose**
186. Respiration of glucose occurs in ... stages. ----- **3**
187. Most of ATP is generated in the last stage: ----- **Electron Transport Chain**
188. Green Bacteria ----- **Non Oxygenic**
189. Moderate temperature loving: ----- **Mesophiles**
190. In bacteria the mini & maxi temperature are mostly apart: ----- **30°C**
191. ... is produced by fermentation: ----- **Acid**
192. Facultative halophiles require: ----- **2% Salt**
193. Oxygen usage provides ... energy. ----- **More**
194. Blood agar is used for: ----- **Fastidious Organisms**
195. Oxidation of acetyl coa and co<sub>2</sub>----- **The Krab Cycle**
196. If cells are placed in hypertonic solution, water leaves the cells shrinking the cell and damaging them. the process is called--- **Plasmolysis**

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Long filamentous structure that propels bacteria is called flagellum. It helps bacteria to move

**2. Define pili and also its functions?**

These are hair-like structure composed of pilin, usually one to ten in number

- Longer than fimbriae
- Host cells
- Bacteria

**Used for attachment to:**

Used for DNA transfer from one bacterium to another: Conjugation (Sex pili) . Also function in twitching Motility. Gliding Motility is also the function of the pili.

**3. What is sporulation?**

Formation of spores takes place within a vegetative cell and the process is called sporulation or sporogenesis. It is initiated when nutrients become unavailable.

**4. What is function of cell wall.**

Cell wall is the most important layer in bacteria. It is rigid layer just outside the plasma membrane. Most important structure in prokaryotic it provides shape to organism it provides protection from osmotic lysis it is involved in pathogenicity.

**5. Stages of Germination spore. 3**

- ❖ **Activation:** It prepares the spore for germination.
- ❖ **Germination:** Spore starts swelling and losing its coats etc.
- ❖ **Outgrowth:** New components are made.
- ❖ **Spore germinates** when it finds a conducive environment for its growth.

**Germination has 3 phases or stages:**

Heat can activate the spore when appropriate moisture and nutrients are present in the environment. It becomes metabolically active.

**6. Parts of flagella??.**

A flagellum consists of the following 3 parts.



- ❖ **Filament:** It is made of a protein called flagellin, which makes H antigen that can be used for serovar identification in gram negative bacteria.
- ❖ **Hook:** A different protein
- ❖ **Basal Body:** The most complex

## 7. What is endospore?

Specialized resting cells Highly durable, dehydrated forms of bacteria Formed inside a

- Survive lack of water; can survive in high salt concentrations. Clostridia spores can survive in honey and that is one reason, honey is not recommended for infants, because spore can cause tetanus in babies.
- Survive radiation danger
- Survive in the toxic environment as well.
- Mostly formed by Gram positive bacteria Genus Clostridium Genus Bacillus A resistant dormant structure formed within a bacterial cell to pass unfavorable conditions. bacterium
- Survive extremes of temperatures; resistant to heat; needs to be autoclaved in order to be killed
- One gram negative: *Coxiella burnetii* also has it.
- Formation of spores takes place within a vegetative cell and the process is called sporulation or sporogenesis. It is initiated when nutrients become unavailable.

## 8. Write name of three passive movements.

Simple diffusion, Facilitated diffusion. Osmosis

## 9. Subgroup of spiral bacteria

Spirals are curved shaped bacteria. They are further divided into 3 more subgroups.

- ❖ **Vibrio:** curved rods
- ❖ **Spirillum:** Helical but rigid
- ❖ **Spirochete:** Helical but flexible

## 10. What is a passive moment write its types?

Movement of substances with the concentration gradient. This means that substances will move from higher concentration of a substance to lower concentration. Gradient provides the force for movements of molecules and this happens with no energy expenditures.

**Passive Movement is divided into two groups.**

- Simple Diffusion
- Facilitated Diffusion

**Passive Movement**



Movement of substances with the concentration gradient. This means that substances will move from higher concentration of a substance to lower concentration. Gradient provides the force for movements of molecules and this happens with no energy expenditures.

**Passive Movement is divided into two groups:**

❖ **Simple Diffusion;**

Area of high concentration to low concentration. This continues until ions or molecules are evenly distributed. When this happens (equal distribution through), it is called a point of equilibrium. O<sub>2</sub> and CO<sub>2</sub> are examples of simple diffusion.

❖ **Facilitated Diffusion**

- ❖ Integral proteins act as channels or carriers in facilitated diffusion
- ❖ Integral proteins are called transporters or permeases
- ❖ No energy is required during transportation of substances through these integral proteins.
- ❖ Two kinds of transporters are known:
- ❖ Nonspecific transporters
- ❖ Ions specific transporters 1. Change in shape 2. Sugars, vitamins
- ❖ Examples of facilitated diffusion include:
- ❖ Large molecules degraded by extracellular enzymes
- ❖ Smaller molecules then bind transporter
- ❖ Water molecules can pass

## 11. Three differences between prokaryotes and eukaryotes.

- ☞ Prominent nucleus is found in eukaryotes while it is absent in prokaryotes.
- ☞ Membrane bound organelles are found in eukaryotes and absent in prokaryotes.
- ☞ No histones are found in prokaryotes while present in eukaryotes.
- ☞ Examples prokaryote bacteria and archaea all organism found in domain Eukarya are eukaryotes.

## 12. Write the name of five layers of endospore

- ☞ **Exosporium:** A thin delicate outermost covering of the spore
- ☞ **Spore coat:** 2nd layer underneath the exosporium. It is thick and composed of several protein layers.
- ☞ **Cortex:** It is the 3rd layer from outside in. It has peptidoglycan in it.
- ☞ **Spore cell wall or core wall:** Surrounds the protoplast or spore core
- ☞ **Spore core:** Contains nucleoid and ribosomes

## 13. Describe structural functions following: I. Ribosomes ii. cell wall iii.



## flagella.

### Ribosomes

Composed of proteins + ribosomal RNA

- ❖ 70S ribosomes (when two units are combined into one unit)
- ❖ 50S: one rRNA
- ❖ 30S: two rRNA
- ❖ Several antibiotics act on ribosomes and inhibit protein synthesis
- ❖ Streptomycin attach to 30S

## Cell wall

Cell wall is the most important layer in bacteria. It is rigid layer just outside the plasma membrane. Most important structure in prokaryotes It provides shape to the organism. It provides protection from osmotic lysis. It is involved in pathogenicity (ability of the organism to cause the disease). Several antibiotics act on it.

### Flagella

Long filamentous structure that propels bacteria. A flagellum consists of the following 3 parts.

**Filament:** It is made of a protein called flagellin, which makes H antigen that can be used for serovar identification in gram negative bacteria.

**Hook:** A different protein

**Basal Body:** The most complex

## 14. Magnetosomes

- ❖ Inclusions of iron oxide
- ❖ Surrounded by invaginations of plasma membrane
- ❖ Present in G negative bacteria
- ❖ Act like a magnet. Bacteria can stick to iron containing rocks for nutrition. ☐ Decompose H<sub>2</sub>O<sub>2</sub> which is toxic for cells.

## 15. Function Of Cell Membrane In Bacteria

- ❖ Selective permeable barrier Passive and Active Transport
- ❖ Respiration in microbes (bacteria)
- ❖ Photosynthesis in microbes
- ❖ Lipid synthesis
- ❖ Cell wall parts are transported by a molecule called bactoprenol which is present in the plasma membrane.
- ❖ PM has many receptors in it with which various ligands can bind and initiate signals for gene expression etc.
- ❖ Cell wall is the most important layer in bacteria. It is rigid layer just outside-the plasma membrane.
- ❖ Most important structure in prokaryotes It provides shape to the organism.



- ❖ It provides protection from osmotic lysis.
- ❖ It is involved in pathogenicity (ability of the organism to cause the disease).
- ❖ Several antibiotics act on it. □ TEM revealed true differences
- ❖ Peptidoglycan thick in G +ive cells
- ❖ Thin in G –ive cells

## 16. Write characteristics of integral proteins.

**Integral proteins are inserted in the membrane or embedded in the membrane.**

Integral proteins are not static in position in the membrane. They can diffuse laterally and change positions in the membrane from time to time. So, plasma membrane is like water pond and integral proteins are like plastic bags people throw in the pond. These plastic bags swim and move by air currents. Membranes are much like that.

Integral proteins act as channels or carriers in facilitated diffusion. Integral proteins are called transporters or permeases.

## 17. Functions of cell membrane? (5marks)

- ❖ Selective permeable barrier
- ❖ Passive and active transport
- ❖ Respiration in microbes (bacteria)
- ❖ Photosynthesis in microbes
- ❖ Lipid synthesis
- ❖ Cell wall parts of transported by a molecule called bactoprenol which is present in the plasma membrane
- ❖ PM has many receptors in it which varies ligands can bind and initiate signals for gene expression etc.

## 18. Oxidative phosphorylation and mechanism of phosphorylation.3marks

**Oxidative Phosphorylation**

Electrons captured from foods are transferred to co-enzymes such as NAD+ or-FAD etc.

- ❖ Then these electrons pass through a series of electron carriers and then ultimately to the last electron acceptor molecules such as O<sub>2</sub> or other inorganic compounds (nitrate, sulphate, carbonate etc) through a series of these electron carriers in system called electron transport chains.
- ❖ During these events, ATP is generated by chemiosmosis.

**Photophosphorylation**

This occurs in plants and chlorophyll containing microbes or photosynthetic cells. In these cells, light energy is finally converted into ATP. An electron transport chain is also involved here.

## 19. Process of fermentation.

**Fermentation:** Initial steps for glucose oxidation by fermentation are the same as they occur in glycolysis for respiration. However, when pyruvate is generated through glycolysis, electrons are also captured by NADH and this NADH needs to be regenerated into NAD+ for recycling. If the final electron



acceptor is one of the end products such as ethanol, lactic acid, acetic acid etc, the process is called fermentation. Both anaerobic respiration and fermentation do not use oxygen during these processes, and during fermentation, there are no electron transport chain involved.

## 20. Catalase and its protocol.

When H<sub>2</sub>O<sub>2</sub> is produced, it gives rise to peroxide anions which are toxic to the cells. Cells have evolved to deal with this toxic H<sub>2</sub>O<sub>2</sub> by an enzyme called catalase as under:

## 21. Difference between oxidation and reduction 2 marks

**Oxidation** is the process of loss of electrons whereas

**Reduction** is the process of gain of electrons.

OXIDATION	REDUCTION
1. Oxidation is the loss of electrons from an atom, molecule or an ion.	Reduction is the gain of electrons from an atom, molecule or an ion.
2. Oxidation state increase	Oxidation state decrease.
3. Release electrons to the surrounding	Obtain electrons from the surrounding
4. Causes the increase of positive charge of a chemical species.	Causes the increase of negative charge of a chemical species.
5. Occurs in reducing agents.	Occurs in oxidizing agents

## 22. Buffer

Buffers are used to maintain desired pH o Peptones and amino acids are used as buffers o Phosphates are also used for buffers .

A buffer is a solution that can maintain a nearly constant pH if it is diluted, or if relatively small amounts of strong acids or bases are added. A buffer solution can be made by mixing a weak acid with one of its salts OR mixing a weak base with one of its salts.



## 23. Five name of bacteria which grow on optimal temperature.

Organisms are basically classified into three groups based on the temp requirements:

- 1) **Psychrophiles:** These are further divided into strict psychrophiles and psychrotrophs:
  - ❖ **Psychrotrophs:** Cold loving: 15 0C
  - ❖ **Psychrotrophs:** Optimum temp is 20-30 0C. Food spoilage bacteria that can spoil food during refrigeration.
- 2) **Mesophiles: 25 – 40 0C:** These are the ones that cause diseases in animals and humans.
  - ❖ **Moderate** temp loving organisms
  - ❖ **Optimum:** 37 0C as this is the body temperature of humans and animals.
- 3) **Thermophiles: 50 – 60 0C**
  - ❖ Heat loving
  - ❖ Important in organic compost piles
  - ❖ These are further divided into hyperthermophiles that grow optimally at 80 0C. They live in hot springs.

## 24. Define culture , culture medium, inoculum

### a) What is culture.

This term is used to define growth of microbes. In other words, microbial growth in the lab is called a culture.

### b) What is a culture medium?

A nutrient material that supports the growth of microbes in the lab is called a culture medium.

A culture media is a special medium used in microbiological laboratories to grow different kinds of microorganisms. A growth or a culture medium is composed of different nutrients that are essential for microbial growth.

### c) Inoculum

Microbes introduced into a culture medium that initiate growth of organisms. **inoculum** A small amount of material containing **bacteria**, viruses, or other microorganisms that is used to start a culture

## 25. Name three buffers used for controlling PH of culture medium? 3

- 1) Peptones
- 2) Amino Acids
- 3) PBS

## 26. What is phosphorylation?

The addition of an inorganic phosphate group to a chemical compound is called phosphorylation. e.g addition of P to ADP for synthesis of ATP during metabolic reactions.

## 27. Write The Name Of Three Steps Of Glucose Respiration.



Respiration of glucose takes place in three general steps:

- **Glycolysis:** Oxidation of glucose to pyruvic acid
- **Krebs cycle:** Oxidation of acetyl CoA to CO<sub>2</sub>
- **Electron Transport Chain:** Coenzymes that carry electrons from Krebs cycle or glycolysis are oxidized to create ATP.

**Respiration is further divided into two types:**

- ❖ **Aerobic Respiration:** If in the electron transport chain, the final electron-acceptor is oxygen, it is called an aerobic respiration.
- ❖ **Anaerobic Respiration:** If in the electron transport chain, the final electron acceptor is any inorganic compound other than oxygen, it is called an anaerobic respiration.

This final electron acceptor may be a nitrate ion, a sulfate ion, or a carbonate ion.

## 28. Why solid medium is good than liquid medium for the growth of bacteria?

Solidification of the medium is done for purifying organisms from each other as solid medium provides surface for individual colonies to grow well separated from each other. A well isolated colony is assumed to be the progeny of a single cell. Purification of organisms is done by streaking the organisms. Secondly, the solid media are used to study the colony characteristics.

## 29. Coenzyme with example

**Coenzymes** are organic nonprotein molecules that bind with the protein molecule (apoenzyme) to form the active enzyme (holoenzyme). Coenzymes such as NAD, NADP, FAD, FMN etc. are used as carriers of these electrons in oxidation reduction reactions

## 30. How bacteria got nitrogen??

- ↗ By decomposing proteins
- ↗ From NH<sub>4</sub><sup>+</sup> ions
- ↗ From Nitrates
- ↗ Use Gaseous N<sub>2</sub> are nitrogen fixing bacteria.

## 31. Describe 5 bacteria which need oxygen for growth?

- 1) Nocardia asteroides
- 2) Myoacterium tuberculosis
- 3) Bacillus anthracis
- 4) Psedomonas aeruginosa
- 5) Neisseria gonorrhoea



## 32. What are physical requirements for the growth of bacteria.3

1. Temperature
2. pH
3. Osmotic Pressure

## 33. Dry heat method of sterilization.3 marks

Form of dry heat include:

- i. Dry heat (hot-air oven),
- ii. Flaming ( Platinum loop sterilization in the flame of Bunsen burner),
- iii. Incineration (burning to ashes).

Similarly, moist heat can also be grouped into autoclaving (15psi), boiling at 100oC, and Tyndallization (100oC for 3 consecutive days to sterilize sugar solution that can be degraded by autoclaving) and pasteurization (usually at low temperature than 100oC).

## 34. Why 70% alcohol is more effective than 100% alcohol.2 marks.

Ethanol, isopropanol are examples. Alcohols denature proteins, and dissolve lipids. Alcohols require water for being more effective. This is the reason that seventy percent alcohol is more effective than 100%. Please note that alcohols can effectively kill vegetative form of bacteria, and fungi but not spores. Alcohols are not very effective on wounds. Commonly used in hand sanitizers.\

## 35. Antisepsis, sepsis, sterilization definition.3 marks

- a) **Antisepsis:** Removing pathogens from living tissue
- b) **Sepsis:** Microbial contamination A toxic inflammatory condition arising from the spread of an organism from a focus of infection.
- c) **Sanitization:** Lowering microbial counts on eating utensils

## 36. Using of ionization radiation 2 marks.

Include gamma rays, X rays, or high-energy electron beams. The ionizing radiation possesses a wavelength shorter than that of nonionizing radiation, less than about 1 nm. All these short wavelengths cause ionization of water generating high reactive hydroxyl radicals which are damaging to the cells as they bind to DNA and results in mutations. Medical plastic supplies, medicines and meat products can be sterilized by radiation.

## 37. Characteristics Antibiotic chemicals.



Although antibiotics are used to kill organisms in disease states, some antibiotics are not very effective for this purpose; however, these antibiotics could be used in food to prevent food spoilage. Nisin and natamycin prevent spoilage of cheese.

## 38. Types of microbes based on oxygen requirements?

1) Obligate Aerobes 2) Facultative Anaerobes 3) Obligate Anaerobes 4) Aero tolerant Aerobes 5) Obligate Aerobes

### 1) Obligate Aerobes

Oxygen must be present for their growth. These Organisms do not grow if O<sub>2</sub> is not present in the medium. If you test these organisms in a tube containing nutrient agar, the growth will Remain confined to the surface only (see the diagram for the concept). Mycobacterium tuberculosis is an example of such an organism.

### 2) Facultative Anaerobes:

These organisms prefer aerobic respiration; however, if oxygen is not available, they can use anaerobic respiration or fermentative modes for generating ATPs. These organisms will be Present throughout the tube; however, more growth will be seen on the Top (close to the surface) because these organisms prefer using oxygen if it is available.

### 3) Obligate Anaerobes:

Although, these organisms do not use oxygen, they cannot grow in the presence of oxygen. The reason is that oxygen creates toxic) compounds which can kill these cells. Normally, oxygen Toxic compounds are eliminated by the cells, however, strict anaerobe do not have a system to get rid of these toxic compounds when they are made in the cells.

### 4) Aero tolerant Aerobes:

These organisms do not use oxygen and also are not bothered by the presence of oxygen. In other words, they have a Better system to dispose of toxic oxygen compounds

## 39. What is vertical and horizontal gene transfer and also write type of lateral gene transfer.3marks

### Vertical Gene Transfer

This is a normal way of transferring genes from parents to offspring. This happens when a cell divides. Each daughter cell receives exactly what its parent cell has.

### Horizontal Gene Transfer

When genes are transferred from cells to cells within the same species, the process is called horizontal gene transfer. This can happen between cells of the same species, or across different species of organisms. Horizontal gene transfer involves a donor and a recipient cell. The recipient cell then



incorporates received DNA into its own genome and this genome becomes a recombinant molecule or recombinant DNA. The cell that has this recombinant DNA in it is called a recombinant cell. Three processes are known by which genes can be transferred horizontally from one cell to the other, and they include:

- ☞ Transformation
- ☞ Conjugation
- ☞ Transduction

## 40. What is HRF and function.2 marks

- If F factor gets integrated into the chromosome of the recipient cells, the bacterium becomes high frequency of recombination cell (Hfr).
- Conjugation can be used for gene mapping on the chromosomes.
- [conjugation\\_mapping.html](#)
- High frequency of recombination is also a kind of conjugation.

## 41. How bacteria can be identified.

Microbes especially bacteria (disease causing) can be identified by three methods:

- A. Classical or Conventional Method   B. Serological Methods   C. Nucleic Acid based Methods

### Classical Methods

Classical Methods of microbial identification involve differential staining of the sample before its culturing, culturing the sample onto nutrient agar, blood agar and MacConkey's agar, purifying the culture (colonies expected to be involved in the disease) and detection of various enzymes that belong to various metabolic pathways. Classically, such methods used to take a long time to perform (3 days at least); however, rapid identification methods have become available now which use preformed media that can be used for testing the presence of metabolic enzymes.

### Serological Methods

Serological Methods involve antibodies and antigen interactions. Antibodies are produced by B lymphocytes against any foreign antigens such as bacteria and their toxins that enter the body of animals or humans. Antibodies are very specific in their interaction. In other words, antibodies made against E. coli do not bind or interact with Staphylococci or vice versa. Although, there are many serological techniques that can be successfully used for identification of microbial infections, we will focus on only a few of them. The main advantage of using serological method is the speed and economy. In other words, serological methods are quick to do (take only about an hour) and can work directly on the sample (sample does not have to be cultured and purified as is needed in conventional methods of identification). Serological methods can be performed on cultured microbes as well which again speed up the diagnosis. Also remember that in all these serological tests, either the serum or the antigen should be known to us.



## 42. Write Names Of 5 Kingdom System (5)

In 1969, five kingdom classification was proposed by Robert Whittaker as under:

- 1) **Monera:** Bacteria
- 2) **Plantae:** plants
- 3) **Animalia:** Animals
- 4) **Fungi:** Yeasts, molds and mushrooms
- 5) **Protista:** These are unicellular eukaryotes. Organisms that do not fit into any other category are placed in Protista. They are larger than prokaryotes. They include algae, protozoa, slime molds and water molds.

## 43. Five Kingdom Classification of Organisms

- a) Animalia b) Plantae c) Fungi d) Monera e) Protista

Living organisms are subdivided into 5 major kingdoms, including the Monera, the Protista (Protoctista), the Fungi, the Plantae, and the Animalia. Each kingdom is further subdivided into separate phyla or divisions. Generally "animals" are subdivided into phyla, while "plants" are subdivided

## 44. Taxonomic Hierarchy

Microbes are placed in groups based on similarities that they share with each other. All organisms can be grouped into a series of subdivisions that make up the taxonomic hierarchy. A bacterial species represents —a monophyletic and genetically coherent cluster of individual organisms that show a high degree of overall similarity with respect to many independent characteristics, and is diagnosable by a discriminative phenotypic property (definition taken from the internet).

A genus consists of various species; however, these species differ from each other in certain ways, although these are related by descent with each other. Related genera make up a family. A group of similar families constitutes an order, and a group of similar orders makes up a class. Related classes, in turn, make up a phylum. All phyla that are related to each other make up a kingdom, and related kingdoms are grouped into a domain.

**Domain > Kingdom • Phylum • Class Order > Family • Genus • Species**

## 45. Major Two Prokaryotes Group?

Domain Archea Domain eubacteria

## 46. Differences Between Prokaryotes And Eukaryotes.... 3

Prokaryotes	Eukaryotes
-------------	------------



<b>Cell type</b>	<b>Cell type</b>
Mostly unicellular(some cyanobacteria may be multicellular)	Mostly multicellular
<b>Nucleus</b> True nucleus is absent. Nucleus lack nuclear membrane and nucleolus. Such nucleus is called nucleoid.	<b>Nucleus</b> Nuclear membrane and nucleolus are present.
<b>Chromosome</b> Usually single circular without histones.	<b>Chromosome</b> Multiple linear with histones

## 47. F+cell.2 marks.

In E. coli, fertility factor (F factor) plasmid was the first plasmid observed to be transferred from one organism to the other, hence those bacteria that have this plasmid are called F+ cells to differentiate from those that do not have one (F-). However, once F- cells acquire F+ plasmid, they also become F+.

## 48. Western blotting.5 marks

Western Blotting: We can use this technique for the detection of antigen in the serum. Microbial proteins can be separated on SDS-PAGE by electrophoresis and the presence of these proteins can be detected by enzyme-tagged antibodies specific to those proteins. A color band will be seen where the specific protein (antigen) is present on the gel. Please remember that proteins in the gel are first transferred to a paper strip before they could be detected by specific antibodies as seen in the accompanying figure

## 49. Four bacterial growth curve phase. (lec 24-34 m add krna h)

There are four distinct phases of this curve.

### 1) The Lag Phase:

Cells prepares for growth in this phase. No growth is observed during this period or phase, however. Cells are metabolically very active during this phase.

### 2) The Log Phase:

During this phase, organisms multiply exponentially or logarithmically. Generation time becomes constant during this phase and that is the reason, the log graph will show a straight line. Cells are in the most active stage during this phase of growth curve. For commercial applications such as vaccine production, cells have to remain in this phase in order to reproduce most efficiently resulting in increased cell mass or number. Another application of this phase of growth is to determine the generation time.



### 3) The Stationary Phase:

This is also called a period of equilibrium as microbial deaths equal production of new cells. In other words, organisms start dying during this phase, however, the number of dead organisms is replaced by new organisms because there is still replication of cells going on. So, overall number of organisms does not change. This is the reason, it is called a stationary phase.

### 4) The Death Phase:

The number of deaths exceeds the number of new cells formed during this phase. In other words, overall number decreases. It is also called logarithmic decline phase. Why there is a decline phase or death phase. The reason is simple: Nutrients are depleted and waste products which are toxic to the cells accumulate suppressing the growth and killing the cells.

## 50. Three Character Of Algae.

These are simple eukaryotic cells. Some are unicellular, others are multicellular (thallus); however, they lack tissues such as roots, stem and leaves typically seen in plants.

Algae absorb nutrients from water through their surfaces and are mostly photoautotrophs; however, a few are chemoheterotrophs. They are responsible for 80% atmospheric O<sub>2</sub> on the face of the earth.

Microscopic exam is needed to identify unicellular and filamentous algae. However, multicellular algae that are commonly known as seaweeds are macroscopic in nature and can be identified morphologically without the help of a microscope. Four groups of such algae include blue-green algae, green algae, brown algae and red algae. These algae are located in the sea at various locations and absorb light of various wavelengths, hence red algae are located far from the surface and can use blue light from the sun as blue light is of shorter wavelength and can penetrate deep in the sea.

Also remember, blue-green algae need magnification in order to be correctly identified, although they are not microscopic. o Body of multicellular alga such as seaweed is called a thallus which consists of branched holdfasts (anchor alga to rock) stemlike hollow stipes and leaflike blades. There is no vascular tissue in these algae. Also, the stipe is not lignified or woody, so it does not provide support to the weed. Surrounding water provides the support for the thallus. Some algae have a gas filled body inside them which keeps them floating in the water. This gas filled structure is called pneumatocyst or float. These are eukaryotes. Their cell wall consists of cellulose. These are photosynthetic and produce oxygen. They are usually unicellular, but multicellular algae are also common. Seaweeds and pond scum are some of the examples.

## 51. Thermal death point and thermal death rate.

- ❖ **Thermal Death Point:** It is the lowest temperature at which all cells in a culture are killed in 10 min. It will be a specific temperature for a specific species of organism.



- ❖ **Thermal Death Time:** Time (minimum) during which all cells in a culture are killed at a given temperature. This will vary from temperature to temperature for the same organism. Obviously, higher temperatures will take less time to kill the organisms than low temperatures.

## 52. Characteristics Antibiotic chemicals.

Although antibiotics are used to kill organisms in disease states, some antibiotics are not very effective for this purpose; however, these antibiotics could be used in food to prevent food spoilage. Nisin and natamycin prevent spoilage of cheese.

## 53. Physical and chemical method of making of smear. 3marks

Staining starts with making a smear using a glass slide.

- ☞ Using a platinum loop, a colony of a drop of broth culture can be smeared into a thin film on a glass slide for making a smear.
- ☞ The specimen is spread into a thin film (smear).
- ☞ Smear is air-dried.
- ☞ Smear is fixed (attached) to the slide before staining.
- ☞ **Heating** the slide is one way of fixing the smear. ☐ **Methyl alcohol** can be used.

## 54. Advantage Of Staining

- ☞ Most organisms appear colorless when seen under a microscope.
  - ☞ Staining emphasizes certain structures of the organisms.
  - ☞ Staining is just coloring with a dye.
  - ☞ Staining increases visibility of microbes because staining increases contrast.
  - ☞ Shape, size and arrangements of the organisms can be readily seen.
  - ☞ Purity or contamination of a culture could be determined.
  - ☞ Differentiation and classification of microbes is possible. For example, microbes can be categorized into Gram positive or Gram negative groups.
  - ☞ Structures such as flagella, capsule and spores etc. of bacteria can be detected with staining.
- It gives quick results when examining infections.
- It is simple and cost-effective.
  - It helps with determining appropriate treatments for infection.
  - It allows for various methods of testing.
  - It is basically a key procedure in identifying bacteria

## 55. What Is Resulation?



Ability of the lenses to distinguish between two closely lying objects as separate. Light microscope resolving power is 0.2.

## 56. Acid-Fast Staining??

Some bacteria such as Mycobacterium has a waxy material in their cell wall

### Acid-Fast Staining

The acid-fast stain is a laboratory test that determines if a sample of tissue, blood, or other body substance is infected with the bacteria that causes tuberculosis (TB) and other illnesses. Some of the sample is placed on a glass slide, stained, and heated. The cells in the sample hold onto the dye. The slide is then washed with an acid solution and a different stain is applied. Bacteria that hold onto the first dye are considered "acid-fast" because they resist the acid wash. These types of bacteria are associated with TB and other infections.

### Industrial Microbiology

Use of microbes or their enzymes for large scale production of biomolecules

### Medical microbiology?

- ↗ Deals with diseases of humans and animals
- ↗ Identifications of disease causing agents
- ↗ Control and elimination of microbes
- ↗ Tracking down new pathogens



تونیک ہو اور لوگ تجھے برا کہیں تو یہ اس سے  
اچھا ہے کہ تو برا ہو اور لوگ تجھے نیک کہیں۔

عائیزہ رانیش