BT102 FINAL TERM MCQS AND SUBJECTIVE (NOTES)

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1. Hot air oven temperature is _____ **170degree for 2 hour**

2. Example of Biguanides is_____ **chlorohexidine**

3. _____ is virus infecting bacteria. **Bacteriophage**

4. Sight of entry through which microorganism enter body. **Portals of entery**

5. Plasmid is _____ stranded **_____Double_____**

6. Lyme disease is caused by. _____**BORRELIA BURGDORFERI**

7. Proteins are separated by_____ **Gel electrophoresis**

8. Structural support is provided by ____.**core polysaccharides**

9. Cell wall is absent in ____.**Mycoplasma**

10. Alpha hemolysis make _____**GREENISH HALO**

11. Study of fungi is_____. **Mycology**

12. 30S ribosome contain _____.**2rRNA**

13. _____ % alcohol is more effective. **70%**

14. Study of microbes is called _____**Microbiology**

15. Monitoring disease in a population. _____**EPIDEMIOLOGY**

16. Algal body is___. **Thallus**

17. Obligate halophiles live in_____. **30% salt**

18. Specimen or sample is placed on____. **Stage**

19. Mycobacterium is stained by ____**acid fast staining**

20. **Pilli_____**transfer DNA from one bacterium to other

21. Half of the dry weight of microbe is **_____carbon___**

22. Hot air method is_____. **121 degree at 15psi for 20min**

23. _____proteins are loosly connected and soluble in water. **Peripheral**

24. Mesophils optimum temperature is_____. **37°C**

25. A sexual spore is formed by___ _____**Mitosis**

28. Consistently present but with low incidence is_____. **Endemic**

29. Which is not lymphocyte____. **Monocytes**

30. Process in hot air sterilization is _____.**Oxidation**

31. Water molecules pass through____. **Aquaporines**

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32. Direct count method _____.**Membrane filter**

33. Extra chromosomal circular DNA ___.**Plasmid**

34. Unicellular fungi is ____.**yeast**

35. Mycobiont is _____.**fungi**

36. ELISA is used for_____. **Antigen and antibody**

37. Western blotting is used for ____.**Proteins**

38. Which is not belonging to innate immunity? ____ **Specific**

39. Which is not belonging to ELISA_____ **Probe**

53. Which do not grow in the presence of O2 ___.**Obligate anaerobes**

54. Which is not a method of direct count_____ **Spectrophotometer**

55. Persistent infection: Virus replicates but _____**slowly**

56. Which of the following is not bacterial gene transfer method_____ **Transfection**

57 Which one is correct answer regarding sterilization_____.**Removel of microbes and their spores.**

58. Ethylene oxide is strongly alkylating agent that kills the microbes reacting with the functional group of _____to block replication and enzymatic activity. ____**DNA**

59. ____ is the transfer of DNA by a virus called bacteriophage.__**Transduction**

60. Transformation is the horizontal gene transfer between two_____. **Bacteria**

61. The primary stain of gram method is_____. **Crystal violet**

62. Antigen antibody reaction is a _____method for microbial identification. _____**Serological**

63. Phenol and phenolic compound is widely used antiseptic for disruption .**Plasma membrane**

64. Buffer are used to maintain ____in medium. ____**pH**___

65. Protains could be detected by ._____ **Gel electrophoresis**

66. The halogen iodine and chlorine inhabit ____function. ____**Protein**_____

67. Proteins from microbes are separated by _____. Electrophoresis

68. Endospores are stained with _____**Malachite green**

69. Vaccine of small pox _____ **Edward Jenifer**

70. _____alcohol is more effective than 100% _____**70%**

80. Hot air sterilized by _____ **Oxidation**

81. F means ____ **Fertility factor**

82. Bacteriophage is a _____**Virus**

83. The study of the evolutionary history of organism's _____ **Systematics/Phylogeny**

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84. Mycobiont is example of _____**Fungi**

85. Infectious circular RNA of plants_____**Viroid**

86. Consistently present, but with low incidence____**Endemic**

CURRENT MIDTERM BT102 MCQS

1.The primary stain is used in fast staining is_____ CARBOL FUSCHIN

2.Which are also called volutin. _____ METACHROMATIC GRANULES

3.Which do not grow in presence of oxygen _____OBLIGATE ANAEROBES

4.This is indicated by clear colorless zone surrounding _____β-HEMOLYSIS

5.....through that simpler invertebrates could arise by spontaneous generation. ____ARISTOTLE

6.Obligate halophiles required high salt concentration for growth _____30%

7.In hot air method which condition is used _____170˚C, 2 hr

8.This is not true when an object is sterilized by ethylene oxide._____1500mg/l

9.After staining and washing with alocohol gram negative bacteria appear _____COLORLESS

10. __is a basic dye _____ METHYLENE BLUE

11. During glycolysis _____molecule of pyruvic acid produced _____2 (TWO)

12. Nucleoid and ribosomes are formed ___ SPORE CORE

13. _____bacteria has high salt concentration _____HALOPHILES

14. Which is used for transfer of DNA from one bacterium to other bacteria? _____PILLI

15. The optimal temperature for growth of hyperthermophilis is _____80C

16. Unicellular fungi is _____ YEAST

17. Magnification power of light microscope is _____0.2um

18. Alpha hemolysis make _____GREENISH HALO

19. Involve storage of carbon ,phosphate and other substances in prokaryote ___INCLUSION BODIES

20. Exponential growth of bacteria occur in ____LOG PHASE

21. Small pox vaccine was introduced by.....in 1796._____ EDWARD JENNER

22. Very small dot like colonies of bacteria are called _____PUNCTIFORM

23. Half of the dry weight of the microbes is composed of ____ C (CARBON)

24. Acellular organisms are ____ VIRUS

25. Peripheral proteins are ____ to cell membrane and are ___ in water. _____LOOSLY CONNECTED – SOLUBLE

26. _____structural backbone for living matter. ___C (CARBON)

27. Gram negative bacteria has rings_____ FOUR(4)

28. Which is used for mordant in gram staining_____IODINE

29. Monitoring disease in a population. _____EPIDEMIOLOGY

30. Robert hook 1st drawing of microbes _____1665

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31. Rat bite fever is caused by_____ SPIRILLUM MINUS
32. Asepsis is. _____ ABSENCE OF SIGNIFICANT CONTAMINATION.
33. Direct transfer of phosphorus to ADP is carried out in. _____SUBSTRATE LEVEL PHOSPHORYLATION.
34. Microbes require nitrogen and sulphur for. _____PROTEIN SYNTHESIS.
35. Ribosomes are composed of. _____PROTEIN AND rRNA.
36. Syphilis is caused by._____ TREPONEMA PALLIDUM.
37. Study of fungi is called. _____MYCOLOGY.
38. Which one is in antigenic in nature? _____O SIDE.
39. Lyme disease is caused by. _____BORRELIA BURGDORFERI
40. Bacterial growth curve has __ phases. _____4 (FOUR)
41. Slide or Specimen placed on __ of microscope_____ STAGE
42. In LPS, Core polysaccharide gives _____STRUCTURAL SUPPORT
43. Which does not contain cell wall ____MYCOPLASMA
44. Mixture of MacConkey agar _____Nutrient agar + Bile salt + CV
45. Darkfield microscope used which lens _____CONDENSER LENSE
46. Viroids are composed of _____circular ssRNA
47. Penicillin was derived from ___Fungi (Penicillium notatum)
48. Example of negative stain is___ Eosin • Acid fuchsin • Nigrosin
49. _____ is counter stain_____ Safranin
50. Structural sport in lipopolysaccharide is provided by ____ Core Polysaccharides
51. Molds and yeast grow At pH of _____ 5 to 6
52. In ___1865___pasteur found that silk down disease is called by protozoa
53. Anoxygenic in nature_____ ____Rhodopseudomonas _____
54. Psychrophiles required temperature __Cold loving: _____15 0C ___
55. integral proteins____ Imbedded in, Insoluble in water
56. Autoclave is done at_____121˚C, 15mint
57. Kingdom Monera contain._____ Bacteria and Archea
58. Mycobacterium are stained by _____ Acid fast staining
59. Mycobacteria is a type ____Lipophilic
60. Magnetosomes are ....inclusion_____ Iron oxide
61. Bacterial cell wall is made up of _____Peptidoglycan
62. Carl Linnaeus establish the systems of classification in _____1735
63. ETO is supplied in_____ ____10 – 20%
64. Cold loving bacteria are _____ Psychrophiles
65. Helical but rigid bacteria are__ _____Spirillum
66. which is not involved in direct count method _____spectrophotometer

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67. Optimum temperature of Psychrotophs 20-30
68. Components of lipopolysaccharides 3
69. Acellular organisms are Viruses
70. Cell wall of fungi composed of Chittin
71. Ribosomes function is Protein synthesis
72. Mesophiles bacteria have optimum temperature about 37^0C
73. _____ is an example of obligate aerobes Mycobacterium tuberculosis
74. Small dot like colonies of bacteria Puntiform
75. Which is not involved in direct count method Spectrophotometer
76. Which are used for indirect microbial count except Membrane filter Technique
77. Study of microbes Microbiology

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2MARKS QUESTIONS

1. **Define magnification**

Magnification is the enlargement of an object its formula is Magnification of objective lens x magnification of ocular lens

2. **Define Buffer**

A buffer is the substance that maintains the desired pH in the solution or any medium.

3. **What is 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.

4. **Give two advantages of solid media in bacterial culturing.**

   - Pure culture is easy to obtain by streaking the organisms
   - Colony characters can be studied

5. **Physical Requirements of Media**

   Physical: Requirements • Temperature • pH • Osmotic Pressure

6. **Passive movement**

   The movement of molecules from high concentration to low concentration without use of ATP (energy) is called passive transport. Example, Simple Diffusion, Facilitated diffusion and Osmosis

7. **Flagellum and its function (2)**

   Long filamentous structure that propels bacteria, the primary role of the flagellum is locomotion, but it also often has function as a sensory organelle, being sensitive to chemicals and temperatures outside the cell. **Example Chemotaxis –Phototaxis**

8. **Glycoclyx, its composition and function**

   It is the outermost layer, viscous and gelatinous in nature that surrounds the cells. It is composed of polysaccharide and polypeptide or both. • Capsule: If glycol calyx is organized and firmly attached to the cell, it is called a capsule.– Plays important role in virulence (degree of pathogenicity)–Can also be a part of the vaccine against the bacteria to which it belongs.–Can be demonstrated by negative staining technique

9. **Characters tics of microaerophiles**

   A microaerophile is a microorganism that requires oxygen to survive, but requires environments containing lower levels of oxygen than are present in the atmosphere (i.e. <21% O_2; typically 2–10% O_2). Many microaerophiles are also capnophiles, requiring an elevated concentration of carbon dioxide (e.g. 10% CO_2 in the case of *Campylobacter* species)

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10. **Write composition of teichoic Acid?**

    Teichoic Acid Composition: - (glycerol or ribitol + Phosphate)

11. **Differ b/w chemotaxis and phototaxis**

    Phototaxis: - The movement of organism or its part towards the light whiles the movement of an organism towards specific stimulus or chemical substance called chemotaxis.

12. **What is 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

13. **Define virulence**

    The ability of an agent of infection to produce disease, the **virulence** of a microorganism is a measure of the severity of the disease it causes.

14. **Two teichoic acid present in bacterial cell wall.**

    1) Lipoteichoic Acid 2) Wallteichoic acid

15. **Define antiseptics**

    An **antiseptic** is a substance that stops or slows down the growth of microorganisms. Like Ethanol , hydrogen peroxide etc.

16. **What is high frequency combinations**

    If F factor gets integrated into the chromosome of the recipient cells, the bacterium becomes high frequency of recombination cell, it is a kind of conjugation.

17. **Differentiate between clone and strain**

    Clone: Population of cells derived from a single cell that is genetically identical. **Strain:** A genetic variant of a clone is called a strain

18. **Difference between positive sense and negative sense RNA**

    The main difference between positive and negative sense RNA virus is that positive sense RNA virus consists of viral mRNA that can be directly translated into proteins whereas negative sense RNA virus consists of viral RNA that is complementary to the viral mRNA.

19. **What is zoonosis?**

    Primarily an animal infection, but can be transmitted to humans. It can assume epidemic proportions in humans and is difficult to control

20. **Q. Write characteristics of Microaerophiles**

    1) Aerobes but O2 is required in low amounts. 2) Produce O2 toxic compounds if exposed to more O2

21. **Q Name two basic dyes (2)**

    Crystal violet • Methylene blue • Malachite green • Safranin

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22. **Q Two methods for Viable counting (2)**

    1) Spread plate 2) Pour plate

23. **Q.4 what is microbiology**

    Studying microbes is microbiology

24. **Q. characteristics of Integral proteins.(2)**

    Imbedded in the membrane –Insoluble in water –Amphipathic in nature

25. **Q. Formula of magnification?**

    Magnification of objective lens x magnification of ocular lens

26. **Q. Substrate level phosphorylation 2**

    The Direct transfer of P to ADP

27. **Q. Macconky agar 3**

    Nutrient agar + Bile salt + CV • Selective & differential, Used for gut bacteria

28. **Q. what is virulence?2**

    Virulence: The ability of an agent of infection to produce disease. The ***virulence*** of a microorganism is a measure of the severity of the disease it causes.

29. **Q. Advantages of solid medium.2**

    Pure culture is easy to obtain by streaking the organisms • Colony characters can be studied

30. **Pasturization method**

    It is a method in which the liquid usually milk is pasteurized to Reduces spoilage organisms and pathogens

31. **Q. Two types of fermentation?**

    Lactic acid fermentation and alcoholic fermentation

32. **Q. define L-form bacteria 2m**

    L-form organisms are naturally found without the cell wall. In other words, normally, they have cell wall but under certain conditions, they may lack a cell wall.

33. **Q. Industrial microbiology**

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

34. **Q. Give classes of media based on function 3m**

    Defined and complex media • General purpose media • Enriched media • Selective media • Differential media

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3MARKS QUESTIONS

35. Describe transduction, conjugation transformation (3)

- **Transduction:-** Transferring of a gene from a bacterium to another bacterium via a virus is called transduction
- **Conjugation:-** Bacterial conjugation is the transfer of genetic material between bacterial cells by direct cell-to-cell contact or by a bridge-like connection between two cells
- **Transformation:-** Transformation is the process by which a DNA molecule is taken up from the external environment and incorporated into the genome of the recipient cell or uptake of naked DNA by microbes.

36. Economical use of fungi (3)

- Saccharomyces are used for alcoholic beverages under anaerobic conditions for alcohol production.
- Saccharomyces are incubated aerobically (for bread making), they metabolize glucose to produce CO2 which expands the dough causing it to rise
- Yeast is also extensively used for molecular biology work and vaccine production. Vitamin C is obtained from Aspergillus niger
- antibiotics from many fungi and anticancer Taxol from Taxomyces are some other examples of useful fungal products
- Mushrooms can be cooked and eaten as a source of proteins for humans
- Entomophaga (kills gypsy moth), hence is used as a biological pest control

37. Difference between vertical and horizontal gene transfer (3)

- **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.

38. Define Plasmogamy, Karyogamy and Meiosis (3)

- **Plasmogamy:** A haploid nucleus of a donor cell (+) penetrates the cytoplasm of a recipient cell (-).
- **Karyogamy**: The (+) and (-) nuclei fuse to form a diploid zygote nucleus. Sexual Spores
- **Meiosis:** The diploid nucleus gives rise to haploid nuclei (sexual spores).

39. What are interferons? give their functions

These are antiviral proteins, produced by macrophages and lymphocytes in response to viral infections. Fibroblasts can also secrete it. These proteins interfere with viral replication

Types of Interferon:

- Alpha: It is released by all infected cells.
- Beta: Also produced by infected cells.

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- Gamma: This one is released by lymphocytes only. Lymphocytes belong to adaptive immune system (just remember that).

40. -L form bacteria

L-form organisms, are naturally found without the cell wall. In other words, normally, they have cell wall but under certain conditions, they may lack a cell wall..

41. Function of cell wall in bacteria(3)

1) Shape 2) Protection from osmotic lysis 3) Pathogenicity

42. Define Virus, virusoid, viroids(3)

- **VIRUSES:** They are acellular structures that consist of a protein capsid enclosing either DNA or RNA (but never both) and sometimes may contain an extra membrane called envelope
- **VIROIDS:** They are composed only of circular single stranded (ss) RNA
- **VIRUSOIDS:** They contain circular ssRNA that need helper viruses for replication and encapsidation. They are also called satellite viruses
- **PRIONS:** These are basically infectious proteins formed inside the body. They behave like organisms as they can be transmitted from one individual to another. Extremely resistant to heat.

43. DNA lateral transfer

Lateral gene transfer or 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.

44. Types of Spiral Bacteria?

Vibrio: curved rods. **Spirillum:** Helical but rigid **Spirochete:** Helical but flexible

45. Characteristic of bacterial colony. (3)

- **Forms of bacterial colonies** like Punctiform, circular, filamentous etc.
- **Elevation of bacterial colonies** like Flat, raised, convex etc.
- **Margins of Bacterial colonies** like entire look circular, undulate, curled etc.

46. Magnetosomes characteristics.

- Inclusions of iron oxide
- Surrounded by invaginations of plasma membrane
- Present in G negative bacteria

47. Functions of bacterial cell wall.3

1) Shape 2) Protection from osmotic lysis 3) Pathogenicity

48. what are the physical and chemical methods for making Smear on the slide

a. Physical method: Heat
b. Chemical Methods: Ethanol or formaldehyde

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LONG QUESTION

Q.1 Epidemiology and its methods 5

ANS- The study of where and when diseases occur and how they are transmitted in a population

Descriptive Epidemiology: (recording the data about disease). It includes location and time of cases of disease, gender, health, age of patients etc. (Basically, frequency and distribution of risk factors in population are recorded). Prevalence and incidence of disease are typical examples. Such studies can be retrospective (after they occur) or prospective (before they occur). So, in summary, in descriptive epidemiology, information about an already existing disease is recorded.

Analytical Epidemiology: It relates to determining the cause of the disease. Analysis of data, mode of transmission of diseases and means to prevent diseases also come in this discipline. Such studies can be done with case.

Control methods in which factors that have preceded the disease are determined. A group of people who have the disease is compared with another group of people in the same location who are free of the disease.

A **Cohort method** tracks two groups forward from exposure to outcome. Cohort study compares the experience of a group exposed to the factor with another group not exposed to the factor.

Q-2 How infectious diseases transmit? Give detail of transition by direct contact, vector and vehicles 5

Direct Transmission: person to person physical contact is a direct contact. Influenza spread is a typical example

Indirect Transmission: A nonliving object is involved. Objects in the use of a patient such as handkerchief, utensils,

pillow and bedding are called fomites. These can transmit organisms to susceptible individuals.

Droplet Transmission: Mucus droplets are created when you sneeze for example. These droplets carry organisms that may infect another individual who comes in contact with the droplets. One sneeze may produce 20,000 droplets. Influenza can be spread by this route.

Vehicle Transmission: Transmission of disease agents by a medium, such as water, food, or air. Other media include blood and other body fluids, drugs, and intravenous fluids.

What are Vectors? A vector is a vehicle (animate or inanimate) that carries a pathogen from one host to another.

Arthropods are vectors for many diseases. There are two ways these arthropods can transmit organisms to susceptible hosts:

Mechanical Transmission: In this type of transmission, organisms stick to the body parts of insects and get transmitted passively from one location to another. Biological Transmission: Microbes multiply in the insect and is transmitted actively by insect bites from one individual to another

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Q-3 How fungi can be identified by biochemical testing,

Fungal biochemical tests are tests performed to identify fungi.

The following are some systems currently being used for the identification of yeasts:

- **Carbohydrate fermentation** studies: This tests whether a certain yeast ferments different carbohydrates.
- **Carbohydrate assimilation** studies: This tests whether yeast can aerobically utilize different carbon and nitrogen compounds with oxygen as their final electron acceptor.
- **API 20C System**: Freeze-dried sugars are placed into wells on a plastic strip, yeast basal medium suspended yeast is pipetted into wells, and incubated. Turbidity determines growth.
- **Uni-Yeast Tek System**: Identifies yeasts based on their ability to ferment certain sugars

Q-4 Explain types of algae

Phaeophyta (Kelp)

1) Brownish in color 2) Cellulose and alginic acid cell walls 3) Multicellular 4) Chlorophyll *a* and *c*, xanthophylls

5) Store carbohydrates 6) Harvested for algin

Rhodophyta

1) Reddish in color 2) Cellulose cell walls 3) Most are multicellular 4) Chlorophyll *a* and *d*, phycobiliproteins

5) Store glucose polymer 6) Harvested for agar and carrageenan

Chlorophyta

1) Green algae 2) Cellulose cell walls 3) Unicellular or multicellular 4) Chlorophyll *a* and *b*

5) Store glucose polymer 6) Believed to have given rise to terrestrial plants

Bacillariophyta

1) Brownish in color 2) Pectin and silica cell walls 3) Unicellular 4) Chlorophyll *a* and *c*, carotene, xanthophylls

5) Store oil 6) Fossilized diatoms formed oil 7) Produce domoic acid

Dinoflagellata

1) Brownish in color 2) Cellulose in plasma membrane 3) Unicellular
4) Chlorophyll *a* and *c*, carotene, xanthins 5) Store starch 6) Some are symbionts in marine animals
7) Neurotoxins cause paralytic shellfish poisoning

Q-5 Explain types of conidiophores

Conidiospores

- **Conidia:** in this form Chain of spores are formed at the end of a conidiphore for example Aspergillus
- **Arthroconidia:** in this form spores are formed by fragmentation of septate hypha for example Coccidioides immitus
- **Blastoconidia:** spores are formed in the result of budding of the parent cells for example Candida albicans
- **Chlamydioconidia:** spores formed by rounding and enlargement within a hyphal segment Example Candida albicans

Q-6 Explain ELISA (5)

Enzyme Linked Immunosorbent Assay –ELISA

- Some antigen antibody reactions are not visible to the eyes.
- Such reactions are visualized indirectly using various probes.
- Probes include enzymes, radioisotopes etc. Serological Testing
- Enzymes or radioisotopes are conjugated to antibodies
- Presence of enzymes detected by incubating with substrate that forms colored compounds

Q-7 Microbial identification method. Give detail of two. 5

1) **Enzyme Linked Immunosorbent Assay –ELISA**

- Some antigen antibody reactions are not visible to the eyes.
- Such reactions are visualized indirectly using various probes.
- Probes include enzymes, radioisotopes etc. Serological Testing
- Enzymes or radioisotopes are conjugated to antibodies
- Presence of enzymes detected by incubating with substrate that forms colored compounds

2) **Western Blotting**

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

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10 MARKS QUESTIONS

Q1. **Define immunity, difference between innate and adaptive immunity in Detail (10)**

Immunity: Ability of the body to protect itself from harmful effects of diseases.

Susceptibility: lack of immunity which leads to easy establishment of disease.

Types of Immunity

1) **Innate (Natural):**

- **Present at birth:** One is born with these defenses, so it is present without any exposure to the microbes. That is the reason, it is non-specific.
- **Rapid to respond:** Because it is already there, it interacts with the microbes as soon as they enter the body.
- **Nonspecific**: It means that it does not differentiate if it is an E. coli or a Staph or Salmonella. Body defense system against these entire pathogens act in a similar fashion. In other words, the same macrophage can phagocytize E. coli, Staph or Salmonella at the same time (if these pathogens are present there).
- Does not increase in response with repeated exposures to the same agent. Therefore, it has no memory.
- **First line of defense:** Physical barriers (skin, mucus membrane) provide the first line of defense as they prevent the entry of the organisms by providing a physical barrier which if broken will let the microbes go inside.
- **Second line of defense**: Phagocytic cells and their secretions provide a second line of barriers for microbes. So, if microbes succeed in breaching or breaking the first barrier, macrophages, neutrophils and such other cells phagocytize these microbes and kill them before these can establish infection in the body.

2) **Adaptive (Acquired): It is the third line of defense.** Acquired by experience, specific to an organism.

- **Specific:** It means that antibodies made against E. coli will destroy E. coli only, and will not do any harm to a Staph for example.
- **Have memory**: It means if antibodies have once been made against E. coli, this exposure will be remembered by the body, and if a second encounter is made with the same type of E. coli again, the body would mount a heightened immune response against E. coli because it has memory cells developed in the body which upon second stimulation proliferate quickly and mount a greater defensive response. O
- **Because of memory**, body's immune response increase with every repeated exposure. It has a limit also!
- **Slower to respond:** For the first time exposure, the body's response is slower and takes a long time compared with the innate immunity which is immediate.
- **Adaptive Immune Response** can further be divided into:
    - **Humoral immune response** (antibody response by B cells or lymphocytes)
    - **Cellular immune response** (T cells are made which kills microbial harboring cells).

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MIDTERM 5 MARKS QUESTIONS INCLUDED IN FINAL TERM

Q.1 Write About the 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

Q.2 Function of cell membrane in bacteria?

1. Selective permeable barrier
2. Passive and Active Transport
3. Respiration in microbes (bacteria)
4. Photosynthesis in microbes
5. Lipid synthesis
6. Cell wall parts are transported by a molecule called bactoprenol which is present in the plasma membrane.
7. PM has many receptors in it with which various ligands can bind and initiate signals for gene expression etc

Q.3; Write names of kingdom as per five kingdom system of classification.

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

1. **Kingdom Monera:-** The Kingdom Monera consists of prokaryotic, unicellular organisms. No nuclear membrane or membrane-bound organelles such as chloroplasts. Examples of Monera include Archaea and Bacteria.

   - **BACTERIA:** These are prokaryotes, usually single-celled organisms. Their cell wall is made of peptidoglycan. These are true bacteria

   - **ARCHEA:** These are also prokaryotes but their cell wall lacks peptidoglycan (may have special lipids

2. **PROTISTS:** This group includes algae, protozoa, slime molds and water molds.

   - **Algae**: These are eukaryotes. Their cell wall consists of cellulose. These are photosynthetic and produce oxygen

   - **Protozoa:** These are also eukaryotes, unicellular and have no cell wall. They move by pseudopods, flagella or cilia. Some are photosynthetic

   - **Slime Molds:** They are fungus like organisms at one time that may assume a protozoon like nature at another time. Basically, they are single celled but aggregate to form multicellular reproductive structures

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- **Water Molds:** These are protists that grow on the surface of fresh water and humid soils. Also known as mildews and white rusts. They look like fungus

3. **FUNGI**: Usually unicellular (but also multicellular), their cell wall consists of chitin

4. **Plantae:** Multicellular eukaryotic and Autotrophs, photosynthesis. Like plants

5. **Animalia:** Multicellular eukaryotic and heterotrophs

Q.4; Characteristics of Metachromatic granules

1. Also called volutin, they stain red with certain dyes such as methylene blue. That is why they are called metachromatic (stain in different color as methylene blue gives blue color but the color on these granules is red).
2. Large inclusions
3. These inclusions contain inorganic phosphates. Inorganic phosphates are used up in ATP synthesis.
4. Characteristics of Corynebacterium diphtheria: This bacterium can be identified by the presence of these granules in it.

Q.5; Pili structure and its functions

Structure

1. These are hair-like structure composed of pilin, usually one to ten in number.
2. Longer than fimbriae

Function

3. Used for attachment to: • Host cells • Bacteria
4. Used for DNA transfer from on bacterium to another: Conjugation (Sex pili)
5. Also function in twitching Motility
6. Gliding Motility is also the function of the pili

Q.6; Name of types of microscopy

Types of Microscopes:

1. **Darkfield microscopy**
   - Uses a darkfield condenser having an opaque disk
   - Used for unstained specimens suspended in liquids
2. **Phase contrast microscopy**
   - Light rays can be in phase or
   - out of phase
3. **Fluorescent microscopy**
   - Uses fluorochoromes and UV light as illumination source
   - Fluorochoromes: substances that absorb short wavelength of light and emit longer wavelength (visible).
4. **Transmission electron microscopy**

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- Electron microscope (EM) makes use of electron beam as an alternative to light rays
- It is used to analyses the internal structure of the organisms like cell organelles etc

5. **Scanning electron microscopy**
   - It is modified type of Electron microscopy in which electron beam doesn't pass through the specimen and the entire structure can be seen under this microscope

Q.7 Types of bacteria based on oxygen requirement for growth

Based on the use and concentration of Oxygen, microbes can be classified into five groups:

1. **Obligate Aerobes:** Oxygen must be present for their growth. These organisms do not grow if O2 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. **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.
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.
4. **Aerotolerant 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. They will grow evenly throughout the tube of medium as seen in the accompanying diagram.
5. **Microaerophiles:** –Aerobes but O2 is required in low amounts. –Produce O2 toxic compounds if exposed to more O2 Examples Listeria, Vibrio

Q. 5 Classifications of bacteria on the basis of 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 hyper thermophiles that grow optimally at 80 0C. They live in hot springs.

Q. Name 5 types of microbiology.5

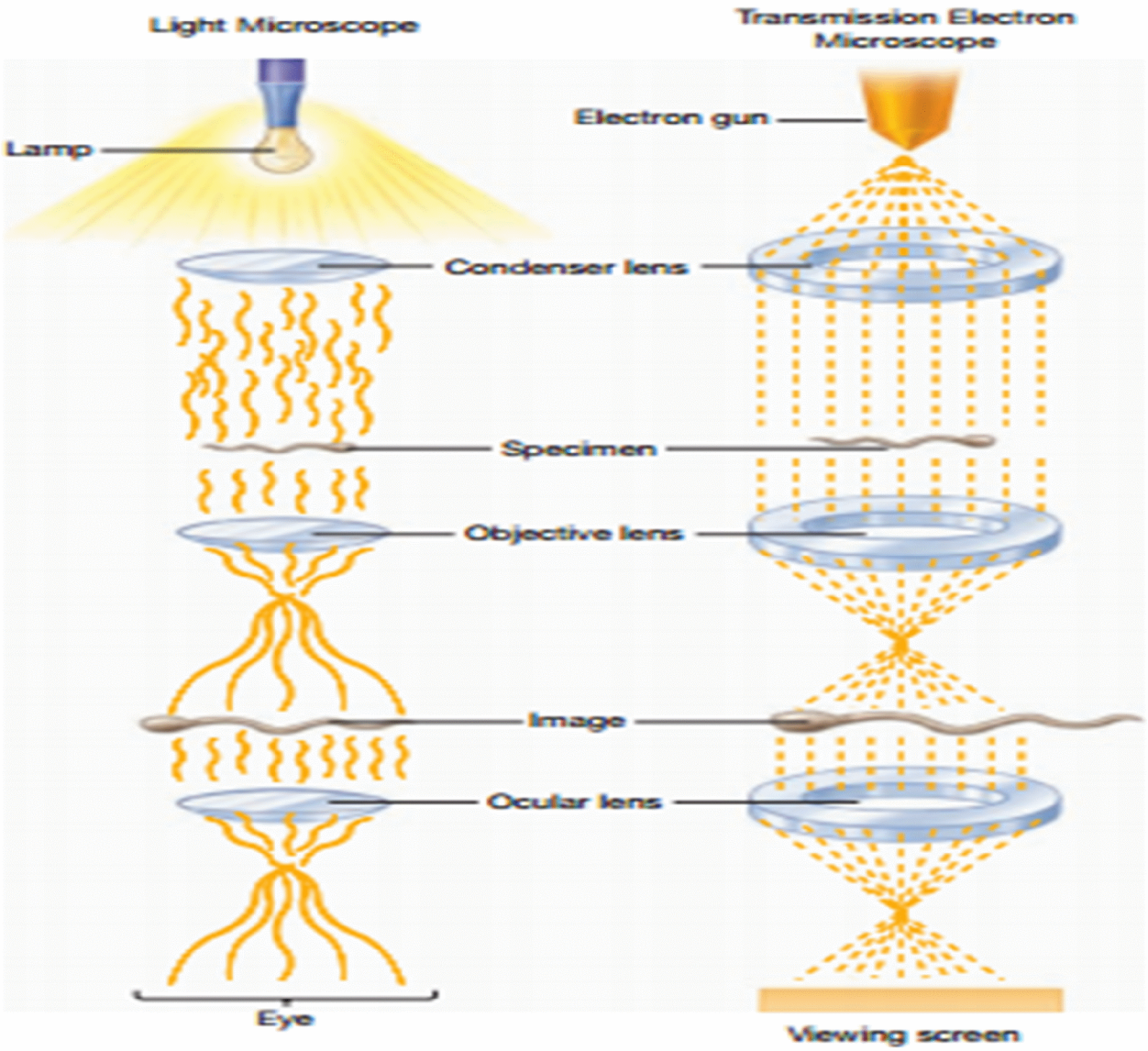
1) Bacteriology 2) Mycology 3) Medical Biology 4) Immunology 5) Food microbiology

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Q. Classes of media based (5)

Defined and complex media • General purpose media • Enriched media • Selective media • Differential media

Q. Label Electron Microscope 5



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