Microbiology - Introduction

Very short answer questions

1. **Name the organism from which streptomycin is obtained. Who first time isolated?**
   Ans: The organism is *Streptomyces griseus*. It was first isolated by Waksman.

2. **Name the antibiotics obtained from Penicillumnotatum. Who first time discovered?**
   Ans: Penicillin. Alexander Flemming.
3. **In which food do you find Lactic acid Bacteria? Mention their useful application?**
   Ans: lactic acid bacteria are found in Curd. They convert the milk into curd. During the growth of these bacteria, they produce acids which coagulate and partially digest the milk proteins. These bacteria improve the nutritional quality increasing Vitamin B_{12}. They control disease causing bacteria in stomach.
4. **Write briefly about occurrence and distribution of Microorganisms?**
   Ans: Microbes are ubiquitous. They are found in all places such as soil, water, air, food, animals, pants, dead wood, clothes, leather, dead organic matter, nails, skin and a number of other habitats where ever nutrients and moisture are available. Some microbes can grow in extreme conditions. Microbes that tolerate extreme acidic conditions are called as acidophiles, alkaline conditions as alkalophiles, high temperatures as thermophiles, high salt concentrations as halophiles.
5. **Define Microbiology?**
   Ans: It is study of organisms that can be seen only under microscope such as bacteria, viruses, protozoans, most of the algae, fungi etc.

Short answer questions

1. **Explain the importance of Microbiology?**
   Ans:
   1. **Recycling of Materials**: Saprophytic microorganisms such as fungi and bacteria decompose the dead organic matter and play a key role in recycling of materials. They help in regulation of biogeochemical cycles.
   2. **Disease and Antibiotics**: Pathogenic microbes such as bacteria, viruses, protozoans nematodes cause diseases in plants, animals and man. Some microbes produce antibiotics which help in curing diseases caused by microbes. Penicillin is produced by Penicilliumnotatum. It was discovered by Alexander Flemming. Streptomyces grieseus produces Streptomycin. This antibiotic was discovered by Walksman.
   3. **Industry**: Industrial products such as Enzymes, Amino acids, Vitamins, Organic acids and Alcohols are commercially produced by using microbes.
   4. **Dairy Products**: Microbes play a role in the production of dairy products. A common example is formation of curd from milk. Microbes such as Lactobacillus and other commonly called Lactic Acid Bacteria grow in milk and convert it to curd. During the growth of these bacteria, they produce acids which coagulate and partially digest the milk proteins. These bacteria improve the nutritional quality increasing Vitamin B_{12}. They control disease causing bacteria in stomach.

5. **Sewage**: Microbes such as bacteria and fungi are used in sewage disposal.
6. **Extraction of Metals**: Microbes are used in extracting valuable metals like uranium from rocks. This usage of microbes in mining reduces the cost by more than 50%.
7. **Genetic Engineering**: Altering the genetic makeup of an organism is the most important development in Microbiology. This branch is called as Genetic engineering.
8. **Biological Control**: Microbes are used as biocontrol agents. It refers to usage of living organisms to control diseases of plants and plant pests. *Bacillus thuringiensis* used to eradicate insects pests that damage crops like cotton.
9. **Exomicrobiology**: Microbes are used for exploration of like in outer space and other planets.
10. **Biogas**:Methanogenic bacteria are used for biogas production which is used as fuel.

Important Questions

Very short answer questions

1. Name the organism from which streptomycin is obtained. Who first time isolated?
2. Name the antibiotics obtained from Penicillumnotatum. Who first time discovered?
3. In which food do you find Lactic acid Bacteria? Mention their useful application?

Short Answer Question

1. **Explain the importance of Microbiology?**

Bacteria

Very short answer questions

1. **What are Pleomorphic bacteria? Give an example?**
   Ans: Bacteria that change their shape based on the variations in environment and nutrient availability are called as Pleomorphic bacteria. Example is *Acetobacter*.

2. **What is Capsule of bacteria? Mention its functions.**
   Ans: It is thick and tough covering usually made of polysaccharide and present around the cell wall of some bacteria and a type of Glycocalyx. It helps in attaching the bacteria to other surfaces such as host and substrata and protects the bacterium from desiccation by storing huge amount of water.

3. **What is plasmid and what is its significance?**
   Ans: It is extrachromosomal double stranded DNA ring of bacteria which can either independent or integrated with main chromosome. It has genes for special metabolic pathways, fertility factor, antibiotic resistance, toxins production and pathogenicity.

4. **What is transformation? Who discovered it and in which organism?**
   Ans: It is abosorption of Naked DNA by a bacterium from its surroundings and its change into a new form. It was discovered in Streptococcus pneumoniae by Griffith.

5. **Who discovered bacteria for the first time? What is the name given to bacteria by him?**
   Ans: Leeuwenhoek. The name Animalcules was given by him.
6. Name the symbiotic bacterium present in legume plants and add a note on its significance.
   Ans: Rhizobium. It is present in the nodules of the roots of legume plant. It fixes atmospheric nitrogen into ammonia and gives it to the pant. In return it gets organic food from the root cortical cell. Root nodules improve soil fertility and there by enhance not only legume crop production but also subsequently raised crops.
7. **Define Plasmid? Mention the different types of plasmids?**

   Ans: It is extra chromosomal DNA ring present in bacterial cells. It has genes for sex factor, drug resistance, pathogenicity and special metabolic pathways. These are of various types such as F plasmids, R plasmids, Col plasmids etc.

8. **Which bacteria produce Gobar gas? How?**

   Ans: Methanogenic bacteria like *Methanococcus* and *Methanobacillus* produce Methane or Gobar gas by fermenting dung.

9. **Name any two human diseases caused by bacteria?**

   Ans: Tuberculosis, Diphtheria

10. **Write the scientific name of common human intestine bacterium. How is it used in biotechnology?**

    Ans: The name is *Escherichiacoli*. Its reconstructed plasmid is used as vector in Biotechnology. The cell is used as host organism to form genetically modified organism useful to mankind for the production of various useful products like Human Insulin known as HumulinWrite the scientific name of common human intestinal bacterium. How is it used in biotechnology?
11. **Define botulism. Name the bacterium responsible for botulism? June -2010, March – 2005**

    Ans: Botulism is a disease of humans caused due to consumption of food containing the toxin Botulin. The bacterium responsible for it is *Clostridium botulinum*.

12. **Name the huge bacterium that lives in brown surgeon fish. What is its shape?**
    Ans: Epulopsciumfishelsoni. Rod shape

13. **Name the largest bacterium found in ocean sediments off the coast of Namibia. What is its shape?**
    Ans: Thiomargaritanamibiensis. Coccus. It is a streptococcus.

14. **What is the shape of Beggiotoa? Based on nutrition to which type it belongs?**
    Ans: Beggiotoa is thread like or filamentous bacterium. It is chemoautotroph and sulphur bacterium.
15. **Write briefly on Gram stain?**
    Ans: Bacteria are stained with Gram stain. It is crystal violet. This dye stains the bacteria as violet. The bacteria are transferred to iodine solution and then to alcohol or acetone. Those bacteria which retain purple color are called as Gram +ve and that do not retain are called as Gram –ve.
16. **Define Glycocalyx? Into how many layers it is differentiated?**
    Ans: Glycocalyx is covering present outside the cell wall of bacteria. It is chemically made of polysaccharide or protein. It is differentiated into loose slime layer and compactly associated capsule.
17. **What is slime layer? Mention its functions?**
    Ans: it is loosely surrounding semisolid polysaccharide present outside the cell wall. It protects the cell from loss of water and nutrients. It also helps the bacterium in attaching to the substratum and host cells.
18. **What is fimbriae? What is its function?**
    Ans: Fimbriae are short, slender, straight, hollow appendages of bacteria commonly seen in Gram –ve bacteria. They help in attaching to the solid substrata of aquatic environment and host tissues.
19. **What is sex pilus? What is its function?**
    Ans: These are appendages similar to fimbriae. These are larger than pili and less in number and seen in F^+ strain. They help in conjugation by adhering to female bacterium and establishing conjugation canal.
20. **What is mesosome? Mention the functions that it performs?**
    Ans: Mesosomes are invaginations of plasma membrane commonly seen in Gram +ve bacteria. These are vesicle like. These help in septum formation, DNA replication, absorption of nutrients and binary fission.

21. **What are the reserve food materials in Bacteria?**

Ans: Glycogen or Poly β-hydroxy butyrate granules.

22. What are gas vacuoles? What is their function?
Ans: These are aggregates of small cylindrical vesicles seen in aquatic bacteria. These help in floating the bacteria on or near the surface of water.

23. Define nucleoid?
Ans: it is part of the protoplasm where the chromosome of bacteria is present. It is also known as incipient nucleus.

24. Name the bacterium that lives as a parasite on harmful bacteria. What is its significance?
Ans: Bdellovibriobacteriovorous. It is used to clean the river ganges.

25. What is conjugation? Who discovered it and in which organism?
Ans: Conjugation is a type of genetic recombination in which the genetic material is transferred from one bacterium to another bacterium upon contact of both donor and receipient bacteria through conjugation canal formed by sex pili. It was discovered by Lederberg and Tautum in E.coli.

26. What is transduction? Who discovered it and in which organism?
Ans: It is virus mediated gene transfer in bacteria. It was discovered by Zinder and Lederberg in Salmonella typhimurium.

27. Name the magnetotactic bacterium and write two sentences about it?
Ans: Aquaspirillummagnetotacticum. It orients itself in the earth's magnetic field. It is example for bacteria which respond to environmental factors other than chemicals.

28. Which organisms are called as scavengers of nature and why?
Ans: Saprophytes are called as scavengers of nature because they clean the environment by degrading dead bodies of plants and animals and excreta of organisms.

29. Define ammonifying bacteria and give an example?
Ans: Bacteria that release ammonia from nitrogenous organic substances such as amino acids, proteins and nucleic acids are called as ammonifying bacteria. Ex: Bacillus ramosus, B. mycoides

30. Define denitrification. Give one example for denitrifying bacteria?
Ans: It is liberation of molecular nitrogen from nitrates and nitrites by bacteria. Ex: Micrococcus denitrificans, Thiobacillusdenitrificans.

31. Define nitrifying bacteria and give two examples?
Ans: Bacteria that covert ammonia into nitries and nitrates are called as nitrifying bacteria. Ex: Nitrosomonas, Nitrobacter.

32. Mention any two antibiotics obtained from Stroptomyces species?
Ans: Streptomycin, Neomycin

33. Name any two plant diseases caused by Xanthomonas?
Ans: Citrus canker, Bacterial blight of Paddy.

34. Name any two human diseases caused by Mycobacterium?

Ans: Leprosy, Tuberculosis.

Short Answer Questions

1. **How are bacteria classified on the basis of number and distribution of flagella?**

   Ans: Bacteria are classified as

   1. Atrichous with out flagella as in Cocci,

   2. Monotrichous with a single flagellum at one pole

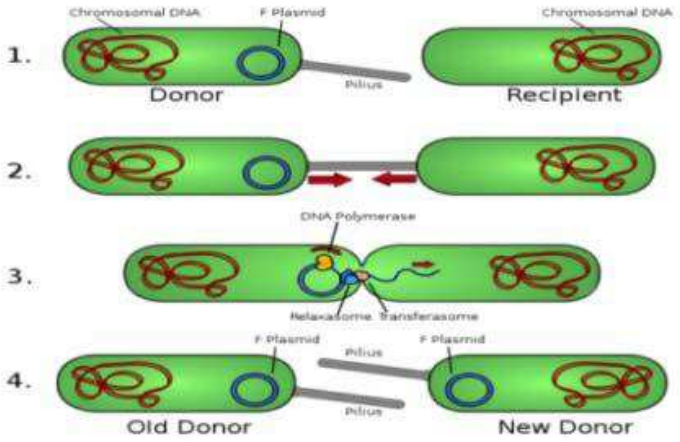
   3. Lpphotrichous with a tuft of flagella at one end,

   4. Amphitrichous with either one of group of flagella at both poles and

   5. Peritrichous with flagella all over the body.

2. **Explain conjugation in Bacteria?**

   Ans: Conjugation is transfer of genetic material from one bacterium to another through cell to cell contact. It was discovered by Lederberg and Tatum in *E.coli*. The bacterium has F^+ or male and F^- or Female strains. The male has F plasmid and Sex pili and the female not. The male attaches to Female with the help of sex pili and establishes conjugation canal. The F plasmid of male replicates and one of the daughter plasmids enters into F^- strain and F^- becomes F^+ strain or male. Sometimes a nick is formed in the F plasmid and one of the strands enters into the female and both single stranded plasmids form another strand on it by replication. It also results the male to maintain its identity and the female becomes male.



3. **Explain the industrial applications of bacteria?**

   Ans: 1. Rettin of Fibres: *Clostridium felsinium* is used for Flax and *Clostridium butyricum* for Sun-hemp.

2. Some bacteria are used in tanning the leather.

3. *Bacillus megatherium* is used to cure tobacco leaves and *Micrococcus* to cure tea leaves.

4. *Lactobacillus* is used in fermentation process of Dairy products

5. Methanococcus, Methanobacillus are used in Biogas production.

6. *Clostridiumacetobutylicum* is used in Aceton and Butonol production.

7. *Acetobacteraceti* and *A*. *pasteurianum* in Vinegar production.

8. *Lactobacillusdelbruckii* in Lactic acid production.

9. *Propionibacteriumpropionum* in Propionic acid production

10. *Zymomonasmobilis* and *Thermoanaerobacterethanolicus* in Ethanol production.

4. **How bacteria are important in Agriculture? March – 2010**

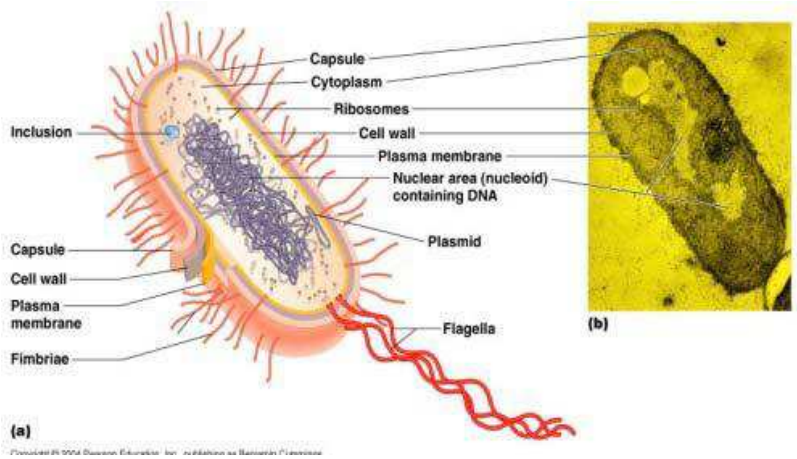
Ans: In the following ways bacteria are useful in Agriculture.

1. **Ammonifying bacteria** such as *Bacillus ramosus*liberate ammonia from proteins and amino acids of dead bodies of plant and animals and improve soil fertility.
2. **Nitrifying bact**eria such as *Nitrosomonas* and *Nitrobacter* convert the ammonia into Nitrates by nitrification.
3. **Symbiotic bacteria** like Rhizobium of legume root nodules and non-symbiotic bacteria like *Azotobacter*, *Clostridium*, *Rhodospirillum*, *Chlorobacterium* fix the atmospheric nitrogen by nitrogen fixation to increase soil fertility.
4. Bacteria like *Bacillus thuringiensis* known as **biopesticides** are used as biological control against insect pests.
5.

6. **Explain the structures present external to cell wall of bacterial cell. ?March – 2009**

Ans: The structures of bacteria present external to cell wall are Glycocalyx, Flagella, Pili and Sex pili.

Glycocalyx: It is a layer made of polysaccharides or proteins present outside the cell wall. It is compact, tough and thick it is called as Capsule. It helps in protecting the bacterial cell from desiccation. Slime layer is loose sheath like structure present outside the cell wall. It prevents the loss of nutrients and water from the bacterial cell. Both capsule and slime layer help in adhering to the surface of host or substrata.
Flagella: These are elongated structures that help in locomotion by showing rotation and arise from basal granule. They do not show 9+2 structure. They are made of flagellin protein. They consist of 3 coiled filaments. These are absent in Cocci. Based on their distribution they are described as Monotrichous with one flagellum, Amphitrichous with flagella at both ends, Lophotrichous with flagella as a tuft at one end and Peritrichous with flagella all over the cell.



Pili: these are relatively short, straight, rigid structures that come out of the cell in many Gram-ve bacteria. They are 1000 per cell. They are made of Pilin. They help in adhering the cell to other surfaces. Gram+ve bacterium Corynebacteriumrenale also has Pili.

Sex Pili: these are also appendages similar to Pili but longer than pili and usually 1-10 in number and associated with only donor bacteria. They help in adhering to the recipient bacterium and transferring the genetic material during conjugation by forming conjugation canal.

7. **Write briefly about chemoautotrophs?**

Ans: Organism that use carbon dioxide as carbon source and energy source is oxidation of inorganic substances is called as chemoautotrophs. The various chemoautotrophs are

1. **Hydrogen bacteria**: These oxidise hydrogen in the presence of oxygen. Ex: Hydrogenomonas.
2. **Sulphur bacteria**: these oxidise either hydrogen sulphide Ex: Beggiotoa or oxidise the sulphur to sulphuric acid. Ex: Thiobacillusthio-oxidans.
3. **Iron bacteria**: These oxidise ferrous iron to ferric iron. Ex: Thiobacillusferro-oxidans.
4. **Nitrifying bacteria**: These oxidise ammonia to nitrites and nitrates. Ex: Notrosomonas that forms nitrite from ammonia and Nitrobacter that converts Nitrite to nitrate.

8. **Explain the nutrition in bacteria based on source of energy and carbon?**

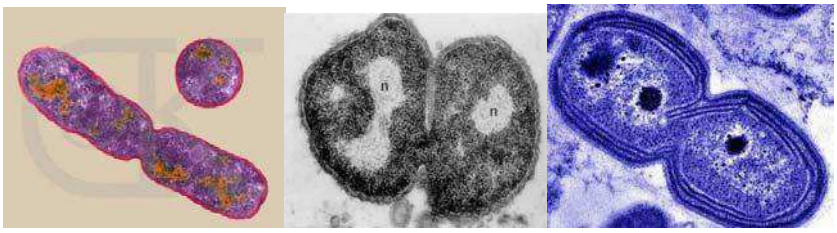
Ans: Bacterial nutrition is classified into four types based on energy and carbon source. They are

1. **Chemoautotrophs:** These use carbon dioxide as carbon source and energy source is oxidation of chemical substances. Ex: Beggiotoa, Hydrogenomonas.
2. **Photoautotrophs**: These have photosynthetic pigments and use light energy and carbon source is carbon dioxide. Ex: Chlorobium, Chromatium
3. **Photoheterotrophs:** Energy source is light bur carbon source is organic compound. Ex: Rhodospirillum, Rhodopseudomonas.

4. **Chemoheterotrophs**: These bacteria use organic compounds as energy and carbon source. Ex: Saprophytes like Bacillus species and Parasites such as Xanthomonas, Vibrio

9. Write shortnotes on most common method of reproduction in bacteria?

Ans: The most common method of reproduction in bacteria is Binary fission. It takes place during favourable conditions. During this, the bacterial cell enlarges in size and its nucleoid or DNA is replicated and forms two daughter nucleoids. Later a constriction is formed on Plasma membrane at mesosomal area which is advanced towards the centre to divide the cytoplasm into two units. Simultaneously a furrow is formed on cell wall which is advanced centripetally toe form two daughter cells which may be equal or inequal in size. In cocci, the bacterial cell may divide in any plane. In bacilli it may be vertical or transverse. A bacterial cell usually divides once in every 19-20 minutes.



10. Write about harmful activities of bacteria?

Ans: 1. Spoilage of food: Bacteria like Clostridium botulinum damage the food stuffs and release potential toxin such as botulin which is responsible for causing the disease Botulism.

2. Diseases: Bacteria cause diseases in plants, animals and human beings.

Plant diseases: 1. Bacterial blight of Paddy – Xanthomonasoryzae

2. Angular leafspot of cotton – Xanthomonasmalvacearum

Animal diseases: 1. Anthrax in cattle – Bacillus anthracis

2. Tuberculosis in animals – Mycobacterium tuberculosis.

Human diseases: 1. Plague – Pasteurellapestis

2. Pneumonia – Diplococcuspneumoniae

11. How are bacteria classified on the basis of their shape? March-2007

Ans: Based on shape, bacteria are classified into the following types.

1. **Cocci:** These are spherical bacteria. The single spherical cell is called as Monococcus, two bacterial cells as Diplococcus, a group of four spherical cells as Tetracoccus, a chain of spherical cells as Streptococcus, spherical cells arranged like bunch of grapes as Staphylococcus and spherical cells arranged in cubes of eight as Sarcina.
2. **Bacilli:** These are rod shaped bacteria. A single rod cell is called as Monobacillus, two spherical cells as Diplobacillus, and chain of rod cells as Streptobacillus.
3. **Vibrios:** These are comma shaped bacteria.
4. **Spirillae**: These are spiral shaped bacteria. Flexible spirillae are called as Spirochaetes (*Spirochaeta, Cristispira*).

5. **Pleomorphic:** These occur as small rods, long rods, ellipsoids or chains of small rods based on nutritional conditions and environment. Ex: *Acetobacter*.

6. *Beggiotoa* is thread like bacterium

VIRUSES

Very short Answer questions

1. **Mention any two living and two non-living characters of Viruses?**
   Ans: **Living characters**: 1. It has Nucleic acid and protein 2. it can undergo mutation and show reprocuciton. Non- living characters: 1. It has no protoplasm 2. No response to external stimuli

2. **Define Peplos and Peplomers. Given an example.**
   Ans:Peplos is the covering present outside the capsid and made of Lipids, Proteins and Carbohydrates. Its units are called as Peplomers. It is common in vertebrate viruses like Influenza virus.

3. **Define prophage?**
   Ans: The DNA of Bateriophage in integrated state in the chromosome of Bacteria during lysogenic cycle is called as Propphage.

4. **Name any fungus and Nematode that transmit plant viruses?**
   Ans: The fungus is Olpidiumbrassicae and nematode is Xephenema.

5. **Name any two plant viruses with DNA?.**
   Ans: The two viruses are Dahlia Mosaic Virus and Cauliflower Mosaic Virus

6. **What is a temperate phage? What is the name of its replication process? March-2005**
   Ans: The bacteriophages whose DNA is integrated into bacterial DNA during its replication are called as temperate phages. The replication process of these viruses is called as lysogenic cycle.

7. **What are zymophages and Cyanophages?**
   Ans: Viruses parasitic on yeasts are called as zymophages. Viruses parasitic on blue green algae are called as Cyanophages.

8. **What is a virion? Mention the smallest and the largest virion.?**
   Ans: Particle of virus is called as virion. The smallest virus is coliphage f_2 and the largest is Vaccinia virus.

9. **What are nucleoprotein particles? What is the genetic material in them?**
   Ans: Viruses are nucleoprotein particles. The genetic material in them is DNA or RNA.

10. **Define capsomers.**
    Ans: Capsomers are units of capsid which are chemically proteins.

11. **Differentiate between capsomers and peplomers.**
    Ans: Capsomers are units of capsid and are chemically proteins whereas peplomers are units of peplos and chemically made of lipids, carbohydrates and proteins.

12. **Name any two animal viruses which have RNA as genetic material.**

Ans: Polio virus, Influenza virus.

13. Name the viruses having single stranded DNA.
Ans: ΦX174, M12

14. Name the viruses having double stranded RNA.
Ans: Reo virus, wound tumour virus, Rice dwarf virus.

15. Give the examples for viruses which have helical symmetry and cubic symmetry.
Ans: Tobacco mosaic virus has helical symmetry, Adenovirus has cubical symmetry.

16. What is binal symmetry? Give an example.
Ans: Symmetry with both helical and cubical nature is called as binal symmetry. Ex: Bacteriophage.

17. Name the diseases caused by viroids and prions.
Ans: Citriusexocortosis and Potato spindle tuber diseases are caused by viroids where as Mad cow and scarpie diseases are caused by prions.

18. What is the shape of TMV? What is the genetic material?
Ans: Rod shape. Single stranded RNA.

19. What is the shape of T_4 bacteriophage? What is its genetic material?
Ans: Tad pole shape. Genetic material is double stranded DNA.

20. Define virulent phages. Give an example.
Ans: Viruses which promote the breakdown of host genetic material and lysis of host cell during their replication are called as virulent phages. Ex: Bacteriophage T_4

21. What is Ghost?
Ans: The empty protein coat or capsid left outside the host cell by virus during the replication of bacteriophages is called as ghost.

22. Give a brief account of latent period.
Ans: The period from the entry of viral DNA into bacterial cell to the formation of viral particles is called as latent period. At the beginning of this stage, presence of viral particles cannot be noticed in the host and that period is called as eclipse period. During the later period the virus particles are formed.

23. What is lysozyme? What is its function?
Ans: Lysozyme is a hydrolytic enzyme present at the base of viral tail. It helps in dissolving the bacterial cell wall by breaking the glycosidic bonds between NAG and NAM of cell wall.

24. Define Lysis and burst size.?
Ans: Physiological breakdown of bacterial cell wall during bacteriophage reproduction is called as Lysis. Number of viral particles required for the lysis of bacterial cell wall is called as Burst size.

25. Define temperate phages. Give an example.?

Ans: Bacteriophages that do not promote immediate breakdown of bacterial DNA and cell wall but integrate their DNA with bacterial DNA which is carried to successive generations of bacteria are called as temperate phages. Ex: λ phage.

26. Mention the differences between virulent phages and temperate phages.?

Ans:

Virulent Phages	Temperate phages
1. Do not integrate their DNA with bacterial DNA	1. Integrate their DNA with bacterial DNA
2. Promote the lysis of bacterial cell	2. Do not promote the lysis of bacterial cell

27. Differentiate between vein clearing and vein banding.?

Ans: In vein clearing the chlorophyll of host leaf present along the veins is degraded in vein banding except along the vein, in the remaining regions it is degraded.

28. Define vectors. Mention any plant disease that transmits through vectors.?

Ans: Any living agent that carries the virus or disease inoculum from infected plant to healthy plant is called as Vector. Potato leaf roll, Papaya mosaic and Rice tungro are transmitted through insect vectors.

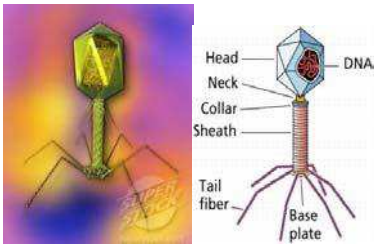
29. What is prion? How does it differ from a viroid?

Ans: Infectious protein particles are called as prions. It differs from viroids in lacking nucleic acid.

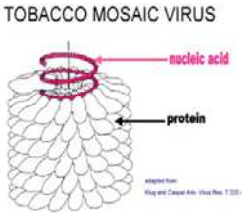
Short Answer questions

1. **Explain the structure of T even bacteriophage. ?June – 2010, March – 2010**

   Ans: Viruses that attack the bacteria are called as Bacteriophages. These were first discovered by Twort and named by Herelle. T even phages resemble tadpole with a head and tail. The head is 65X95nm and hexagonal in cross section. It is capped by a hexagonal pyramid. Head has highly folded double stranded DNA which is 1000 times longer than the phage. The tail has several parts present around the core. The tail core is 95X8nm. It is extended from the base of the head to tail plate. The tail core is surrounded by a contractile sheath with 144 subunits arranged helically in 24 helices. A collar is present between the head and tail which has unknown function. The tail is sealed by a hexagonal end plate. It has 6 jointed tail fibers and tail pins at its corners on the outer side. The tail fibers help in attaching to the bacterium at the time of infection.



2. **Explain the structure of TMV. Draw labeled diagram. May-2009**



Ans: The structure of Tobacco Mosaic Virus is known due to Electron Microscopic, X-ray crystallographic and Biochemical studies. It was crystallized be Stanley and the detailed structure was given by Franklin et.al. It is a rod shaped plant virus with helical symmetry, 300 X 18-19nm size and has 39 X 10^6daltons molecular weight. It has capsid with 2130 capsomers arranged helically and each capsomer has 158 amino acids. It has central core with 4nm diameter. Over the capsomers, towards the interior, a single stranded RNA is helically arranged. It has 6,500 nucleotides.

3. **How are Viruses classified on the basis of host? March-2009**
   Ans: Viruses are classified into the following types based on the host.
   1. Phytophages. These Viruses are parasitic on Plants.
   2. Zoophages: These viruses attack the animal cells.
   3. Bacteriophages: These viruses are parasitic on bacteria.
   4. Mycophages: These viruses are parasitic on Fungi.
   5. Zymophages: These viruses infect the yeast cells.
   6. Cyanophages: These viruses are parasitic on Blue green algae.
4. **Explain the differences between the Lytic cycle and Lysogenic cycle. ? March-2006**
   Ans:

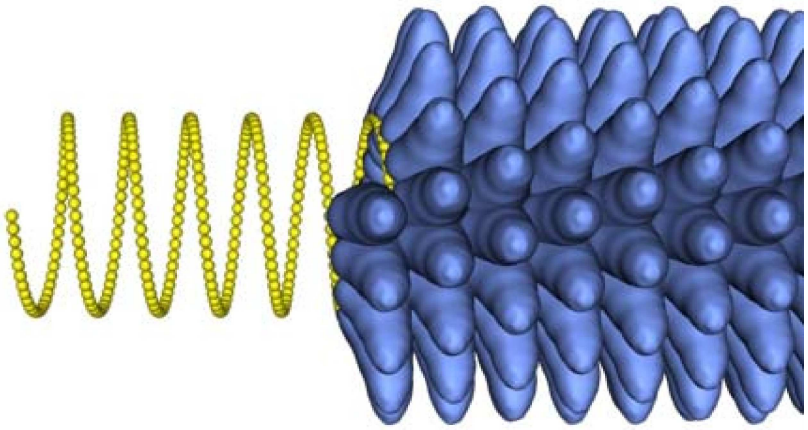
Lytic Cycle	Lysogenic cycle
1. Bacterial cell undergoes lysis at the end of this cycle.	1. No immediate lysis of bacterial cell.
2. Viral DNA promotes the degradation of bacterial DNA.	2. Bacterial DNA is not destroyed.
3. Prophages are not formed and the host bacterium is not allowed to survive	3. Prophages persist in close association with bacterial DNA for several generations of bacterial cells.
4. These viruses are called as Virulent Phages. Ex: T – even phages	5. These are called as Temperate phages Ex: Coliphage - λ

5. **Enumerate the morphological variations of viruses.**
   Ans:

Shape of Virus	Example
1. Rod shape	Tobacco Mosaic Virus
2. Rectangular	Vaccinia virus
3. Polyhedral	Adeno virus
4. Spheroidal	Polio virus
5. Tadpole shaped	Bacteriophages
6. Bullet shaped	Rhabdo virus

6. **Write briefly about the symmetry of Viruses.?**
   Ans: Viral symmetry is dependent on the arrangement of capsomers of capsid. The basic symmetry is helical and cubical

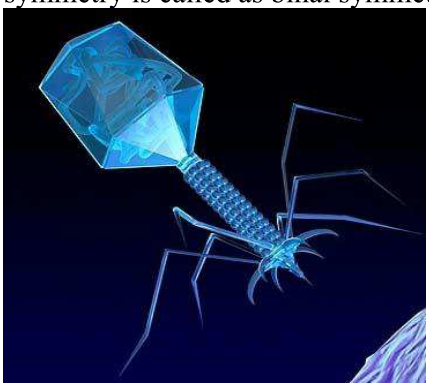
1. Helical symmetry: In this type the capsomers are arranged like helical staircase around the nucleic acid.
Ex: Tobacco mosaic virus



2. Cubical symmetry: In this type, the capsid is polyhedral in shape and the capsomers are arranged in icasohedron symmetry. In icasohedron symmetry, each face is an equilateral triangle and it shows 20 faces. Ex: Adenovirus



T even bacteriophages exhibit a combination of helical and cubic symmetry. Such symmetry is called as binal symmetry.



7. **Give a brief account of any four symptoms of leaves in virus infected plants.?**
Ans:
1. Chlorosis: It is whitening or yellowing of the entire leaf due to the loss of chlorophyll.
Ex: Peach yellowing



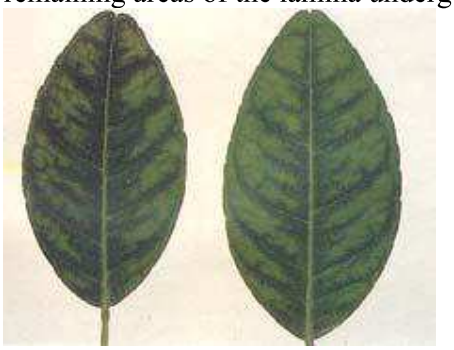
2. Mosaic: it is the colour change that occurs in isolated patches in the green lamina. Ex: Tobacco mosaic disease.



3. Vein clearing: it is a symptom where the tissues close to the veins turn yellow, while the remaining areas remain green. Ex: Bhendi vein clearing.



4. Vein banding: It is a condition where the tissues close to the vein remain green and the remaining areas of the lamina undergo chlorosis. Ex: Citrus vein banding



8. **Explain the chemical structure of virus.**
   Ans: Chemically viruses are nucleoprotein particles. Their protein coat is called as Capsid. It is made of units called as capsomers. Some viruses have additional covering made of lipids, carbohydrates and proteins called as Peplos. Its units are called as peplomers. Nucleic acid is enclosed by capsid. It may be DNA or RNA. DNA is usually double stranded and seen in most of the bacteriophages and Animal viuruses. Some plant

viruses such as Dahlia mosaic virus and Cauliflower mosaic virus also have DNA. Single stranded DNA is seen in bacteriophages like M 12 and Φ X 174. Similarly RNA is usually present in plant viruses. It is usually single stranded. It is double standed in Reo virus, wound tumour virus, Rice dwarf virus etc. Animal viruses with RNA are Polio virus and influenza virus.

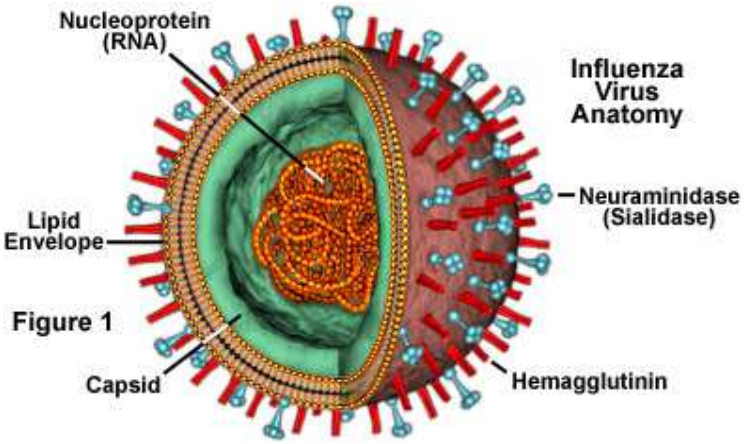


Figure 1