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I pray the almighty to bless the students for consummate success in their examinations.

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UNIT-I

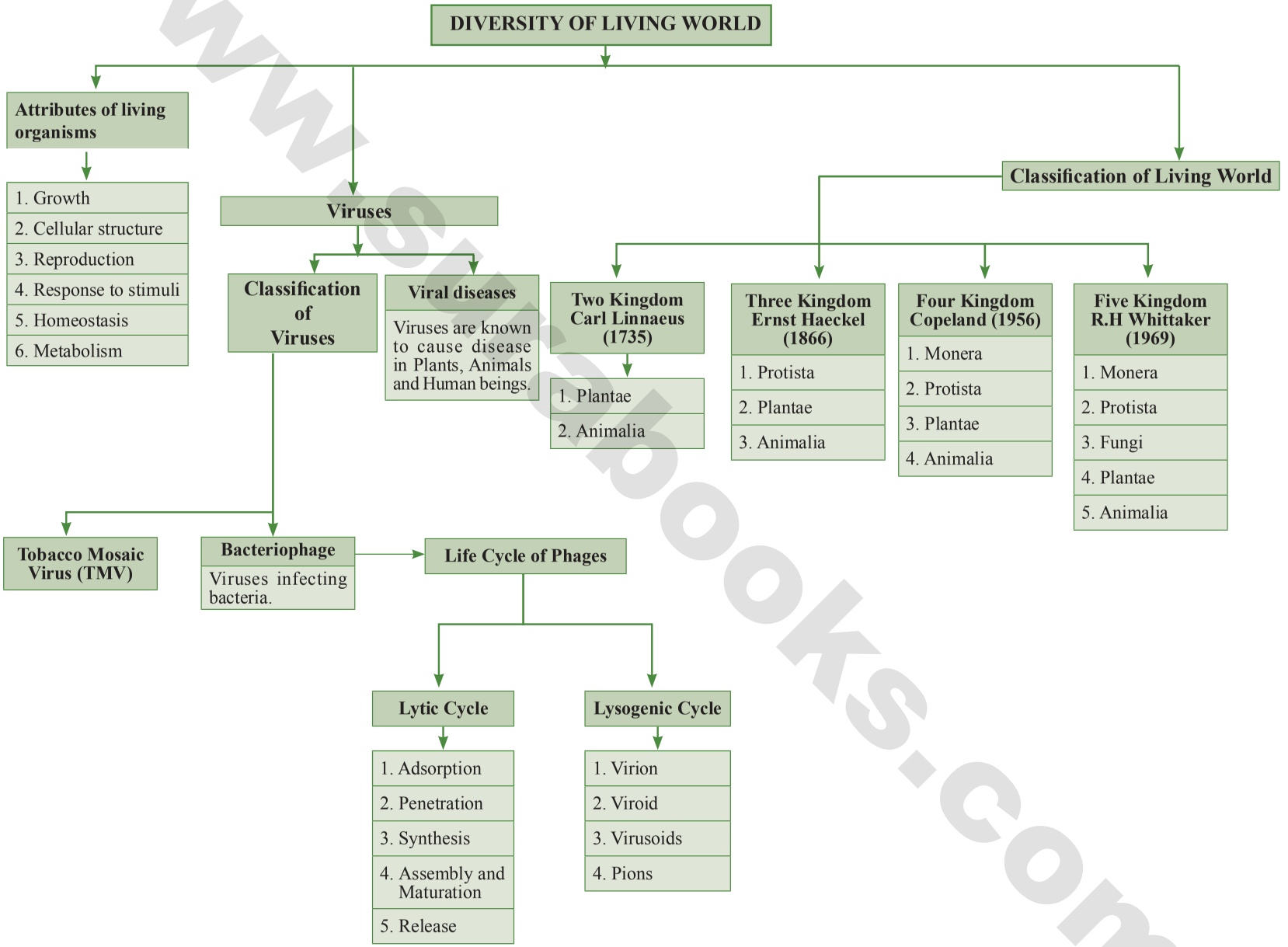
DIVERSITY OF LIVING WORLD

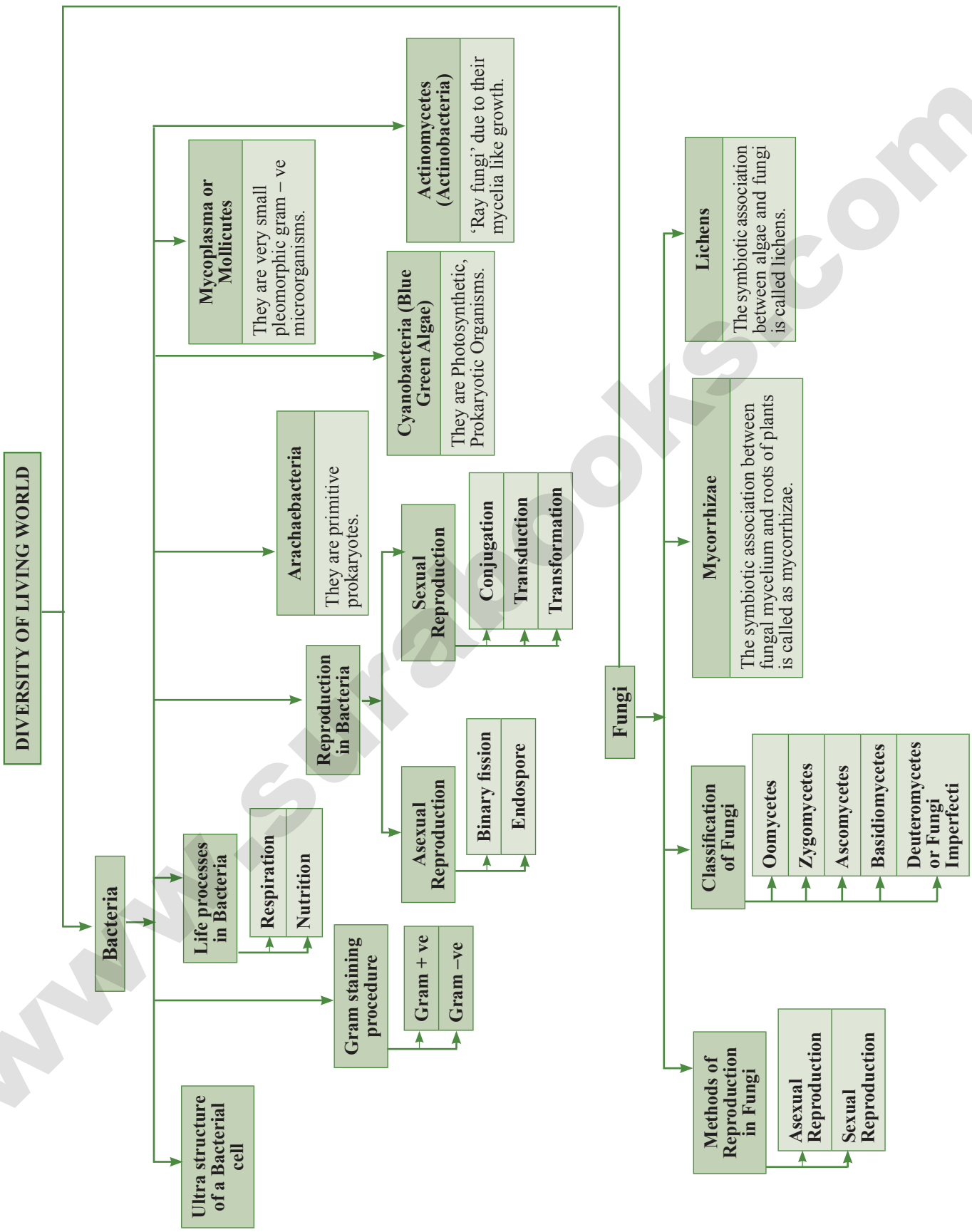
Chapter 1

LIVING WORLD

CHAPTER SNAPSHOT

CONCEPT MAP





MUST KNOW DEFINITIONS

Biosphere	:	Life on earth exists within a complex structure called **Biosphere.**
Growth	:	Growth is an intrinsic property of all living organisms through which they can increase cells both in number and mass.
Response to stimuli	:	All organisms are capable of sensing their environment and respond to various physical, chemical and biological stimuli.
Consciousness	:	Animals sense their surroundings by sense organs. This is called **Consciousness.**
Homeostasis	:	Property of self-regulation and tendency to maintain steady state within an external environment which is liable to change is called **Homeostasis.**
Metabolism	:	The sum total of all the chemical reactions taking place in a cell of living organism is called **metabolism.**
Cyclosis	:	The movement of cytoplasm is called **Cytoplasmic streaming** or **Cyclosis.**
Virology	:	The study of viruses is called **Virology.**
Viral genome	:	Each virus possess only one type of nucleic acid either DNA or RNA.
Deoxyviruses and Ribo Viruses	:	The virus possessing DNA are called **"Deoxyviruses"** whereas those possessing RNA are called **"Riboviruses"**.
TMV	:	**T**abacco **M**osaic **V**irus.
Bacteriophage	:	Viruses infecting bacteria are called Bacteriophages.
Prophage	:	The integrated phage DNA is called **Prophage.**
Virion	:	**Virion** is an intact infective virus particle which is non- replicating outside a host cell.
Viroid	:	**Viroid** is a circular molecule of ssRNA without a capsid.
Virusoids	:	They are the small circular RNAs which are similar to viroids.
Prions	:	They are the causative agents for about a dozen fatal degenerative disorders of the central nervous system of humans and other animals.
Cyanophages	:	Viruses infecting blue green algae are called **Cyanophages.**
Mycoviruses (or) Mycophages	:	The viruses attacking fungi are called **Mycoviruses** or **Mycophages.**
Nucleoid (or) Genophore	:	The genetic material is called **Nucleoid** or **Genophore** or **Incipient nucleus.**
Capnophilic Bacteria	:	Bacteria which require CO_2 for their growth are called as **Capnophillic Bacteria.**
Autotrophic Bacteria	:	Bacteria which can synthesis their own food are called **Autotrophic Bacteria.**
Transformation	:	Transfer of DNA from one bacterium to another is called **Transformation.**
Transduction	:	Phage mediated DNA transfer is called **Transduction.**
Generalized Transduction	:	The ability of a bacteriophage to carry genetic material of any region of bacterial DNA is called **Generalized transduction.**

Specialized (or) Restricted Transduction	:	The ability of the bacteriophage to carry only a specific region of the bacterial DNA is called **Specialised** or **Restricted transduction.**
Archaebacteria	:	They are primitive prokaryotes. They are mostly **Chemoautotrophs.**
Cyanobacteria	:	They are popularly called as **"Blue green algae"** (Cyanophyceae).
Mycoplasma or Mollicutes	:	They are very small, pleomorphic gram negative microorganisms.
Actinomycetes	:	Actinomycetes are also called 'Ray fungi' due to their mycelia like growth.
Mycology	:	The study of fungi is called **Mycology.**
Deuteromycetes or Fungi Imperfecti	:	The fungi belonging to this group lack sexual reproduction and are called **Imperfect fungi.**
Mycorrhizae	:	The symbiotic association between fungal mycelium and roots of plants is called as **mycorrhizae.**
Lichens	:	The symbiotic association between algae and fungi is called **Lichens.**
Phycobiont and Mycobiont	:	The algal partner is called **Phycobiont** or **Photobiont** and the fungal partner is called **Mycobiont.**
Ascolichen	:	The fungal partner of lichen belongs to ascomycetes, it is called **Ascolichen.**
Basidiolichen	:	The fungal partner of lichen belongs to basidiomycetes it is called **Basidiolichen.**

Evaluation

1. Which one of the following statement about virus is correct? *[Sep-2020]*

(a) Possess their own metabolic system.

(b) They are facultative parasites

(c) They contain DNA or RNA

(d) Enzymes are present

[Ans. (c) They contain DNA or RNA]

2. Identify the incorrect statement about the Gram positive bacteria *[Sep-2020; Aug-'22; QY-'23]*

(a) Teichoic acid absent

(b) High percentage of peptidoglycan is found in cell wall

(c) Cell wall is single layered

(d) Lipopolysaccharide is present in cell wall

[Both (a) and (d) are the incorrect statements]

3. Identify the Archaebacterium

(a) *Acetobacter* *[May-'22; Mar; QY & HY-'23; July-'24]*

(b) *Erwinia*

(c) *Treponema*

(d) *Methanobacterium*

[Ans. (d) *Methanobacterium*]

4. The correct statement regarding Blue green algae is _____. *[Mar-2020; CRT-'22; QY-'24]*

(a) lack of motile structures

(b) presence of cellulose in cell wall

(c) absence of mucilage around the thallus

(d) presence of floridean starch

[Ans. (a) lack of motile structures]

5. Identify the correctly matched pair *[Mar & July-'23]*

(a)	Actinomycete	-	(a) Late blight
(b)	Mycoplasma	-	(b) Lumpy jaw
(c)	Bacteria	-	(c) Crown gall
(d)	Fungi	-	(d) Sandal spike

[Ans. (c) Bacteria-Crown gall]

6. Differentiate homoiomerous and heteromerous lichens. *[HY-2018 & '23; Sep-2021; July-'23 & '24; HY-'23]*

Ans.

Homoiomerous Lichens	Heteromerous Lichens
Algal cells are evenly distributed in the thallus.	A distinct layer of algae and fungi present in the thallus.

7. Write the distinguishing features of monera.

[Mar-2020; July-'23 & '24;QY-'23& '24]

Ans.

1. They are prokaryotic organisms.
2. Cell wall is present and made of peptidoglycan and mucopeptides.
3. They are mostly unicellular. Eg : Cyanobacteria, Mycoplasma.

8. Why do farmers plant leguminous crops in crop rotations/mixed cropping? *[HY-'23;;QY-'24]*

Ans.

1. The bacteria *rhizobium* forms root nodules in the leguminous crops only and lives in symbiotic association with the plant.
2. They help to convert atmospheric nitrogen to nitrate salts in the soil thereby adding fertility to the soil.
3. Hence growing leguminous crops in crop rotations/ mixed cropping helps to maintain fertility of the soil.

9. Briefly discuss on five kingdom classification. Add a note on merits and demerits. *[Sep-2020; CRT-'22; Mar & QY-'23]*

Ans. R.H.Whittaker proposed five kingdom classification in the year 1969. *[July-'24]*

Kingdoms :

	Cell type	Level of organization	Cell wall	Nutrition	Motility	Organisms
Monera	Prokaryotic	Mostly unicellular rarely multicellular	Present (made up of Peptidoglycan and Mucopeptides)	Autotrophic (Phototrophic, Chemoautotrophic) Heterotrophic (parasitic and saprophytic)	Motile or non-motile	Archaebacteria, Eubacteria, Cyanobacteria, Actinomycetes and Mycoplasma
Protista	Eukaryotic	Unicellular	Present in some (made up of cellulose), absent in others	Autotrophic - Photosynthetic. Heterotrophic	Motile or non-motile	Chrysophytes, Dinoflagellates, Euglenoids, Slime molds, *Amoeba*, Plasmodium, Trypanosoma, Paramecium
Fungi	Eukaryotic	Multicellular and unicellular	Present (made up of chitin or cellulose)	Heterotrophic - parasitic or Saprophytic	Non-motile	Yeast, Mushrooms and Molds
Plantae	Eukaryotic	Tissue/organ	Present (made up of cellulose)	Autotrophic (Photosynthetic)	Mostly Non-motile	Algae, Bryophytes, Pteridophytes, Gymnospherms and Angiosperms
Animalia	Eukaryotic	Tissue/organ/ organ system	absent	Heterotrophic (Holozoic)	Mostly motile	Sponges, Invertebrates and Vertebrates

Merits :

1. The classification is based on the complexity of cell structure and organization of thallus.
2. Based on the mode of nutrition.
3. Separation of fungi from plants.
4. It shows the phylogeny of the organisms.

Demerits :

1. The Kingdom Monera and protista accommodate both autotrophic and heterotrophic organisms, cell wall lacking and cell wall bearing organisms thus making these two groups more heterogeneous.
2. Viruses were not included in the system.

10. Give a general account on lichens. *[Mar-2020 & '24; QY-'24]*

Ans. 1. The symbiotic association between algae and fungi is called **lichens.**

2. The algal partner is called **phycobiont**, and the fungal partner is called **mycobiont.**

3. Algae provide nutrition for fungal partner and fix the thallus to the substratum through **rhizinae**. Asexual reproduction takes place through fragmentation, Soredia and Isidia. Phycobionts reproduce by akinetes, aplanospore etc., Mycobionts produce **ascocarps** during sexual reproduction.

Classification :

1. **Based on the habitat** :
   - **(i)** Corticolous (on Bark)
   - **(ii)** Lignicolous (on Wood)
   - **(iii)** Saxicolous (on Rocks)
   - **(iv)** Terricolous (on Ground)
   - **(v)** Marine(on siliceous rocks of sea)
   - **(vi)** Fresh water(on siliceous rock of fresh water).
2. **Based on morphology :**
   - **(i)** Leprose (a distinct fungal layer is absent)
   - **(ii)** Crustose - Crust like
   - **(iii)** Foliose - Leaf like
   - **(iv)** Fruticose - Branched pendulous shrub like

3. **Based on algal cells distribution :**
   - (i) Homoiomerous - Algal cells evenly distributed in the thallus.
   - (ii) Heteromerous - Distinct layer of algae and fungi present.
4. **Based on fungal partner:**
   - (i) Ascolichen - Fungal partner is a ascomycete.
   - (ii) Basidiolichen - Fungal partner is a basidiomycetes

Economic importance :

1. Lichens secrete organic acids like **Oxalic acids** which corrodes the rock surface and helps in weathering of rocks, thus acting as pioneers in Xerosere.
2. Sensitive to air pollutants (sulphur-di oxide) and considered as pollution indicators.
3. **Usnic acid** produced from lichens show antibiotic properties.
4. Dye present in litmus paper (acid base indicator in labs) is got from *Roccella montagnei*.
5. *Cladonia rangiferina* (Reindeer mose) is used as food for animals living in Tundra regions.

Botany Long Version Questions (for pure science Group)

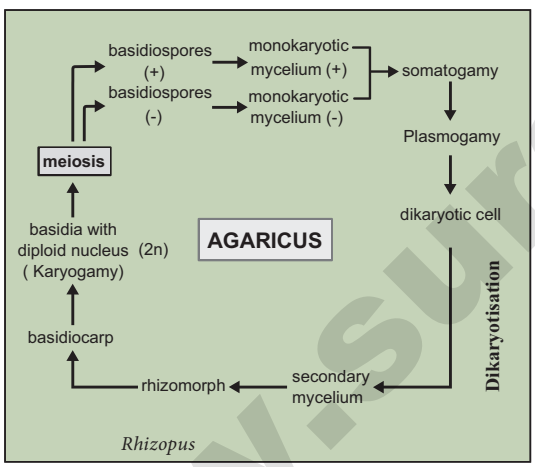
Long Version Evaluation

Q.No. 1 to 10 Refer Evaluation.

11. Write the outline of the life cycle of *Agaricus*.

[May-'22; July-'23 & '24; HY-'23]

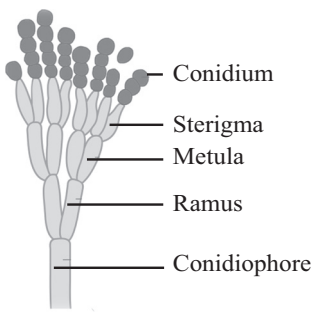
Ans.



Life Cycle of *Agaricus*

12. What is Sterigma?

Ans. Sterigmata is a small stalk that bears a conidia.



Conidia formation - *Penicillium*

13. Name the types of mycelium found in *Agaricus*.

Ans. The thallus is made up of branched structures called **hyphae**. A large number of hyphae constitute the mycelium.

Types of mycelium:

1. **Primary mycelium:** The primary mycelium develops from the germination of basidiospore. It is septate, uninucleate and haploid. It is also called **monokaryotic mycelium.**
2. **Secondary mycelium:** Fusion of two primary mycelium of opposite strains give rise to secondary mycelium or **dikaryotic mycelium**. The dikaryotic mycelium develops into hyphal cords called **Rhizomorphs**, and perennates the soil for a long period.
3. **Tertiary mycelium:** The tertiary mycelium is found in the fruit body called **basidiocarp**. Each cell of the hyphae posssess a cell wall made up of chitin and cell organelles like mitochondria, golgibodies, endoplasmic reticulum etc., are also present.

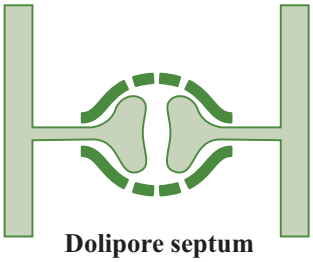
14. Differentiate oidium and Chlamydospore.

Ans. *[July-'23]*

No.	Oidium	Chlamydospore
1.	The hypha divided and developed into spores are called **oidia** or **oidium**.	Thick walled resting spores are called **chlamydospores**.
2.	Produced by asexual reproduction Eg: *Erysiphe*	Produced by asexual reproduction Eg: *Fusarium*

15. Name the fungal group which possess dolipore septum.

Ans. *Basidiomycetes* is the fungal which possess dolipore septum.



Dolipore septum

16. Mention the diseases caused by fungi in plants.

Ans.

No.	Name of the disease	Causal organism
1.	Blast of Paddy	*Magnaporthe grisea*
2.	Red rot of sugarcane	*Colletotrichum falcatum*
3.	Anthracnose of Beans	*Colletotrichum lindemuthianum*
4.	White rust of crucifers	*Albugo candida*
5.	Peach leaf curl	*Taphrina deformans*
6.	Rust of wheat	*Puccinia graminis tritici*

17. Give two examples for mycorrhizae forming fungi.

Ans. 1. *Pisolithus tinctorius*
2. *Oidiodendron*
3. *Gigaspora*

18. Differentiate Gram positive and Gram negative bacteria. ***[Mar-'23 &'24]***

Ans.

No.	Characteristics	Gram positive Bacteria	Gram negative Bacteria
1.	Cell wall	Thick layered with 0.015µm-0.02µm	Thin layered with 0.0075µm–0.012µm thick
2.	Rigidity of cell wall	Rigid due to presence of Peptidoglycans	Elastic due to presence of lipoprotein-polysaccharide mixture
3.	Chemical composition	Peptidoglycans-80% Polysaccharide-20% Teichoic acid present	Peptidoglycans-3 to 12% rest is polysaccharides and lipoproteins. Teichoic acid absent
4.	Outer membrane	Absent	Present
5.	Periplasmic space	Absent	Present
6.	Susceptibility to penicillin	Highly susceptible	Low susceptible
7.	Nutritional requirements	Relatively complex	Relatively simple
8.	Flagella	Contain 2 basal body rings	Contain 4 basal body rings
9.	Lipid and lipoproteins	Low	High
10.	Lipopolysaccharides	Absent	Present

GOVERNMENT EXAM QUESTIONS

Bio-Botany (Short version)

CHOOSE THE CORRECT ANSWERS 1 MARK

1. Who had defined the infectious agent in tobacco leaves as *contagium vivum Fluidum*? *[First Mid-2018]*

(a) Dimitry Ivanowsky (b) M.W. Beijierink
(c) F.W. Twort (d) Edward Jenner

[Ans. (b) M.W. Beijierink]

2. Which one of the following is not the characteristic feature of cyanobacteria? *[Govt. MQP-2018]*

(a) they are multicellular
(b) they form colonies
(c) they form blooms in polluted water bodies
(d) they can fix atmospheric nitrogen

[Ans. (a) they are multicellular]

3. Approximate number of capsomeres in TMV is _____. *[QY-2018]*

(a) 3120 (b) 1203
(c) 2130 (d) 3021 **[Ans. (c) 2130]**

4. Fusion of both morphologically and physiologically dissimilar gametes called _____ *[QY-2018]*

(a) Isogamy (b) Anisogamy
(c) Oogamy (d) Syngamy

[Ans. (b) Anisogamy]

5. The integrated phage DNA is called _____. *[HY-2018]*

(a) prophage (b) bacteriophage
(c) cyanophage (d) mycophage

[Ans. (a) prophage]

6. Identify the incorrect statement about the Gram positive bacteria *[July-'23]*

(a) Teichoic acid absent
(b) High percentage of peptidoglycan is found in cell wall
(c) Cell wall is thick layered
(d) Lipo polysaccharides absent

[(a) Teichoic acid absent]

7. Match the following and choose the correct answer *[QY-2019]*

	List I		List II
A	Athlete's foot	i	Viral disease
B	Diphtheria	ii	Protozoic disease
C	Rabies	iii	Bacterial disease
D	Amoebic dysentry	iv	Fungal disease

(a) A (iii), B (iv), C (ii), D (i)
(b) A (iv), B (iii), C (i), D (ii)
(c) A (iv), B (iii), C (ii), D (i)
(d) A (ii), B (i), C (iv), D (iii)

[Ans. (b) A (iv), B (iii), C (i), D (ii)]

8. Match the following : *[HY-2019]*

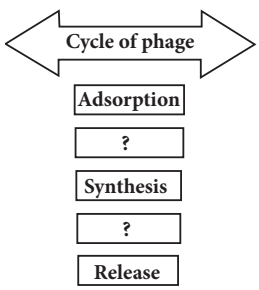
	List I		List II
(1)	Green Sulphur Bacteria	(i)	*Chromatium*
(2)	Purple Sulphur Bacteria	(ii)	Methano bacterium
(3)	Purple Non-Sulphur Bacteria	(iii)	Chlorobium
(4)	Archae Bacteria	(iv)	Rhodopirillum

(a) (1)-(i), (2) - (ii), (3) - (iii), 4 - (iv)
(b) (1)-(ii), (2) - (iii), (3) - (iv), 4 - (i)
(c) (1)-(iii), (2) - (i), (3) - (iv), 4 - (ii)
(d) (1)-(iv), (2) - (i), (3) - (ii), 4 - (iii)

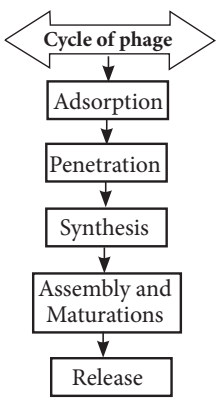
Ans. (c) (1)-(iii), (2) - (i), (3) - (iv), 4 - (ii)]

VERY SHORT ANSWERS 2 MARKS

1. Complete the Multiplication cycle of Phage *[Govt. MQP-2018]*



Ans.



2. What are prions? Name one human diseases and cattle disease caused by prions. *[First Mid-2018]*

Ans. Prions are proteinaceous infectious particles.
Disease caused by prions: In humans - several disorders of central nervous system.
Cattle disease: Mad cow disease and scrapie disease in sheep.

3. What is Virion? *[QY-2018; May-'22]*

Ans. **Virion** is an intact infective virus particle which is non-replicating outside a host cell.

4. A few hours after taking food, a person feels hungry. Name the metabolic activity that is responsible for this. Justify your answer. *[QY-2019]*

Ans. Metabolism activity responsible for this is catabolism. It is breaking down process from larger molecule into smaller units. The stored chemical energy is released and used so the person feels hungry.

5. Give the merits of five kingdom classification. *[CRT-'22]*

Ans.
1. The classification is based on the complexity of cell structure and organization of thallus.
2. It is based on the mode of nutrition.
3. Separation of fungi from plants.
4. It shows the phylogeny of the organisms.

6. What are lichens? *[Aug-'22]*

Ans.
1. They are symbiotic associations formed between algae and fungi.
2. The algal component (autotrophic) is called **phycobiont** and fungal component (heterotrophic) is **mycobiont.**

7. What are mesosomes? *[QY-'23]*

Ans. Localized infoldings of plasma membrane into the cell in the form of vesicles, tubules and lamellae. Folded together to maximize their surface area and helps in respiration and in binary fission.

8. Write down the non- living characteristic features of virus. *[Mar-'24]*

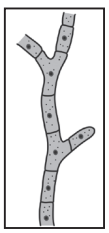
Ans.
1. Can be crystallized.
2. Absence of metabolism.

9. Why Viruses are called 'Biologist Puzzle? *[QY-'24]*

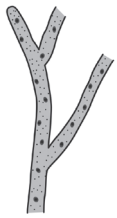
Ans.
1. They exhibit both living and non living characteristics. Hence they are considered to be a biologists puzzle.
2. They multiply within a living host and act as non living particles outside host cell.

Short Answers — 3 MARKS

1. Refer the diagram of septate mycelium given. With that reference draw coenocytic mycelium. *[Govt. MQP-2018]*



Ans.



Coenocytic mycelium

2. Do you agree that virus is living organism? If you say yes, justify your answer. *[June-2019]*

Ans. No. Virus is non-living organism. They exhibit characteristics of living organisms when they are occupying a living cell (host organism).

3. Write the importance of Mycorrhizae. *[May-'22]*

Ans. **Importance of Mycorrhizae :**
1. Mycorrhizae helps to derive nutrition in *Monotropa*, a saprophytic angiosperm.
2. Improves the availability of minerals and water to the plants.
3. Provides drought resistance to the plants.
4. Protects roots of higher plants from the attack of plant pathogens.

4. Explain Binary Fission in bacteria. *[Aug-'22]*

Ans. Under favourable conditions the cell divides into two daughter cells. The nuclear material divides first and it is followed by the formation of a simple median constriction which finally results in the separation of two cells.

Long Answers — 5 MARKS

1. (i) A Danish Physician, Christian Gram developed a staining procedure to differentiate bacteria. List the various steps involved in that procedure.

(ii) Distinguish between Deoxy viruses and Ribo viruses with example. *[March-2019]*

Ans. **i) Gram staining Techniques :**
1. Prepare a smear of bacterial culture.
2. Stain with crystal violet for 30 seconds.
3. Rinse in distilled water for 2 seconds.
4. Grams Iodine for 1 minute.
5. Rinse in distilled water.
6. Wash in 95% ethanol or acetone for 10 to 30 seconds.
7. Rinse in distilled water

8. Safranin for 30-60seconds
9. Rinse in distilled water and blot
10. Observe under microscope.

ii) Distinguish between Deoxy viruses and Ribo viruses :

	Deoxy viruses	Ribo viruses
1	The viruses possessing DNA	Viruses possessing RNA
2	Ex: Majority of animal viruses	Ex: Majority Plant viruses
3	(OR) Cauliflower Mosaic virus	(OR) HIV viruses

2. Write the steps involved in Gram staining Bacteria. *[QY-2018; Sep-2021]*

Ans.

Prepare a smear of bacterial culture
↓
Stain with Crystal violet for 30 seconds
↓
Rinse in distilled water for 2 seconds
↓
Grams Iodine for 1 minute
↓
Rinse in distilled water
↓
Wash in 95% ethanol or acetone for 10 to 30 seconds
↓
Rinse in distilled water
↓
Safranin for 30–60 seconds
↓
Rinse in distilled water and blot
↓
Observe under microscope

3. Write the steps involved during the phage multiplication in which the disintegration of host bacterial cell occurs. Draw a diagram. *[QY-2019]*

Ans. **Lytic Cycle :** During lytic cycle of the phage the disintegration of host bacterial cell occurs and the progeny virions are released The steps are:

1. Adsorption :

(i) Phage (T_4) particles interact with cell wall of host ***(E.coli).***

(ii) The phage tail makes contact between the two, and tail fibres recognize the specific receptor sites present on bacterial cell surface.

(iii) The lipopolysaccharides of tail fibres act as receptor in phages.

(iv) The process involving the recognition of phage to bacterium is called **landing.**

(v) Once the contact is established between tail fibres and bacterial cell, tail fibres bend to anchor the pins and base plate to the cell surface. This step is called **pinning.**

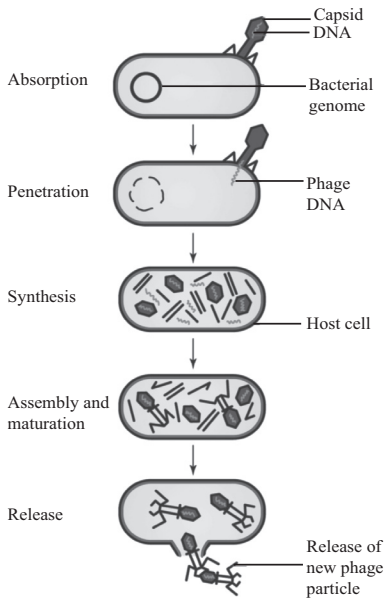
2. Penetration :

(i) This process involves mechanical and enzymatic digestion of the cell wall of the host. At the recognition site phage digests certain cell wall structure by viral enzyme (lysozyme).

(ii) After pinning the tail sheath contracts (by using ATP) and appears shorter and thicker.

(iii) The base plate enlarges through which DNA is injected into the cell wall without using metabolic energy. The step involving injection of DNA particle alone in to the bacterial cell is called Transfection.

(iv) The empty protein coat leaving the outside cell is known as **'ghost'.**



Lytic cycle

3. Synthesis :

(i) Degradation of bacterial chromosome,

(ii) Protein synthesis and

(iii) DNA replication.

The phage nucleic acid takes over the host biosynthetic machinery. Host DNA gets inactivated and breaks down. Phage DNA suppresses the synthesis of bacterial protein and directs the metabolism of the cell to synthesis the proteins of the phage particles and simultaneously replication of phage DNA also takes place.

4. Assembly and Maturation :

(i) DNA of the phage and protein coat are synthesized separately, assembled to form phage particles.

(ii) This assembling process of the phage particles is known as **maturation**.

(iii) After 20 min of infection about 300 new phages are assembled.

5. Release :

(i) The phage particles gets accumulate inside the host cell.

(ii) The phage particles are released by the lysis of host cell wall.

4. Explain sexual reproduction in Bacteria.

Ans. **Sexual Reproduction in Bacteria:** *[HY-2019]*

Typical sexual reproduction involving the formation and fusion of gametes is absent in bacteria. However gene recombination can occur in bacteria by three different methods. They are:

(i) Conjugation
(ii) Transformation
(iii) Transduction

(i) Conjugation

1. J. Lederberg and Edward L. Tatum demonstrated conjugation in *E. coli*. in the year 1946.

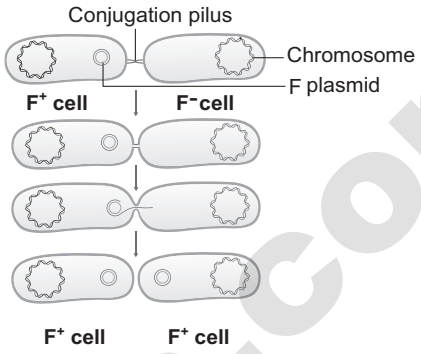
2. In this method of gene transfer the donor cell gets attached to the recipient cell with the help of pili.

3. The pilus grows in size and forms the conjugation tube.

4. The plasmid of donor cell which has the F+ (fertility factor) undergoes replication.

5. Only one strand of DNA is transferred to the recipient cell through conjugation tube.

6. The recipient completes the structure of double stranded DNA by synthesizing the strand that complements the strand acquired from the donor.

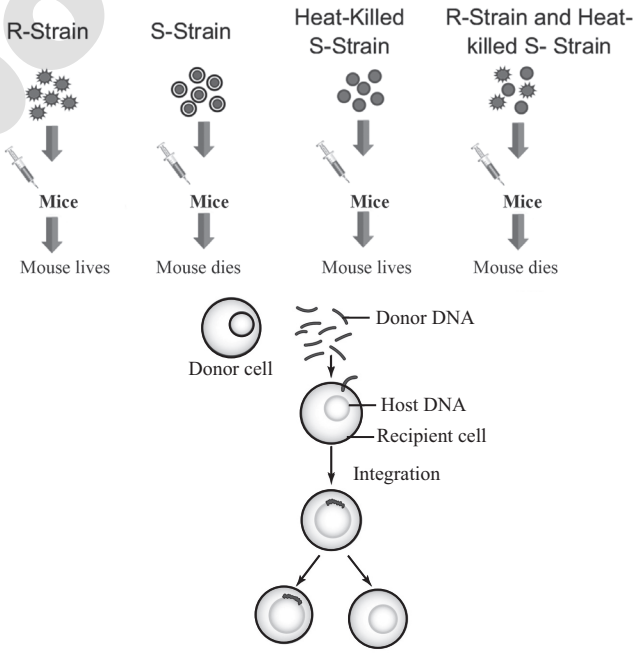


Conjugation

(ii) Transformation:

1. Transfer of DNA from one bacterium to another is called transformation.

2. In 1928 the bacteriologist Frederick Griffith demonstrated transformation in Mice using *Diplococcus pneumoniae*.



Transformation in Bacteria

3. Two strains of this bacterium are present. One strain produces smooth colonies and are virulent in nature (S type) In addition another strain produced rough colonies and are avirulent (R type).

4. When S-type of cells were injected into the mouse, the mouse died. When R-type of cells were injected, the mouse survived.

5. He injected heat killed S-type cells into the mouse the mouse did not die.

6. When the mixture of heat killed S-type cells and R-type cells were injected into the mouse. The mouse died.
7. The avirulent rough strain of *Diplococcus* had been transformed into S-type cells.
8. The hereditary material of heat killed S-type cells had transformed R-type cell into virulent smooth strains.
9. Thus the phenomenon of changing the character of one strain by transferring the DNA of another strain into the former is called Transformation.

(iii) Transduction:

Zinder and Lederberg (1952) discovered Transduction in *Salmonella typhimurum*. Phage mediated DNA transfer is called Transduction.

Transduction is of two types:

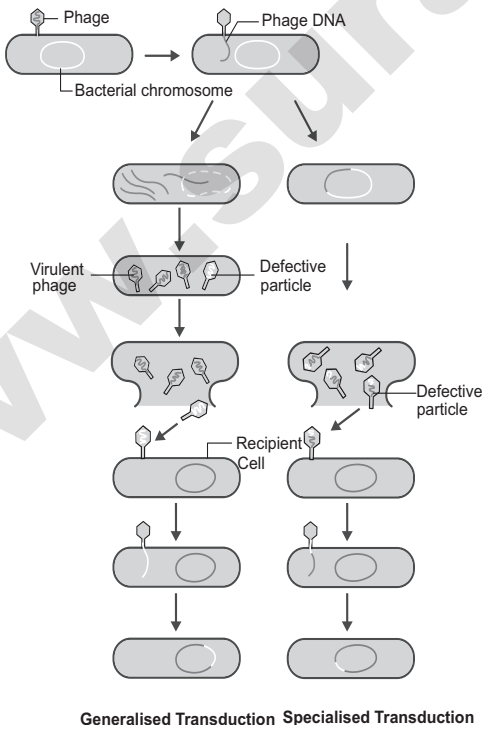
(i) Generalized transduction
(ii) Specialized or Restricted transduction.

(i) Generalized Transduction:

The ability of a bacteriophage to carry genetic material of any region of bacterial DNA is called generalised transduction.

(ii) Specialized or Restricted Transduction:

The ability of the bacteriophage to carry only a specific region of the bacterial DNA is called specialized or restricted transduction.



Transduction in Bacteria

5. Write the economic importance of fungi. *[Mar-'23]*

Ans. **Economic importance of fungi:**

1. Food :

(i) Mushrooms like *Lentinus edodes, Agaricus bisporus, Volvariella volvaceae* are consumed as food for their high nutritive value.

(ii) Yeasts provide vitamin B and *Eremothecium ashbyii* is a rich source of Vitamin B_{12}.

2. Medicine :

(i) Fungi produce antibiotics, arrest the growth or destroy the bacteria. Some of the antibiotics produced by fungi. Penicillin *(Penicilium notatum),* Cephalosporins *(Acremonium chrysogenum) etc.,*

(ii) **Ergot alkaloids** *(Ergotamine)* produced by *Claviceps purpurea* is used as vasoconstrictors.

3. Industries:

Production of Organic acid : For the commercial production of organic acids fungi are employed in the Industries. Eg: Citric acid and Gluconic acid by *Aspergillus niger.*

4. Bakery and Brewery :

(i) **Yeast** *(Saccharomyces cerevisiae)* is used for fermentation of sugars to yield alcohol. Bakeries utilize yeast for the production of bakery products like bread, buns, rolls etc.,

(ii) *Penicillium roquefortii* and *Penicillim cammemberti* are employed in cheese production.

5. Production of enzymes :

(i) *Aspergillus Oryzae, Aspergillus niger* were employed in the production of enzymes like **Amylase, Protease, Lactase** etc.

(ii) **'Rennet'** which helps in the coagulation of milk in cheese manufacturing is derived from and *Mucor spp.*

6. Agriculture :

(i) Mycorrhiza forming fungi like ***Rhizoctonia, Phallus, Scleroderma*** helps in absorption of water and minerals.

(ii) Fungi like ***Beauveria bassiana, Metarhizium anisoplia*** are used as Biopesticides to eradicate the pests of crops.

(iii) **Gibberellin**, produced by a fungus ***Gibberella fujikuroi*** induce the plant growth and is used as growth promoter.

Botany (Long version)

Choose the Correct Answers — 1 MARK

1. **Virus infecting bacteria are called _____ .** *[May-'22]*

(a) Cyanophage (b) Bacteriophage
(c) Zoophage (d) Mycophage

[Ans. (b) Bacteriophage]

2. **The micro-organism which lack cell-wall and appear like "Fried Egg" in culture is :** *[Aug-'22]*

(a) Archaebacteria (b) Actinomycetes
(c) Cyanobacteria (d) Mycoplasma

[Ans. (b) Mycoplasma]

3. **Which of the following components provides sticky character to the bacterial cell?** *[Mar-'24]*

(a) Plasma membrane (b) Cell wall
(c) Glycocalyx (d) Nuclear membrane

[Ans. (c) Glycocalyx]

Very Short Answers — 2 MARKS

1. **What is Archaebacteria? Name any two bacterial plant diseases.** *[Mar-2020; QY-'23]*

Ans. Archaebacteria are primitive prokaryotes and are adapted to thrive in extreme environments like hot springs, high salinity, low pH and so on. They are mostly chemoautotrophs.

1. Bacterial blight 2. Fire blight

2. **What is transduction and mention its types?** *[Sep-2021]*

Ans. Zinder and Lederberg (1952) discovered Transduction in *Salmonella typhimurum*. Phage mediated DNA transfer is called Transduction.

Transduction is of two types:

1. Generalized transduction
2. Specialized or Restricted transduction.

3. **Write any two general characteristic features of Lichen.** *[May-'22]*

Ans.
1. Lichens secrete organic acids like Oxalic acids which corrodes the rock surface and helps in weathering of rocks, thus acting as pioneers in Xerosere.
2. Lichens are sensitive to air pollutants especially to sulphur-di-oxide. Therefore, they are considered as pollution indicators.

4. **Define Virion.** *[Aug-'22]*

Ans. **Virion** is an intact infective virus particle which is non-replicating outside a host cell.

5. **What are capnophilic bacterium?** *[Mar-'23]*

Ans. Bacteria which require CO_2 for their growth are called capnophilic bacteria . **Eg:** *Campylobacter.*

6. **Name the four types of Ascocarps.** *[Mar-'24]*

Ans. Cleistothecium, Perithecium, Apothecium and Pseudothecium.

Short Answers — 3 MARKS

1. **What are Magnetosomes?** *[Mar-2020]*

Ans.
1. Intracellular chains of 40 - 50 magnetite (Fe_3O_4) particles found in bacterium - ***Aquaspirillum magnetotacticum.***
2. Helps the bacterium to locate nutrient rich sediments.

2. **What is Fimbriae or Pili?** *[Mar-2020]*

Ans.
1. Pili or Fimbriae are hair like appendages found on surface of cell wall of gram-negative bacteria Eg: ***Enterobacterium.***
2. The pili are 0.2 to 20 µm long with a diameter of about 0.025µm .
3. In addition to normal pili there are special type of pili which help in conjugation called sex pili are also found.

3. **Write any 3 importance of Mycorrhizae.** *[May-'22]*

*** Refer Short version Government Exam Questions - 3 Marks - Q.No. 3**

4. **What is heterocyst? Mention its function.** *[Aug-'22]*

Ans. In some forms a large colourless cell is found in the terminal or intercalary position called Heterocysts.

5. **Name any 3 Human diseases caused by Bacteria and their pathogens.** *[Mar-'24]*

Ans.

Human diseases		
No.	**Name of the disease**	**Name of the pathogen**
1.	Cholera	*Vibrio cholerae*
2.	Typhoid	*Salmonella typhi*
3.	Tuberculosis	*Mycobacterium tuberculosis*

6. Write any three living characters of viruses. *[Mar-'24]*

Ans. **Living characters of viruses :**

1. Presence of nucleic acid and protein.
2. Capable of mutation.
3. Ability to multiply within living cells.

Long Answers — 5 MARKS

1. Write a note on economic importance of bacteria. *[Sep-2020]*

Ans.

No.	Beneficial aspects	Bacteria	Role
1.	**Soil fertility**		
	Ammonification	*Bacillus ramosus*	Convert complex proteins in the dead bodies of plants and animals into ammonia which is later converted into ammonium salt.
2.	**Antibiotics**		
	Chloromycetin	*Streptomyces venezuelae*	Cures typhoid fever.
3.	**Industrial uses**		
	a) Cheese	*Lactobacillus lactis*	Convert milk to cheese.
	b) Vitamins	*Escherichia coli*	Produces Vitamin K and vitamin B complex in human intestine.
	c) Curing of Tea and Tobacco	*Micrococcus candicans, Bacillus megatherium*	Adding special flavour and aroma to tea and tobacco leaves by fermentation.
4.	**Diseases**		
	a) Bacterial blight	*Xanthomonas oryzae*	Affects rice crop.
	b) Cholera	*Vibrio cholerae*	Affects human beings.
	c) Anthrax	*Bacillus anthracis*	Affects sheep.

Additional

Choose the Correct Answers — 1 MARK

I. Choose the correct options for the below Questions:

1. Identify the criteria not used for classification of viruses?

(a) –ss or – ds (b) Use of RT
(c) (+) RNA or (–) RNA (d) Reproduction

[Ans. (d) Reproduction]

2. Which one of the following is a rod-shaped bacteria?

(a) *Coccus* (b) *Bacillus*
(c) *Spirillum* (d) *Vibrio*

[Ans. (b) *Bacillus*]

3. Which feature do not possess by Basidiomycetes?

(a) Clamp connection (b) Club Fungi
(c) Dolipore septum
(d) Lack sexual reproduction

[Ans. (d) Lack sexual reproduction]

4. Which one of the following bacterium can cause crown gall disease in plants?

(a) *Bacillus* (b) *Clostridium*
(c) *Agrobacterium tumefaciens*
(d) *E.Coli* **[Ans. (c) *Agrobacterium tumefaciens*]**

5. **Who discovered the transformation process?**
(a) Griffith (b) Ehrenberg
(c) Pasteur (d) Hooke
[Ans. (a) Griffith]

6. **Which of the following is called 'true bacteria'?**
(a) Archaebacteria (b) Eubacteria
(c) *Methanobacterium* (d) *Halobacterium*
[Ans. (b) Eubacteria]

7. **Which is the fastest growing cyanobacteria?**
(a) *Halobacterium* (b) *Methanobacterium*
(c) *Spirulina* (d) *Thermoprotens*
[Ans. (c) Spirulina]

8. **Who introduced the Gram staining method?**
(a) Bergy (b) Christian Gram
(c) Ehrenberg (d) Lederberg
[Ans. (b) Christian Gram]

9. **Who discovered plasmid ?**
(a) David (b) Koch
(c) Joshua Lederberg (d) Griffith
[Ans. (c) Joshua Lederberg]

10. **Which one of the following organisms completely lacks a cell wall?**
(a) Eubacteria (b) Archaebacteria
(c) Fungi (d) Mycoplasma
[Ans. (d) Mycoplasma]

11. **Which gram negative bacterium caused duodenal and gastric ulcers?**
(a) *Helicobacter Pylori* (b) *Helicobacter Vibrio*
(c) *E.Coli* (d) *Haemophillus*
[Ans. (a) *Helicobacter Pylori*]

12. **Who is the Father of Indian Mycology?**
(a) P.A. Micheli (b) Sir Edwin John Butler
(c) Blackley (d) Raper
[Ans. (b) Sir Edwin John Butler]

13. **Which one of the following is N_2-fixing cyanobacteria?**
(a) *Gnetum* (b) *Sequoia*
(c) *Anabaena* (d) *Thuja*
[Ans. (c) *Anabaena*]

II. Choose the Correct Options for the Below Fill in the Blanks:

1. **Earth was formed _____ billion years ago.**
(a) 4.6 (b) 5.5 (c) 4 (d) 3
[Ans. (a) 4.6]

2. **A virus with dsDNA is called as _____.**
(a) Parvo viruses (b) Toga viruses
(c) Adeno viruses (d) Retro viruses
[Ans. (c) Adeno viruses]

3. **_____ is a sexual method of reproduction.**
(a) Binary fission (b) Budding
(c) Conidia (d) Gametangial contact
[Ans. (d) Gametangial contact]

4. **Vaccination for small pox was discovered by ____.**
(a) d' Herelle (b) Edward Jenner
(c) Robert Gallo (d) F.W. Twort
[Ans. (b) Edward Jenner]

5. **1 Nanometer =_____.**
(a) 10^9 meter (b) 10^{-9} meters
(c) 10^8 meters (d) 10^{-6} meters
[Ans. (b) 10^{-9} meters]

6. **Size of TMV =_____.**
(a) 300 × 200 nm (b) 30 × 20 nm
(c) 300 × 20 nm (d) 280 × 40 nm
[Ans. (c) 300 × 20 nm]

7. **Viruses were classified into seven classes by _____.**
(a) David Baltimore (b) Twort
(c) Ehrenberg (d) Alexopoulos
[Ans. (a) David Baltimore]

8. **TMV has a molecular weight of _____Daltons.**
(a) 39×10^6 (b) 38×10^5
(c) 39×10^7 (d) 39×10^{10}
[Ans. (a) 39×10^6]

9. **TMV has approximately _____capsomeres.**
(a) 2030 (b) 2130
(c) 2330 (d) 2000 **[Ans. (b) 2130]**

10. **Mad cow disease is caused by _____.**
(a) Prions (b) Virion
(c) Viroid (d) Phage
[Ans. (a) Prions]

11. **_____is considered to be a new kindgom.**
(a) Protista (b) Chromista
(c) Monera (d) Plantae
[Ans. (b) Chromista]

12. **The classification published in recent times was given by _____.**
(a) Carl Woese (b) Ruggerio *et al*
(c) Whittaker (d) Copeland
[Ans. (b) Ruggerio *et al*]

13. **Founder of modern Bacteriology_____.**
(a) Koch (b) Griffith
(c) Lederberg (d) Gram **[Ans. (a) Koch]**

14. **Bacteria was first discovered by a _____ scientist.**
(a) German (b) Dutch
(c) French (d) American
[Ans. (b) Dutch]

15. **_____ are obligate aerobes.**
(a) *Streptococcus* (b) *Clostridium*
(c) *Micrococcus* (d) *E. Coli*
[Ans. (c) *Micrococcus*]

16. **Griffith demonstrated transformation in _____.**
(a) 1928 (b) 1930
(c) 1975 (d) 1900 **[Ans. (a) 1928]**

17. **Food poisoning is caused by _____.**
(a) *Yersinia* (b) *Clostridium*
(c) *Treponema* (d) *Vibrio*
[Ans. (b) *Clostridium*]

18. **_____ was awarded a Nobel prize for his work on TMV.**
(a) Jenner (b) Mayer
(c) W.M. Stanley (d) Robert Gallo
[Ans. (c) W.M. Stanley]

19. **_____ shows cuboid symmetry.**
(a) TMV (b) Bacteriophage
(c) Herpes virus (d) Influenza
[Ans. (c) Herpes virus]

20. **Lysozyme is secreted by phage during _____ .**
(a) Adsorption (b) Synthesis
(c) Penetration (d) Maturation
[Ans. (c) Penetration]

21. **_____ is a capnophilic bacteria.**
(a) *Campylobacter* (b) *Chlorobium*
(c) *Chromatium* (d) *Clostridium*
[Ans. (a) *Campylobacter*]

22. **_____is a disease affecting animals.**
(a) Scab (b) Anthrax
(c) Ring rot (d) Canker
[Ans. (b) Anthrax]

23. **_____is found in corolloid roots of *Cycas*.**
(a) *Dermacarpa* (b) *Nostoc*
(c) *Scytonema* (d) *Chara*
[Ans. (b) *Nostoc*]

24. **A marine cyanobacterial species_____.**
(a) *Trichodesmium* (b) *Gloeocapsa*
(c) *Nostoc* (d) *Cycas*
[Ans. (a) *Trichodesmium*]

25. **The organisms isolated from pleural fluid of cattle _____.**
(a) Actinomycetes (b) Virus
(c) Phage (d) Mycoplasma
[Ans. (d) Mycoplasma]

26. **Nitrogen fixation in non leguminous plants is done by_____.**
(a) *Rhizobium* (b) *Alnus*
(c) *Frankia* (d) *Streptomyces*
[Ans. (c) *Frankia*]

27. **_____is considered as founder of mycology.**
(a) P.A. Micheli (b) Webster
(c) Blackley (d) Ainsworth
[Ans. (a) P.A. Micheli]

28. **Spermatization is a sexual mode of reproduction in _____.**
(a) *Rhizopus* (b) *Neurospora*
(c) *Ascomycetes* (d) *Penicillium*
[Ans. (b) *Neurospora*]

29. **Sac fungi refers to_____.**
(a) Ascomycetes (b) Zygomycetes
(c) Basidiomycetes (d) Deuteromycetes
[Ans. (a) Ascomycetes]

30. **A plant growth promoter got from fungi is _____.**
(a) Rennet (b) Gibberellin
(c) Ergot (d) Griseofulvin
[Ans. (b) Gibberellin]

31. **The base plate of T_4 phage has _____ tail fibres.**
(a) 5 (b) 4 (c) 6 (d) 8
[Ans. (c) 6]

32. **Monotropa derives nutrition by_____.**
(a) Root Nodules (b) Lichens
(c) Mycorrhizae (d) Roots
[Ans. (c) Mycorrhizae]

33. **_____are considered as pollution indicators.**
(a) Mycorrhiza (b) Actinomycete
(c) Lichens (d) Cyanobacteria
[Ans. (c) Lichens]

34. **Living organisms constitute _____ .**
(a) Living world (b) Non-living world
(c) Animal kingdom (d) Plant kingdom
[Ans. (a) Living world]

35. **Living thing is otherwise called as _____ .**
(a) Organ (b) Organelle
(c) Organism (d) Cell
[Ans. (c) Organism]

36. **Living things are made of _____ .**
(a) Organisms (b) Atoms
(c) Organs (d) Cells **[Ans. (d) Cells]**

37. **Sum total of constructive reactions is called as _____ .**
(a) Anabolism (b) Catabolism
(c) Metabolism (d) Embolism
[Ans. (a) Anabolism]

38. **Sum total of destructive reactions is called as _____ .**
(a) Metabolism (b) Catabolism
(c) Embolism (d) Anabolism
[Ans. (b) Catabolism]

39. **A multicellular organism grows by _____ .**
(a) budding (b) cell division
(c) fission (d) spore formation
[Ans. (b) cell division]

40. **Growth in plant is _____ .**
(a) Diffusable (b) Unlocalized
(c) Limited (d) Life long
[Ans. (d) Life long]

41. **Organisms grow by _____ .**
(a) cell division (b) spore formation
(c) fragmentation
(d) vegetative propagation **[Ans. (a) cell division]**

42. **Increase in body mass is considered as _____ .**
(a) cell division (b) homeostasis
(c) reproduction (d) growth
[Ans. (d) growth]

43. **_____ do not grow.**
(a) Living organisms (b) Microorganisms
(c) Dead organisms (d) All the above
[Ans. (c) Dead organisms]

44. **_____ multiply and spread very fast by producing millions of asexual spores.**
(a) Bacteria (b) Pteridophytes
(c) Fungi (d) Sea weeds
[Ans. (c) Fungi]

45. **Some fungi, filamentous algae and the protonema of mosses multiply by _____ .**
(a) fission (b) fertilization
(c) pollination (d) fragmentation
[Ans. (d) fragmentation]

46. **Yeast and *Hydra* reproduce by _____ .**
(a) Budding (b) Fission
(c) Spore formation
(d) Vegetative propagation **[Ans. (a) Budding]**

47. **_____ is the building block of all living things.**
(a) Cells (b) Organs
(c) Atoms (d) Compounds
[Ans. (a) Cells]

48. **_____ is a basic unit of life.**
(a) Atoms (b) Compounds
(c) Soils (d) Cell **[Ans. (d) Cell]**

49. **Detection of changes in their living place by organisms is called _____ .**
(a) Interactions (b) Consciousness
(c) Autotropic (d) Meterotropic
[Ans. (b) Consciousness]

50. **Bacteriophage varies in size from _____ .**
(a) 10-100nm (b) 1-10nm
(c) 50-500nm (d) 20-40nm
[Ans. (a) 10-100nm]

51. **Viruses that cause diseases in fungi are called _____ .**
(a) Cyanophages (b) Bacteriophages
(c) Lactophages (d) Mycophages
[Ans. (d) Mycophages]

52. **The cancer causing viruses are also called _____ .**
(a) Oncogenic viruses (b) Corona viruses
(c) HIV (d) Mycoviruses
[Ans. (a) Oncogenic viruses]

53. **The term bacteria was first used by _____ .**
(a) Stanley (b) Pasteur
(c) Hooke (d) Ehrenberg
[Ans. (d) Ehrenberg]

54. **Bacterial cell wall contains _____ .**
(a) peptidoglycan (b) glucose
(c) flagellin (d) chitin
[Ans. (a) peptidoglycan]

55. **_____ is a thermophilic gram negative bacteria.**
(a) *Rhizobium* (b) *Salmonella*
(c) *Pseudomonas* (d) *Thermus aquaticus*
[Ans. (d) *Thermus aquaticus*].

56. Actinomycetes are also called _____
(a) Ray fungi (b) Liverworts
(c) Hyphae (d) Pileus
[Ans. (a) Ray fungi]

57. Extra chromosomal self-replicating DNA segments called _____ .
(a) CDNA (b) rDNA
(c) Plasmid (d) RNA
[Ans. (c) Plasmid]

58. An example of photoautotrophic bacteria is ____ .
(a) *Nitrosomonas* (b) *Nitrobacter*
(c) *Chlorobium* (d) *Spirillum*
[Ans. (c) *Chlorobium*]

59. A bacterial cell is covered by _____ .
(a) glycocalyx (b) flagellin
(c) chitin (d) peptidoglycan
[Ans. (a) glycocalyx]

60. Disease causing organisms are called as _____ .
(a) organisms (b) pathogens
(c) recipients (d) decomposers
[Ans. (b) pathogens]

61. Bacterial photosynthesis differs from higher plants in evolution of _____ .
(a) Oxygen (b) Hydrogen sulphide
(c) Hydrogen (d) CO_2
[Ans. (a) Oxygen]

62. The study of Bacteria is called _____ .
(a) Virology (b) Mycology
(c) Physiology (d) Bacteriology
[Ans. (d) Bacteriology]

63. Bacteria were first discovered by _____ .
(a) Ehrenberg (b) Leeuwenhoek
(c) Koch (d) Bergy
[Ans. (b) Leeuwenhoek]

64. Dermatophytes are fungi which cause infection in the _____ .
(a) head (b) foot
(c) skin (d) nail **[Ans. (c) skin]**

65. _____ is the branch of science that deals with the study of fungi.
(a) Phycology (b) Oncology
(c) Mycology (d) Psychology
[Ans. (c) Mycology]

66. The fungal cell wall is made up of _____ .
(a) cellulose (b) peptidoglycan
(c) pectin (d) chitin
[Ans. (d) chitin]

67. A completely closed ascocarp is called _____ .
(a) cleistothecium (b) perethecium
(c) apothecium (d) pseudothecium
[Ans. (a) cleistothecium]

68. It is the smallest Cell _____ .
(a) Bacteria (b) Blue green algae
(c) Yeast (d) Mycoplasm
[Ans. (d) Mycoplasm]

69. Which is the fundamental property of all living organisms?
(a) Growth (b) Germination
(c) Respiration (d) Photosynthesis
[Ans. (a) Growth]

III. Identify the correct Statements:

1. Identify the correct statements from the below about "Gram negative bacteria".
(I) Thin layered with 0.0075 µm - 0.012 µm thick.
(II) Rigid due to presence of peptidoglycans.
(III) Elastic due to presence of lipoprotein-polysaccharide mixture.
(IV) Contain 4 basal body rings.
(a) I, II and III only (b) I, III and IV only
(c) I, II and IV only (d) II, III and IV only
[Ans. (b) I, III and IV only]

2. Identify the correct statements from the below about "Actinomycetes".
(I) Actinomycetes are also called 'Ray fungi'
(II) Produce an aerial mycelium.
(III) Their DNA contain high guanine and cytosine content.
(IV) It's also called as Actinobacteria
(a) I, II and III only (b) I, III and IV only
(c) II, III and IV only (d) I, II and IV only
[Ans. (b) I, III and IV only]

3. Identify the correct statements from the following about "T_4 bacteriophage".
(I) T_4 phage is rod shape.
(II) Consist of 2000 identical subunits.

(III) T_4 phage is tadpole shape.
(IV) Consists of head, collar, tail, base plates and fibers.
(a) II, III and IV only (b) I, II and III only
(c) I, III and IV only (d) I, II and IV only
[Ans. (a) II, III and IV only]

4. **Identify the correct statements from the following about "Fungi".**
(I) The word "Fungus" is derived from Latin meaning "Mushroom".
(II) Study of fungi is called mycology.
(III) They exist in unicellular or multicellular forms.
(IV) Alexander Fleming is consider as founder of mycology.
(a) I, II and III only (b) II, III and IV only
(c) I, III and IV only (d) I, II and IV only
[Ans. (a) I, II and III only]

5. **Identify the correct statements from the below about "bacterial genome".**
(I) Nucleoid (II) Contains histone
(III) Linear
(IV) Absence of nuclear membrane
(a) I and IV only (b) I and II only
(c) III and IV only (d) All the above
[Ans. (a) I and IV only]

IV. Identify the wrong statements :

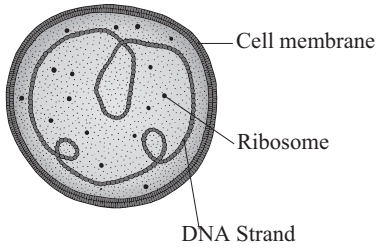
1. **Identify the wrong statement from the below.**
(a) The viruses possessing DNA are called Deoxy viruses.
(b) Majority of animal and bacterial viruses are DNA viruses.
(c) HIV possess DNA
(d) Cauliflower mosic virus possess DNA.
[Ans. (c) HIV possess DNA]

2. **Identify the wrong statement from the below about "*Frankia*".**
(a) *Frankia* is a symbiotic actinobacterium.
(b) It produces root nodules.
(c) It fixes nitrogen in leguminous plants.
(d) It produce multicellular sporangium.
[Ans. (c) It fixes nitrogen in leguminous plants]

3. **Identify the wrong statement from the below about 'Cyanobacteria'.**
(a) Cyanobacteria are popularly called as "Blue green algae".
(b) Most of them are fresh water and few are marine.
(c) Cyanobacteria found in different habitats.
(d) Cyanobacteria decrease the level of free oxygen in atmosphere.
[Ans. (d) Cyanobacteria decrease the level of free oxygen in atmosphere]

4. **Identify the wrong statement from the below about 'Fungi'.**
(a) Fungi produce antibiotics like penicillin.
(b) Fungi cause food poisoning due to the production of toxins.
(c) Fungi do not cause diseases in Human Being.
(d) Fungi provide delicious and nutritious food called mushrooms. **[Ans. (c) Fungi do not cause diseases in Human Being]**

5. **Identify the wrong statement from the below about diagram "Mycoplasma".**



(a) Mycoplasma lack cell wall
(b) Mycoplasma appears like "Fried egg" in culture
(c) It cause disease in animals and plants
(d) Mycoplasma are very large organism
[Ans. (d) Mycoplasma are very large organism]

6. **Identify the wrong statements from the below about diagram "Penicillin".**

(a) Alexander Fleming discovered penicillin.
(b) Penicillin used in the world war II.
(c) In the form of yellow powder saved lives of soldier.
(d) E.J. Butler also involved in the discovery of penicillin. **[Ans. (d) E.J. Butler also involved in the discovery of penicillin]**

7. **Identify the wrong statements from the below about "Importance of Mycorrhizae".**
(a) Helps to derive nutrition.
(b) Does not improve the availability of minerals.
(c) Provides drought resistance to plants.
(d) Protects roots from the attack of plant pathogens.
[Ans. (b) Does not improve the availability of minerals]

V. Match the following :

1.

1.	C.G.Ehrenberg	(i)	Bacterial transformation
2.	Christian Gram	(ii)	Bacterium
3.	David H. Bergy	(iii)	Gram staining method
4.	Fredrick Griffith	(iv)	Bergey's manual

	1	2	3	4
(a)	ii	iii	iv	i
(b)	i	ii	iii	iv
(c)	ii	iv	i	iii
(d)	iii	i	ii	iv

[Ans. (a) 1 - ii, 2 - iii, 3 - iv, 4 - i]

2.

1.	Zygomycetes	(i)	Imperfect fungi
2.	Ascomycetes	(ii)	Club fungi
3.	Basidiomycetes	(iii)	Bread mold fungi
4.	Deuteromycetes	(iv)	Sac fungi

	1	2	3	4
(a)	iv	i	ii	iii
(b)	iii	iv	ii	i
(c)	i	ii	iii	iv
(d)	iii	ii	iv	i

[Ans. (b) 1 - iii, 2 - iv, 3 - ii, 4 - i]

3.

1.	Nutritious food	(i)	Yeast
2.	Single celled fungus	(ii)	Mush rooms
3.	Antibiotics	(iii)	Rennet
4.	Coagulation of milk	(iv)	Penicillin

	1	2	3	4
(a)	ii	i	iv	iii
(b)	i	ii	iii	iv
(c)	iv	iii	i	ii
(d)	iii	iv	i	ii

[Ans. (a) 1 - ii, 2 - i, 3 - iv, 4 - iii]

4.

1.	Sulphur Bacteria	(i)	*Nitrosomonas*
2.	Iron Bacteria	(ii)	*Hydrogenomonas*
3.	Hydrogen Bacteria	(iii)	*Ferrobacillus ferrooxidans*
4.	Nitrifying Bacteria	(iv)	*Thiobacillus thiooxidans*

	1	2	3	4
(a)	iv	iii	ii	i
(b)	i	ii	iii	iv
(c)	iv	i	ii	iii
(d)	iii	i	ii	iv

[Ans. (a) 1 - iv, 2 - iii, 3 - ii, 4 - i]

VI. Identify the correct assertion and reason:

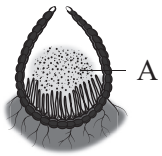
1. **Assertion (A) : Major red tide incident in florida in the year 1982 killed hundreds and thousands of fishes.**
Reason (R) : Red tide is caused by toxic Bloom of Dinoflagellates like *Gymnodinium breve and Gonyaulax tamarensis*.
(a) (A) is correct and (R) explains (A)
(b) (A) is correct, (R) is wrong
(c) Both (A) and (R) are wrong
(d) (A) is wrong (R) is correct
[Ans. (a) (A) is correct and (R) explains (A)]

2. **Assertion (A) : Prokaryote takes a joy ride on polar bear.**
Reason (R) : Cynobacterium is a prokaryotic organism, grows on the fur of a polar bear.
(a) (A) is wrong and (R) is correct
(b) Both (A) and (R) are wrong
(c) (A) is correct and (R) explains (A)
(d) (A) is correct and (R) is wrong
[Ans. (c) (A) is correct and (R) explains (A)]

3. **Assertion (A) : The history of world war II recorded the use of penicillin.**
Reason (R) : Penicillin is an antibiotic, used in the form of yellow powder to save lives of soldiers.
(a) (A) is correct and (R) explains (A)
(b) (A) is wrong and (R) is correct
(c) Both (A) and (R) are wrong
(d) (A) is correct and (R) is wrong
[Ans. (a) (A) is correct and (R) explains (A)]

VII. Identify the correct options for the parts of the diagram :

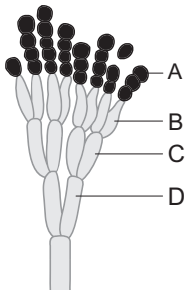
1. **Identify the parts marked as 'A' for the below diagram**



(a) Conidia
(b) Pycniospore
(c) Seta
(d) Conidiophore

[Ans. (b) Pycniospore]

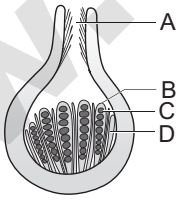
2. **Identify the parts marked as A, B, C and D for the below diagram "Conidia formation - *Penicillium*".**



	A	B	C	D
(a)	Sterigma	Metula	Ramus	Conidium
(b)	Conidium	Sterigma	Metula	Ramus
(c)	Ramus	Sterigma	Conidium	Metula
(d)	Conidium	Metula	Penicillin	Sterigma

[Ans. (b) A-Conidium, B-Sterigma C-Metula, D-Ramus]

3. **Identify the parts marked as A, B, C and D for the below diagram "V.S. of peritheium".**



	A	B	C	D
(a)	Ascus	Ascospore	paraphysis	Ostiole
(b)	Ascospore	Ascus	paraphysis	Ostiole
(c)	Ostiole	Ascus	Ascospore	paraphysis
(d)	Ostiole	Ascospore	Ascus	paraphysis

[Ans. (c) A-Ostiole, B-Ascus, C-Ascospore D-paraphysis]

VIII. Identify the Correct pair from the below :

1. (a) Photoorgantrophs - *Rhodospirillum*
   (b) Obligate aerobes - *Chlorobium*
   (c) Anaerobes - *Chromatium*
   (d) Photolithotrophs - *Campylobacter*

[Ans. (a) Photoorgantrophs - *Rhodospirillum*]

2. (a) P.A.Micheli - Copeland
   (b) Asexual phase - Anamorph
   (c) Actinomycetes - Fungi
   (d) C.H. Blackley - Cell wall

[Ans. (b) Asexual phase - Anamorph]

IX. Identify the Incorrect pair from the below :

1. (a) *Lactobacillus lactis* - Curd
   (b) *Salmonella typhi* - Typhoid
   (c) Glycocaly X - Capsule
   (d) Cell wall - lipoprotein

[Ans. (d) Cell wall - lipoprotein]

2. (a) Nucleoid - Genophore
   (b) *Micrococcus* - Obligate aerobes
   (c) Capnophilic Bacteria - O_2
   (d) Green sulphur bacteria - Bacterioviridin

[Ans. (c) Capnophilic Bacteria - O_2]

X. Identify the Odd-man out from the below :

1. **Identify the odd-man out from the below.**
   (a) Crustose (b) Foliose
   (c) *Rhizopus* (d) Fructicose

[Ans. (c) *Rhizopus*]

Reason: *Rhizopus* is a type of fungi. Others are types of lichens.

2. **Identify the odd-man out from the below.**
   (a) Athlete's foot (b) Anthracnose
   (c) Aspergillosis (d) Candidiasis

[Ans. (b) Anthracnose]

Reason: Anthracnose is a fungal disease in plants. Others are fungal diseases in Humans.

Very Short Answers — 2 MARKS

1. Define growth.

Ans. Growth is an intrinsic property of all living organisms through which they can increase cells both in number and mass.

2. What is Homeostasis?

Ans. 1. Property of self-regulation and tendency to maintain a steady state within an external environment which is liable to change is called **Homeostasis**.
2. It is essential for the living organisms to maintain internal condition to survive in the environment.

3. How was the word virus derived?

Ans. The word virus is derived from Latin meaning 'Poison'.

4. Name the exceptions in viruses with regard to nucleic acid.

Ans. Majority of animal viruses are DNA viruses. But HIV is the animal virus which possess RNA. Similarly, plant viruses generally contain RNA. However, Cauliflower Mosaic virus posses DNA.

5. What is Prophage?

Ans. In the lysogenic cycle of a phage, the integrated phage DNA is called prophage.

6. Name two viral diseases affecting Humans.

Ans. 1. AIDS.
2. Polio.

7. Mention any two features of bacteria.

Ans. 1. They are Prokaryotic organisms and lack nuclear membrane.
2. The genetic material is called nucleoid or genophore.
3. They reproduce by vegetatively by Binary fission and endospore formation.

8. Categorise the following based on nutrition.

(a) *Chlorobium* (b) Iron bacteria

Ans. (a) *Chlorobium* - Photoautotrophic bacteria / Photolithotroph.
(b) Iron bacteria - Chemoautotrophic bacteria / Chemolithotroph.

9. What is retting of fibres?

Ans. The fibres from the fibre yielding plants are separated by action of the bacteria *Clostridium*. This is called **retting of fibres**.

10. What is the role of bacteria in production of Tea?

Ans. The special flavor and aroma of the tea are due to fermentation of Tea leaves by bacteria. Eg: *Bacillus megatherium*. This is called **curing of Tea** and **Tobacco**.

11. Name the bacteria which causes.

(a) Food Poisoning (b) Plague

Ans. (a) Food Poisoning - *Clostridium botulinum*
(b) Plague - *Yersinia Pestis*

12. What is the unique feature of cell membrane of Archaebacteria?

Ans. Presence of lipids like glycerol and isopropyl ethers in the cell membrane. Hence it shows resistance against cell wall antibiotics and lytic agents.

13. What is plectenchyma?

Ans. The mycelium is organised into loosely or compactly interwoven fungal tissues called plectenchyma.

14. What are holocarpic fungi?

Ans. 1. In holocarpic fungi, the entrire thallus is converted into a reproductive structure.
2. It is further divided into two types: prosenchyma and pseudoparenchyma.

15. What are Coprophilous fungi?

Ans. Fungi growing on dung are called coprophilous fungi. Eg : *Pilobolus*.

16. Why are Club fungi so called?

Ans. 1. The basidium is club shaped with four basidiospores.
2. Thus, this group of fungi (Basidiomycetes) is popularly called **Club fungi**.

17. What is ergot?

Ans. 1. It's a fungal group refer to genus *Claviceps*.
2. It is a Alkaloid produced by *Claviceps purpurea* (fungus), called ergotamine. Its is used as vasoconstrictor.

18. What is the significance of yeast? (*Saccharomyces cerevisiae*)

Ans. 1. Yeast is used for the fermentation of sugars to yield alcohol.
2. Bakeries use yeast for the production of bread, buns, rolls etc.

19. Why "Amanita verna" referred as "Toad stools"?

Ans. They are highly poisonous Fungi due to the production of Toxins. They are commonly referred as **"Toad stools"**.

20. Name some toxins produced by fungi.

Ans. Aflatoxin, Patulin, Ochratoxin A.

21. What is heterothallism?

Ans. In sexual reproduction of fungi, the two sexual hyphae are morphologically similar but dissimilar physiologically. This phenomenon is called **heterothallism**. Eg : ***Rhizopus.***

22. Bt crops - What are they?

Ans. Bt toxin found in *Bacillus thuringiensis* finds application in raising insect resistant crops. They are called as **Bt crops**.

23. Name a biodegradable plastic.

Ans. PHB (Poly-β hydroxyl butyrate) is a microbial plastic which is biodegradable.

24. Name the causal agent of Duodenal ulcer.

Ans. *Helicobacter pylori.*

25. Name a microbe used in PCR technology.

Ans. *Thermus aquaticus* is a thermophilic gram negative bacteria which produces Taq Polymerase a key enzyme for Polymerase Chain Reaction (PCR).

26. Cyanobacteria helped in raising level of free oxygen in Atmosphere. Do you agree?

Ans.
1. Yes. The Stromatolites are deposits formed when colonies of cyanobacteria bind with calcium carbonate. (2.7 billion years old).
2. Their abundance in fossil records proves that they have helped to raise level of free oxygen in the atmosphere.

27. Name the organism from which Red sea got its name.

Ans. *Trichodesmium erythraeum* a cyanobacterium which imparts red colour to the water.

28. What is the significance of *phytophthora infestans*?

Ans.
1. It is a fungus which causes late blight of potato and affected the potato crop in Ireland.
2. It caused a million deaths forcing people to migrate, since potato is the staple food in Ireland.

29. What does SARS stand for?

Ans. SARS - Severe Acute Respiratory Syndrome.

30. List out the property of living things.

Ans. Movement, Nutrition, Respiration and Excretion are considered as the property of living things.

31. Define metabolism. Mention its types.

Ans.
1. The sum total of all the chemical reactions taking place in a cell of a living organism is called metabolism.
2. **Types of metabolism:**
   - **(i)** Anabolism
   - **(ii)** Catabolism

32. What is the name of DNA virus and RNA virus?

Ans.
1. The Name of DNA Virus - **'Deoxyviruses'.**
2. The Name of RNA Virus - **'Riboviruses'.**

33. What does cyanophages mean? Who reported it?

Ans.
1. Viruses infecting blue green algae are called **Cyanophages.**
2. Reported - **Safferman** and **Morris** in the year 1963.

34. What does Mycophages mean?

Ans.
1. The viruses attacking fungi are called **Mycoviruses** or **Mycophages.**
2. Mycophages were first reported by Hollings in 1962.

35. Name some viral diseases seen in Animals.

Ans.
1. Cattle - Foot and mouth disease
2. Dog - Rabies
3. Horse - Encephalomyelitis

36. What is the name of small circular RNAs which are similar to viroids?

Ans. Virousoid are the small circular RNAs which are similar to viroids but they are always linked with larger molecules of the viral RNA. Discovered by J.W. Randles and Co-workers in 1981.

37. Mention the function of glycocalyx.

Ans. It is a thick, gelatinous layer bound tightly to the cell wall of bacteria is called capsule. It protects the cell from desiccation and antibodies.

38. Define transformation.

Ans. **Transfer of DNA** from one bacterium to another is called transformation.

39. Differentiate plant growth from animal growth.

Ans.

No.	Plant growth	Animal growth
1.	Growth is indefinite.	Growth is definite.
2.	It occurs throughout life	It occurs for some period.

40. How do Viroids differ from Viruses?

Ans.

No.	Viroid	Viruses
1.	Circular molecule of ssRNA.	Nucleic acid - RNA or DNA.
2.	Without a capsid.	Covered by capsid.
3.	RNA has low molecular weight.	RNA or DNA may be single or double stranded.

41. Distinguish between Photolithotrophs and Photoorganotrophs.

Ans.

Photolithotrophs	Photoorganotrophs
In photolithotrophs, the hydrogen donor is an inorganic substance. E.g: *Chlorobium*	In Photoorganotrophs, the hydrogen donor is utilize organic acid or alcohol. E.g: *Chlorobium*, *Rhodospirillum*

42. What are polysomes?

Ans. Ribosomes held together, by mRNA and form polysomes or polyribosomes. The ribosomes are the sites of protein synthesis.

43. Explain generalized transduction.

Ans. The ability of a bacteriophage to carry genetic material of any region of bacterial DNA is called **generalized transduction**.

44. What are Hormogones?

Ans. A portion of filament of blue green algae that becomes detatched and reproduces by cell division. Eg : ***Nostoc.***

45. Why do we call Actinomycetes as 'Ray fungi'?

Ans. Actinomycetes are also called 'Ray Fungi' due to their mycelia like growth. Eg: *Streptomyces.*

46. What do you understand from the term 'Teleomorph'?

Ans. Sexual phase in the reproduction of fungi is called **Teleomorph**.

47. Mention the kingdoms included in Whittaker's classification.

Ans. The Kingdoms include Monera, Protista, Fungi, Plantae and Animalia.

48. Define mycology. Who is the founder of mycology?

Ans. Study of fungi is called **mycology**. P.A. Micheli is considered as the founder of mycology.

49. Blue green algae can also be called as myxophyceae. How?

Ans.
1. The presence of mucilage around the thallus is characteristic feature of cyanobacteria group.
2. Therefore, this group is also called myxophyceae.

50. Growth of living thing is an intrinsic property- Justify.

Ans.
1. Living cells grow by the addition of new protoplasm within the cells.
2. Therefore, growth in living thing is intrinsic.

51. Define Anabolism.

Ans. The process of building up or synthesis of complex substances from simpler ones. Eg: Photosynthesis.

52. Define Catabolism.

Ans. The process of breakdown of complex substances into simpler substances.
Eg: Respiration, Excretion.

53. What are the twin characteristics of growth?

Ans. Increase in mass and increase in number of individuals are the twin characteristics of growth.

54. Write the name of any two organisms that show fragmentation.

Ans.
1. Filamentous algae.
2. Protonema of mosses.

55. Define Fungi.

Ans.
1. Fungi are ubiquitous, eukaryotic, achlorophyllous heterotrophic organisms.
2. They exist in unicellular or multicellular forms.

56. Explain specialized transduction or restricted transduction.

Ans. The ability of the bacteriophage to carry only a specific region of the bacterial DNA is called **specialized** or **restricted transduction**.

57. Write the features of living things.

Ans.
1. Growth and metabolism.
2. Reproduction.
3. Ability to sense stimuli (Consciousness)
4. Ability to self-replicate and self - organise.

58. Explain the statement of non-living things also grow.

Ans.
1. Non-living things like mountains, boulders, sand dunes also grow by accumulating the material on their external surface.
2. But, this growth is considered as external growth in comparison to the growth of living things which is internal.

59. What is reproduction?

Ans. The production of new individuals or offsprings which can be accomplished by sexual or asexual reproduction.

60. What are the advantages of consciousness in living organism?

Ans.
1. Consciousness enables an organism to respond to various external factors by sense organs.
2. It is the ability of living organisms to respond to various physical, chemical and biological stimuli from their surroundings.

61. List out the external factors / stimuli influencing plants.

Ans. Light, Water, Temperature, Pollutants, these are the external factors of stimuli.

62. What does bacteriophage means?

Ans. Bacteriophages are viruses which attack and destroy bacteria.

63. What is the need for classification?

Ans. **Need for classification:**

1. To relate things based on common characteristic features.
2. To define organisms based on the salient features.
3. Helps in knowing the relationship amongst different groups of organisms.

64. Define Genophore.

Ans.

1. The bacterial chromosome is a single circular DNA molecule, tightly coiled and is not enclosed in a membrane as in Eukaryotes.
2. This genetic material is called **nucleoid** or **genophore**.

65. What are Endospores?

Ans. During unfavourable condition bacteria produce thick walled resting spores called **endospores**. Eg: ***Clostridium tetani* produces endospores.**

66. How are fungi classified at present?

Ans. Fungi are classified into three divisions namely Gymnomycota, Mastigomycota and Amastigomycota.

67. What is Pruteen?

Ans.

1. "Pruteen" is a single cell protein.
2. Derived from ***Methylophilus*** and ***Methylotropus.***

68. Name some important antibiotics produced by Actionomycetes.

Ans. Streptomycin, Chloramphenicol, and Tetracycline.

69. Why are lichens called as dual organisms?

Ans. Lichens are dual organisms because they contain fungus or mycobiont and an algae or phycobiont.

70. What is hyphae?

Ans. The fungal body is an assemblage of long extremely fine, almost transparent threads called **hyphae**.

71. What is mycelium?

Ans. Numerous hyphae are twined around one another to form **mycellium** - vegetative body of a fungus.

72. Define the role of algal partner or phycobiont in a lichen.

Ans.

1. Nitrogen fixation (if cyanobacterial type)
2. Photosynthesis
3. Provides vitamins and other growth substances.

73. Distinguish between anamorph and telomorph.

Ans.

1. The asexual phase of fungi is called **anamorph**.
2. The sexual phase of fungi is called **telomorph**.

74. What is holomorph?

Ans. Fungi showing both sexual and asexual phases are called **holomorph**.

75. Define the role of fungal partner or mycobiont in a lichen.

Ans.

1. Outer covering for protection.
2. Attachment to substratum.
3. Protection against harmful radiations.

76. Mention the types of asexual reproduction in lichens.

Ans. Fragmentation, Soredia and Isidia.

77. What is ghost?

Ans.

1. During virulent cycle of a phage in the 'penetration'stage, the DNA of phage is injected into the bacterial cell.
2. The empty protein coat of phage left outside the cell is called **ghost**.

78. What is a lysogenic phage?

Ans.

1. In the lysogenic cycle of phage, the phage DNA gets integrated into the DNA of the host cell and gets multiplied along with nucleic acid of the host.
2. No independent viral particle is formed.

79. Deuteromycetes are imperfect fungi - Justify.

Ans. The fungi belonging to deuteromycetes lack sexual reproduction and are called imperfect fungi.

80. What is red tide ?

Ans.

1. Red tide is caused by toxic bloom of Dinoflagellates like *Gymnodinium* species.
2. A major red tide incident in west coast of Florida in the year (1982) killed thousands of fishes.

81. Name some toxins produced by Fungus.

Ans. Alfatoxin, Patulin and Ochratoxin-A.

82. Why is Robert koch considered to be the founder of modern bacteriology?

Ans.

1. He identified the causal organism for Anthrax, Cholera and Tuberculosis.
2. He experimentally proved the concept of infection.
3. He received a Nobel prize in Medicine (1905).

83. List out the antibiotics produced by fungi.

Ans. Penicillin, cephalosporins and griseofulvin.

84. Does Yoghurt a good source of probiotics?

Ans. Yes.

1. Probiotics are live microorganisms that when administered in adequate amounts confer health benefit on the host. Eg: **Yoghurt** is a probiotic food. It contains ***Lactobacillus*** species.
2. It maintains gut flora in humans and maintains good health.

85. Which bacteria is called a superbug?

Ans. A bacterium named *Pseudomonas putida* is a superbug genetically engineered which breakdown hydrocarbons.

86. How does *Agrobacterium* help in Genetic engineering?

Ans. *Agrobacterium tumefaciens* causes crown gall disease in plants but its inherent tumour inducing principle helps to carry the desired gene into the plant through Genetic engineering.

87. Define reproduction and mention its types.

Ans.
1. Reproduction is the tendency of a living organism to replicate its own species.
2. There are two types of reproduction namely asexual and sexual.

88. Name the hydrogen donor of green sulphur bacteria and purple sulphur bacteria.

Ans.
1. Hydrogen donor of green sulphur bacteria is H_2S and possess pigment called Bacterioviridin. Example: *Chlorobium*.
2. Hydrogen donor of purple sulphur bacteria is thiosulphate. Example: *Chromatium*.

Short Answers — 3 MARKS

1. Mention the potential applications of fungi in agriculture.

Ans.
1. Mycorrhiza forming fungi like *Rhizoctonia* helps in absorption of water and minerals.
2. Fungi like *Beauveria bassiana* are used as biopesticides to eradicate crop pests.
3. Gibberellin is a plant growth promoter produced by a fungus *Gibberella fujikuroi*.

2. What are the three main symmetry of viruses?

Ans. Generally viruses are of three types based on shape and symmetry.
1. Cuboid symmetry-Eg: Adenovirus, Herpes virus.
2. Helical symmetry - Eg : Influenza virus, TMV.
3. Complex or Atypical symmetry - Eg : Bacteriophage, Vaccinia virus.

3. Explain the circular molecule of ssRNA without a capsid?

Ans.
1. Viroid is a circular molecule of ssRNA without a capsid and was discovered by **T.O. Diener** in the year **1971.**
2. The RNA of viroid has low molecular weight. Viroids cause citrus exocortis and potato spindle tuber disease in plants.

4. Distinguish Prokaryotic and Eukaryotic organisms.

Ans.

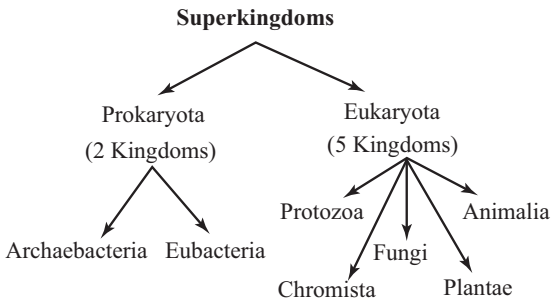
No.	Prokaryotic	Eukaryotic
1.	Unicellular organisms.	Unicellular or multicellular organisms.
2.	Lack membrane bound nucleus.	Definite nucleus is present bound by nuclear membrane.
3.	Organelles like mitochondria, endoplasmic reticulum are absent.	Organelles like mitochondria, endoplasmic reticulum are present.
4.	Eg : ***Amoeba.***	Eg : ***Oedogonium.***

5. What are the symptoms of Tobacco Mosaic Disease?

Ans.
1. Discoloration of leaf colour along the veins.
2. Typical yellow and green mottling which is the mosaic symptom.
3. Downward curling of young apical leaves.
4. Stunted growth and yield is affected.

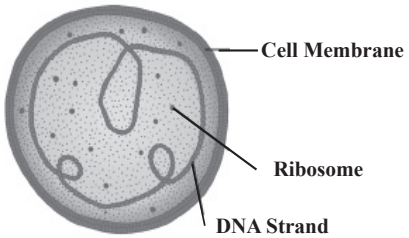
6. Name the divisions of seven kingdom classification?

Ans.



7. Draw a labelled diagram of *Mycoplasma*.

Ans.



8. What are Actinomycetes ? Give example.

Ans. 1. Actinomycetes or 'Ray fungi' are anaerobic or facultative anaerobic microorganisms.

2. They show mycelia like growth.
3. Eg : ***Streptomyces.***

9. What is Mycorrhiza? Mention the types.

Ans. The Symbiotic association between fungal mycelium and roots of plants is called as **Mycorrhizae**.

Types:

1. Ectomycorrhizae
2. Endomycorrhizae
3. Ectendomycorrhizae

10. List out the bacteria used in dairy industry.

Ans.

No.	Bacteria	Role
1.	*Lactobacillus lactis* and *Lactobacillus bulgaricus.*	Making curd (Convert milk sugar lactose into lactic acid).
2.	*Lactobacillus lactis.*	Used in making cheese.
3.	*Lactobacillus lactis.*	Used in curd and making butter.

11. What are Prions? Who discovered it?

Ans. 1. Prions are the causative agents for about a dozen fatal degenerative disorders of the central nervous system of humans and other animals.

2. For Eg : **Creutzfeldt – Jacob Disease (CJD), Bovine Spongiform Encephalopathy (BSE)** – commonly known as **mad cow disease.**

3. Discovered by **Stanley B. Prusiner** in the year **1982**.

12. List out the Animal diseases caused by Bacteria.

Ans.

Animal diseases			
No	**Name of the Animal**	**Name of the diseases**	**Name of the pathogen**
1.	Sheep	Anthrax	*Bacillus anthracis*
2.	Cattle	Brucellosis	*Brucella abortus*
3.	Cattle	Bovine tuberculosis	*Mycobacterium bovis*
4.	Cattle	Black leg	*Clostridium chauvoei*

13. Mention the economic importance of lichens.

Ans. 1. Lichens secrete organic acids like Oxalic acids which corrodes the rock surface and helps in weathering of rocks, acting as pioneers in xerosere.
2. Lichens are sensitive to air pollutants and are considered as pollution indicators.
3. ***Cladonia rangiferina*** (Reindeer moss) is used as food for animals living in Tundra regions.
4. Usnic acid produced from lichens show antibiotic properties. (Note: Any three points).

14. Discuss in detail about the Bacterial Chromosome.

Ans. 1. The Bacterial Chromosome is a single circular DNA molecule, tightly coiled and is not enclosed in a membrane as in Eukaryotes.
2. This genetic material is called **Nucleoid** or **Genophore.**
3. The DNA is not bound to histone proteins.

15. What are Gram-Positive bacteria?

Ans. 1. The bacteria which retain the violet colour in Gram's staining procedure are called as Gram Positive bacteria.
2. Eg: *Pneumococcus, Streptococcus.*

16. Cyanobacteria plays a major role in our ecology. Discuss.

Ans. 1. Cyanobacteria, also known as **'Blue green algae'** help in carbon fixation in a major way on the ocean surface.
2. They are helpful in nitrogen fixation in paddy fields leading to a better harvest.
3. About 80% of photosynthesis on ocean surface is done by cyanobacteria. So, it can be said that they play a major role in our ecology.

17. Write down the characteristics features of Archaebacteria.

Ans. 1. They are most primitive prokaryotes.
2. They are found in extreme environmental conditions. Eg: Hot springs.
3. Unique feature is presence of lipids like glycerol and isopropyl ethers in their cell membrane. Hence the membrane shows resistance against cell wall antibiotics. Eg: Methanobacterium.

18. What are Gram-Negative bacteria?

Ans. 1. The bacteria which become decolourised and appear in red colour in Gram's staining procedure are called as gram negative bacteria.
2. Eg: *E.coli, Salmonella.*

19. List out some Human diseases caused by Fungi.

Ans. **Human diseases caused by fungi:**

No.	Human diseases	Causal organisam
1.	Athlete's foot	*Epidermophyton floccosum*
2.	Candidiasis	*Candida albicans*
3.	Coccidioidomycosis	*Coccidioides immitis*
4.	Aspergillosis	*Aspergillus fumigatus*

20. Name some plant diseases caused by Fungi.

Ans. **Plant diseases caused by Fungi:**

No.	Name of the disease	Causal organism
1.	Red rot of sugarcane	*Colletotrichum falcatum*
2.	Anthracnose of Beans	*Colletotrichum lindemuthianum*
3.	White rust of crucifers	*Albugo candida*

21. Lichens are the pioneer organisms. Justify.

Ans.
1. Lichens are the pioneer organisms in the new terrains which colonise bare rocks, mountains and cliffs.
2. They corrode the rocks and accumulate a certain amount of minerals and organic matter.
3. The plants like mosses and grasses appear later in succession, utilizing the first soil formed by lichens.
4. Lichens thus, can convert a barren area into one that can support vegetation.

22. Tabulate the difference between anabolism and catabolism.

Ans. Metabolism includes Anabolism and Catabolism.

No.	Anabolism	Catabolism
1.	Building up process.	Breaking down process.
2.	Smaller molecules combine together to form larger molecule.	Larger molecule break into smaller units.
3.	Energy is consumed.	Energy is released.
4.	Chemical energy is formed and stored.	The stored chemical energy is released and used.
5.	Eg: Synthesis of proteins from amino acids.	Eg :Breaking down of glucose to CO_2 and water

23. List some viral diseases which occur in plants.

Ans. **Plant diseases :**
1. Tobacco Mosaic Disease.
2. Cauliflower Mosaic Disease.
3. Sugarcane Mosaic Disease.
4. Potato leaf roll.
5. Bunchy top of banana.
6. Leaf curl of papaya.
7. Vein clearing of Lady's finger.
8. Rice tungro Disease.
9. Cucumber Mosaic Disease.
10. Tomato spotted wilt Disease.

Note: 6 diseases may be listed for **3 Marks** question.

Long Answers — 5 MARKS

1. List some viral diseases which occur in Humans.

Ans. **Human Diseases :**
1. Common cold.
2. Hepatitis B.
3. Cancer.
4. SARS (Severe Acute Respiratory Syndrome).
5. AIDS (Acquied Immuno Deficiency Syndrome).
6. Rabies.
7. Mumps.
8. Polio.
9. Chikungunya.
10. Small Pox.
11. Chicken pox.
12. Measles.

Note: 6 diseases may be listed for **3 Marks** question.

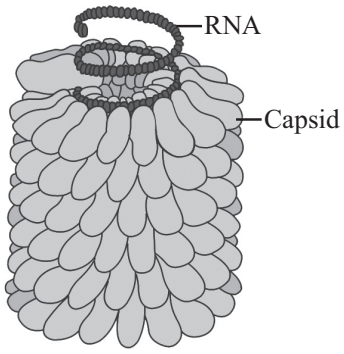
2. Describe the structure of Tobacco Mosaic Virus.

Ans. **Tobacco Mosaic Virus** was discovered in 1892 by Dimitry Ivanowsky from Tobacco plant.

Structure of Tobacco Mosaic Virus :

1. TMV is a rod shaped helical virus measuring about 300 ×20nm with a molecular weight of 39 $\times 10^6$ Daltons.

2. The virion is made up of two constituents, a protein coat called **capsid** and a core called nucleic acid.

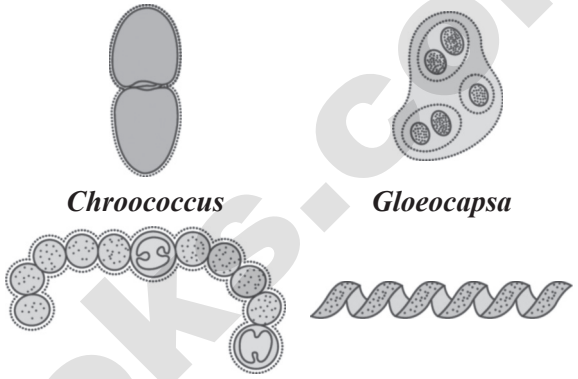


3. The capsid is made up of approximately 2130 identical protein subunits called capsomeres.
4. The Nucleic acid consists of central single stranded RNA molecule.
5. The genetic information necessary for the formation of a complete TMV particle is contained in its RNA. It has 6,500 nucleotides.

3. Write down the salient features of Cyanophyceae.

Ans. **Salient features :**

1. The members of this group are prokaryotes and lack motile reproductive structures.
2. The thallus is unicellular in *Chroococcus*, Colonial in *Gloeocapsa* and filamentous trichome in *Nostoc*.
3. Gliding movement is noticed in some species (*Oscillatoria*).
4. The protoplasm is differentiated into a centroplasm and peripheral region bearing chromatophore called chromoplasm.
5. The photosynthetic pigments include c-phyocyanin and c-phycoerythrin along with myxoxanthin and myxoxanthophyll.
6. In some forms a large colourless cell is found in the terminal or intercalary position called Heterocysts. They are involved in nitrogen fixation.
7. The reserve food material is Cyanophycean starch.
8. They reproduce only through vegetative methods and produce Akinetes, Hormogonia, fission and endospores.
9. The presence of mucilage around the thallus is characteristic feature of this group. Therefore, this group is also called Myxophyceae.
10. Sexual reproduction is absent.
11. *Microcystis aeruginosa, Anabaena flos-aquae* cause water blooms and release toxins and affect the aquatic organism. Most of them fix atmospheric nitrogen and are used as biofertilizers (Example: *Nostoc, Anabaena*). *Spirulina* is rich in protein hence it is used as single cell protein.



4. Give a brief account on the attributes of living world.

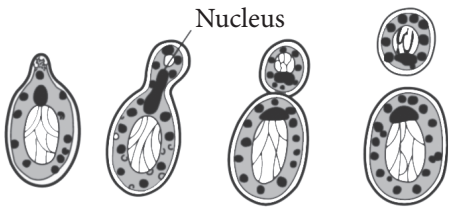
Ans. **Attributes of living organisms :**

1. **Growth :** It is an intrinsic property of all living organisms through which they can increase cells both in number and mass.
   - **(i)** Addition of new protoplasm within the cells occur. Unicellular and multicellular organisms grow by cell division.
   - **(ii)** Plants show indefinite growth life throughout and animals show definite growth.
   - **(iii)** Growth in non-living objects is extrinsic. In bacteria growth occurs by cell division. Hence, growth and reproduction are mutually inclusive events.
2. **Cellular Structure : Cells of living organisms may be prokaryotic or Eukaryotic.**

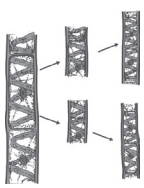
No.	Prokaryotic Cells	Eukaryotic Cells
1.	Nuclear membrane is absent.	Membrane bound nucleus is present.
2.	Membrane bound organelles like Mitochondria are absent. Eg : *Amoeba*	Membrane bound organelles like Mitochondria are present. Eg : *Ooedogonium*

3. **Reproduction :** It is a tendency of a living organism to perpetuate its own species.

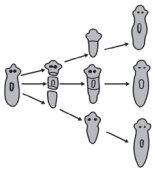
(i) **Asexual reproduction :** Production of progeny with features more or less similar to parents. Eg : **Conidia** (*Aspergillus penicillium*), **Budding** (Hydra).



Budding - Yeast



Fragmentation - *Spirogyra*



Regeneration - *Planaria*

(ii) **Sexual Reproduction :** Variation is seen in progeny through recombination.

4. **Response to stimuli :**

(i) All living organisms are capable of sensing their environment and respond to various physical, chemical and biological stimuli.

(ii) Animals sense their surroundings by use of sense organs and is called **Consciousness.** In plants examples are bending of plants towards light. Closure of leaves in venus fly trap etc. This type of response is called **Irritability**.

5. **Homeostasis :**

(i) Property of self-regulation and tendency to maintain a steady state within an external environment which is liable to change is called **Homeostasis**.

(ii) Living organism must maintain internal condition to survive in this environment.

6. **Metabolism :** The sum of all the chemical reactions taking place in a cell of living organism is called **metabolism**.

Metabolism
Anabolism Catabolism

No.	Anabolism	Catabolism
1.	Building up process.	Breaking down process.
2.	Smaller molecules combine together to form larger molecule	Larger molecule break into smaller units
3.	Chemical energy is formed and stored	The stored chemical energy is released and used
4.	Eg : Synthesis of proteins from amino acids.	Eg :Breaking down of glucose to CO_2 and water.

Movement, Nutrition, Respiration and excretion are also considered as the property of living things.

5. **Write down the general characteristic features of bacteria.**

Ans. **General characteristic features of bacteria :**

1. They are prokaryotic organisms and lack nuclear membrane and membrane bound organelles.
2. The genetic material is called **nucleoid** or genophore or incipient nucleus.
3. The cell wall is made up of **polysaccharides** and **proteins.**
4. Most of them lack chlorophyll, hence they are heterotrophic but some are autotrophic and possess bacteriochlorophyll.
5. They reproduce vegetatively by Binary fission and endospore formation.
6. They exhibit variations which are due to genetic recombination and is achieved through conjugation, transformation and transduction.
7. The shape and flagellation of the bacteria varies in different types of bacteria.

6. **Explain the ultrastructure of bacterial cell.**

Ans. The bacterial cell reveals three layers 1. Capsule/ Glycocalyx 2. Cell wall and 3.Cytoplasm .

Capsule/Glycocalyx :

1. A thick layer of glycocalyx bound tightly to the cell wall is called capsule.
2. It protects cell from desiccation and antibiotics.
3. It helps to retain the nutrients in bacterial cell.

Cell wall :

1. The bacterial cell wall is granular and is rigid. Provides protection and gives shape to the cell.

2. Chemical composition of cell wall is rather complex and is made up of Peptidoglycan or mucopeptide.
3. One of the most abundant polypeptide called **porin** is present, it helps in the diffusion of solutes.

Plasma membrane :

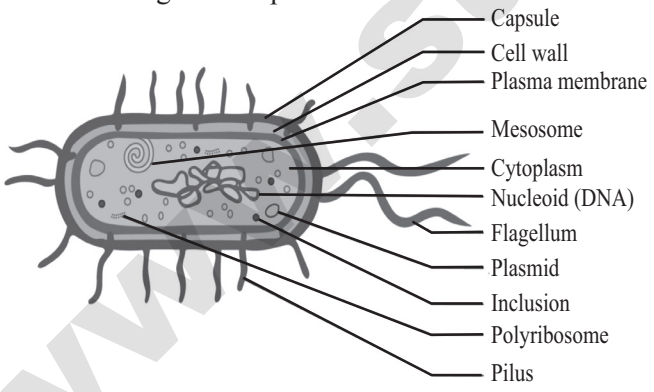
1. Plasma membrane is made up of lipoprotein.
2. It controls the entry and exit of small molecules and ions.
3. The enzymes involved in the oxidation of metabolites (i.e., the respiratory chain) as well as the photosystems used in photosynthesis are present in the plasma membrane.

Cytoplasm :

1. Cytoplasm is thick and semitransparent. It contains ribosomes and other cell inclusions.
2. Cytoplasmic inclusions like glycogen, poly-β hydroxybutyrate granules, sulphur granules and gas vesicles are present.

Bacterial chromosome :

1. The bacterial chromosome is a single circular DNA molecule, tightly coiled and is not enclosed in a membrane as in Eukaryotes.
2. This genetic material is called **Nucleoid** or **Genophore**.
3. The DNA is not bound to histone proteins.
4. The single chromosome or the DNA molecule is circular and attached to plasma membrane at one point, which helps in chromosome seperation during DNA replication.



Ultra structure of bacterial cell

Plasmid :

1. Plasmids are extra chromosomal double stranded, circular, self-replicating, autonomous elements. They contain genes for fertility, antibiotic resistant and heavy metals.
2. Helps in the production of bacteriocins and toxins which are not found in bacterial chromosome. (The size of a plasmid varies from 1 to 500 kb).
3. Plasmids are classified into different types based on the function.
4. Some of them are F (Fertility) factor, R (resistance) plasmids, Col (Colicin) plasmids, Ri (Root inducing) plasmids and Ti (Tumour inducing) plasmids.

Mesosomes :

1. Localized infoldings of plasma membrane into the cell in the form of vesicles, tubules and lamellae.
2. Folded together to maximize their surface area and helps in respiration and in binary fission.

Polysomes :

The ribosomes are the site of protein synthesis. The number of ribosome per cell varies from 10,000 to 15,000. Ribosomes are 70 S type. Ribosomes are held together by mRNA and form polyribosomes or polysomes.

Flagella :

1. Certain motile bacteria have numerous thin hair like projections of variable length emerge from the cell wall called **flagella**.
2. The flagella of Eukaryotic cells contain 9+2 microtubles but each flagellum in bacteria is made up of a single fibril.
3. Flagella are used for locomotion.
4. Based on the number and position of flagella there are different types of bacteria.

Fimbriae or pili :

1. Pili or fimbriae are hair like appendages found on surface of cell wall of gram-negative bacteria (Eg : *Enterobacterium*).
2. Pili which helps in conjugation are called **sex pili.**

7. Write down the salient features of Ascomycetes.

Ans.

1. Ascomycetes include a wide range of fungi such as yaests, powdery mildews, lupfungi, morels.
2. Majority of the species live in terrestrial environment, some live in aquatic environments both fresh water and marine.
3. The mycelium is well developed, branched with simple septum.
4. Majority of them are saprophytes but few parasites are also known. Eg: Powdery mildew – Erysiphe.

5. Asexual reproduction takes place by fission, budding, oidia, conidia, chlamydospore.
6. Sexual reproduction takes place by the fusion of two compatible nuclei.
7. Plasmogamy is not immediately followed by karyogamy. Instead a dikaryotic condition is prolonged for several generations.
8. A special hyphae called **ascogenous hyphae** is formed.
9. A crozier is formed when the tip of the ascogenous hyphae recurves forming a hooked cell. The two nuclei in the penultimate cell of the hypha fuse to form a diploid nucleus. This cell form young ascus.
10. The diploid nucleus undergo meiotic division to produce four haploid nuclei , which further divide mitotically to form **eight nuclei**. The nucleus gets organised in to **8 ascospores**.
11. The ascospores are found inside a bag like structure called ascus. Due to the presence of ascus, this group is popularly called **'Sac fungi'**.
12. Asci gets surrounded by sterile hyphae forming fruit body called **ascocarp**.
13. There are 4 types of ascocarps namely Ceistothecium (Completely closed), Perithecium (Flask shaped with ostiole), Apothecium (Cup shaped, open type) and Pseudothecium. Eg : Yeast, Cup Fungi.

8. What are Mycorrhizae? Explain the types.

Ans. **Mycorrhizae:**

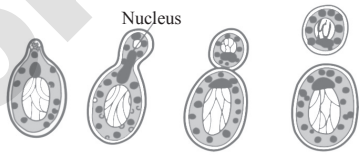
1. The symbiotic association between fungal mycelium and roots of plants is called as **mycorrhizae**.
2. In this relationship fungi absorb nutrition from the root and in turn the hyphal network of mycorrhizae forming fungi helps the plant to absorb water and mineral nutrients from the soil.

Types:

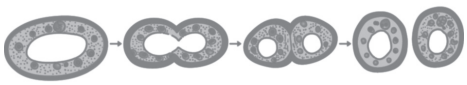
1. **Ectomycorrhizae :**
   - (i) The fungal mycelium forms a dense sheath around the root called **mantle**.
   - (ii) The hyphal network penetrate the intercellular spaces of the epidermis and cortex to form Hartignet. Eg: *Pisolithus tinctorius.*
2. **Endomycorrhizae :**
   - (i) The hyphae grows mainly inside the roots, penetrate the outer cortical cells of the plant root.
   - (ii) A small portion of the mycelium is found outside the root.
   - (iii) This form is also called **Vesicular Arbuscular Mycorrhizal** fungi (VAM Fungi) due to the presence of Vesicle or arbuscle like haustoria.
     - (i) Arbuscular mycorrhizae (VAM) Eg: ***Gigaspora***
     - (ii) Ericoid mycorrhizae- Eg: ***Oidiodendron***
     - (iii) Orchid mycorrhizae - Eg: *Rhizoctonia*
3. **Ectendomycorrhizae :**
   The fungi form both mantle and also penetrates the cortical cells.

9. Explain the different methods of asexual reproduction in fungi.

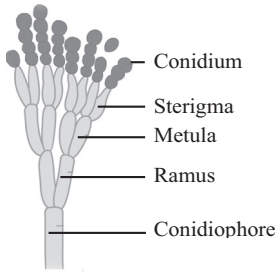
Ans.
1. **Zoospores:** They are flagellate structures produced in zoosporangia. Eg : *Chytrids*.
2. **Conidia :** The spores produced on condiophores. Eg: *Aspergillus penicillium*.



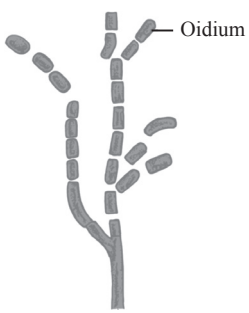
Budding - Yeast



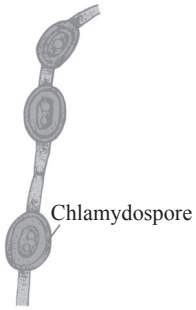
Fission - Yeast



Conidia formation - *Penicillium*



Thallospore - *Erysiphe*



Chlamydospore - *Fusarium*

3. **Oidia/Thallospores :** The hypha divide and developed in to spores called **oidia**. Eg : *Erysiphe*.
4. **Fission:** The vegetative cell divides into 2 daughter cells. Eg: *Schizosaccharomyces*- Yeast.
5. **Budding:** A small outgrowth is developed on parent cell, which gets detached and becomes independent. Eg : *Saccharomyces* - Yeast.
6. **Chlamydospore:** Thick walled resting spores are called chlamydospores. Eg: *Fusarium*.

10. Why are viruses known as the intermediate between living and non-living entities?

Ans. Viruses are the intermediate between living and non-living entities.

Viruses resembles living beings which are as follows:

1. Presence of nucleic acid and protein.
2. Capable of mutation.
3. Ability to multiply within living cells.
4. Able to infect and cause diseases in living beings.
5. Show irritability.
6. Host –specific.

Viruses resembles non-living beings which are as follows:

1. Can be crystallized.
2. Absence of metabolism.
3. Inactive outside the host.
4. Do not show functional autonomy.
5. Energy producing enzyme system is absent.

Hence viruses are said to be intermediate between living and non-living entities.

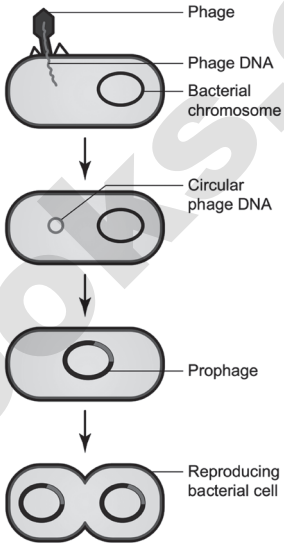
11. List the differences between Bacteria and Cyanobacteria.

Ans.

S. No.	Bacteria	Cyanobacteria
1.	Cells are smaller.	Cells are comparatively larger.
2.	They may possess flagella.	They usually lack flagella.
3.	They are both autotrophic and heterotrophic.	They are autotrophic.
4.	Autotrophic bacteria contain bacteriochlorophyll.	They possess the pigments chlorophyll a phycocyanin and phycoerythrin.
5.	They may be aerobic or anaerobic.	They are aerobic.
6.	The reserve food is glycogen.	The reserve food is cyanophycean starch.
7.	Sexual reproduction is seen.	Sexual reproduction is absent.

12. Explain lysogenic cycle of a phage.

Ans.



1. In the lysogenic cycle, the phage DNA gets integrated into the DNA of the host cell and gets multiplied along with nucleic acid of the host. No independent viral particle is formed.
2. As soon as the phage injects its linear DNA into the host cell it becomes circular and integrates into the bacterial chromosome by recombination. The integrated phage DNA is now called **prophage.**
3. The activity of the prophage gene is repressed by two repressor proteins which are synthesized by phage genes. This checks the synthesis of new phages within the host cell.
4. However, each time the bacterial cell divides, the prophage multiplies along with the bacterial chromosome.
5. On exposure to UV radiation and chemicals the excision of phage DNA may occur and results in lytic cycle.

13. Describe the respiration life processes in bacteria.

Ans. Two types of respiration is found in bacteria. They are

1. Aerobic respiration :

These bacteria require oxygen as terminal acceptor and will not grow under anaerobic conditions (i.e. in the absence of O_2)

Eg: *Streptococcus.*

Obligate aerobes :

Some *Micrococcus* species are obligate aerobes (i.e. they must have oxygen to survive).

2. Anaerobic respiration :

These bacteria do not use oxygen for growth and metabolism but obtain their energy from fermentation reactions. Eg : ***Clostridium.***

a) Facultative anaerobes :

(i) There are bacteria that can grow either using oxygen as a terminal electron acceptor or anaerobically using fermentation reaction to obtain energy.

(ii) Facultative anaerobes are often termed "aerobes".

(iii) When a facultative anaerobes such as *Ecoli* is present at a site of infection like an abdominal abscess, it can rapidly consume all available O_2 and change to anaerobic metabolism producing an anaerobic environment and thus allow the anaerobic bacteria that are present to grow and cause disease. Eg: *Escherichia coli* and *Salmonella.*

b) Capnophilic Bacteria:

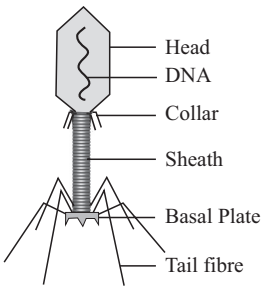
Bacteria which require CO_2 for their growth are called as **capnophilic bacteria**.

Eg : *Campylobacter* .

14. Describe the structure of T_4 phage.

Ans. **Structure of T_4 Bacteriophage :**

1. The T_4 phage is tadpole shaped and consists of head, collar, tail, base plate and fibres.



2. The head is hexagonal which consists of about 2000 identical protein subunits.

3. The long helical tail consists of an inner tubular core which is connected to the head by a collar.

4. There is a base plate attached to the end of tail.

5. The base plate contains six spikes or tail fibres.

6. These fibres are used to attach the phage on the cell wall of bacterial host during replication.

7. A dsDNA molecule of about 50 µm is tightly packed inside the head.

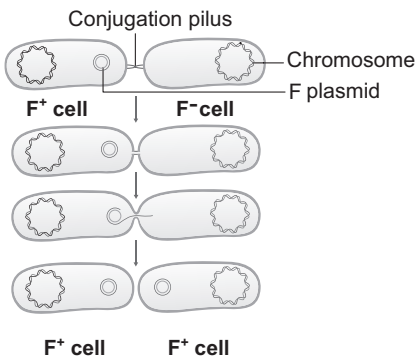
8. The DNA is about 1000 times longer than the phage itself.

15. Explain conjugation in bacteria.

Ans. **1.** It is a method of sexual reproduction in bacteria. J. Lederberg and Edward L. Tatum demonstrated conjugation in *Ecoli.* in the year 1946.

2. In this method of gene transfer the donor cell gets attached to the recipient cell with the help of pili. The pilus grows in size and forms the conjugation tube.

3. The plasmid of donor cell which has the F^+ (fertility factor) undergoes replication.



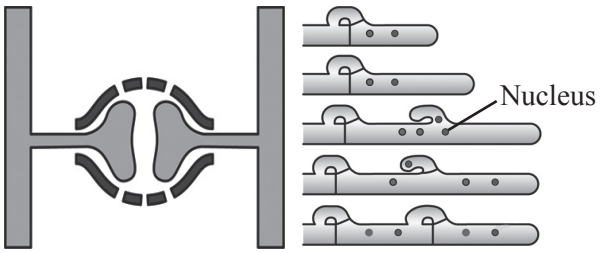
Conjugation

4. Only one strand of DNA is transferred to the recipient cell through conjugation tube.

5. The recipient completes the structure of double stranded DNA by synthesizing the strand that complements the strand acquired from the donor.

16. Write a note on Basidiomycetes.

Ans. **1.** Basidiomycetes include Puff balls, Toad stools, Bird nest's fungi, Bracket fungi, Stink horns, Rusts and Smuts.



Dolipore Septum Clamp connection

2. The members are terrestrial and lead a saprophytic and parasitic mode of life.
3. The mycelium is well developed, septate with dolipore septum(bracket like). Three types of mycelium namely Primary, Secondary and Tertiary are found.
4. Clamp connections are formed to maintain dikaryotic condition.
5. Asexual reproduction is by means of Conidia, Oidia or Budding.
6. Sexual reproduction is present but sex organs are absent. Somatogamy or spermatisation results in plasmogamy.
7. Karyogamy is delayed and dikaryotic phase is prolonged. Karyogamy takes place in basidium and it is immediately followed by meiotic division.
8. The four nuclei thus formed are transformed into basidiospores which are borne on sterigmata outside the basidium (Exogenous).
9. The basidium is club shaped with four basidiospores. Thus this group of fungi is popularly called **club fungi**. The fruit body formed is called **Basidiocarp**.

17. Discuss in detail about mode of nutrition in bacteria.

Ans. **Nutrition :** On the basis of their mode of nutrition, bacteria are classified into two types:

I. Autotrophic Bacteria :

Bacteria which can synthesis their own food are called **autotrophic bacteria**. Further subdivided as:

A. Photoautotrophic bacteria :

Bacteria use sunlight as their source of energy to synthesize food. They are:

1. Photolithotrophs :

Hydrogen donor is an inorganic substance.

a. Green sulphur bacteria :

Hydrogen donor is H_2S and possess pigment called **Bacterioviridin.**Eg : *Chlorobium.*

b. Purple sulphur bacteria

Hydrogen donor is thiosulphate, Bacteriochlorophyll is present. Chlorophyll containing chlorosomes are present. Eg: *Chromatium*

2. Photoorganotrophs :

They utilize organic acid or alcohol as hydrogen donor. Eg: Purple non sulphur bacteria - *Rhodospirillum*.

B. Chemoautotrophic bacteria :

Do not have photosynthetic pigment hence they cannot use sunlight energy. This type of bacteria obtains energy from organic or inorganic substance.

1. Chemolithotrophs :

This type oxidize inorganic compound to release energy.
Eg : Sulphur bacteria -*Thiobacillus, thiooxidans*

2. Chemo-organotrophs :

This type oxidize organic compounds to release energy. Eg : Methane bacteria - *Methanococcus*

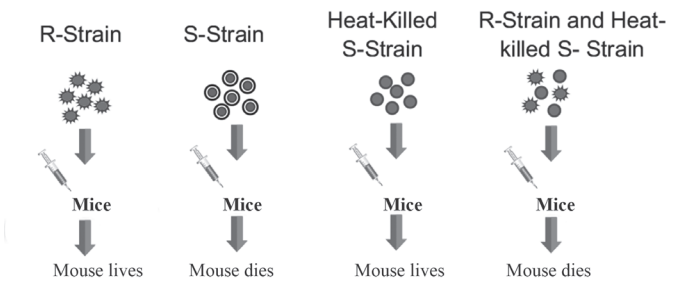
II. Heterotrophic Bacteria :

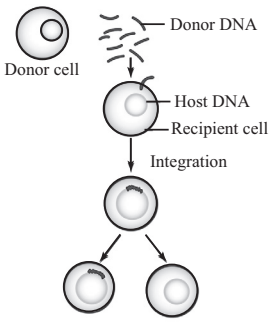
They are Parasites *(Mycobacterium)* Saprophytes *(Bacillus mycoides)* or Symbiotic (*Rhizobium* in root nodules of leguminous crops).

18. Explain transformation in bacteria as experimented by Griffith.

Ans. **Transformation :**

1. Transfer of DNA from one bacterium to another is called **transformation.**
2. In 1928 the bacteriologist Frederick Griffith demonstrated transformation in Mice using *Diplococcus pneumoniae*.





Transformation in Bacteria

3. Two strains of this bacterium are present. One strain produces smooth colonies and are virulent in nature (S type). In addition another strain produced rough colonies and are avirulent (R type).
4. When S-type of cells were injected into the mouse, the mouse died. When R-type of cells were injected, the mouse survived.
5. When he injected heat killed S-type cells into the mouse the mouse did not die.
6. When the mixture of heat killed S-type cells and R-type cells were injected into the mouse. The mouse died.
7. The avirulent rough strain of Diplococcus had been transformed into S-type cells.
8. The hereditary material of heat killed S-type cells had transformed R-type cell into virulent smooth strains.
9. Thus the phenomenon of changing the character of one strain by transferring the DNA of another strain into the former is called **Transformation.**

19. Discuss the role of bacteria in soil fertility.

Ans. **Soil fertility :**

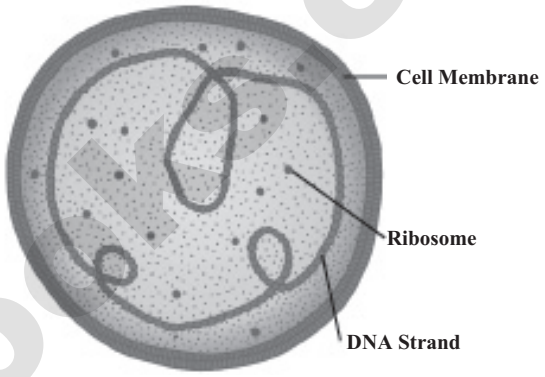
1. The Ammonifying bacteria like *Bacillus ramosus* and *Bacillus mycoides* convert complex proteins in the dead bodies of plants and animals into ammonia, later converted into ammonium salt.
2. The Nitrifying bacteria such as *Nitrobacter, Nitrosomonas* convert ammonium salts into nitrites and nitrates.
3. Nitrogen fixing bacterial such as *Azotobacter, Clostridium* and *Rhizobium* (a symbiotic bacterium) are capable of converting atmospheric nitrogen into organic nitrogen.
4. The nitrogenous compounds are also oxidized to nitrogen.

All these activities of bacteria increase soil fertility.

20. Explain the general characteristic features of Actinomycetes.

Ans. **Actinomycetes :**

1. Actinomycetes are also called **'Ray fungi'** due to their mycelia like growth.
2. They are anaerobic or facultative anaerobic microorganisms and are Gram positive. They do not produce an aerial mycelium.
3. Their DNA contain high guanine and cytosine content. Eg : *Streptomyces.*



Structure of *Mycoplasma*

4. ***Frankia*** is a symbiotic actinobacterium which produces root nodules and fixes nitrogen in non – leguminous plants such as ***Alnus*** and ***Casuarina.***
5. It produces multicellular sporangium.
6. ***Actinomyces bovis*** grows in oral cavities and cause lumpy jaw.
7. *Streptomyces* is a mycelial forming Actinobacteria which lives in soil, they impart "earthy odour" to soil after rain which is due to the presence of Geosmin (volatile organic compound). Some important antibiotics namely, Streptomycin, Chloramphenicol, and Tetracycline are produced from this genus.

21. Explain the characteristic features of Mycoplasma or Mollicutes.

Ans.
1. The Mycoplasma are very small (0.1 – 0.5µm), pleomorphic gram negative microorganisms.
2. They are first isolated by **Nocard** and **coworkers** in the year 1898 from pleural fluid of cattle affected with bovine **pleuropneumonia.**
3. They lack cell wall and appears like **"Fried Egg"** in culture.
4. The DNA contains low Guanine and Cytosine content than true bacteria.

5. They cause disease in animals and plants. Little leaf of brinjal, witches broom of legumes phyllody of cloves, sandal spike are some plant diseases caused by **mycoplasma**.
6. Pleuropneumonia is caused by *Mycoplasma mycoides.*

22. Discuss the role of bacteria in Industries.

Ans. **1. Dairy Industry :**
Lactic acid bacteria *(Streptococus lactis)* are employed to convert milk sugar lactose into lactic acid.

2. Vinegar :
Vinegar (Acetic acid) is obtained by the activity of acetic acid bacteria *(Acetobacter aceti)*. This bacterium oxidizes ethyl alcohol obtained from molasses by fermentation to acetic acid or vinegar.

3. Alcohols and Acetone :
Butyl Alcohol, Methyl alcohol and Acetone are prepared from molasses by the fermentation activity of the anaerobic bacterium *Clostridium acetobutylicum.*

4. Retting of fibres :
The fibres from the fibre yielding plants are separated by the action of bacteria like *Clostridium* it is called as **retting of fibres**.

5. Vitamins :
E.Coli and ***Clostridium acetobutylicum*** bacteria living in the intestine of human produce large quantities of vitamin K and vitamin B complex. Vitamin B_2 is prepared by the fermentation of sugar.

6. Curing of Tea and Tobacco :
The leaves of tea and tobacco are fermented by the activity of ***Bacillus megatherium*** bacteria to impart the characteristic flavour.

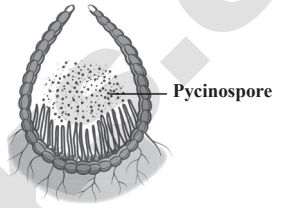
23. List out some plant diseases caused by Bacteria.

Ans.

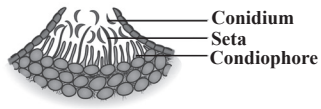
No.	Name of the Host	Name of the disease	Name of the pathogen
1.	Rice	Bacterial blight	*Xanthomonas oryzae*
2.	Apple	Fire blight	*Erwinia amylovora*
3.	Carrot	Soft rot	*Erwinia caratovora*
4.	Citrus	Citrus canker	*Xanthomonas citri*
5.	Cotton	Angular leaf spot	*Xanthomonas malvacearum*
6.	Potato	Scab	*Streptomyces scabies*
7.	Potato	Ringrot	*Clavibacter michiganen sissubsp sepedonicus*

24. Give the salient features of the class Deuteromycetes.

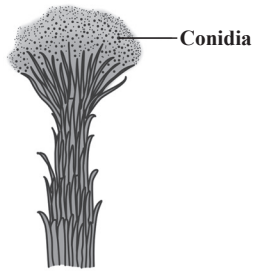
Ans. **1.** The fungi belonging to this group lack sexual reproduction and are called **imperfect fungi.**



Pycinidium - ***Phoma***



Acervulus - ***Colletotrichum***



Synnema - ***Graphium***

2. A large number of species live as saprophytes in soil and many are plant and animal parasites.
3. Asexual reproduction takes place by the production of Conidia, Chlamydospores, Budding, Oidia etc.,
4. Conidia are also produced in special structures called Pycnidium, Acervulus, Sporodochium and Synnema.
5. Parasexual cycle operates in this group of fungi. This brings genetic variation among the species.

25. Write about sexual reproduction in fungi.

Ans. Sexual reproduction in fungi includes **3 steps** 1. Fusion of two protoplasts (plasmogamy) 2. Fusion of nuclei (karyogamy) and 3. Production of haploid spores through meiosis.