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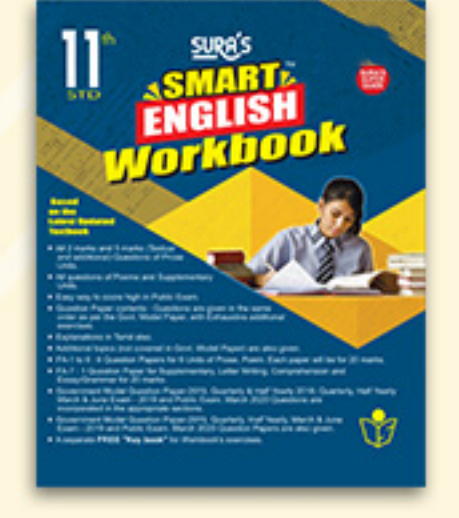
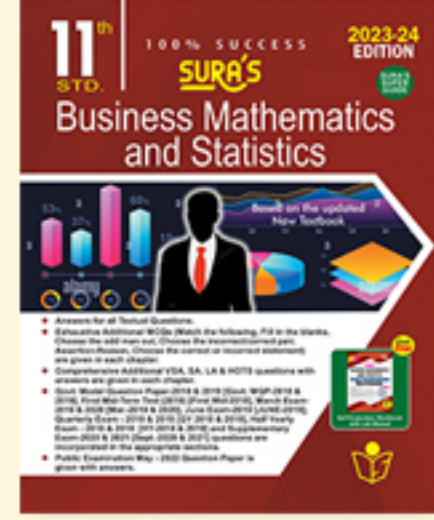
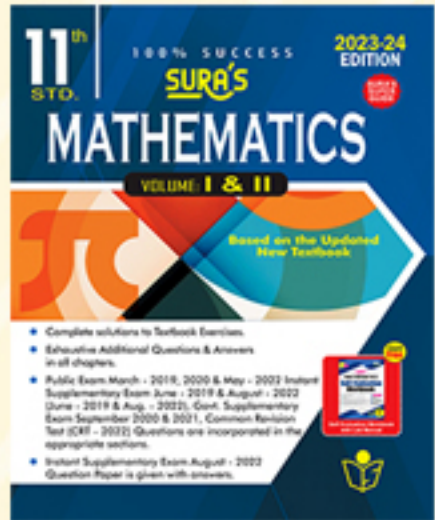
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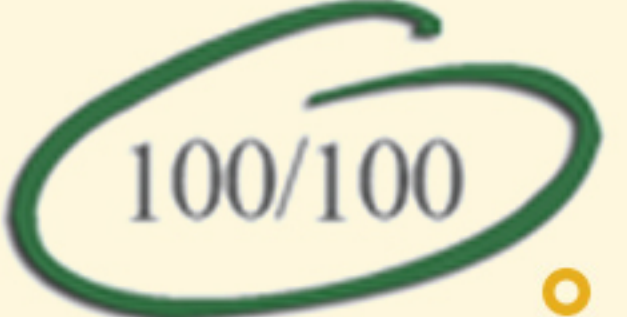


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SURA'S

BIO-BOTANY

&

BOTANY

(SHORT VERSION AND LONG VERSION)

11th Standard

BASED ON THE UPDATED NEW TEXTBOOK

Salient Features

- ⊙ Complete Solutions to Textbook Exercises.
- ⊙ Chapter Snapshot, Concept Map, Must know Definitions are given in each chapter.
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It gives me great pride and pleasure in bringing to you **Sura's Bio-Botany & Botany** guide for **11th Standard**. It is prepared as per the latest Syllabus. A deep understanding of the text and exercises is rudimentary to have an insight into the subject. The students have to carefully understand the topics and exercises.

Our guide encompasses all the requirements of the students to comprehend the text and the evaluation of the textbook.

It will be a teaching companion to teachers and a learning companion to students.

Our guide provides a precise and clear understanding of text and exercises from the examination perspective.

In order to learn effectively, I advise students to learn the subject sectionwise and practice the exercises given.

Though these salient features are available in our guide, I cannot negate the indispensable role of the teachers in assisting the student to understand the subject thoroughly.

I sincerely believe this guide satisfies the needs of the students and bolsters the teaching methodologies of the teachers.

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

1.1 Attributes of living organisms

1.2 Viruses

- 1.2.1 Milestones in Virology
- 1.2.2 Size and Shape
- 1.2.3 Characteristic features of Viruses
- 1.2.4 Classification of Viruses
- 1.2.5 Tobacco Mosaic Virus (TMV)
- 1.2.6 Bacteriophage
- 1.2.7 Multiplication or Life Cycle of Phages
- 1.2.8 Viral diseases

1.3 Classification of Living World

- 1.3.1 Need of Classification
- 1.3.2 Classification of Living World
- 1.3.3 Five Kingdom Classification

1.4 Bacteria

- 1.4.1 Milestones in Bacteriology
- 1.4.2 General characteristic features of Bacteria
- 1.4.3 Ultrastructure of a Bacterial cell

1.4.4 Gram staining procedure

1.4.5 Life processes in Bacteria

1.4.6 Reproduction in Bacteria

1.4.7 Economic Importance of Bacteria

1.4.8 Archaeobacteria

1.4.9 Cyanobacteria (Blue Green Algae)

1.4.10 Mycoplasma or Mollicutes

1.4.11 Actinomycetes (Actinobacteria)

1.5 Fungi

1.5.1 Milestones in Mycology

1.5.2 General Characteristic features

1.5.3 Methods of Reproduction in Fungi

1.5.4 Classification of Fungi

1.5.5 Kingdom: Myceteae (Fungi)

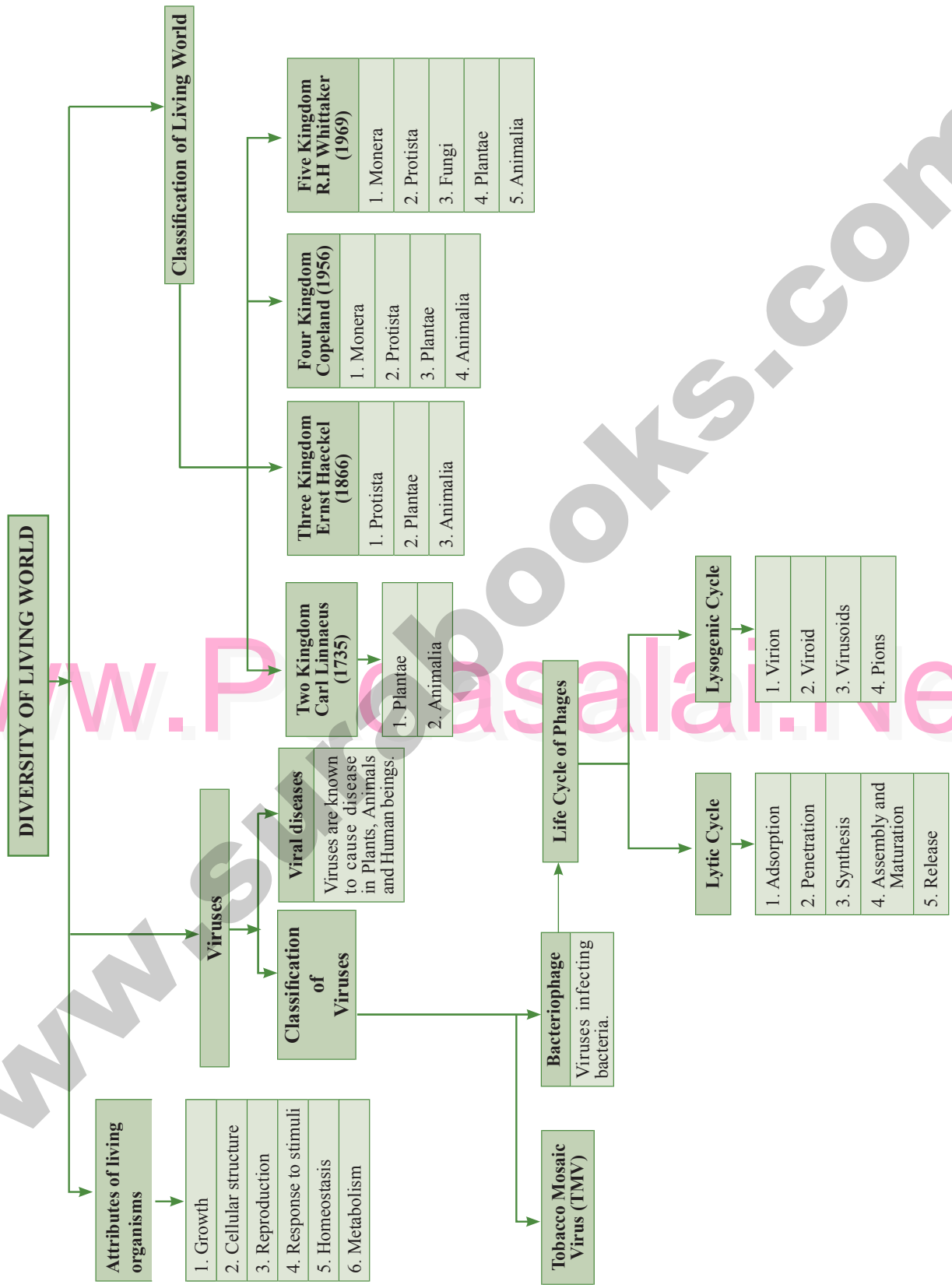
1.5.6 Economic Importance

1.5.7 Agaricus

1.5.8 Mycorrhizae

1.5.9 Lichens

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	:	Tabacco Mosaic Virus .
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 Capnophilic 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 .

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]

- (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 [May-'22]

- (a) *Acetobacter*
- (b) *Erwinia*
- (c) *Treponema*
- (d) *Methanobacterium*

[Ans. (d) *Methanobacterium*]

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

- (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

- | | | |
|------------------|---|------------------|
| (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 homoimerous and heteromerous lichens. [HY-2018; Sep-2021]

Ans.

Homoimerous 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]

- 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?

- 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]

Ans. R.H. Whittaker proposed five kingdom classification in the year 1969.

Kingdoms :

	Cell type	Level of organization	Cell wall	Nutrition	Motility	Organisms
Monera	Prokaryotic	Mostly unicellular rarely multicellular	Present (made up of Peptidoglycan and Mucopolysaccharides)	Autotrophic (Phototrophic, Chemoautotrophic) Heterotrophic (parasitic and saprophytic)	Motile or non-motile	Archaeobacteria, 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, Gymnosperms 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]

- 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) Homoimerous - 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 :

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

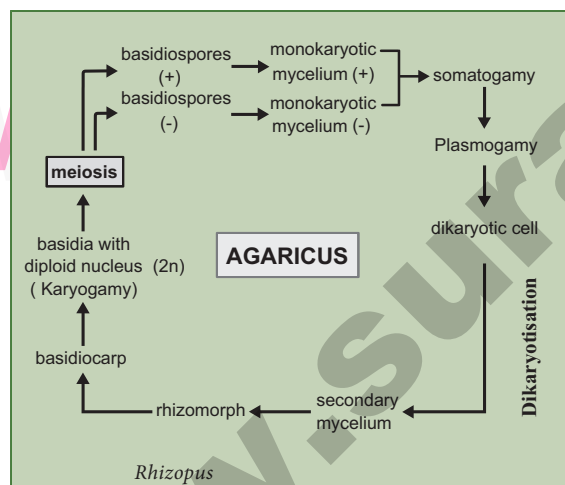
BOTANY LONG VERSION QUESTIONS (FOR PURE SCIENCE GROUP)**Long Version Evaluation**

Q.No. 1 to 10 Refer Evaluation.

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

[May-'22]

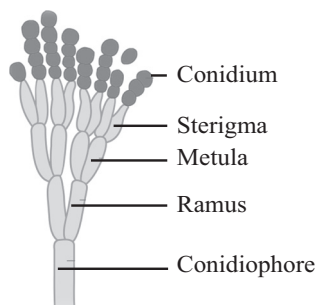
Ans.



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:

- Primary mycelium:** The primary mycelium develops from the germination of basidiospore. It is septate, uninucleate and haploid. It is also called **monokaryotic mycelium**.
- 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.
- Tertiary mycelium:** The tertiary mycelium is found in the fruit body called **basidiocarp**. Each cell of the hyphae possess a cell wall made up of chitin and cell organelles like mitochondria, golgibodies, endoplasmic reticulum etc., are also present.

14. Differentiate oidium and Chlamyospore.

Ans.

No.	Oidium	Chlamyospore
1.	The hypha divided and developed into spores are called oidia or oidium .	Thick walled resting spores are called chlamyospores .
2.	Produced by asexual reproduction Eg: <i>Erysiphe</i>	Produced by asexual reproduction Eg: <i>Fusarium</i>

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. 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 dysentery	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)]

7. 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)	Rhodospirillum

- (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)

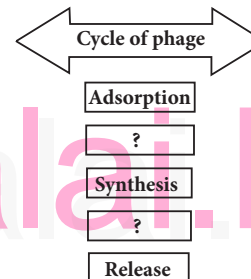
[Ans. (c) (1)-(iii), (2) - (i), (3) - (iv), 4 - (ii)]

VERY SHORT ANSWERS

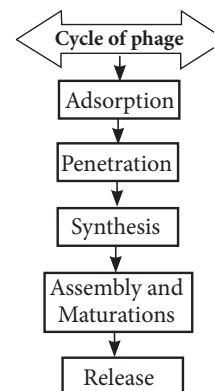
2 MARKS

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? (or) Define 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**.

SHORT ANSWERS

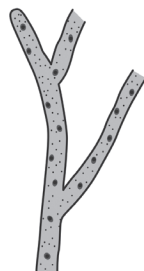
3 MARKS

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-2018]

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 :

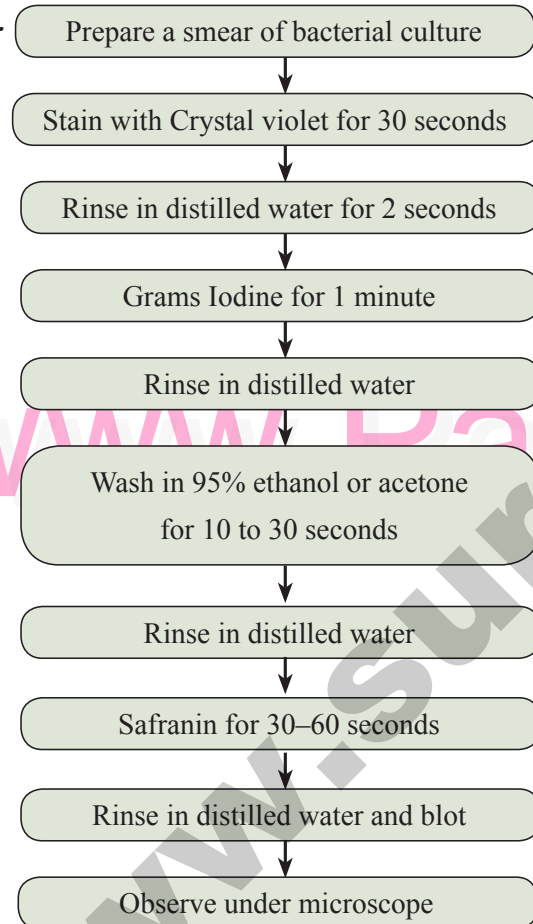
1. Prepare a smear of bacterial culture.
2. Stain with crystal violet for 30 seconds.
3. Rinse in distilled water for 2 seconds.
4. Grams Iodine for 1 minute.
5. Rinse in distilled water.
6. Wash in 95% ethanol or acetone for 10 to 30 seconds.
7. Rinse in distilled water
8. Safranin for 30-60seconds
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.



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:

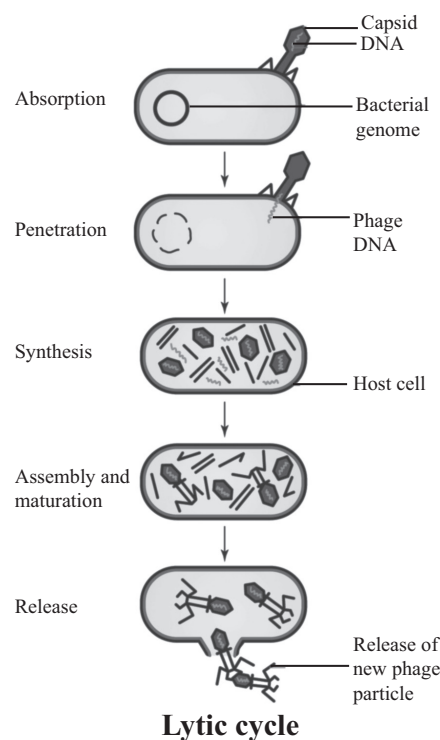
1. Adsorption :

- (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 into the bacterial cell is called Transfection.
- (iv) The empty protein coat leaving the outside cell is known as '**ghost**'.

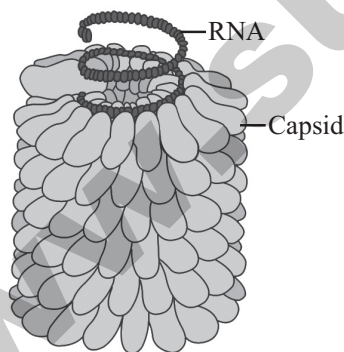


LONG ANSWERS**5 MARKS****1. List some viral diseases which occur in Humans.****Ans. Human Diseases :**

1. Common cold.
2. Hepatitis B.
3. Cancer.
4. SARS (Severe Acute Respiratory Syndrome).
5. AIDS (Acquired 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 :**

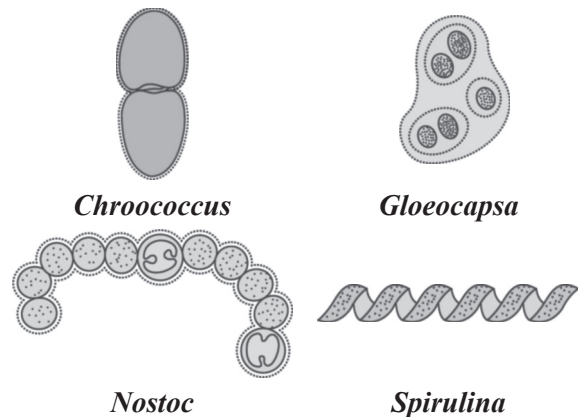
1. TMV is a rod shaped helical virus measuring about $300 \times 20\text{nm}$ with a molecular weight of 39×10^6 Daltons.
2. The virion is made up of two constituents, a protein coat called **capsid** and a core called nucleic acid.



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.

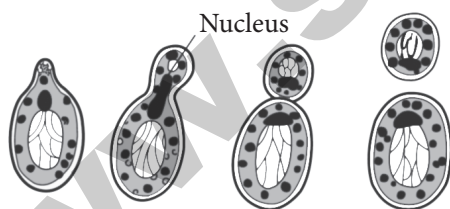
Ans. Attributes of living organisms :

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

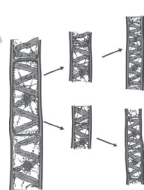
No.	Prokaryotic Cells	Eukaryotic Cells
1.	Nuclear membrane is absent.	Membrane bound nucleus is present.
2.	Membrane bound organelles like Mitochondria are absent. Eg : <i>Amoeba</i>	Membrane bound organelles like Mitochondria are present. Eg : <i>Ooedogonium</i>

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

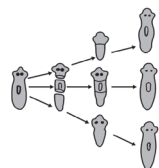
- Asexual reproduction :** Production of progeny with features more or less similar to parents. Eg : **Conidia** (*Aspergillus penicillium*), **Budding** (Hydra).



Budding - Yeast



Fragmentation - *Spirogyra*



Regeneration - *Planaria*

- Sexual Reproduction :** Variation is seen in progeny through recombination.

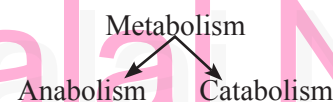
4. **Response to stimuli :**

- All living organisms are capable of sensing their environment and respond to various physical, chemical and biological stimuli.
- 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 :**

- Property of self-regulation and tendency to maintain a steady state within an external environment which is liable to change is called **Homeostasis**.
- Living organism must maintain internal condition to survive in this environment.

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



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 :

- They are prokaryotic organisms and lack nuclear membrane and membrane bound organelles.
- The genetic material is called **nucleoid** or genophore or incipient nucleus.

- The cell wall is made up of **polysaccharides** and **proteins**.
- Most of them lack chlorophyll, hence they are heterotrophic but some are autotrophic and possess bacteriochlorophyll.
- They reproduce vegetatively by Binary fission and endospore formation.
- They exhibit variations which are due to genetic recombination and is achieved through conjugation, transformation and transduction.
- 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 :

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

Cell wall :

- The bacterial cell wall is granular and is rigid. Provides protection and gives shape to the cell.
- Chemical composition of cell wall is rather complex and is made up of Peptidoglycan or mucopeptide.
- One of the most abundant polypeptide called **porin** is present, it helps in the diffusion of solutes.

Plasma membrane :

- Plasma membrane is made up of lipoprotein.
- It controls the entry and exit of small molecules and ions.
- 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.

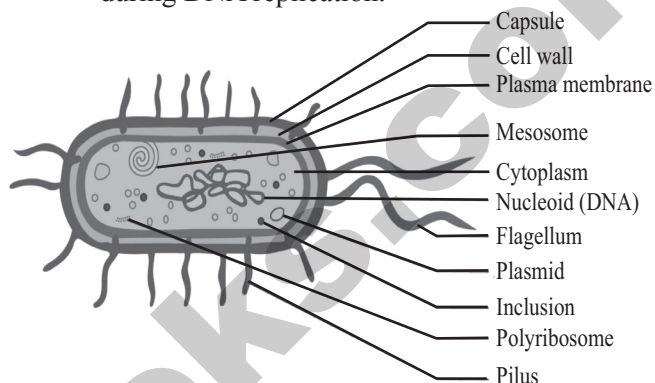
Cytoplasm :

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

Bacterial chromosome :

- The bacterial chromosome is a single circular DNA molecule, tightly coiled and is not enclosed in a membrane as in Eukaryotes.

- This genetic material is called **Nucleoid** or **Genophore**.
- The DNA is not bound to histone proteins.
- The single chromosome or the DNA molecule is circular and attached to plasma membrane at one point, which helps in chromosome separation during DNA replication.



Ultra structure of bacterial cell

Plasmid :

- Plasmids are extra chromosomal double stranded, circular, self-replicating, autonomous elements. They contain genes for fertility, antibiotic resistant and heavy metals.
- 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).
- Plasmids are classified into different types based on the function.
- Some of them are F (Fertility) factor, R (resistance) plasmids, Col (Colicin) plasmids, Ri (Root inducing) plasmids and Ti (Tumour inducing) plasmids.

Mesosomes :

- 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.

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 :

- Certain motile bacteria have numerous thin hair like projections of variable length emerge from the cell wall called **flagella**.

UNIT-I

DIVERSITY OF LIVING
WORLD

Chapter 2

PLANT KINGDOM

CHAPTER SNAPSHOT

2.1 Classification of Plants

2.2 Life Cycle patterns in Plants

2.3 Algae

2.3.1 General characteristic features

2.3.2 Classification

2.3.3 Economic Importance

2.3.4 Chara

2.4 Bryophytes

2.4.1 General characteristic features

2.4.2 Classification of Bryophytes

2.4.3 Economic Importance

2.4.4 Marchantia

2.5 Pteridophytes

2.5.1 General characteristic features

2.5.2 Classification of Pteridophytes

2.5.3 Economic Importance

2.5.4 Selaginella

2.5.5 Types of Stele

2.6 Gymnosperms

2.6.1 General characteristic features

2.6.2 Classification of Gymnosperms

2.6.3 Comparison of Gymnosperms
with Angiosperms

2.6.4 Economic importance of
Gymnosperms

2.6.5 Cycas

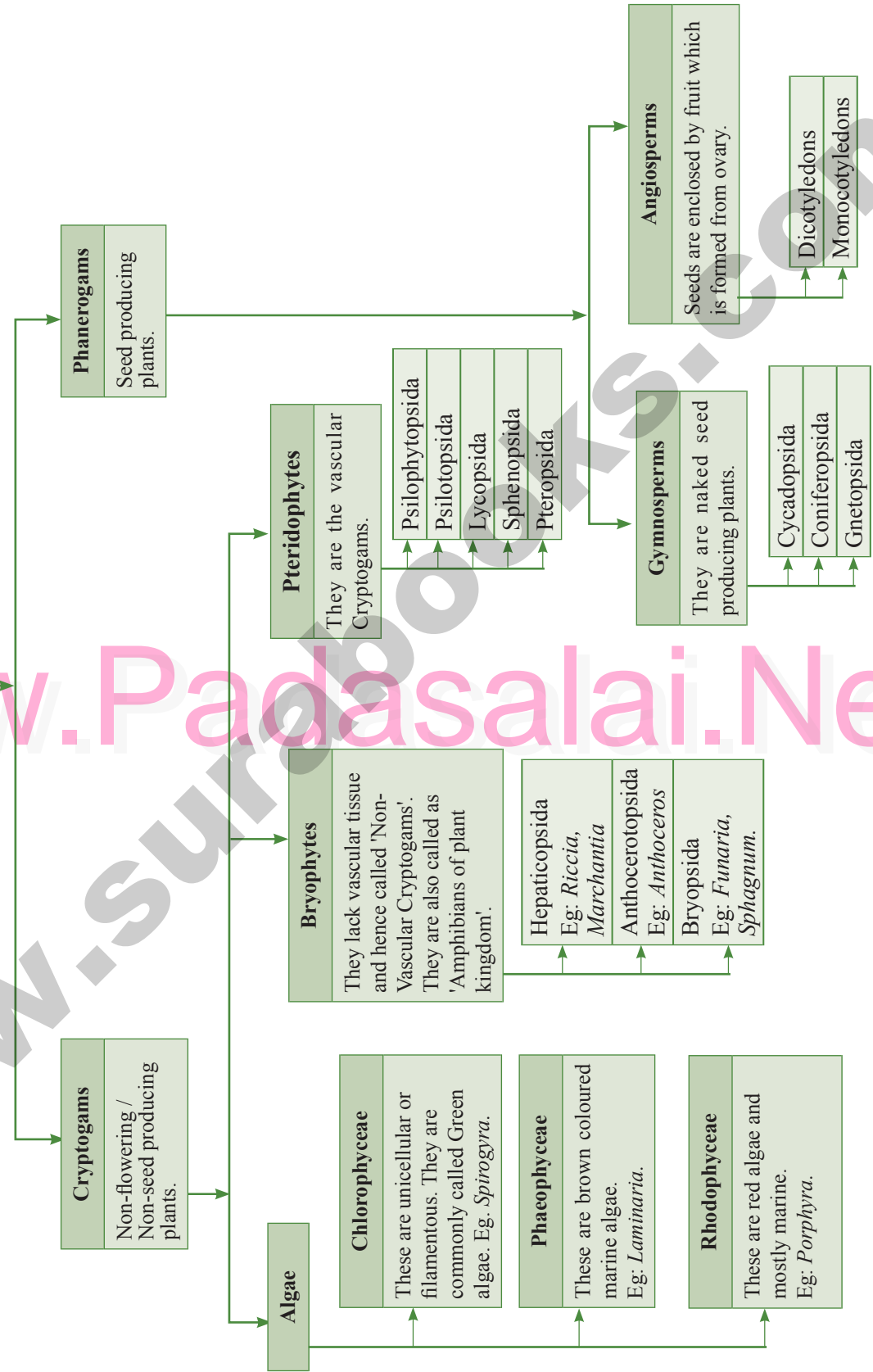
2.7 Angiosperms

2.7.1 Salient features of Angiosperms

2.7.2 Characteristic features
of Dicotyledons and
Monocotyledons

CONCEPT MAP

PLANT KINGDOM



MUST KNOW DEFINITIONS

- Alternation of generation** : Alternation of the haploid gametophyte phase (n) with diploid sporophytic phase (2n) during the life cycle is called **Alternation of generation**.
- Cryophytic algae** : Algae growing in snow are called **Cryophytic algae**.
- Epiphytic algae** : A few algae grow on the surface of aquatic plants and are called **Epiphytic algae**.
- Algology or Phycology** : The study of algae is called **Algology or Phycology**.
- Fucoxanthin** : A golden brown pigment which gives shades of colours from olive green to brown to the algal members.
- Non-vascular cryptogams** : In bryophytes, Vascular tissue is completely absent, hence they called "**Non-vascular cryptogams**".
- Amphibians of plant kingdom** : Bryophytes are also called "**Amphibians of plant kingdom**" because they need water for completing their life cycle.
- Pteridophytes** : **Pteridophytes** are seedless vascular cryptogams.
- Gymnosperms** : Naked Seed bearing plants.
- Angiosperms** : Bear ovules enclosed in a protective cover called ovary which forms the fruit.
- AGP** : Angiosperms phylogeny Group System of Classification.

Evaluation

1. Which of the plant group has gametophyte as a dominant phase? [Mar-2020; Sep-2020; Sep-2021]

- (a) Pteridophytes (b) Bryophytes
(c) Gymnosperm (d) Angiosperm

[Ans. (b) Bryophytes]

2. Which of following represents gametophytic generation in pteridophytes? [Sep-2021; CRT-'22]

- (a) Prothallus (b) Thallus
(c) Cone (d) Rhizophore

[Ans. (a) Prothallus]

3. The haploid number of chromosome for an Angiosperm is 14, the number of chromosome in its endosperm would be [March-2019 & 2020; Aug-'22]

- (a) 7 (b) 14
(c) 42 (d) 28

[Ans. (c) 42]

4. Endosperm in gymnosperm is formed [Sep-2020]

- (a) At the time of fertilization.
(b) Before fertilization.
(c) After fertilization.
(d) Along with the development of embryo.

[Ans. (b) Before fertilization]

5. Differentiate haplontic and diplontic life cycle.

[Sep-2020; Sep-2021]

Ans.

No.	Haplontic life cycle	Diplontic life cycle
1.	Gametophytic phase is dominant, photosynthetic and independent.	Sporophytic phase (2n) is dominant, photosynthetic and independent.
2.	Sporophytic phase is represented by the zygote. Eg: <i>Volvox</i>	The gametophytic phase is represented by the single to few celled gametophyte. Eg: <i>Fucus sps.</i>

6. What is plectostele? Give example.

[First Mid-2018; March-2019 & 2020; CRT-'22]

(OR)

What is plectostele? Give an example. Draw the diagram.

[QY-2019; Mar-2020]

Ans. 1. Protostele - Stele in which phloem surrounds xylem.

2. Plectostele is a type of protostele in which xylem plates alternate with phloem plates. Eg: *Lycopodium clavatum*.



Plectostele

7. What do you infer from the term pycnoxylic?

[Aug-'22]

Ans. It refers to a type of wood in Gymnosperms which is compact with narrow medullary ray. Eg: *Pinus*.

8. Mention two characters shared by gymnosperms and angiosperms? [March-2019]

- Ans. 1. Both plant groups produce seeds.
2. Presence of Eustele
3. Presence of well organised plant body with roots, stem and leaves.

9. Do you think shape of chloroplast is unique for algae. Justify your answer? [May-'22]

Ans. Variation among the shapes of chloroplast is found in algae and is very unique especially in green algae.

No.	Name of Algae	Shape of chloroplast
1.	<i>Chlamydomonas</i>	Cup shaped
2.	<i>Chara</i>	Discoid
3.	<i>Ulothrix</i>	Girdle shaped
4.	<i>Oedogonium</i>	Reticulate
5.	<i>Spirogyra</i>	Spiral
6.	<i>Zygnema</i>	Stellate
7.	<i>Mougeoutia</i>	Plate like

They contain chlorophyll 'a' and 'b' pigments for photosynthesis.

The chloroplasts also contain pyrenoids which store starch.

10. Do you agree with the statement 'Bryophytes need water for fertilization'? Justify your answer.

[Govt.MQP-2018; QY-2019]

- Ans. 1. Yes. In Bryophytes sexual reproduction occurs in Gametophyte (dominant phase).
2. The antherozoids have flagella and swim in a thin film of water to reach the Archegonium.
3. They fuse with the egg and form the zygote which initiates the sporophyte.
4. Thus without water the life cycle of a Bryophyte cannot be completed.

BOTANY LONG VERSION QUESTIONS (FOR PURE SCIENCE GROUP)

Long Version Evaluation

Q.No. 1 to 10 Refer Evaluation.

11. List the classes of algae.

Ans. Algae Classes:

- | | |
|---------------------|----------------------|
| 1. Chlorophyceae | 2. Xynthophyceae |
| 3. Chrysophyceae | 4. Bacillariophyceae |
| 5. Cryptophyceae | 6. Dinophyceae |
| 7. Chloromonadineae | 8. Euglenophyceae |
| 9. Euglenophyceae | 10. Phaeophyceae |
| 11. Rhodophyceae | 12. Cyanophyceae |

12. Mention the pigments and storage food of Dinophyceae.

Ans. **Pigments of Dinophyceae:**

Chlorophyll 'a' and 'c' carotenoids.

Storage food of Dinophyceae:

Starch and oil.

13. What is Nucule?

Ans. In the alga *chara*, the female sex organ is called Oogonium or Nucule. It is located above the male sex organ called Antheridium or Globule.

14. Differentiate nodal and internodal cells of *Chara*.

Ans. The main axis of *chara* (alga) is branched, long and differentiated with nodes and internodes.

Internode:

- The internode is made up of an elongated cell in the centre called axial cell which is surrounded by vertically elongated small cells which originate from the node.
- They are called cortical cells.
- The internodal cells have a large central vacuole, many nuclei and numerous discoidal chloroplasts.

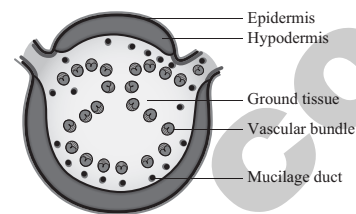
Nodal cells:

They are uninucleate with few ellipsoidal chloroplasts.

15. Explain the internal structure of *Cycas* rachis.

- Ans. 1. The outermost layer is epidermis and is covered by thick cuticle.
2. The hypodermis is made up of two layers of sclerenchyma on the adaxial side and many layered on the abaxial side.
3. The ground tissue is parenchymatous. The peculiar feature of the rachis is the arrangement of vascular bundle i.e., in an inverted omega shape pattern.

- Each vascular bundle is covered by a single layered sclerenchymatous bundle sheath.
- Vascular bundles are collateral, endarch and open.

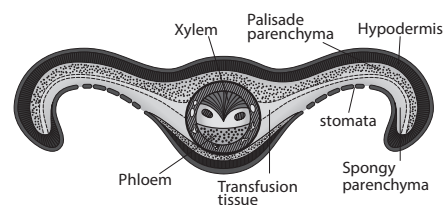


T.S. of Rachis

- A single layered endodermis and few layered pericycle surrounds the bundle.
- A diploxylic condition is present in the vascular bundles. (presence of both centripetal and centrifugal xylem).

T.S. of Leaflet :

- The leaflet of *Cycas* in transverse section shows the presence of upper and lower epidermis. The epidermal cells are thick walled and are covered with thick cuticle.
- The lower epidermis is not continuous and is interrupted by sunken stomata. The hypodermis consists of sclerenchyma cells to prevent transpiration.
- The mesophyll is differentiated into palisade and spongy parenchyma. The cells of this layer are involved in photosynthesis.
- The spongy parenchyma present in close proximity to the lower epidermis bear large intercellular spaces which help in gaseous exchange.
- Layers of colourless, elongated cells which run parallel to the leaf surface from the midrib to the margin of the leaflet are seen.
- These constitute the Transfusion tissue that helps in the lateral conduction of water. The vascular bundle has xylem facing upper epidermis and phloem facing lower epidermis.
- The protoxylem occupies the centre, hence the bundle is mesarch. The vascular bundle has a sclerenchymatous bundle sheath.



T.S. of leaflet

GOVERNMENT EXAM QUESTIONS

Bio-Botany (Short version)

CHOOSE THE CORRECT ANSWERS 1 MARK

- Which one of the following is considered important in the development of seed habit? [Govt. MQP-2018]
(a) Heterospory (b) Haplontic life cycle
(c) Free living gametophyte
(d) Dependent sporophyte [Ans. (a) Heterospory]
- Which of the following represent gametophytic generation in pteridophytes? [QY-2018]
(a) Prothallus (b) Thallus
(c) Cone (d) Rhizophore
[Ans. (a) Prothallus]
- Water is essential for fertilization _____. [HY-2018]
(a) Angiosperms (b) Bryophytes
(c) Gymnosperms (d) Fungi
[Ans. (b) Bryophytes]
- The book of "The structure and reproduction of the Algae" was published by: [June-2019]
(a) F.E. Fritsch (b) F.E. Round
(c) R.E. Lee (d) M.S. Randhawa
[Ans. (a) F.E. Fritsch]
- Number of chromosome in the endosperm of an angiosperm is 54. What would be the Number of chromosome in it's haploid condition. [QY-2019]
(a) 18 (b) 27 (c) 54 (d) 108
[Ans. (a) 18]

VERY SHORT ANSWERS 2 MARKS

- Why Bryophytes are called amphibians of plant kingdom? [QY-2018]
Ans. Bryophytes are also called "Amphibians of plant kingdom" because they need water for completing their life cycle.
- We are using perfume to our body. Write the name of the plant and their product. [June-2019]
Ans. Plant name : *Cedrus atlantica*
Product : Oil

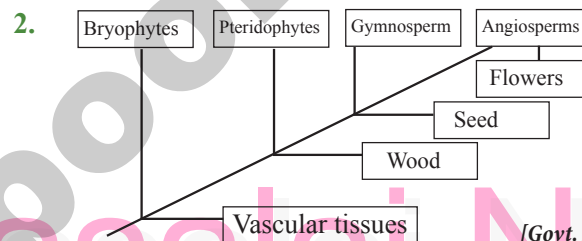
SHORT ANSWERS

3 MARKS

- Mention any three salient features of Angiosperms.

[First Mid-2018]

- Ans. 1.** Vascular tissue (Xylem and Phloem) is well developed.
- Flowers are produced instead of cone.
 - The embryo sac (Ovule) remains enclosed in the ovary.
 - Pollen tube helps in fertilization, so water is not essential for fertilization.
 - Double fertilization is present. The endosperm is triploid.
 - Angiosperms are broadly classified into two classes namely
 - Dicotyledons and
 - Monocotyledons.



[Govt. MQP- 2018]

What does the above figure refers to? How does this help to elucidate mechanism of phylogeny.

- Ans.** The above diagram describes the classification of the plant kingdom and its characteristics and shows how organisms are related to one another.

LONG ANSWERS

5 MARKS

- Explain the different types of life cycle patterns in plants. [First Mid-2018]

Ans. Life cycle patterns in plants:

Haplontic Life Cycle:

- Gametophytic phase is dominant, photosynthetic and independent, whereas sporophytic phase is represented by the zygote.
- Zygote undergoes meiosis to restore haploid condition. Example: *Volvox*, *Spirogyra*.

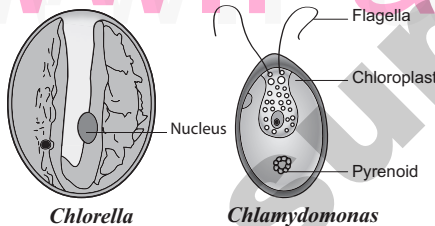
Diplontic Life Cycle :

- Sporophytic phase (2n) is dominant, photosynthetic and independent.
- The gametophytic phase is represented by the single to few celled gametophyte.
- The gametes fuse to form Zygote which develops into Sporophyte. Example: *Fucus*, Gymnosperms and Angiosperms.

LONG ANSWERS**5 MARKS**

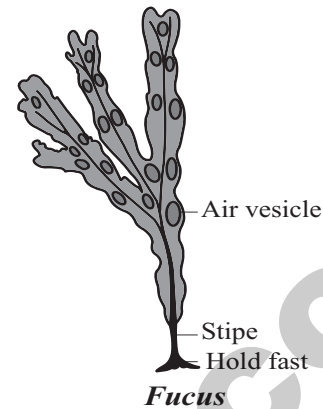
1. Write down the characteristic features of chlorophyceae.

- Ans. 1.** The members are commonly called '**Green algae**'. Most of the species - aquatic (Fresh water - *Spirogyra*, Marine - *Ulva*). Few - terrestrial (*Trentipholia*).
2. Variation among the shape of the chloroplast is found in members of algae. It is Cup shaped (*Chlamydomonas*); Discoid (*Chara*); Girdle shaped (*Ulothrix*); Reticulate (*Oedogonium*); Spiral (*Spirogyra*); Stellate (*Zygnema*); Plate like (*Mougeoutia*).
3. Chlorophyll 'a' and Chlorophyll 'b' are the major photosynthetic pigments.
4. Storage bodies called pyrenoids are present in the chloroplast and store starch. They also contain proteins.
5. The cell wall is made up of inner layer of cellulose and outer layer of Pectin.
6. Vegetative reproduction takes place by means of fragmentation and asexual reproduction is by the production of zoospores, aplanospores and akinetes.
7. Sexual reproduction is present and may be isogamous, anisogamous or oogamous. Eg: *Chlorella*, *Chlamydomonas*, *Volvox*, *Spirogyra*, *Ulothrix*, *Chara* and *Ulva*.



2. Write down the characteristic features of Phaeophyceae.

- Ans. 1.** The members of this class are called '**Brown algae**'. Majority of the forms are found in marine habitats. *Pleurocladia* is a fresh water form.
2. The thallus is filamentous (*Ectocarpus*) frond like (*Dictyota*) or may be giant kelps (*Laminaria* and *Macrocystis*).
3. The thallus is differentiated into leaf like photosynthetic part called **fronds**, a stalk like structure called **stipe** and a holdfast which attach thallus to the substratum.
4. The Pigments include **Chlorophyll 'a', 'c', carotenoids** and **Xanthophylls**. A golden brown pigment called **fucoxanthin** is present and it gives shades of colour from olive green to brown to the algal members of this group.



5. **Mannitol** and **Laminarin** are the reserve food materials.
6. Motile reproductive structures are present. Two laterally inserted unequal flagella are present.
7. Among these one is whiplash and another is tinsel.
8. Although sexual reproduction ranges from isogamy to Oogamy, most of the forms show Oogamous type.
9. Alternation of generation is present (isomorphic, heteromorphic or diplontic). Eg: *Sargassum*, *Laminaria*, *Fucus* and *Dictyota*.
3. Write down the characteristic features of Rhodophyceae.

- Ans. 1.** Members of this group include '**Red algae**' and are mostly marine. The thallus is multicellular, macroscopic and diverse in form.
2. *Porphyridium* is the unicellular form. Filamentous (*Goniotrichum*) ribbon like (*Porphyra*). *Corollina* and *Lithothamnion* are heavily impregnated with lime and form coral reefs.
3. Apart from chlorophyll 'a' *r*-phycoerythrin and *r*-phycocyanin are the photosynthetic pigments.
4. Asexual reproduction takes place by means of monospores, neutral spores and tetraspores. The storage product is **floridean starch**.
5. Sexual reproduction is **oogamous**.
- (i) Male sex organ is spermatangium which produces spermatium.
- (ii) Female sex organ - **carpogonium**.
6. The spermatium is carried by the water currents and fuse with egg nucleus to form zygote.
7. The zygote develops into carpospores. Meiosis occurs during carpospore formation.
8. Alternation of generation is present. Eg: *Ceramium*, *Polysiphonia*, *Gelidium*, *Cryptonemia* and *Gigartina*.

UNIT-III

CELL BIOLOGY AND
BIOMOLECULES

Chapter 6

CELL: THE UNIT OF LIFE

CHAPTER SNAPSHOT

6.1 Discovery

6.2 Microscopy

6.2.1 Bright field Microscope

6.2.2 Electron Microscope

6.3 Cell Theory

6.3.1 Exception to Cell Theory

6.3.2 Protoplasm Theory

6.3.3 Cell sizes and shapes

6.4 Types of Cell

6.4.1 Prokaryotes

6.4.2 Mesokaryotes

6.4.3 Eukaryotes

6.5 Plant and Animal cell

6.5.1 Ultra Structure of an Eukaryotic Cell

6.5.2 Protoplasm

6.5.3 Cell Wall

6.5.4 Cell Membrane

6.6 Cell Organelles

6.6.1 Endomembrane System

6.6.2 Endoplasmic Reticulum

6.6.3 Golgi Body (Dictyosomes)

6.6.4 Mitochondria

6.6.5 Plastids

6.6.6 Chloroplast

6.6.7 Ribosome

6.6.8 Lysosomes (Suicidal Bags of Cell)

6.6.9 Microbodies

6.6.10 Peroxisomes

6.6.11 Glyoxysomes

6.6.12 Sphaerosomes

6.6.13 Centrioles

6.6.14 Vacuoles

6.7 Nucleus

6.7.1 Chromosomes

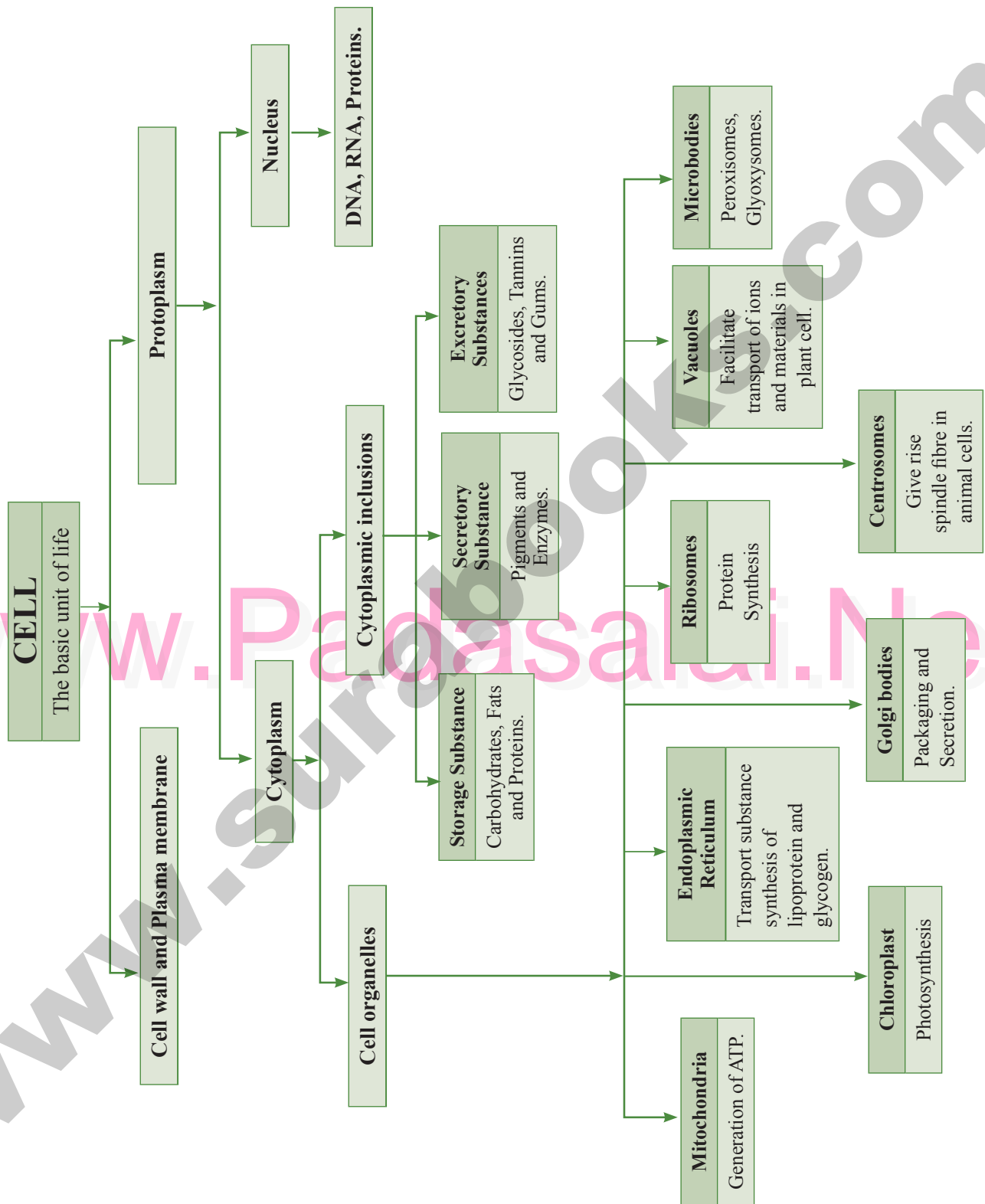
6.8 Flagella

6.8.1 Prokaryotic Flagellum

6.8.2 Eukaryotic Flagellum-Cell
Motility

6.8.3 Cilia

CONCEPT MAP



MUST KNOW DEFINITIONS

Magnification	:	The optical increase in the size of an image is called Magnification .
Compound Microscope	:	The common light microscope which has many lenses are called as Compound microscope .
Primary magnification	:	The first magnification of the microscope is done by the objective lens which is called Primary magnification .
Secondary magnification.	:	The second magnification of the microscope is obtained through eye piece lens and called as Secondary magnification .
'Patch Stop Carrier'	:	A special effect in an ordinary microscope is brought about by means of a special component called 'Patch Stop Carrier'.
Micrometry	:	The microscope also has facility to measure microscopic objects through a technique called ' Micrometry '.
Prokaryotes	:	The organisms with primitive nucleus are called as Prokaryotes .
Mesokaryotes	:	The organisms which shares some of the characters of both prokaryotes and eukaryotes.
Eukaryotes	:	Those organisms which have true nucleus are called as Eukaryotes .
Protoplasm	:	It is the living content of the cell that is surrounded by plasma membrane.
Cell Wall	:	It is the outermost protective cover of a cell.
Flip flopping or Flip flop movement	:	The movement of membrane lipids from one side of the membrane to the other side by vertical movement is called flip flopping or flip flop movement.
Cytoplasmic streaming	:	Movement of the cellular materials around the cell occurs through a process called Cytoplasmic streaming .
Endoplasmic Reticulum (ER)	:	It is the largest of the internal membranes of a plant cell.
Rough Endoplasmic Reticulum (RER)	:	Ribosomes are present in the outer surface of the membrane it is called as RER .
Smooth Endoplasmic Reticulum (SER)	:	Ribosomes are absent in the endoplasmic reticulum it is called as SER .
Thylakoid	:	In chloroplast, inside the stroma there are flat interconnected sacs called Thylakoid .
Quantosomes	:	Thylakoid contain small, rounded photosynthetic units called Quantosomes .
Polysomes or Polyribosomes	:	During protein synthesis many ribosomes are attached to the single mRNA and is called Polysomes or Polyribosomes .
Microbodies	:	Eukaryotic cells contain enzyme bearing membrane enclosed vesicles called Microbodies .

- Cell inclusions** : These are non-living materials present in the cytoplasm. They are organic and inorganic compounds.
- Chromosome** : During cell division chromatin is condensed into an organized form called **Chromosome**.
- Chromatin** : The chromosomes are composed of thread like strands called **Chromatin** which is made up of DNA, protein and RNA.

Evaluation

- The two subunits of ribosomes remain united at critical ion level of *[June-2019]*
 - Magnesium
 - Calcium
 - Sodium
 - Ferrous

[Ans. (a) Magnesium]
- Sequences of which of the following is used to know the phylogeny *[HY-2019]*
 - mRNA
 - rRNA
 - tRNA
 - Hn RNA

[Ans. (b) rRNA]
- Many cells function properly and divide mitotically even though they do not have *[Mar-2020]*
 - Plasma membrane
 - cytoskeleton
 - mitochondria
 - Plastids

[Ans. (d) plastids]
- Keeping in view the fluid mosaic model for the structure of cell membrane, which one of the following statements is correct with respect to the movement of lipids and proteins from one lipid monolayer to the other *[May & Aug-'22]*
 - Neither lipid nor proteins can flip-flop
 - Both lipid and proteins can flip flop
 - While lipids can rarely flip-flop proteins cannot
 - While proteins can flip-flop lipids cannot

[Ans. (c) While lipids can rarely flip-flop proteins cannot]
- Match the columns and identify the correct option: *[Sep-2020]*

	Column-I		Column-II
(a)	Thylakoids	(i)	Disc-shaped sacs in Golgi apparatus
(b)	Cristae	(ii)	Condensed structure of DNA
(c)	Cisternae	(iii)	Flat membranous sacs in stroma
(d)	Chromatin	(iv)	Infoldings in mitochondria

 - (a) (b) (c) (d)
 - (iii) (iv) (ii) (i)
 - (iv) (iii) (i) (ii)
 - (iii) (iv) (i) (ii)
 - (iii) (i) (iv) (ii)

[Ans. (3) a-(iii), b-(iv), c-(i), d-(ii)]
- Bring out the significance of Transmission Electron Microscope.

Ans. 1. It provides two dimensional image.

2. The magnification is 1–3 lakhs times and resolving power is 2–10 Å.

3. It is used for studying detailed structure of viruses, mycoplasma, cellular organelles, etc.
- State the protoplasm theory. *[Mar-2020]*

Ans. 1. **Max Schultze (1861)** established similarity between protoplasm and sarcodes and proposed a theory which later on was called "**Protoplasm Theory**" by **O. Hertwig (1892)**.

2. **Huxley (1868)** proposed protoplasm as a "physical basis of life". (Sarcodes - Living juice in animal cell.)

8. Distinguish between prokaryotes and eukaryotes.

[QY-2018]

Ans.	Features	Prokaryotes	Eukaryotes
	Size of the cell	~1 - 5 μm	~10 - 100 μm
	Nuclear character	Nucleoid, no true nucleus,	True nucleus with nuclear membrane
	DNA	Usually circular without histone proteins	Usually linear with histone proteins
	RNA/Protein synthesis	Couples in cytoplasm	RNA synthesis inside nucleus/ Protein synthesis in cytoplasm
	Ribosomes	50S + 30S	60S + 40S
	Organelles	Absent	Numerous
	Cell movement	Flagella	Flagella and cilia
	Organization	Usually single cell	Single, colonial and multicellular
	Cell division	Binary fission	Mitosis and meiosis
	Examples	Bacteria and Archaea	Fungi, plants and animals

9. Difference between plant and animal cell.

[Mar-2020 ; Sep-2020 & 2021; Aug-'22]

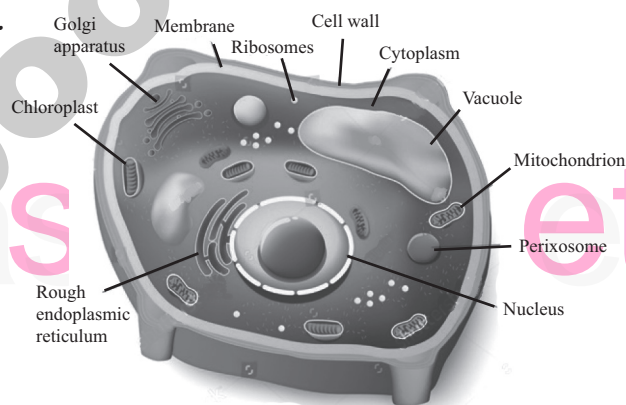
Ans.

No.	Plant cell	Animal cell
1	Usually they are larger than animal cells.	Usually smaller than plant cells.
2	Cell wall present in addition to plasma membrane and consists of middle lamellae, primary and secondary walls.	Cell wall absent.
3	Plasmodesmata present.	Plasmodesmata absent.
4	Chloroplast present.	Chloroplast absent.

5	Vacuole large and permanent.	Vacuole small and temporary.
6	Tonoplast present around vacuole.	Tonoplast absent.
7	Centrioles absent except motile cells of lower plants.	Centrioles present.
8	Nucleus present along the periphery of the cell.	Nucleus at the centre of the cell.
9	Lysosomes are rare.	Lysosomes present.
10	Storage material is starch grains.	Storage material is a glycogen granules.

10. Draw the ultra structure of plant cell. [Sep-2020]

Ans.



Ultra Structure of Plant Cell

GOVERNMENT EXAM QUESTIONS**Bio-Botany (Short version)****CHOOSE THE CORRECT ANSWERS 1 MARK**

1. Regarding flip-flop movement, which one of the following statement is correct? [Govt. MQP-2018]

- Proteins can flip-flop, lipids cannot
- Neither lipids nor proteins can flip-flop
- Both lipids and proteins can flip-flop
- Lipids can rarely flip-flop, proteins cannot

[Ans. (d) Lipids can rarely flip-flop, proteins cannot]

2. German botanist Matthias Schleiden and German Zoologist Theodor Schwann proposed cell theory in _____ . [QY-2018]

- (a) 1833 (b) 1883
(c) 1863 (d) 1933 [Ans. (a) 1833]

3. Ribosomes were first observed by _____ [HY-2018]

- (a) Christian de Duve (b) George Palade
(c) A.Kolliker (d) A.F.U.Schimper
[Ans. (b) George Palade]

4. Protoplasm was first observed by _____ [Mar-2020]

- (a) Hardy (b) Hugovanmohl
(c) Corti (d) Huxley
[Ans. (c) Corti]

5. The common light microscope which has many lenses are called as _____ . [CRT-'22]

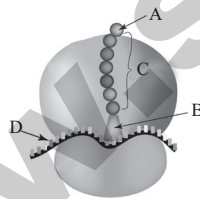
- (a) Compound microscope
(b) Bright field microscope
(c) Electron microscope
(d) Transmission electron microscope
[Ans. (a) Compound microscope]

VERY SHORT ANSWERS 2 MARKS

1. Write a specific feature about the membrane of mitochondria. [Govt. MQP-2018]

- Ans. 1.** Mitochondrion has double membranes.
2. The outer membrane contains proteins called Porins molecules smaller than 1000 daltons .
3. The inner membrane forms convolutions called cristae.

2. Identify and labelled the part marked in the following diagram. [QY-2019]



- Ans. 1.** A - Amino acid
2. B - tRNA
3. C - Growing Polypeptide Chain
4. D - mRNA

3. Bring out the significance of phase contrast microscope. [Sep-2020]

- Ans. 1.** It provides two dimensional images.
2. A beam of electron passes through the specimen to form an image on fluorescent screen.
3. It is used for studying detailed structure of viruses, mycoplasma, cellular organelles etc.

4. Write any two functions of cell wall. [CRT-'22]

- Ans. 1.** Offers definite shape and rigidity to the cell.
2. Serves as barrier for several molecules to enter the cells.

5. Name the types of chromosomes classified based on the position of centromere. [May-'22]

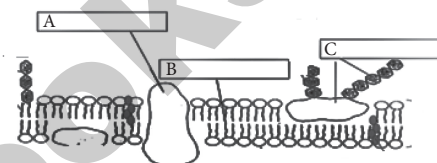
- Ans. 1.** Telocentric (Terminal centromere).
2. Acrocentric (terminal centromere capped by Telomere).
3. Sub-metacentric (centromere subterminal).
4. Metacentric (centromere median).

SHORT ANSWERS

3 MARKS

1. Mark the A,B,C parts for given diagram.

[Govt. MQP-2018]



Membrane Structure : Fluid-Mosaic Model

- Ans.** A - Channel protein
B - Lipid molecule
C - Glycoprotein
[* Out of Syllabus]

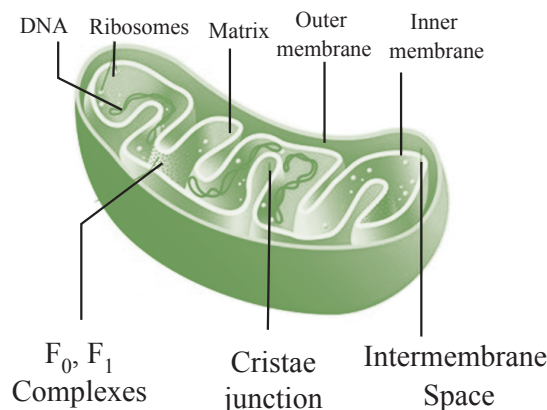
2. Define polysomes / polyribosomes. [QY-2018]

- Ans.** Ribosomes held together, by mRNA form polysomes or polyribosomes and are the sites of protein synthesis in a cell.

3. a. Draw and label the structure of Mitochondria. [HY-2019]

b. Why Mitochondria is called as 'the power house of a cell'? [March-2019]

Ans. a. Structure of Mitochondria :



b. Mitochondria is called as 'The power house of a cell' : Since huge amount of energy is generated in mitochondria in the form of ATP molecules they are called 'power house of the cell'.

4. You are looking like your father or mother in externally. Why? Explain the reason. [June-2019]

Ans. 1. A person's physical appearance is determined by genetic combinations from both parents.

2. These can be broken down into dominant and recessive traits.

5. Which is determined your parental characters? Describe about the structure. [June-2019]

Ans. 1. The chromosomes are composed of thread like strands called chromatin which is made up of DNA, protein and RNA. Each chromosome consists of two symmetrical structures called chromatids.

2. During cell division the chromatids forms a well organized chromosomes with definite size and shape.

3. They are identical and are called sister chromatids. A typical chromosome has narrow zones called constrictions.

4. There are two types of constrictions, namely primary constriction and secondary constriction.

5. The primary constriction is made up of centromere and kinetochore. Both the chromatids are united at centromere, whose number varies.

6. The monocentric chromosome has one centromere and the polycentric chromosome has many centromeres.

7. Centromere contains a complex system of protein fibres called kinetochore. Kinetochore is the region of chromosome which is attached to the spindle fibre during mitosis.

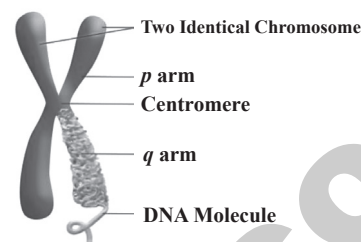
8. Besides primary there are few secondary constrictions are present.

9. Nucleoli develop from these secondary constrictions are called nucleolar organizers.

10. Secondary constrictions contain the genes for ribosomal RNA which include the formation of nucleoli and are called nucleolar organizer regions.

11. A satellite or SAT Chromosome is a short chromosomal segment or rounded body separated

from main chromosome by a relatively elongated secondary constriction. It is a morphological entity in certain chromosomes.



Structure of a Chromosome

12. Telomere is the terminal part of chromosome. It offers stability to the chromosome.

13. DNA of the telomere has specific sequence of nucleotides. Telomere in all eukaryotes are composed of many repeats of short DNA sequences (5'TTAGGC3' sequence in *Neurospora crassa* and human beings).

14. Maintenance of telomeres appears to be an important factor in determining the life span and reproductive capacity of cells, so studies of telomeres and telomerase have the promise of providing new insights into conditions such as ageing and cancer. Telomeres prevent the fusion of chromosomal ends with one another.

6. List out the functions of the nucleus. [Sep-2021]

Ans. 1. Controlling all the cellular activities.

2. Storing the genetic or hereditary information.

3. Coding the information in the DNA for the production of enzymes and proteins.

4. DNA duplication and transcription takes place in the nucleus.

5. In nucleolus ribosomal biogenesis takes place.

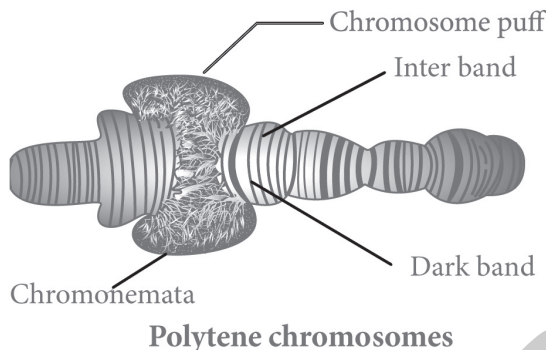
7. Describe the structure of polytene chromosomes with a suitable diagram. [CRT-'22]

Ans. Polytene Chromosomes:

1. It is observed in the salivary glands of *Drosophila* (fruit fly) by C.G. Balbiani in 1881. In larvae of many flies, and some insects the interphase Chromosomes duplicates and reduplicates without nuclear division.

2. A single Chromosome which is present in multiple copies form a structure called **Polytene Chromosome** which can be seen in light microscope.

- They are genetically active. There is a distinct alternating dark bands and light inter-bands. About 95% of DNA are present in bands and 5% in inter-bands.
- The polytene Chromosome has extremely large puff called **Balbani rings** which is seen in chironomous larvae. It is also known as **chromosomal puff**. Puffing of bands are the sites of intense RNA synthesis.
- As this Chromosome occurs in the salivary gland it is known as **salivary gland Chromosomes**.
- Gene expression, transcription of genes and RNA synthesis occurs in the bands along the Polytene Chromosomes.

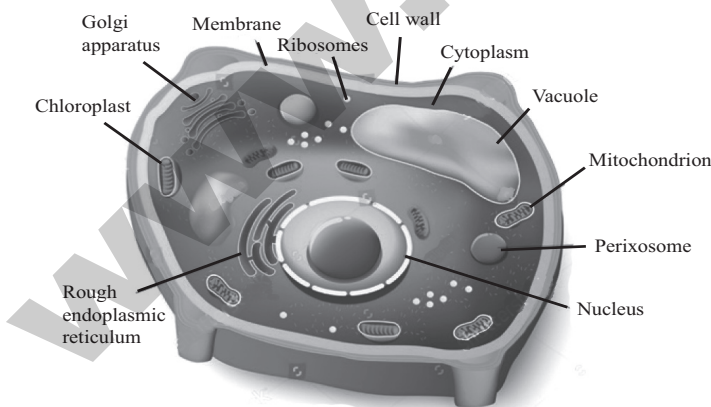


LONG ANSWERS

5 MARKS

- Draw the ultrastructure of plant cell and explain its parts. [May-'22]

Ans. Plant cell : A typical plant cell has prominent cell wall, a large central vacuole and plastids in addition to other organelles present in animal cell.



Ultra Structure of Plant Cell

Cell Wall : Cell wall is the outermost protective cover of the cell. It is present in bacteria, fungi and plants whereas it is absent in animal cell. It was first observed by Robert Hooke. It is an actively growing portion. It is made up of different complex material in various organism.

In plant, cell wall shows three distinct regions (a) Primary wall (b) Secondary wall (c) Middle lamellae.

Cytoplasm: Cytoplasm is the main arena of various activities of a cell. It is the semifluid gelatinous substance that fills the cell. It is made up of eighty percent water and is usually clear and colourless. The cytoplasm is sometimes described as non nuclear content of protoplasm. It gives support and protection to the cell organelles. It helps movement of the cellular materials around the cell through a process called cytoplasmic streaming.

Botany (Long version)

CHOOSE THE CORRECT ANSWERS 1 MARK

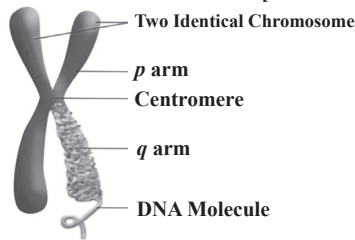
- _____, Camillo Golgi visualized a netlike reticulum of fibrils near the nucleus, were named as Golgi bodies. [Mar-2020]
(a) 1899 (b) 1896 (c) 1897 (d) 1898
[Ans. (d) 1898]
- Cell theory was proposed by : [Sep-2021]
(a) Singer and Nichol森
(b) Schwann and Schleiden
(c) Hook and Brown
(d) Robertson [Ans. (b) Schwann and Schleiden]
- _____ is an exception to Cell Theory. [May-'22]
(a) Fungi (b) Bacteria
(c) Mycoplasma (d) Virus
[Ans. (d) Virus]

VERY SHORT ANSWERS 2 MARKS

- What is plasmodesmata? [May-'22]
Ans. Plasmodesmata act as a channel between the protoplasm of adjacent cells through which many substances pass through.
- Name the two types of electron microscopes. [Aug-'22]
Ans. 1. Transmission Electron Microscope (TEM).
2. Scanning Electron Microscope (SEM).

SHORT ANSWERS**3 MARKS****1. Draw and label the structure of chromosome.****Ans.**

[HY-2018 ; Mar-2020]



Structure of a Chromosome

2. List the functions of Nucleus.

[May-'22]

* Refer Short version Government Exam Questions - 3 Marks - Q.No.6

3. Mitochondria is called "power house of a cell". Give reason.

[Aug-'22]

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

Additional**CHOOSE THE CORRECT ANSWERS 1 MARK****I. CHOOSE THE CORRECT OPTIONS FOR THE BELOW QUESTIONS:****1. Who gave the term 'Chromosome'?**

- (a) Balbiani (b) Robert Hooke
(c) Waldeyer (d) Aristotle

[Ans. (c) Waldeyer]

2. Who proposed fluid mosaic model?

- (a) S.J. Singer and G. Nicholson
(b) Aristotle (c) Robert Hooke
(d) Leeuwenhoek

[Ans. (a) S.J. Singer and G. Nicholson]

3. Which possess flagella?

- (a) Paramecium (b) Yeast
(c) Amoeba (d) Euglena

[Ans. (d) Euglena]

4. Which directs formation of the bipolar spindle during cell division?

- (a) Golgi body (b) Centriole
(c) Ribosome (d) Cilia

[Ans. (b) Centriole]

5. In human which cell lacks nucleus?

- (a) RBC (b) Lymphocyte
(c) Monocytes (d) Neutrophils

[Ans. (a) RBC]

6. What is the name of the membrane which surrounds the vacuole in cell?

- (a) Fibroblast (b) Leuoplast
(c) Tonoplast (d) Elaioplast

[Ans. (c) Tonoplast]

7. Which organelle is not considered as a part of Endomembrane system?

- (a) Vacuole (b) Chloroplast
(c) Endoplasmic reticulum
(d) Lysosome

[Ans. (b) Chloroplast]

8. Identify the unicellular organism?

- (a) Mushroom (b) *Spirogyra*
(c) *Chlamydomonas* (d) Chiton

[Ans. (c) *Chlamydomonas*]**9. What is the function of SER?**

- (a) Synthesis of protein (b) Synthesis of lipids
(c) Synthesis of enzyme
(d) All the above

[Ans. (b) Synthesis of lipids]

10. Bacteria possess which type of ribosomes?

- (a) 70S (b) 80S (c) 60S (d) 40S

[Ans. (a) 70S]

11. Various colours in flower, fruit and seeds are due to presence of which pigment?

- (a) Chloroplast (b) Chlorophyll
(c) Anthocyanin (d) All the above

[Ans. (c) Anthocyanin]

12. Which organelle is associated in the formation of basal granules, cilia and flagella?

- (a) Golgi apparatus (b) Centrosome
(c) Mitochondria (d) Lysosome

[Ans. (b) Centrosome]

13. Which organelle possesses circular DNA?

- (a) Golgi apparatus (b) Lysosome
(c) Ribosome (d) Chloroplast

[Ans. (d) Chloroplast]

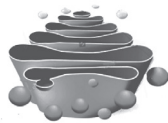
14. Which type of chromosome in the given diagram?

- (a) Metacentric (b) Sub-Metacentric
(c) Acrocentric (d) Telocentric

[Ans. (a) Metacentric]

15. Given diagram indicates which organelle?

- (a) Mitochondria
(b) Chloroplast
(c) Golgi apparatus
(d) Endoplasmic reticulum



[Ans. (c) Golgi apparatus]

II. CHOOSE THE CORRECT OPTIONS FOR THE BELOW FILL IN THE BLANKS:

1. Robert Hooke coined the term cell based on observation of _____.

- (a) Cork (b) Bacteria
(c) Cyano bacteria (d) Pus cells

[Ans. (a) Cork]

2. The term *animalcules* was used by _____.

- (a) Pasteur (b) Dutrochet
(c) Leeuwenhock (d) Robert Hooke

[Ans. (c) Leeuwenhock]

3. A patch stop carrier is a part of _____.

- (a) Bright field microscope
(b) Dark field microscope
(c) Electron microscope
(d) Phase contrast microscope

[Ans. (b) Dark field microscope]

4. _____ provides 3 dimensional images of surface of microscopic objects.

- (a) TEM (b) SEM
(c) Phase Contrast microscope
(d) Dark field microscope

[Ans. (b) SEM]

5. The term protoplasm was coined by _____.

- (a) Purkinje (b) Mohl
(c) Schultze (d) Felix

[Ans. (a) Purkinje]

6. Endoplasmic reticulum and golgi are involved in the formation of _____.

- (a) centrioles
(b) peroxisomes and centrioles
(c) centrioles and basal body
(d) lysosomes

[Ans. (d) lysosomes]

7. Digestion of cell organelles by the cell is called _____.

- (a) Phagocytosis (b) Pinocytosis
(c) Autophagy (d) Autolysis

[Ans. (c) Autophagy]

8. Janus Green is used to stain _____.

- (a) Starch (b) Nucleus
(c) Mitochondria (d) Chromosome

[Ans. (c) Mitochondria]

9. Nucleosome contains _____ histone subunits.

- (a) 6 (b) 8 (c) 4 (d) 10

[Ans. (b) 8]

10. In mitochondria, F_1 -particles are found in _____.

- (a) Matrix (b) Cristae
(c) Outer layer (d) All the above

[Ans. (b) Cristae]

11. The materials essential for dark reaction are located in _____.

- (a) Thylakoids (b) Circular - DNA
(c) Stroma (d) Ribosomes

[Ans. (c) Stroma]

12. No membrane surrounds _____ organelle.

- (a) Lysosome (b) Nucleolus
(c) Golgi body (d) Nucleus

[Ans. (b) Nucleolus]

13. _____ actively synthesizes r-RNA.

- (a) Nucleoplasm (b) Nucleus
(c) Nucleolus (d) All the above

[Ans. (c) Nucleolus]

14. In each chromosome centromere possessing disc shaped structure is called _____.

- (a) Kinetochore (b) Satellite
(c) Long arm (d) Short arm

[Ans. (a) Kinetochore]

15. Electron microscope was first introduced by _____.

- (a) Ruska (b) Roha
(c) Hertwig (d) Jansen

[Ans. (a) Ruska]

16. Chromosome in which centromere is located at the end is _____.

- (a) Acrocentric (b) Sub-metacentric
(c) Metacentric (d) Telocentric

[Ans. (d) Telocentric]

17. The leucoplast which stores protein is known as _____.

- (a) Aleuroplasts (b) Chloroplasts
(c) Amyloplasts (d) Elainoplasts

[Ans. (a) Aleuroplasts]

18. The subunits of prokaryotic ribosomes are _____.

- (a) 50S + 30S (b) 60S + 40S
(c) 40S + 30S (d) 60S + 50S

[Ans. (a) 50S + 30S]

19. "Cell in a structural and functional unit of organisms", was said by _____.

- (a) Robert Hook
(b) Schleiden and Schwann
(c) Aristotal
(d) Mendel

[Ans. (b) Schleiden and Schwann]

20. Nucleolus is _____.

- (a) Located in nucleus, Possess r-RNA and possess a spherical structure.
(b) Rod like structure present near nucleus.
(c) Spherical structure present in cytoplasm near nucleus.
(d) None of these

[Ans. (a) Located in nucleus, Possess r-RNA and possess a spherical structure]

21. Mitochondria stores _____.

- (a) Carbohydrate (b) Protein
(c) ATP (d) Lipid

[Ans. (c) ATP]

22. Process occurring in mitochondria is _____.

- (a) Hill reaction (b) Glycolysis
(c) Phosphorylation (d) Calvin cycle

[Ans. (c) Phosphorylation]

23. In higher plants cell wall is made up of _____.

- (a) Peptidoglycan (b) Cellulose
(c) Lipoprotein (d) Callose

[Ans. (b) Cellulose]

24. Microtubules are made up of a protein called ____.

- (a) Myosin (b) Nexin
(c) Actin (d) Durable protein

[Ans. (b) Nexin]

25. _____ is the energy currency of the cell.

- (a) FAD (b) NAD
(c) ATP (d) Glucose

[Ans. (c) ATP]

26. The term cell was coined by _____.

- (a) Robert Brown (b) Robert Hooke
(c) Flemming (d) Boveri

[Ans. (b) Robert Hooke]

27. Polytene chromosomes are formed by _____.

- (a) Mitosis (b) Mitosis
(c) Endomitosis (d) Meiosis

[Ans. (c) Endomitosis]

28. The middle lamella is made up of _____.

- (a) Muramic acid (b) Calcium pectate
(b) Phosphoglycerol (d) Hemicellulose

[Ans. (b) Calcium pectate]

III. IDENTIFY THE CORRECT STATEMENTS:

1. Identify the correct statements from the below about "Protoplasm".

- (I) Viscosity of protoplasm is 2 – 20.
(II) The refractive index of the protoplasm is 1.4.
(III) The pH of the protoplasm is around 6.8.
(IV) Approximately 54 elements are present in protoplasm.

- (a) I, II, III only (b) I, III, IV only
(c) I and III only (d) I and IV only

[Ans. (a) I, II and III only]

2. Identify the correct statements from the below about "Glyoxysomes".

- (I) Discovered by Harry Beevers (1961).
(II) It is a single membrane bound organelle.
(III) It is a sub cellular organelle.
(IV) It contains enzymes of glyoxylate pathway.

- (a) I and III only (b) I, II and III only
(c) II and III only (d) I, II, III and IV

[Ans. (d) I, II, III and IV]

3. Identify the correct statements from the below about "Lysosomes".

- (I) Lysosomes were discovered by Christian de Duve.
(II) Lysosomes are known as "Suicidal bags".
(III) They are found in prokaryotic cell.
(IV) They are found in eukaryotic cells.

- (a) I, II and III only (b) I, II and IV only
(c) I, II and IV only (d) I, II, III and IV

[Ans. (b) I, II and IV only]

4. Identify the correct statements from the below about "Peroxisomes".

- (I) Peroxisomes identified as organelles by Christian de Duve.
(II) Peroxisomes are small spherical bodies.
(III) Leaf cells have many peroxisomes.
(IV) Commonly found in liver and kidney of mammals.

- (a) I, II and III only (b) I and IV only
(c) I and III only (d) I, II, III and IV

[Ans. (d) I, II, III and IV]

5. Identify the correct statements from the below about "Vacuoles".

- (I) Vacuoles contain cell sap.
 (II) Vacuoles accumulate products like tannins.
 (III) Water enter the vacuoles by osmosis.
 (IV) Bounded by single unit membrane called "Hub".
 (a) I, II and III only (b) I and IV only
 (c) I, II, III and IV (d) I and II only

[Ans. (a) I, II and III only]

6. Identify the correct statements from the below about "Electron microscope".

- (I) Glass slides are used
 (II) They work in a vacuum medium
 (III) The stubs are coated in gold
 (IV) A 2-D picture is obtained.
 (a) I and II only (b) II and III only
 (c) I and IV only (d) I only

[Ans. (b) II and III only]

IV. IDENTIFY THE WRONG STATEMENTS:

1. Identify the wrong statement from the below about "Chromosomes".

- (a) Chromosomes are composed of thread like strands called chromatin.
 (b) Monocentric chromosome has one centromere.
 (c) Each chromosomes has two symmetrical structure called chromatin.
 (d) Physical carriers of rRNA.

[Ans. (d) Physical carriers of rRNA]

2. Identify the wrong statement from the below about "Function of the nucleus".

- (a) Controlling all the cellular activities.
 (b) Storing the genetic (or) hereditary information.
 (c) In chromosomes ribosomal biogenesis takes place.
 (d) DNA duplication and transcription takes place here.

[Ans. (c) In chromosomes ribosomal biogenesis takes place]

3. Identify the wrong statement from the below

- (a) Chromatin is a viscous gelatinous.
 (b) Bridges first proved that chromosomes are the physical carriers of genes.
 (c) Telomere is the terminal part of chromosome.
 (d) SAT chromosomes are long chromosomal segment.

[Ans. (d) SAT chromosomes are long chromosomal segment]

V. MATCH THE FOLLOWING:

- | | |
|--------------------------|--------------------|
| 1. Golgi | (i) Ribosome |
| 2. Mitochondria | (ii) Quantosome |
| 3. Endoplasmic reticulum | (iii) Glycoprotein |
| 4. Plastid | (iv) oxysome |

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

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

- | | |
|-------------|--|
| 2. 1. Corti | (i) Coined the term protoplasm |
| 2. Purkinje | (ii) Observed a living juice n animal cell |
| 3. Dujardin | (iii) Indicated importance of protoplasm |
| 4. Van Mohl | (iv) First observed protoplasm |

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

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

- | | |
|------------------------------|---------------|
| 3. 1. Compound Microscope | (i) Ruska |
| 2. Dark field Microscope | (ii) Zernike |
| 3. Phase contrast Microscope | (iii) Jansen. |
| 4. Electron Microscope | (iv) Sigmondy |

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

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

- | | |
|---------------------|----------------------------|
| 4. 1. 70s Ribosomes | (i) Sub units 40s and 60s |
| 2. 16sr RNA | (ii) Sub units 30s and 50s |
| 3. 80s Ribosomes | (iii) 40s sub unit |
| 4. 18sr RNA | (iv) 30s subunit |

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

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

5. 1. Robert Hooke (i) Mesokaryotes
 2. Dodge (ii) Cell
 3. Ernest Ruska (iii) Cell theory
 4. Rudolf Virchow (iv) Electron Microscope
- | | | | | |
|-----|----|-----|-----|-----|
| | 1 | 2 | 3 | 4 |
| (a) | i | ii | iii | iv |
| (b) | ii | iii | iv | i |
| (c) | ii | i | iv | iii |
| (d) | ii | i | iii | iv |

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

VI. IDENTIFY THE CORRECT ASSERTION AND REASON:

1. Assertion (A) : Protoplasm theory explains nature and different properties of protoplasm.

Reason (R) : Cell size and shape differ from type of tissue or organs and organisms.

- (a) (A) is correct but (R) does not explains (A)
 (b) Both (A) and (R) is wrong
 (c) Both (A) and (R) are correct
 (d) (R) is correct and (A) is wrong

[Ans. (a) (A) is correct but (R) does not explains (A)]

2. Assertion (A) : Flagella is essential to seek out a nutritionally more favorable environment.

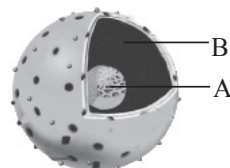
Reason (R) : When E-coli are cultured in medium rich in glucose they lack flagella when grown in nutritionally poor medium they possess flagella.

- (a) Both (A) and (R) is correct
 (b) Both (A) and (R) are wrong
 (c) (A) is correct and (R) is wrong
 (d) (A) is wrong and (R) is correct.

[Ans. (a) Both (A) and (R) is correct]

VII. IDENTIFY THE CORRECT OPTIONS FOR THE PARTS OF THE DIAGRAM:

1. Identify the parts marked as A and B for the below diagram



- | | |
|----------------|------------------|
| A | B |
| (a) Nucleolus | Nuclear membrane |
| (b) Nucleolus | Chromatin |
| (c) Nucleolus | Nucleoplasm |
| (d) Chromosome | Nuclear membrane |

[Ans. (c) A-Nucleolus, B-Nucleoplasm]

2. Identify the parts marked as A and B for the below diagram



- | | |
|---------------------|-----------------|
| A | B |
| (a) Crystals | Starch granules |
| (b) Vacuoles | Mitochondria |
| (c) Nucleus | Golgi apparatus |
| (d) Golgi apparatus | Chloroplast |

[Ans. (b) A-Vacuoles, B-Mitochondria]

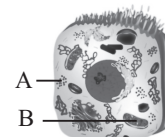
3. Identify the parts marked as A and B for the below diagram

- | | |
|----------------|------------|
| A | B |
| (a) Stalk | Satellite |
| (b) Centromere | Satellite |
| (c) Satellite | Stalk |
| (d) Satellite | Centromere |



[Ans. (d) A-Satellite, B-Centromere]

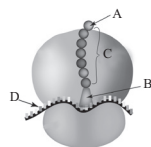
4. Identify the parts marked as A and B for the below diagram



- | | |
|------------------|-----------------|
| A | B |
| (a) SER | Mitochondria |
| (b) Ribosome | Mitochondria |
| (c) Mitochondria | Golgi apparatus |
| (d) RER | Mitochondria |

[Ans. (b) A-Ribosome, B-Mitochondria]

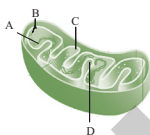
5. Identify the parts marked as A, B, C and D for the below diagram "Structures of Ribosome".



- | | A | B | C | D |
|-----|---------------------------|-------|---------------------------|---------------------------|
| (a) | Amino acid | t-RNA | mRNA | Growing polypeptide chain |
| (b) | t-RNA | mRNA | Amino acid | Growing polypeptide chain |
| (c) | Growing polypeptide chain | mRNA | t-RNA | Amino acid |
| (d) | Amino acid | t-RNA | Growing polypeptide chain | mRNA |

[Ans. (d) A - Amino acid, B - t-RNA, C - Growing polypeptide chain, D - mRNA]

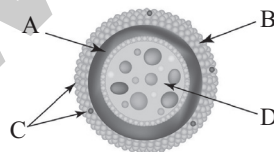
6. Identify the parts marked as A, B, C and D for the below diagram "Mitochondria".



- | | A | B | C | D |
|-----|------------------|-----------|------------------|------------------|
| (a) | Cristae Junction | Matrix | DNA | Ribosomes |
| (b) | Cristae Junction | Matrix | Ribosomes | DNA |
| (c) | Matrix | DNA | Cristae Junction | Ribosomes |
| (d) | DNA | Ribosomes | Matrix | Cristae Junction |

[Ans. (d) A - DNA, B - Ribosomes, C - Matrix, D - Cristae Junction]

7. Identify the parts marked as A, B, C and D for the below diagram "Lysosome".

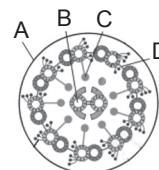


- | | A | B | C | D |
|-----|----------------------|--|---------------------------|---|
| (a) | Lipid Layer Membrane | Glycosylated membrane transport proteins | Hydrolytic enzyme mixture | |

- | | | | | |
|-----|---------------------------|---------------------------|--|--|
| (b) | Lipid Layer Membrane | Hydrolytic enzyme mixture | Glycosylated membrane transport proteins | |
| (c) | Membrane | Lipid Layer | Hydrolytic enzyme mixture | Glycosylated membrane transport proteins |
| (d) | Hydrolytic enzyme mixture | Lipid Layer Membrane | Glycosylated membrane transport proteins | |

[Ans. (a) A - Lipid Layer, B - Membrane, C - Glycosylated membrane transport proteins, D - Hydrolytic enzyme mixture]

8. Identify the parts marked as A, B, C and D for the below diagram "Eukaryotic Flagellum".



- | | A | B | C | D |
|-----|-----------------|----------------------|-----------------|----------------------|
| (a) | Plasma membrane | Central Microtubules | Radial spokes | Nexin |
| (b) | Plasma membrane | Nexin | Radial spokes | Central Microtubules |
| (c) | Nexin | Radial spokes | Plasma membrane | Central Microtubules |
| (d) | Plasma membrane | Radial spokes | Nexin | Central Microtubules |

[Ans. (a) A - Plasma membrane, B - Central Microtubules, C - Radial spokes, D - Nexin]

VIII. IDENTIFY THE CORRECT PAIR FROM THE BELOW :

- | | |
|------------------|----------------|
| (a) Mesokaryotes | - Dodge |
| (b) Bioplasts | - Altmann |
| (c) Mitochondria | - Later Benda |
| (d) Protoplasm | - Robert Hooke |

[Ans. (a) Mesokaryotes - Dodge]

2. Identify the Correct pair from the below about "Stains and their affinity".

- | | |
|-----------------|-----------------|
| (a) Eosin | - Nucleus |
| (b) Saffranine | - Cytoplasm |
| (c) Cotton blue | - Fungal Hyphae |
| (d) Janus green | - Starch |

[Ans. (c) Cotton blue - Fungal Hyphae]

IX. IDENTIFY THE INCORRECT PAIR FROM THE BELOW :

1. (a) Cilia - Flagellum
(b) Vacuoles - Tonoplast
(c) Glyoxysome - Harry Beevers
(d) Centriole - Hub

[Ans. (a) Cilia - Flagellum]

2. (a) Mitochondria - Kolliker
(b) Golgi - Altmann
(c) Lysosome - De Duve
(d) Peroxisome - De Duve

[Ans. (b) Golgi - Altmann]

X. IDENTIFY THE ODD-MAN OUT FROM THE BELOW :

1. Identify the odd-man out regarding "Chromosome".

- | | |
|-----------------|-----------------|
| (a) Telocentric | (b) Tonoplast |
| (c) Metacentric | (d) Acrocentric |

[Ans. (b) Tonoplast]

Reason: In plant cells vacuoles are larger, bounded by a single unit membrane called Tonoplast, Others are the types of chromosomes based on centromere.

2. Identify the odd-man out regarding "Endoplasmic reticulum".

- | | |
|---------------|------------------|
| (a) Cisternae | (b) Vesicles |
| (c) Tubules | (d) Golgi bodies |

[Ans. (d) Golgi bodies]

Reason: Golgi bodies - Netlike reticulum of fibrils near the nucleus. Others are the parts of the Golgi apparatus.

3. (a) Amyloplast (b) Elaioplast
(c) Proteoplast (d) Rhodoplast

[Ans. (d) Rhodoplast]

Reason: Rhodoplast is a type of Chromoplasts. Other are the of Leucoplasts.

4. (a) Glyoxysome (b) Phosphate granules
(c) Carboxysomes (d) Gas vacuoles

[Ans. (a) Glyoxysome]

Reason: Glyoxysome is a single membrane bound organelle. Others are the reserve materials of prokaryotes.

VERY SHORT ANSWERS

2 MARKS

1. Define 'magnification' of a Microscope.

Ans. Magnification:

7. The optical increase in the size of an image is called **magnification**. It is calculated by the following formula

8.
$$\text{Magnification} = \frac{\text{size of image seen with the microscope}}{\text{size of the image seen with normal eye}}$$

2. What is Tonoplast?

Ans. In plant cells vacuoles are large, bounded by a single unit membrane called **Tonoplast**.

3. What is microbodies? Give examples.

Ans. 1. Eukaryotic cells contain many enzyme bearing membrane enclosed vesicles called **microbodies**.

2. They are single unit membrane bound cell organelles.
Eg: **Peroxisomes** and **Glyoxysomes**.

4. What is SAT-Chromosomes?

Ans. 1. A satellite or SAT Chromosome are short chromosomal segment or rounded body separated from main chromosome by a relatively elongated secondary constriction.

2. It is a morphological entity in certain chromosomes.

5. What is a telomere?

Ans. 1. Telomere is the terminal part of chromosome.

2. It offers stability to the chromosome.

6. What are nucleolar organisers?

Ans. 1. In a chromosome apart from primary constriction, secondary constrictions occur.

2. The nucleoli develop from secondary constrictions are called nucleolar organisers. Secondary constrictions contain the genes for ribosomal RNA which include the formation of nucleoli and are called nucleolar organiser regions.

7. What are nucleosomes?

Ans. The chromatin is a viscous gelatinous substance that contains DNA, histone & non-histone proteins and RNA, H1, H2A, H2B, H3 and H4 are the different histones found in chromatin. It is formed by a series of repeated units called **nucleosomes** each nucleosome has a core of 8 histone subunits.

8. What are chromomeres?

- Ans. 1.** They are bead like accumulations of chromatin material which are visible during interphase in polytene chromosomes.
- 2.** They can be seen in polytene chromosomes.
- 3.** At metaphase they are not visible.

9. How are cells classified?

- Ans. 1.** Prokaryotes
- 2.** Mesokaryotes
- 3.** Eukaryotes

10. 'Suicidal bags' of the cell. - Explain.

Ans. The lysosomes contain a variety of hydrolytic enzymes, which can digest material within the cell. Thus they are called **suicidal bags of the cell**.

11. What is Svedberg units?

- Ans. 1.** The size of ribosomes and their subunits are usually given in Svedberg unit (named after Theoder Svedberg).
- 2.** It is a measure of a particle size dependent on the speed with which particle sediment in the ultracentrifuge.

SHORT ANSWERS

3 MARKS

1. What are the functions of chloroplast?

- Ans. 1.** Photosynthesis.
- 2.** Light reactions takes place in granum.
- 3.** Dark reactions take place in stroma.
- 4.** Chloroplast is involved in photorespiration.

2. Differentiate the 70S Ribosomes and 80s Ribosomes.

Ans.	No.	70S Ribosomes	80S Ribosomes
	1.	Have 30S small subunit and 50S large sub unit.	Have 40S small subunit and 60S large subunit.
	2.	Found in Prokaryotes.	Found in Eukaryotes.
	3.	16S rRNA in 30S small subunit.	18S in rRNA in 40S small subunit.

3. Differentiate between Chromoplasts and Leucoplasts.

Ans.	No.	Chromoplasts	Leucoplasts
	1.	Coloured Plastids.	Colourless Plastids store food materials.
	2.	Eg: Chloroplast Occurs in green algae and higher plants Pigments chlorophyll 'a' and 'b'.	Eg: Amyloplast – Stores – Starch.

4. Define primary magnification.

Ans. The first magnification of the microscope is done by the objective lens which is called **primary magnification** and it is real, inverted image.

5. Name the four sites in plant cells where ribosomes are seen.

- Ans. 1.** Occur free in the cytoplasm.
- 2.** Attached to Endoplasmic Reticulum.
- 3.** Inside Mitochondria.
- 4.** Inside Chloroplast.

6. List out the function of cell wall.

- Ans. 1.** Offers definite shape and rigidity to the cell.
- 2.** Serves as barrier for several molecules to enter the cells.
- 3.** Provides protection to the internal protoplasm against mechanical injury.
- 4.** Prevents the bursting of cells by maintaining the osmotic pressure.
- 5.** Plays a major role by acting as a mechanism of defense for the cells.

7. Write down the functions of Golgi bodies.

- Ans. 1.** Production of Glycoproteins and glycolipids.
- 2.** Transporting and storing lipids.
- 3.** Formation of lysosomes.
- 4.** Production of digestive enzymes.
- 5.** Cell plate and cell wall formation.
- 6.** Secretion of Carbohydrates for the formation of plant cell walls and insect cuticles.
- 7.** **Zymogen granules** (proenzyme/precursor of all enzyme) are synthesised.

8. Define secondary magnification.

Ans. The second magnification of the microscope is obtained through eye piece lens called as **secondary magnification** and it is virtual and inverted image.

9. How do peroxisomes perform photorespiration?

Ans. 1. Peroxisomes are small spherical bodies and single membrane bound organelle.

- It takes part in photorespiration and associated with glycolate metabolism. In plants, leaf cells have many peroxisomes.

10. Name the organism which shares characters of prokaryotes and eukaryotes?

Ans. 1. In the year 1966, scientist Dodge and his coworkers proposed another kind of organisms called **mesokaryotes**. These organisms shares some of the characters of both prokaryotes and eukaryotes.

- These contains well organized nucleus with nuclear membrane and the DNA is organized and the DNA is organized into chromosomes but without histone protein components divides through amitosis similar with histone protein components divide through amitosis similar with prokaryotes. Eg: Protozoa like Noctiluca, some phytoplanktons.

11. What are cilia?

Ans. Cilia (plural) are short cellular, numerous microtubule bound projections of plasma membrane. Cilium (singular) is membrane bound structure made up of basal body, rootlets, basal plate and shaft.

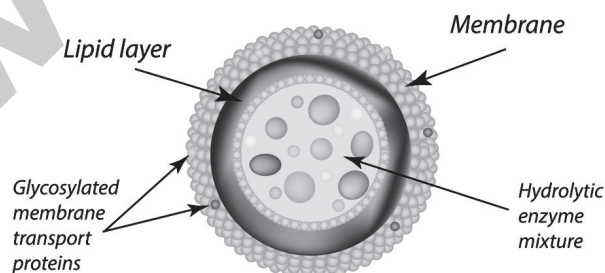
12. Complete the table

- | | |
|--------------------------|------------------|
| 1. Ribosomes | <u> A </u> |
| 2. <u> B </u> | Benda |
| 3. <u> C </u> | De Dure |
| 4. Endoplasmic reticulum | <u> D </u> |

Ans. A - George Palade
B - Mitochondria
C - Lysosome
D - K. R. Porter

13. Draw the structure of a Lysosome and label the parts.

Ans.

**14. Differentiate Flagella of Bacteria and Eukaryotes.**

	Bacteria	Eukaryotes
1.	Flagella are thin.	Flagella are thicker than bacterial flagella.
2.	The structure consists of a basal body associated with cytoplasmic membrane and cell wall with short hook and helical filament.	Has outer nine pairs of microtubules with two microtubules in the centre (9 + 2 arrangement).

15. Name the part of TEM.

- Ans. 1.**
- Electron Generating System
 - Electron Condensor
 - Specimen Objective
 - Tube Lens
 - Projector

LONG ANSWERS**5 MARKS****1. Discuss in detail about the physical properties of protoplasm.**

- Ans. 1.** It is the most important property of the protoplasm by which it exhibits three main phenomena namely Brownian movement, amoeboid movement and cytoplasmic streaming or cyclosis. Viscosity of protoplasm is 2-20 centipoises. The Refractive index of the protoplasm is 1.4.
- Approximately 34 elements are present in protoplasm but only 13 elements are main or universal elements i.e. C, H, O, N, Cl, Ca, P, Na, K, S, Mg, I and Fe. Carbon, Hydrogen, Oxygen and Nitrogen form the 96 of protoplasm.
 - It Protoplasm is translucent, odourless and polyphasic fluid.
 - It is a crystal colloid solution which is a mixture of chemical substances forming crystalloid i.e. true solution (sugars, salts, acids, bases) and others forming colloidal solution (Proteins and lipids).
 - The pH of the protoplasm is around 6.8, contain 90% water (10% in dormant seeds).

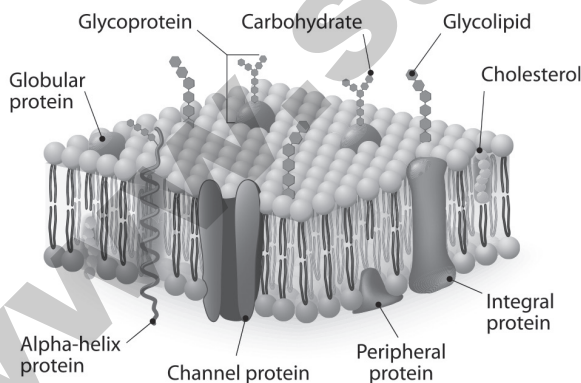
- Protoplasm is neither a good nor a bad conductor of electricity. It forms a delimiting membrane on coming in contact with water and solidifies when heated.
- Cohesiveness:** Particles or molecules of protoplasm are adhered with each other by forces, such as **Van der Waal's bonds**, that hold long chains of molecules together. This property varies with the strength of these forces.
- Contractility:** The contractility of protoplasm is important for the absorption and removal of water especially stomatal operations.
- Surface tension:** The proteins and lipids of the protoplasm have less surface tension, hence they are found at the surface forming the membrane. On the other hand the chemical substances (NaCl) have high surface tension, so they occur in deeper parts of the cell protoplasm.

2. Who proposed the Fluid Mosaic Model of plasma membrane? Describe the fluid mosaic model of plasma membrane with the help of labelled diagram.

Ans. Fluid Mosaic Model :

Jonathan Singer and Garth Nicolson (1972) proposed fluid mosaic model.

- It is made up of lipids and proteins together with a little amount of carbohydrate. The lipid membrane is made up of phospholipid. The phospholipid molecule has a hydrophobic tail and hydrophilic head.



Model of Cell membrane

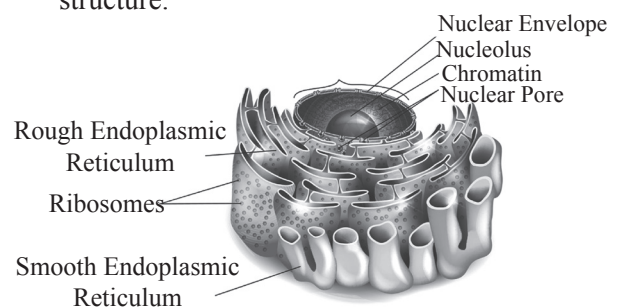
- The hydrophobic tail repels water and hydrophilic head attracts water. The proteins of the membrane are globular proteins which are found intermingled between the lipid bilayer most of which are projecting beyond the lipid bilayer.

- These proteins are called as **integral proteins**. Few are superficially attached on either surface of the lipid bilayer which are called as **peripheral proteins**.
- The proteins are involved in transport of molecules across the membranes and also act as enzymes, receptors (or) antigens.
- The Carbohydrate molecules of cell membrane are short chain polysaccharides. These are either bound with '**glycoproteins**' or '**glycolipids**' and form a '**glyocalyx**'.
- The movement of membrane lipids from one side of the membrane to the other side by vertical movement is called **flip flopping** or **flip flop movement**. This movement takes place more slowly than lateral diffusion of lipid molecule.
- The phospholipids can have flip flop movement because the phospholipids have smaller polar regions, whereas the proteins cannot flip flop because the polar region is extensive.

3. What are the structural elements of endoplasmic reticulum? Explain in detail.

Ans. The largest of the internal membranes is called the **Endoplasmic Reticulum (ER)**. The name endoplasmic reticulum was given by **K.R. Porter (1948)**. It consists of double membrane. Morphologically the structure of endoplasmic reticulum consists of:

- Cisternae** are long, broad, flat, sac like structures arranged in parallel bundles or stacks to form lamella. The space between membranes of cisternae is filled with fluid.
- Vesicles** are oval membrane bound vacuolar structure.



- Tubules** are irregular shaped, branched, smooth walled, enclosing a space.
 - Endoplasmic reticulum is associated with nuclear membrane and cell surface membrane.

- (ii) It forms a network in cytoplasm and gives mechanical support to the cell. Its chemical environment enables protein folding and undergo modification necessary for their function.
- (iii) Misfolded proteins are pulled out and are degraded in endoplasmic reticulum. When ribosomes are present in the outer surface of the membrane it is called as **Rough Endoplasmic Reticulum(RER)**, when the ribosomes are absent in the endoplasmic reticulum it is called as **Smooth Endoplasmic Reticulum(SER)**.
- (iv) Rough Endoplasmic reticulum is involved in protein synthesis and Smooth Endoplasmic reticulum are the sites of lipid synthesis.
- (v) The smooth endoplasmic reticulum contains enzymes that detoxify lipid soluble drugs, certain chemicals and other harmful compounds.

4. Write down the functions of lysosomes.

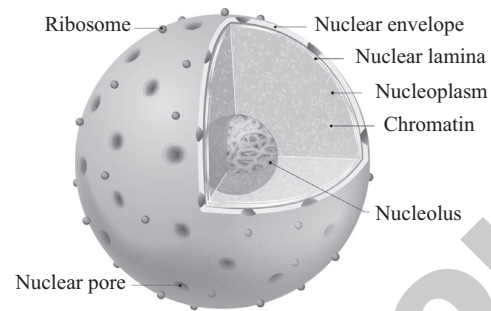
Ans. Functions of lysosomes:

1. **Intracellular digestion:** They digest carbohydrates, proteins and lipids present in cytoplasm.
2. **Autophagy:** During adverse condition they digest their own cell organelles like mitochondria and endoplasmic reticulum.
3. **Autolysis:** Lysosome causes self destruction of cell.
4. **Ageing:** Lysosomes have autolytic enzymes that disrupts intracellular molecules.
5. **Phagocytosis:** Large cells or contents are engulfed and digested by macrophages, thus forming a phagosome in cytoplasm. These phagosome fuse with lysosome for further digestion.
6. **Exocytosis:** Lysosomes release their enzymes outside the cell to digest other cells.

5. Describe the structure of nucleus with a suitable diagram.

Ans. Structure of nucleus :

1. Nucleus is an important unit of cell which control all activities of the cell. Nucleus holds the hereditary information.



Cell Nucleus

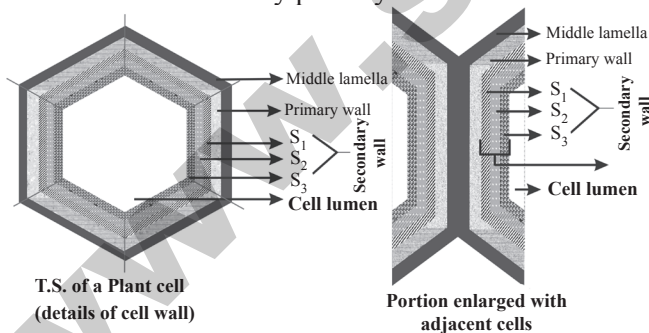
2. It is the largest among all cell organelles. It may be spherical, cuboidal, ellipsoidal or discoidal. It is surrounded by a double membrane structure called **nuclear envelope**, which has the inner and outer membrane.
3. Inner membrane is smooth without ribosomes and the outer membrane is rough with ribosomes and is continues with irregular and infrequent intervals with the endoplasmic reticulum.
4. The membrane is perforated by pores known as nuclear pores, allows materials such as mRNA, ribosomal units, proteins and other macromolecules to pass in and out of the nucleus.
5. The pores enclosed by circular structures called **annuli**. The pore and annuli forms the pore complex. The space between two membranes is called **perinuclear space**.
6. Nuclear space is filled with nucleoplasm, a gelatinous matrix has uncondensed chromatin network and a conspicuous nucleolus. The chromatin network is the uncoiled, indistinct and remain thread like during the interphase.
7. It has little amount of RNA and DNA bound to histone proteins in eukaryotic cells. During cell division chromatin is condensed into an organized form called **chromosome**.
8. The portion of Eukaryotic Chromosome which is transcribed into mRNA contains active genes that are not tightly condensed during interphase is called **euchromatin**.
9. The portion of a Eukaryotic Chromosome that is not transcribed into mRNA which remains condensed during interphase and stains intensely is called **heterochromatin**.
10. Nucleolus is a small, dense, spherical structure either present singly or in multiples inside nucleus and it not membrane bound. Nucleoli possesses genes for rRNA and tRNA.

6. Describe the structure of a cell wall.

Ans. Cell wall is the outermost protective cover of the cell. It is present in bacteria, fungi and plants whereas it is absent in animal cell. It was first observed by Robert Hooke. It is an actively growing portion. It is made up of different complex material in various organism. In bacteria it is composed of peptidoglycan, in fungi chitin and fungal cellulose, in algae cellulose, galactans and mannans. In plants it is made up of cellulose, hemicellulose, pectin, lignin, cutin, suberin and silica. In plant, cell wall shows three distinct regions (a) Primary wall (b) Secondary wall (c) Middle lamellae.

a. Primary wall :

- (i) It is the first layer inner to middle lamellae, primarily consisting of loose network of cellulose microfibrils in a gel matrix.
- (ii) It is thin, elastic and extensible. In most plants the microfibrils are made up of cellulose oriented differently based on shape and thickness of the wall.
- (iii) The matrix of the primary wall is composed of hemicellulose, pectin, glycoprotein and water.
- (iv) Hemicellulose binds the microfibrils with matrix and glycoproteins control the orientation of microfibrils while pectin serves as filling material of the matrix.
- (v) Cells such as parenchyma and meristems have only primary wall.



Plant cell wall

b. Secondary wall :

- (i) Secondary wall is laid during maturation. It plays a key role in determining the shape of a cell. It is thick, inelastic and is made up of cellulose and lignin.

- (ii) The secondary wall is divided into 3 sublayers S_1 , S_2 and S_3 where the cellulose microfibrils are compactly arranged with different orientation forming a laminated structure and the cell wall strength is increased.

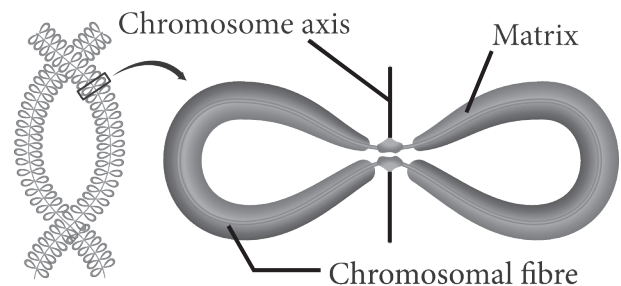
c. Middle lamellae :

- (i) It is the outermost layer made up of calcium and magnesium pectate, deposited at the time of cytokinesis.
- (ii) It is a thin amorphous layer which cements two adjacent cells. It is optically inactive (isotropic).
- (iii) **Plasmodesmata and Pits :** Plasmodesmata act as a channel between the protoplasm of adjacent cells through which many substances pass through.
- (iv) Moreover, at few regions the secondary wall layer is laid unevenly whereas the primary wall and middle lamellae are laid continuously such regions are called pits.
- (v) The pits of adjacent cells are opposite to each other. Each pit has a pit chamber and a pit membrane.
- (vi) The pit membrane has many minute pores and thus they are permeable. The pits are of two types namely simple and bordered pit.

7. Describe the Lampbrush Chromosomes.

Ans. Lampbrush Chromosomes:

1. It occurs at the diplotene stage of first meiotic prophase in oocytes of an animal **Salamandar** and in giant nucleus of the unicellular alga **Acetabularia**.
2. It was first observed by **Flemming** in 1882. The highly condensed Chromosome forms the chromosomal axis, from which lateral loops of DNA extend as a result of intense RNA synthesis.



Lampbrush chromosomes

UNIT-III

**CELL BIOLOGY AND
BIOMOLECULES**

Chapter 7

CELL CYCLE

CHAPTER SNAPSHOT

7.1 Nuclear Divisions

7.2 Cell Cycle

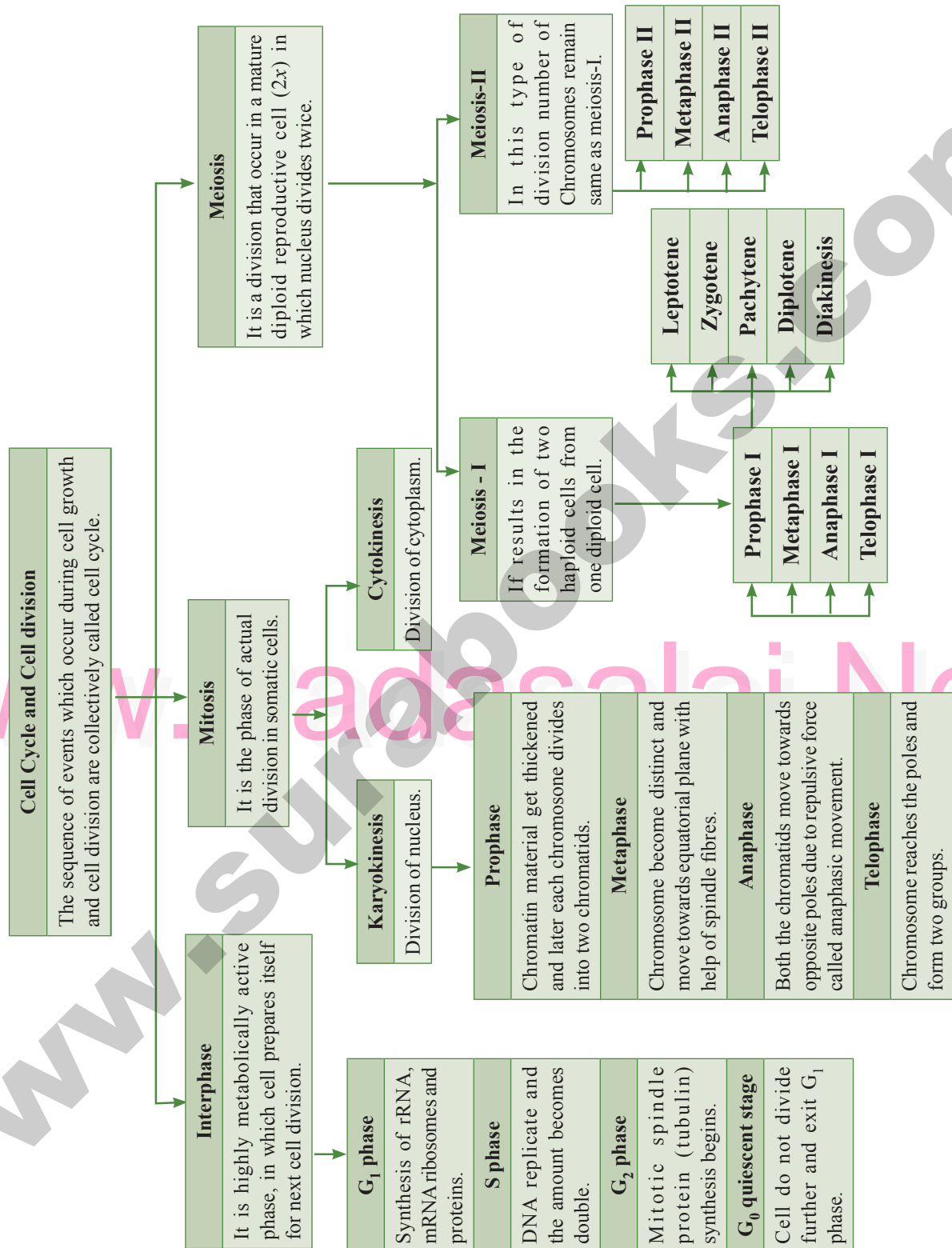
- 7.2.1 Duration of Cell Cycle
- 7.2.2 Interphase
- 7.2.3 G_1 Phase
- 7.2.4 G_0 Phase
- 7.2.5 S Phase - Synthesis Phase - cells with intermediate amounts of DNA.
- 7.2.6 G_2 - The Second Gap phase - 4C amount of DNA in cells of G_2 and mitosis

7.3 Cell Division

- 7.3.1 Amitosis (Direct Cell Division)
- 7.3.2 Mitosis
- 7.3.3 Closed and Open Mitosis
- 7.3.4 Cytokinesis
- 7.3.5 Significance of Mitosis
- 7.3.6 Meiosis
- 7.3.7 Significance of Meiosis

7.4 Difference between Mitosis and Meiosis

CONCEPT MAP



MUST KNOW DEFINITIONS

Cell Cycle	:	A series of events leading to the formation of a new cell is known as Cell cycle .
Interphase	:	Longest part of the cell cycle.
G₁ Phase	:	1 st gap phase.
Prophase	:	Longest phase in mitosis.
Metaphase plate	:	The alignment of chromosome into compact group at the equator of the cell is known as Metaphase plate .
Interkinesis	:	The stage between the two meiotic divisions is called Interkinesis .
Mitogen	:	The factors which promote cell cycle proliferation is called Mitogen .
Mitotic poisons	:	Certain chemical components act as inhibitors of the mitotic cell divisions and they are called Mitotic poisons .
Endomitosis	:	The replication of chromosomes in the absence of nuclear division and cytoplasmic division resulting in numerous copies within each cell is called Endomitosis .

Evaluation

1. The correct sequence in cell cycle is [Mar-2020; May-'22]
- (a) S-M-G₁-G₂ (b) S-G₁-G₂-M
(c) G₁-S-G₂-M (d) M-G-G₂-S
[Ans. (c) G₁-S-G₂-M]
2. If mitotic division is restricted in G₁ phase of the cell cycle then the condition is known as [May-'22]
- (a) S Phase (b) G₂ Phase
(c) M Phase (d) G₀ Phase
[Ans. (d) G₀ Phase]
3. Anaphase promoting complex APC is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in human cell, which of the following is expected to occur?
- (a) Chromosomes will be fragmented
(b) Chromosomes will not condense
(c) Chromosomes will not segregate
(d) Recombination of chromosomes will occur
[Ans. (c) Chromosomes will not segregate]
4. In S phase of the cell cycle [QY-2019]
- (a) Amount of DNA doubles in each cell
(b) Amount of DNA remains same in each cell
(c) Chromosome number is increased
(d) Amount of DNA is reduced to half in each cell
[Ans. (a) Amount of DNA doubles in each cell]
5. Centromere is required for [Sep-2020]
- (a) transcription
(b) crossing over
(c) cytoplasmic cleavage
(d) movement of chromosome towards pole
[Ans. (d) movement of chromosome towards pole]
6. Synapsis occur between [Sep-2021]
- (a) mRNA and ribosomes
(b) spindle fibres and centromeres
(c) two homologous chromosomes
(d) a male and a female gamete
[Ans. (c) two homologous chromosomes]
7. In meiosis crossing over is initiated at [CRT-'22]
- (a) Diplotene (b) Pachytene
(c) Leptotene (d) Zygotene
[Ans. (b) Pachytene]
8. Colchicine prevents the mitosis of the cells at which of the following stage
- (a) Anaphase (b) Metaphase
(c) Prophase (d) interphase
[Ans. (b) Metaphase]
9. The pairing of homologous chromosomes on meiosis is known as [QY-2018 & Mar.-2019; Aug-'22]
- (a) Bivalent (b) Synapsis
(c) Disjunction (d) Synergids
[Ans. (b) Synapsis]
10. Write any three significance of mitosis. [June-2019 ; Mar:2020]
- Ans. 1. **Genetic stability** - Daughter cells are genetically identical to parent cells.
2. **Growth** - As multicellular organisms grow, the number of cells making up their tissue increases. The new cells must be identical to the existing ones.
3. **Repair of tissues** - Damaged cells must be replaced by identical new cells by mitosis.
11. Differentiate between mitosis and meiosis. [Mar-2020 ; Sep-2020]
- Ans.

No.	Mitosis	Meiosis
1.	One division.	Two divisions.
2.	Number of chromosome remain the same.	Number of chromosomes is halved.
3.	Homologous chromosomes line up separately on the metaphase plate.	Homologous chromosomes line up in pairs at the metaphase plate.
4.	Homologous chromosome do not pair up.	Homologous chromosome pair up to form bivalent.
5.	Chiasmata do not form and crossing over never occurs.	Chiasmata form and crossing over occurs.
6.	Daughter cells are genetically identical.	Daughter cells are genetically different from the parent cells.
7.	Two daughter cells are formed.	Four daughter cells are formed.

12. Give an account of G₀ phase. [May-'22]

- Ans. 1.** During interphase some cells exit G₁ and enters a quiescent stage called G₀, where the cells remain metabolically active without proliferation.
- Cells can exist for long periods in G₀ phase. In G₀ cells cease growth with reduced rate of RNA and protein synthesis.
 - G₀ phase is not permanent. Mature neuron and skeletal muscle cell remain permanently in G₀.
 - Many cells in animals remains in G₀ unless called on to proliferate by appropriate growth factors or other extracellular signals.
 - G₀ cells are not dormant.

13. Differentiate cytokinesis in plant cells and animal cells.

Ans. Cytokinesis in Animal Cells :

- It is a contractile process.
- The ring consists of a bundle of microfilaments assembled from **actin** and **myosin**.
- This fibril helps for the generation of a contractile force.
- This force draws the contractile ring inward forming a cleavage furrow in the cell surface dividing the cell into two.

Cytokinesis in Plant Cell :

- Division of the cytoplasm often starts during telophase. In plants, cytokinesis cell plate grows from centre towards lateral walls - centrifugal manner of cell plate formation.
- Phragmoplast contains microtubules, actin filaments and vesicles from **golgi apparatus** and **ER**.
- Microtubule of the phragmoplast to the equator fuse, forming a new plasma membrane and the materials which are placed there becomes new cell wall.
- The first stage of cell wall construction is a line dividing the newly forming cells called a **cell plate**.
- The cell plate eventually stretches right across the cell forming the middle lamella. Cellulose builds up on each side of the middle lamella to form the cell walls of two new plant cells.

14. Write about Pachytene and Diplotene of Prophase I.

[CRT-'22 & Aug-'22]

Ans. It is the third stage of Meiotic prophase I.

Pachytene :

- At this stage bivalent chromosomes are clearly visible as tetrads. Bivalent of meiosis I consists of 4 chromatids and 2 centromeres.

- Synapsis is completed and recombination nodules appear at a site where crossing over takes place between non-sister chromatids of homologous chromosome.
- Recombination of homologous chromosomes is completed by the end of the stage but the chromosomes are linked at the sites of crossing over. This is mediated by the enzyme *recombinase*.

Diplotene :

- Synaptonemal complex disassembled and dissolves. The homologous chromosomes remain attached at one or more points where crossing over has taken place.
- These points of attachment where 'X' shaped structures occur at the sites of crossing over is called **chiasmata**. Chiasmata are chromatin structures at sites where recombination has taken place.
- They are specialised chromosomal structures that hold the homologous chromosomes together.
- Sister chromatids remain closely associated whereas the homologous chromosomes tend to separate from each other but are held together by chiasmata.
- This substage may last for days or years depending on the sex and organism.

GOVERNMENT EXAM QUESTIONS

Bio-Botany (Short version)

CHOOSE THE CORRECT ANSWERS 1 MARK

- If the initial amount of DNA is 8 C then after S phase the amount of DNA would be _____.**
[Govt. MQP-2016]
(a) 4 C (b) 8 C (c) 64 C (d) 16 C
[Ans. (d) 16 C]
- Arrange the stages of meiotic prophase - I in order**
[QY-2019]
(a) Zygotene, Diplotene, Diakinesis, Pachytene, Leptotene
(b) Leptotene, Zygotene, Pachytene, Diplotene, Diakinesis
(c) Leptotene, Pachytene, Zygotene, Diplotene, Diakinesis
(d) Leptotene, Zygotene, Pachytene, Diakinesis, Diplotene
[Ans. (b) Leptotene, Zygotene, Pachytene, Diplotene, Diakinesis]
- In which cell division, independent assortment of genes takes place?**
[Sep-2020]
(a) Closed mitosis (b) Open mitosis
(c) Amitosis (d) Meiosis
[Ans. (d) Meiosis]

VERY SHORT ANSWERS

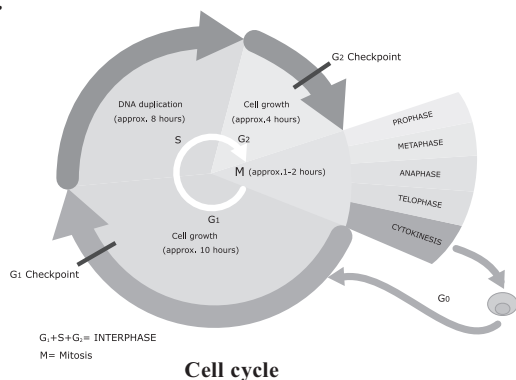
2 MARKS

1. Name the two phases of cell cycle which lasts for longest and shortest span of hours. [Govt. MQP-2018]

Ans. Longest span of hours - G₁ phase of inter phase Shortest span of hours - Mitosis.

2. A series of events leading to the formation of new cell is known as Cell Cycle. Give the diagrammatic view of Cell Cycle. [March-2019]

Ans.



3. What is Synapsis?

[HY-2018; CRT-'22]

Ans. **Synapsis** : Pairing of homologous chromosomes takes place and it is known as **synapsis**.

4. Define Cell Cycle.

[HY-2019]

Ans. A series of events leading to the formation of new cell is known as **cell cycle**.

5. What are chiasmata? State their significance.

[Sep-2021]

Ans. **Chiasmata**: The homologous chromosomes remain attached at one or more points where crossing over has taken place. These points of attachment where 'X' shaped structures occur at the sides of crossing over is called Chiasmata.

Significance of Chiasmata:

- The genetic constitution of the daughter cells differs from the parent cells due to crossing over.
- There is a mixture of paternal and maternal genes in areas of crossing over.

SHORT ANSWERS

3 MARKS

1. At the end of a cell division, a cell produces four cells. Identify the type of cell division and mention its significance in evolution. [Govt. MQP-2019]

Ans. The cell division is meiosis.

Significance of meiosis :

- This maintains a definite constant number of Chromosomes in organisms.
- Crossing over takes place and exchange of genetic material leads to variations among species.

- These variations are the raw materials to evolution.
- Meiosis provides genetic variability by partitioning different combinations of genes into gametes through independent assortment.
- Adaptation of organisms to various environmental stress.

2. Differentiate between Karyokinesis and Cytokinesis. [CRT-'22]

Ans.

No.	Karyokinesis	Cytokinesis
1.	Involves division of nucleus.	Involves division of cytoplasm.
2.	Nucleus develops a constriction at the center and becomes dumbbell shaped.	Plasma membrane develops a constriction along nuclear constriction.
3.	Constriction deepens and divides the nucleus into two.	It deepens centripetally and finally divides the cell into two cells.

LONG ANSWERS

5 MARKS

1. (i) Why is meiosis essential in sexually reproducing organisms?

(ii) Differentiate between S-phase and G₂-phase. [QY-2019]

Ans. (i) 1. Meiosis is essential in sexually reproducing organisms because it keeps the chromosome number constant during formation of gametes / spores.

2. This ensures constant number of chromosomes in **parent** and **offsprings**.

(ii)

No.	S-phase	G ₂ phase
1.	It is called synthetic phase.	It is called pre-mitotic phase.
2.	Growth of the cell continues as replication of DNA occurs.	Cell growth continues by protein and cell organelle synthesis, mitochondria and chloroplasts divide.
3.	DNA content increases from 2C to 4C.	DNA content remains as 4C.

Botany (Long version)

CHOOSE THE CORRECT ANSWERS 1 MARK

1. Anastral mitosis is the characteristic feature of . [Mar-2020]

- (a) All living organisms (b) Lower animals
(c) Higher animals (d) Higher plants

[Ans. (d) Higher plants]

MCQ'S

Chapter 1

- Which of the following are found in extreme saline conditions? (NEET-2017)

(a) Archaeobacteria (b) Eubacteria
(c) Cyanobacteria (d) Mycobacteria

[Ans. (a) Archaeobacteria]
- Select the mismatch (NEET – 2017)

(a) *Frankia* *Alnus*
(b) *Rhodospirillum* *Mycorrhiza*
(c) *Anabaena* *Nitrogen fixer*
(d) *Rhizobium* *Alfalfa*

[Ans. (b) *Rhodospirillum* - *Mycorrhiza*]
- Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen? (NEET – 2017)

(a) *Bacillus* (b) *Pseudomonas*
(c) *Mycoplasma* (d) *Nostoc*

[Ans. (c) *Mycoplasma*]
- Five Kingdom system of classification suggested by R.H. Whittaker is not based on (AIPMT – 2014)

(a) Presence or absence of a well defined nucleus
(b) Mode of reproduction
(c) Mode of nutrition
(d) Complexity of body organisation

[Ans. (a) Presence or absence of a well defined nucleus]
- Mycorrhizae* are the example of (NEET – 2017)

(a) Fungitasis (c) Amensalism
(b) Antibiosis (d) Mutualism

[Ans. (d) Mutualism]
- Which of the following shows coiled RNA strand and capsomeres? (AIPMT – 2014)

(a) Polio virus (b) Tobacco mosaic virus
(c) Measles virus (d) Retrovirus

[Ans. (b) Tobacco mosaic virus]
- Viroids differ from viruses in having : (NEET – 2017)

(a) DNA molecules with protein coat
(b) DNA molecules without protein coat
(c) RNA molecules with protein coat
(d) RNA molecules without protein coat

[Ans. (d) RNA molecules without protein coat]
- Which of the following is correctly matched for the product produced by them? (NEET – 2017)

(a) *Acetobacter acetic* : Antibiotics
(b) *Methanobacterium* : Lactic acid
(c) *Penicillium notatum* : Acetic acid
(d) *Saccharomyces cerevisiae* : Ethanol

[Ans. (d) *Saccharomyces cerevisiae* : Ethanol]
- Which of the following components provides sticky character to the bacterial cell? (NEET – 2017)

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

[Ans. (d) Glycocalyx]
- Which of the following statements is wrong for viroids? (NEET – 2016)

(a) They lack a protein coat
(b) They are smaller than viruses
(c) They causes infections
(d) Their RNA is a high molecular weight

[Ans. (d) Their RNA is a high molecular weight]

11. Which of the following would appear as the pioneer organisms on bare rocks? (NEET – 2016)

- (a) Lichens (b) Liverworts
(c) Mosses (d) Green algae

[Ans. (a) Lichens]

12. One of the major components of cell wall of most fungi is (NEET – 2016)

- (a) Chitin (b) Peptidoglycan
(c) Cellulose (d) Hemicellulose

[Ans. (a) Chitin]

13. Which one of the following statements is wrong? (NEET – 2016)

- (a) Cyanobacteria are also called blue-green algae
(b) Golden algae are also called desmids
(c) Eubacteria are also called false bacteria
(d) Phycomycetes are also called algal fungi

[Ans. (c) Eubacteria are also called false bacteria]

14. Which part of the tobacco plant is infected by *Meloidogyne incognita*? (NEET – 2016)

- (a) Flower (b) Leaf
(c) Stem (d) Root

[Ans. (d) Root]

15. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom (NEET – 2016)

- (a) Animalia (b) Monera
(c) Protista (d) Fungi

[Ans. (b) Monera]

16. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the (NEET – 2016)

- (a) Halophiles (b) Thermoacidophiles
(c) Methanogens (d) Eubacteria

[Ans. (c) Methanogens]

17. How many organisms in the list below are autotrophs? (AIPMT Mains 2012)

Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Saccharomyces,

Trypanosoma, Porphyra, Wolffia

- (a) Four (b) Five
(c) Six (d) Three

[Ans. (c) Six]

Chapter 2

1. Read the following statements (A to E) and select the option with all correct statements

(AIPMT – 2015)

A. Mosses and Lichens are the first organisms to colonise a bare rock.

B. Selaginella is a homosporous pteridophyte.

C. Coralloid roots in *Cycas* have VAM.

D. Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic.

E. In gymnosperms, male and female gametophytes are present within sporangia located on sporophyte.

- (a) B, C and E (b) A, C and D
(c) B, C and D (d) A, D and E

[Ans. (d) A, D and E]

2. An example of colonial alga is (NEET – 2017)

- (a) *Chlorella* (b) *Volvox*
(c) *Ulothrix* (d) *Spirogyra*

[Ans. (b) *Volvox*]

3. Select the mismatch (NEET – 2017)

- (a) *Pinus* - Dioecious
(b) *Cycas* - Dioecious
(c) *Salvinia* - Heterosporous
(d) *Equisetum* - Homosporous

[Ans. (a) *Pinus* - Dioecious]

4. Life cycle of *Ectocarpus* and *Fucus* respectively are (NEET – 2017)

- (a) Haplontic, Diplontic
(b) Diplontic, Haplodiplontic
(c) Haplodiplontic, Diplontic
(d) Haplodiplontic, Halplontic

[Ans. (c) Haplodiplontic, Diplontic]

5. Zygote meiosis is characteristic of (NEET – 2017)

- (a) *Marchantia* (b) *Fucus*
(c) *Funaria* (d) *Chlamydomonas*

[Ans. (d) *Chlamydomonas*]

6. In bryophytes and pteridophytes, transport of male gametes require (NEET – 2016)

- (a) Wind (b) Insects
(c) Birds (d) Water

[Ans. (d) Water]

11th STD.

INSTANT SUPPLEMENTARY EXAM - August 2022

Reg. No.

PART - III - BIOLOGY

Time Allowed : 3.00 Hours]

(with Answers)

[Maximum Marks : 70

- Instructions:** (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - I

(BIO - BOTANY)

(Marks : 35)

SECTION - 1

- Note :** (1) Answer **all** the questions: (8 × 1 = 8)
(2) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

- Identify the incorrect statement about the Gram Positive Bacteria.
 - Teichoic acid absent
 - High percentage of peptidoglycan is found in cell wall
 - Cell wall is single layered
 - Lipopolysaccharide is present in cell wall
- The taxonomy which involves the similarities and dissimilarities among the immune system of different taxa is termed as:
 - Chemotaxonomy
 - Molecular systematics
 - Serotaxonomy
 - Numerical taxonomy
- The pairing of homologous chromosomes on meiosis is known as :
 - Bivalent
 - Synapsis
 - Disjunction
 - Synergids
- What type of transpiration is possible in the xerophyte Opuntia?
 - Stomatal
 - Lenticular
 - Cuticular
 - All the above
- Match the following.

(1) Molybdenum	(i) Chlorophyll
(2) Zinc	(ii) Methionine
(3) Magnesium	(iii) Auxin
(4) Sulphur	(iv) Nitrogenase

- (1)-(i), (2)-(iii), (3)-(iv), (4)-(ii)
 - (1)-(ii), (2)-(i), (3)-(iii), (4)-(iv)
 - (1)-(iv), (2)-(iii), (3)-(i), (4)-(ii)
 - (1)-(iv), (2)-(ii), (3)-(i), (4)-(iii)
- Identify the true statement regarding the light reaction of Photosynthesis.
 - Splitting of water molecule is associated with PSI
 - PS I and PS II involved in the formation of NADPH+H⁺
 - The reaction centre of PS I is chlorophyll 'a' with absorption peak at 680 nm
 - The reaction centre of PS II is chlorophyll 'a' with absorption peak at 700 nm
 - During oxidation of two molecules of cytosolic NADH+H⁺, number of ATP molecules produced in plants are:
 - 3
 - 4
 - 6
 - 8
 - _____ is an underground stem growing horizontally with several lateral growing tips.
 - Musa
 - Cycas
 - Polyalthia
 - Calotropis

SECTION - 2

Note: Answer **any four** questions. (4 × 2 = 8)

- What are Lichens?
- What do you infer from the term 'Pycnoxylic'?
- What is Monadelphous Stamens? Give an example.
- Write a note on Breathing Root.
- Differentiate closed vascular bundle from open vascular bundle.
- Define Bolting.

SECTION - 3

Note: Answer **any three** questions. Question No. **19** is **compulsory**. (3 × 3 = 9)

- Differentiate between Racemose and Cymose Inflorescence.

[349]

11th STD.

INSTANT SUPPLEMENTARY EXAM - August 2022

Reg. No.

PART - III - BOTANY

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Time Allowed : 3.00 Hours]

(with Answers)

[Maximum Marks : 70

- Instructions:** (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
- (2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - I

- Note :** (1) Answer **all** the questions: (15 × 1 = 15)
- (2) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. The micro-organism which lack cell-wall and appear like "Fried Egg" in culture is :
 - (a) Archaeobacteria
 - (b) Actinomycetes
 - (c) Cyanobacteria
 - (d) Mycoplasma
2. The haploid number of chromosome for an angiosperm is 14, the number of chromosome in its endosperm would be:
 - (a) 7
 - (b) 14
 - (c) 42
 - (d) 28
3. The term 'Vernalization' was first used by:
 - (a) Purvis
 - (b) T.D. Lysenko
 - (c) Garner
 - (d) Allard
4. An example for Hypanthodium inflorescence:
 - (a) Dorstenia
 - (b) Nerium
 - (c) Ficus
 - (d) Leucas
5. Binomial nomenclature was first introduced by:
 - (a) Gaspard Bauhin
 - (b) Bentham and Hooker
 - (c) Carolus Linnaeus
 - (d) Engler and Prantl
6. Keeping in view the fluid mosaic model for the structure of cell membrane, which one of the following statements is correct with respect to the movement of lipids and proteins from one lipid monolayer to the other.
 - (a) Neither lipid nor proteins can flip-flop
 - (b) Both lipid and proteins can flip-flop
 - (c) While lipids can rarely flip-flop proteins cannot
 - (d) While proteins can flip-flop lipids cannot
7. At the end of meiosis _____ number of daughter cells are produced.
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
8. First protein, insulin was sequenced by:
 - (a) Fred Sanger
 - (b) Linus Pauling
 - (c) Robert Corey
 - (d) Johannes Mulder
9. The function of vascular tissue is:
 - (a) Loss of water
 - (b) Exchange of gases
 - (c) Synthesis of starch
 - (d) Conduction of water and food
10. The common bottle cork is a product of:
 - (a) Phellem
 - (b) Phellogen
 - (c) Xylem
 - (d) Vascular cambium
11. Stomata of a plant open due to:
 - (a) Influx of K⁺
 - (b) Efflux of K⁺
 - (c) Influx of Cl⁻
 - (d) Influx of OH⁻
12. Match the following.

(1) Molybdenum	(i) Chlorophyll
(2) Zinc	(ii) Methionine
(3) Magnesium	(iii) Auxin
(4) Sulphur	(iv) Nitrogenase

 - (a) (1)-(i), (2)-(iii), (3)-(iv), (4)-(ii)
 - (b) (1)-(ii), (2)-(i), (3)-(iii), (4)-(iv)
 - (c) (1)-(iv), (2)-(iii), (3)-(i), (4)-(ii)
 - (d) (1)-(iv), (2)-(ii), (3)-(i), (4)-(iii)
13. For every CO₂ molecule entering the C₃ cycle, the number of ATP and NADPH required is :
 - (a) 2 ATP + 2 NADPH
 - (b) 2 ATP + 3 NADPH
 - (c) 3 ATP + 2 NADPH
 - (d) 3 ATP + 3 NADPH

14. Assertion (A) : Oxidation phosphorylation takes place during the electron transport chain in Mitochondria.

Reason (R) : Succinyl CoA is phosphorylated into succinic acid by substrate phosphorylation.

- (a) (A) and (R) are correct, (R) is correct explanation of (A).
 (b) (A) and (R) are correct, but (R) is not the correct explanation of (A).
 (c) (A) is correct but (R) is wrong.
 (d) (A) and (R) are wrong.

15. Leaves become modified into spines in _____.

- (a) Silk cotton (b) Opuntia
 (c) Peas (d) Onion

PART - II

Note: Answer any six questions. Q. No 24 is compulsory.
 (6 × 2 = 12)

- 16.** Define virion.
17. What is alternation of generation?
18. What is cladistics?
19. Define Amitosis.
20. What is transpiration?
21. Name the two types of electron microscope.
22. Differentiate phylloclade and cladode.
23. What is photophosphorylation?
24. What are long day plants?

PART - III

Note: Answer any six questions. Q. No. 33 is compulsory.
 (6 × 3 = 18)

- 25.** What is phyllode? Give an example.
26. What is heterocyst? Mention its function.
27. What are hydathodes?
28. Differentiate manoxylic and pycnoxylic.
29. Mitochondria is called 'Power house of the cell'. Give reason.
30. Classify Plant Growth Regulators.
31. What is tissue system? write its types.
32. Give the technical terms for the following:
 (a) A sterile stamen
 (b) Stamens are united in one bunch
 (c) Stamens are attached to the petals
33. What is Emerson's Enhancement Effect?

PART - IV

Note: Answer all the questions (5 × 5 = 25)

- 34.** (a) Explain the modification of tap root system.
 (OR)
 (b) Write about Pachytene and Diplotene of Prophase I.
35. (a) Write the difference between photosystem I and Photosystem II.
 (OR)
 (b) Explain the special type of inflorescence.
36. (a) Draw the L.S of cycas ovule and label the parts.
 (OR)
 (b) Explain the theory of K⁺ transport dealing with opening and closing of stomata.
37. (a) Write the botanical description of Ricinus communis.

(OR)

- (b) Write the flow chart of glycolysis.
38. (a) Write the physiological effects of Gibberellins.

(OR)

- (b) Explain annual rings.



ANSWERS

PART - I

- 1.** (d) Mycoplasma
2. (c) 42
3. (b) T.D. Lysenko
4. (c) Ficus
5. (a) Gaspard Bauhin
6. (c) While lipids can rarely flip-flop proteins cannot
7. (c) 4
8. (a) Fred Sanger
9. (d) Conduction of water and food
10. (b) Phellogen
11. (a) Influx of K⁺

12. (c) (1)-(iv), (2)-(iii), (3)-(i), (4)-(ii)
13. (c) 3 ATP + 2 NADPH
14. (a) (A) and (R) are correct, but (R) is not the correct explanation of (A).
15. (b) Opuntia

PART - II

16. Virion is an intact infective virus particle which is non-replicating outside a host cell.
17. Alternation of generation is common in all plants. Alternation of the haploid gametophytic phase (n) with diploid sporophytic phase (2n) during the life cycle is called **alternation of generation**.
18. 1. The method of classifying organisms into monophyletic group of a common ancestors based on shared apomorphic characters is called **cladistics**.
2. A tree - shaped diagram is the outcome of a cladistic analysis and is called a **cladogram**.
19. Amitosis is also called direct or incipient cell division. Here there is no spindle formation and chromatin material does not condense.
20. The loss of excess of water in the form of vapour from various aerial parts of the plant is called transpiration.
21. 1. Transmission Electron Microscope (TEM).
2. Scanning Electron Microscope (SEM).
- 22.

No.	Phylloclade	Cladode
1.	It is a green, flattened or cylindrical or angled stem or branch of unlimited growth, consisting of a series of nodes and internodes at long or short intervals.	They are similar to phylloclade but with one or two internodes only.
2.	Leaves are modified to spines. Eg: <i>Opuntia</i> .	They bear buds, scales and flowers. Eg: <i>Asparagus</i> .

23. During light reaction of photosynthesis, the addition of phosphate takes place with the help of light generated electron and is hence called photophosphorylation.
24. The plants that require long critical day length for flowering are called long day plants or short night plants.
Eg: Pea, Barley and Oats.

PART - III

25. Phyllodes are flat, green-coloured leaf-like modifications of petioles or rachis. The leaflets or lamina of the leaf are highly reduced or caducous. The phyllodes perform photosynthesis and other functions of leaf.
Example: *Acacia auriculiformis* (Australian Acacia), *Parkinsonia*.
26. In some forms a large colourless cell is found in the terminal or intercalary position called Heterocysts.