

Class XI Session 2024-25
Subject - Biology
Sample Question Paper - 2

Time Allowed: 3 hours

Maximum Marks: 70

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. In *Magnifera indica* Linn, Linn denotes: [1]
 - a) The name of the author who first described the genus.
 - b) The name of the author who first described the formation
 - c) The name of the author who first described the subspecies.
 - d) The name of the author who first described the species.
2. What is the average amount of urine produced by a human in a day? [1]
 - a) 1.4 litres
 - b) 15 litres
 - c) 18 litres
 - d) 180 litres
3. Base pairs found in 5 turns of DNA spirals are _____. [1]
 - a) 50
 - b) 100
 - c) 10
 - d) 20
4. Epiblema of roots is equivalent to: [1]
 - a) Pericycle
 - b) Stele
 - c) Epidermis
 - d) Endodermis
5. An ORD found chiefly among stonecutters due to inhalation of fine stone particles is named _____. [1]
 - a) Bronchitis
 - b) Chalicosis
 - c) Siderosis
 - d) Asthma
6. Dark fixation of CO₂ in CAM plants is called ossification because it produces: [1]

oxygen, chlorine, carbon, etc.

Reason (R): Wet weight is the weight of living tissue and the remains of living tissue after drying gives dry weight.

- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.

16. **Assertion (A):** The amount of CO₂ that can diffuse through the diffusion membrane per unit difference in partial pressure is much higher compared to that of O₂. [1]

Reason (R): The solubility of CO₂ is 20-25 times higher than that of O₂.

- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.

Section B

17. List out the functions of the ground tissue system. [2]
18. How do different senses work in frog? Explain in brief. [2]
19. What is the role of second messenger in protein hormone action? [2]
20. Why there is a need to standardise the system of naming of living organisms? [2]
21. Write the equation to express Cornelius van Niel's findings. [2]

OR

State the law proposed by Blackman for various factors operative for photosynthesis.

Section C

22. The male and female reproductive organs of several pteridophytes and gymnosperms are comparable to floral structures of angiosperms. Make an attempt to compare the various reproductive parts of pteridophytes and gymnosperms with reproductive structures of angiosperms. [3]
23. Differentiate between an Insect and Spider. [3]
24. Find and write down structures of 10 interesting small molecular weight biomolecules. Find if there is any industry which manufactures the compounds by isolation. Find out who are the buyers. [3]
25. State any three functions of indole acetic acid in plants. [3]
26. What makes the synovial joint freely movable? List any two types of synovial joints. [3]
27. Write the differences between: [3]
a. Blood and Lymph
b. Open and Closed system of circulation
c. Systole and Diastole
d. P-wave and T-wave

OR

Why is there no mixing of deoxygenated and oxygenated blood in the human heart normally?

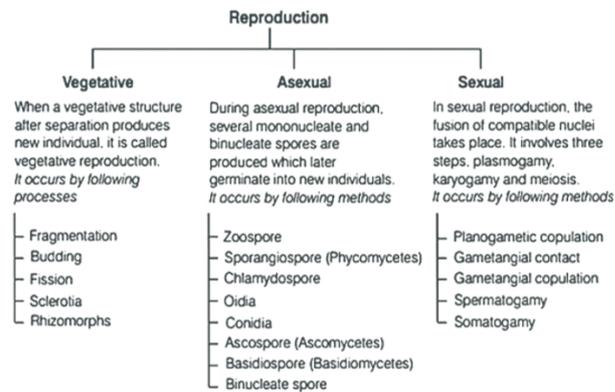
28. Briefly describe the structure of the Brain. [3]

Section D

29. **Read the following text carefully and answer the questions that follow:** [4]
The fungi constitute a unique kingdom of heterotrophic organisms. They show a great diversity in morphology

and habitat. Fungi are cosmopolitan and occur in air, water, soil, and on animals and plants. They prefer to grow in warm and humid places. Most fungi are heterotrophic and absorb soluble organic matter from dead substrates and hence are called saprophytes. When a fungus reproduces sexually, two haploid hyphae of compatible mating types come together and fuse. In some fungi, the fusion of two haploid cells immediately results in diploid cells (2n). The fungiform fruiting bodies in which reduction division occurs, leading to the formation of haploid spores. Symbionts - in association with algae as lichens and with roots of higher plants as mycorrhiza.

Three types of reproduction occur in fungi



i. Observe the given flow chart of reproduction and mention which steps involves in the sexual cycle of fungi.

(1)

ii. What is Rhizopus? Also, mention Rhizopus - wheat rust a correct match? (1)

iii. What is Mycorrhiza? And mention its function. (2)

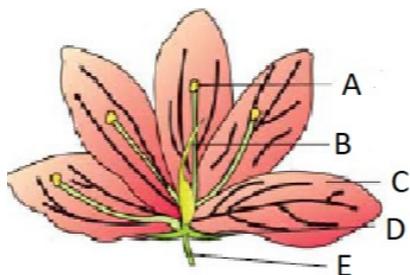
OR

In which form Fungi Stores Food Material? Do fungi have food vacuoles? (2)

30. **Read the following text carefully and answer the questions that follow:**

[4]

Each flower normally has four floral whorls, viz., calyx, corolla, androecium and gynoecium. The calyx is the outermost whorl of the flower and the members are called sepals. Corolla is composed of petals. Petals are usually brightly coloured to attract insects for pollination. The mode of arrangement of sepals or petals in floral bud with respect to the other members of the same whorl is known as aestivation. The main types of aestivation are valvate, twisted, imbricate. The shape and colour of corolla vary greatly in plants. Corolla may be tubular, bell-shaped, funnel-shaped or wheel-shaped and vexillary.



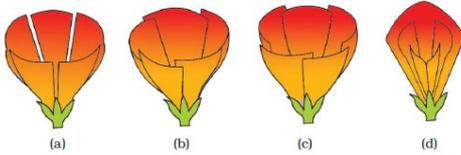
i. Observe the given figure mentioned A, B, C and D. Also mention its function. Identify D and mention its example. (1)

ii. Gamosepalous, Gamopetalous, Polysepalous, Polypetalous, Imbricate. (1)

iii. What is Valvate and twisted aestivation? (2)

OR

Which of the following shows imbricate? Explain imbricate aestivation? (2)



Section E

31. With the help of suitable diagrams describe mitosis. [5]

OR

Explain, why a pair of homologous chromosomes is genetically different, but a pair of sister chromatids is genetically identical before crossing over in meiosis.

32. Differentiate between Aerobic respiration and Fermentation. [5]

OR

Does pyruvic acid enter the Krebs' cycle directly?

33. Give a detail description of plastids with the help of suitable diagram. [5]

OR

Discuss the basic structural organisation of a typical cell.

Solution

Section A

1.

(d) The name of the author who first described the species.
Explanation: In *Mangifera indica* Linn, the word 'Linn' indicates that this species was first described by Linnaeus. Hence, the correct option is the name of the author who first described the species.
2.

(a) 1.4 litres
Explanation: The normal range for 24-hour urine volume is 800 to 2000 milliliters per day (with a normal fluid intake of about 2 liters per day). This is the range.
So average = $\frac{800+2000}{2} = 1400\text{ml} = 1.4 \text{ L}$
3.

(a) 50
Explanation: Each turn of DNA spirals contains 10 base pairs. So, in five turns of DNA total number of Base pair is $5 \times 10 = 50$ base pairs.
4.

(c) Epidermis
Explanation: Epiblema is found in root as single outermost layer through which root hairs arises.
5.

(b) Chalicosis
Explanation: An ORD found mainly among the stonecutters due to inhalation of fine stone particles is called as Chalicosis. It causes inflammation of the bronchioles causing respiratory difficulties.
6.

(b) Malic acid
Explanation: The dark reaction of Carbon dioxide fixation in CAM plants is called ossification because it produces Malic acid. These plants open their stomata during the night to prevent transpiration.
7.

(b) Slightly acidic
Explanation: The pH of urine under healthy conditions is slightly less than 7 so, slightly acidic in nature.
8.

(b) Ureotelic
Explanation: Excretion of urea as metabolic waste is known as Ureotelism. Animals secreting urea are called ureotelic. Frog is ureotelic.
9.

(b) 2 : 4-D and 2 : 4 : 5 T
Explanation: Plant hormone 2 : 4-D and 2 : 4 : 5 T have ability to kills the weeds in the crop field. Weeds are unwanted plants that grow along with crop plants and compete with the crop for nutrient and water.
10.

(c) A gametophyte free-living structure formed in pteridophytes.
Explanation: A gametophyte free-living structure formed in pteridophytes which is of short duration.
11.

(d) Ureotelic - Insects
Explanation: Insects excrete uric acid so they are uricotelic organisms.
12.

(c) High pCO₂
Explanation: The oxygen-haemoglobin curve is shifted to the right when there is high pCO₂, low pO₂, high H⁺ concentration, and high temperature.

13. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: Myxobacteria do not have flagella and move by gliding movement.
14. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in the antero-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of the thoracic chamber in the dorso-ventral axis.
15. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: Living organisms are made of only a small selection of these elements, four of which are carbon, hydrogen, nitrogen, and oxygen make up 96.5% of an organism's weight.
16. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.

Section B

17. Functions of the ground tissue systems are as follows:

- i. It provides mechanical strength while showing bending.
- ii. It has spaces to allow gaseous exchange between cortex and atmosphere.
- iii. It carries out photosynthesis.

18. **Sense Organs in Frog:**

Frog has different types of sense organs which are as follows:

- (a) Sensory papillae or organs of touch,
- (b) Taste buds.
- (c) Nasal epithelium for the sense of smell,
- (d) Eyes for vision and
- (e) Tympanum with internal ears for hearing.

Out of these, eyes and internal ears are well-organised structures and the rest are cellular aggregations around nerve endings. Eyes in a frog are a pair of spherical structures situated in the orbit in skull. These are simple eyes. External ear is absent in frogs and only tympanum can be seen externally. The ear is an organ of hearing as well as balancing.

19. Hormones which do not enter the target cells, interact with specific receptors located on the surface of the target cell membranes and generates second messengers (e.g., cAMP) on the inner side of the plasma membrane. The second messenger, in turn, carries out all the hormonal functions.
20. There are millions of living organisms in the world. Often, these organisms are known by their local names that vary from place to place, even within a country. Hence, the naming process of living organism is standardised in a way that a particular organism is known by the same name all over the world in the scientific community.
21. $2\text{H}_2\text{A} + \text{CO}_2 \longrightarrow 2\text{A} + \text{CH}_2\text{O} + \text{H}_2\text{O}$

OR

Law of Limiting Factors: Proposed by **F.F. Blackman** (1905), this law states that “if a chemical process is affected by more than one factor, then its rate would be determined by a factor that is nearest to its minimal value; it is the factor that directly affects process if its quantity is changed”.

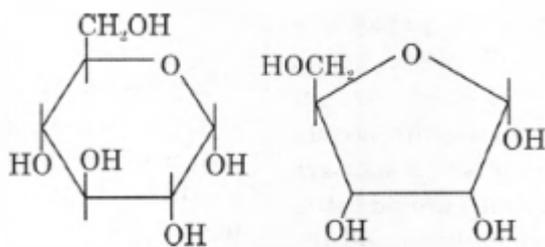
Section C

Structure	Pteridophyte	Gymnosperm	Angiosperm
Main reproductive part	Gametophyte bears antheridia and archegonia	Microsporophylls and megasporophylls represent the gametophyte.	Flower bears antheridium and gynoecium.
Male reproductive part	Antheridia produce male gamete.	The male cone is highly reduced in size.	Antheridia are composed of an anther and a slender stalk. Anther produces the pollen grains, i.e. male gametes.
Female reproductive	Archegonia produce the female	The megasporophyll is large in size and is easily apparent as the	The gynoecium contains the ovary, style and stigma. The fertilised egg develops inside the ovary and eventually,

part	gamete.	female cone.	seeds are produced.
23.	An Insect		A Spider
	The body is divided into head, thorax and abdomen.		The body is divided into cephalothorax and abdomen.
	Have three pairs of jointed legs.		Has four pairs of jointed legs.
	Spinning organs absent.		The abdomen bears spinning organs.
	No carapace.		Cephalothorax covered by a carapace.
	Generally, have simple eyes.		Compound eyes are lacking.
	It has varieties of feeding habits.		It is a predator.

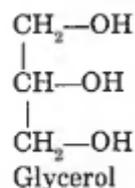
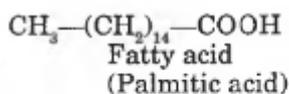
24. **Small Molecular Weight Biomolecules:** Lactic acid, simple sugars, pentoses, hexoses, lipids, fatty acids, amino acids and nucleotides.

Sugar and cotton, as well as biotechnological industries, manufactures the compounds by isolation.



(A) $C_{11}H_{12}O_6$ (Glucose) (B) $C_5H_{10}O_5$ (Ribose)

Sugars (Carbohydrates)



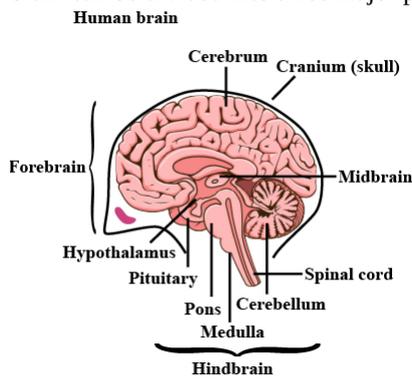
25. i. It promotes **growth and elongation of roots and stems** and **many fruits**.
 ii. In many plants, indole acetic acid **promotes cell division** and **induces apical dominance**.
 iii. It also induces **parthenocarpy**.
26. The **synovial joints** are freely movable joints. The presence of **synovial fluid** in the **synovial cavity** makes this joint movable. This fluid lubricates the joint for free and easy movement. The articulating bones provide considerable movement but articulating surfaces are kept in close contact by a fibrous capsule. The examples of synovial joints are :
- i. Ankle joint and
 ii. Shoulder joint etc.
27. a. Blood contains RBCs and hence can transport gases. Lymph doesn't contain RBCs and cannot transport gases. Lymph mainly contains WBCs and play a role in the immune system of the body.
 b. The Open Circulatory System is a system in which fluid (called hemolymph) in a cavity called the hemocoel bathes the organs directly with oxygen and nutrients and there is no distinction between blood and interstitial fluid this combined fluid is called hemolymph or haemolymph. The cardiovascular systems of humans are closed, meaning that the blood never leaves the network of blood vessels.
 c. Systole is the contraction of heart muscle and diastole is the dilatation of the heart muscle.
 d. Each peak in the ECG is identified with a letter from P to T that corresponds to a specific electrical activity of the heart. The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria. The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole. The T-wave represents the return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole.

OR

The human heart is a four-chambered organ two atria and two ventricles. The two auricles are partitioned by a septum into a right auricle receiving only deoxygenated blood and a left auricle receiving only oxygenated blood. Due to further advancement in

the human heart, the ventricle is **completely partitioned** into the right ventricle and left ventricle to prevent mixing of deoxygenated and oxygenated blood.

28. Structure of brain. The human brain is well protected by the skull. Inside the skull, the brain is covered by cranial meninges consisting of an outer layer called dura mater, a very thin middle layer called arachnoid and an inner layer called pia mater. The brain can be divided into three major parts. (i) Forebrain (ii) Midbrain and (iii) Hindbrain.



Section D

29. i. **The sexual cycle of fungi involves the following steps :**
- The fusion of protoplasts between two motile or non-motile gametes is called plasmogamy.
 - The fusion of two nuclei is called karyogamy.
 - Meiosis in zygote results in haploid spores.
- ii. Rhizopus is a fungus that reproduces by spore formation.
No, Rhizopus - wheat rush is not a correct match.
- iii.
 - Mutualistic associations between fungi and plant roots are called mycorrhizae.
 - Fungi that form mycorrhizal (mycorrhizal fungi) can deliver inorganic nutrients such as phosphate.
 - In exchange, the plants supply the fungi with organic nutrients.

OR

Fungi store food in the form of glycogen, along with oil bodies.

Plants, protists, mammals, and fungi all have vacuoles in their cells. Food vacuoles are sacs enclosed by a membrane and have a digestive function.

30. i. **A-androecium, B-gynoecium, C-corolla, D-calyx**

Androecium: It contains pollen grains, which are responsible for reproduction in the male part of the plant.

Gynoecium: It holds ovary, which is transformed into fruit after fertilization.

Corolla: The corolla promotes pollination and protects the reproductive organs.

Calyx: The main function of the calyx is to protect the floral shoot during the bud stage.

- ii.
 - Ganosepalous:** Plants with many fused sepals are known as Gamosepalous. Eg, Hibiscus, Periwinkle, etc.
 - Polypetalous:** Polysepalous plants are also categorized based on sepals. Eg, Rose, Southern magnolia, etc.
- iii.
 - When the margins of the petals are in contact with each other without overlapping, it is called **valvate aestivation**. For example, Calotropis.
 - Contoured or **twisted aestivation** occurs when the margin of one petal overlaps the margin of the next. Example - Hibiscus.

OR

Figure (c), Imbricate aestivation occurs when the margins of sepals or petals overlap without a clear direction. There is an irregular overlapping of petals by each other in this type of aestivation.

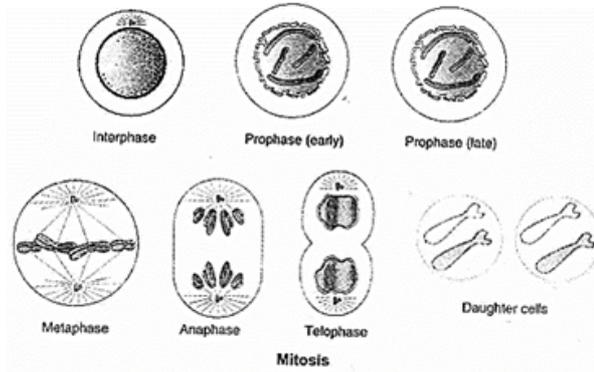
Section E

31. Mitosis is divided into the following four stages:

i. **Prophase**

- Condensation of chromosomal material starts. The chromosomal material becomes untangled during the process of chromatin condensation.
- The centriole, which had undergone duplication during S phase of interphase now begins to move towards opposite poles of the cell.

- At the end of prophase, Golgi complexes, endoplasmic reticulum, nucleolus and the nuclear envelope disappear.



ii. Metaphase

- The metaphase is characterized by all the chromosomes coming to lie at the equator.
- One chromatid of each chromosome connected by its kinetochore to spindle fibres from one pole and its sister chromatid connected by its kinetochore to spindle fibres from the opposite pole.
- The plane of alignment of the chromosomes at metaphase is referred to as the metaphase plate.

iii. Anaphase

- At the onset of anaphase, each chromosome arranged at the metaphase plate is split simultaneously and make the two daughter chromatids.
- They are now referred to as chromosomes of the future daughter nuclei and begin their migration towards the two opposite poles.
- As each chromosome moves away from the equatorial plate, the centromere of each chromosome is towards the pole and hence at the leading edge, with the arms of the chromosome trailing behind.

iv. Telophase

This is the stage which shows the following key events:

- Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.
- Nuclear envelope assembles around the chromosome clusters.
- Nucleolus, Golgi complex and ER reform.

v. Cytokinesis

Karyokinesis is followed by cell division to form two daughter cells. This process is called cytokinesis at the end of which cell division is complete.

OR

A pair of homologous chromosomes are genetically different because in a set of homologous chromosomes, one of the chromosomes belongs to the male parent and the other comes from the female parent. Therefore, one of a pair will contain paternal genes and the other will contain maternal genes.

However, a pair of sister chromatids are genetically identical before crossing over as the chromatids are formed from the replication of DNA during the 'S' phase of interphase. DNA replication ensures that the DNA content is doubled with identical genes being copied from the original DNA. Therefore, there is no genetic variation because there is no exchange of genetic material between sister chromatids.

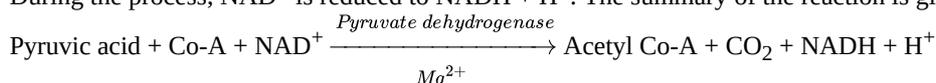
If crossing over occurs, then it would be possible for some genes to be exchanged between the chromatids of homologous chromosomes that have chiasmata, thus leading to genetic variation.

	Aerobic respiration	Anaerobic Respiration
32.	1. It occurs in presence of oxygen.	1. It occurs in absence of oxygen.
	2. Glucose is completely oxidized.	2. Glucose is partially oxidized.
	3. More energy is liberated (36 to 38 ATP)	3. Relatively small amount of energy is liberated (2 ATP)
	4. Occurs in plant and animal cells	4. Occurs in many anaerobic bacteria and human muscle cells
	5. CO ₂ and water is produced as the by product	5. Lactic Acid or Alcohol is produced as the by product of respiration
	6. Aerobic respiration takes place in both cytoplasm and mitochondria of the cell	6. This takes place only in the cytoplasm of the cell.

OR

No, before pyruvic acid as such does not enter Krebs' cycle, pyruvate is first decarboxylated, and then oxidized by the enzyme pyruvate dehydrogenase to form acetyl Co-A. This molecule enters the mitochondria for a further oxidation reaction. This is the connecting link between glycolysis and Krebs' cycle.

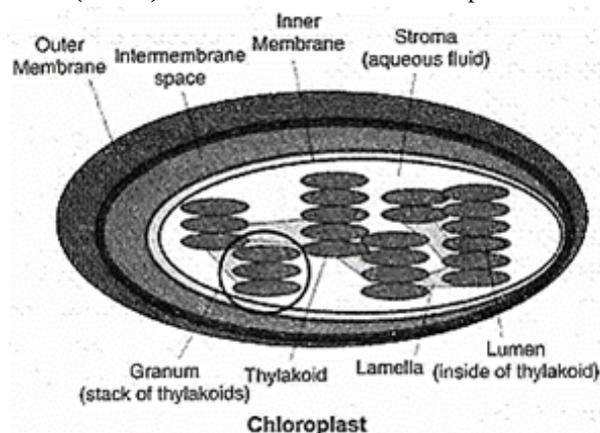
During the process, NAD^+ is reduced to $\text{NADH} + \text{H}^+$. The summary of the reaction is given below



During this process, two molecules of NADH are produced (from the metabolism of two molecules of pyruvic acid produced during glycolysis), and thus, it results in a net gain of 6 ATP molecules ($2 \text{ NADH} \times 3 = 6 \text{ ATP}$).

33. Plastids are found in all plant cells and in euglenoids. These are easily observed under the microscope as they are large. They bear some specific pigments, thus imparting specific colours to the plants. Based on the type of pigments plastids can be classified into chloroplasts, chromoplasts and leucoplasts.

- i. **Chloroplasts:** The chloroplasts contain chlorophyll and carotenoid pigments which are responsible for trapping light energy essential for photosynthesis.
- ii. **Chromoplasts:** In the chromoplasts fat-soluble carotenoid pigments like carotene, xanthophylls and others are present. This gives the part of the plant a yellow, orange or red colour.
- iii. **Leucoplasts:** The leucoplasts are the colourless plastids of varied shapes and sizes with stored nutrients: Amyloplasts store carbohydrates (starch), e.g. potato elaioplasts store oils and fats whereas the aleuroplasts store proteins.
- iv. **Shape and Size of Chloroplasts:** Majority of the chloroplasts of the green plants are found in the mesophyll cells of the leaves. These are lens-shaped, oval, spherical, discoid or even ribbon-like organelles having variable length (5-10 μm) and width (2-4 μm). Their number varies from 1 per cell of the Chlamydomonas, a green alga to 20-40 per cell in the mesophyll.



- v. **Structure of Chloroplasts:** Like mitochondria, the chloroplasts are also double membrane-bound. Of the two, the inner chloroplast membrane is relatively less permeable. The space limited by the inner membrane of the chloroplast is called the stroma. A number of organised flattened membranous sacs called thylakoids are present in the stroma. Thylakoids are arranged in stacks like the piles of coins called grana (singular: granum) or the internal thylakoids. In addition, there are flat membranous tubules called the stroma lamellae connecting the thylakoids of the different grana. The membrane of the thylakoids encloses a space called a lumen. The stroma of the chloroplast contains enzymes required for the synthesis of carbohydrates and proteins. It also contains small, double-stranded circular DNA molecules and ribosomes. Chlorophyll pigments are present in the thylakoids. The ribosomes of the chloroplasts are smaller (70 S) than the cytoplasmic ribosomes (80 S).

OR

The basic structural organisation of a typical cell is as follows:

- i. **Nucleus**, the central part, and brain of the cell, which is spherical in shape. Its number can be one or more per cell. It is denser than the surrounding cytoplasm. The nucleus is composed of chromosomes (contains the genetic material, i.e., DNA), nuclear membrane and centrioles (non-membrane bound organelle present in only animal cells, which helps in cell division).
- ii. **Cytoplasm**, a semi-fluid matrix that occupies the volume of the cell. It is mainly composed of water with free-floating molecules. Inside the cytoplasm, all cellular activities like a gaseous exchange, elimination of wastes, hereditary mechanisms, etc., occur.

Eukaryotic cells also contain another cell membrane-bound distinct structures called **cell organelles**, like mitochondria, vacuoles, Endoplasmic Reticulum (ER), Golgi complex, etc.

The prokaryotic cells lack all these **membrane-bound organelles**. It is to be noted that as ribosomes are not bounded by a

membrane and are found in all cells. Ribosomes are also found in chloroplasts (in plants) and mitochondria and on rough ER other than the cytoplasm. Animal cells contain another non-membrane bound organelle called **centriole**, which helps in cell division.

- iii. **Outer membrane**, the boundary of the cell, which provides protection to the cell and controls the exchange of ions, molecules and other components in and out of the cell. The outer membrane of a cell contains cell wall (only in plant cells) and **plasma membrane**.