Class XI Session 2025-26
Subject - Biology
Sample Question Paper - 9

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. International Code of Biological Nomenclature is applied to_____. **[1]**

   a) Both Plants and Animals b) Virus

   c) Plants d) Animals

2. That biomacromolecule of which all end products of metabolism can't be stored therefore processed for removal via excretion is/are : **[1]**

   a) Vitamin b) Fats

   c) Carbohydrates d) Proteins

3. Aromatic amino acids contain which reactive group? **[1]**

   a) Ethyl b) Hydroxil

   c) Benzene d) Ketone

4. Reticulate venation is characteristic in: **[1]**

   a) Dicotyledonous leaves b) Monocotyledonous leaves

   c) Isobilateral leaves d) Dorsiventral leaves

5. Respiratory process is regulated by certain specialized centres in the brain. One of the following centres can reduce the inspiratory duration upon stimulation: **[1]**

   a) Apneustic centre b) Medullary inspiratory centre

   c) Pneumotaxic centre d) Chemosensitive centre

6. Light reaction otherwise called as: **[1]**

a) Carboxylation
b) Regeneration
c) Photochemical phase
d) Biosynthetic phase

7. The adult human kidney is metanephric. So, first embryonic tubules formed in vertebrates during embryonic development are: **[1]**

a) Amphinephric
b) Metanephric
c) Pronephric
d) Mesonephric

8. Whales can live in cold water as they have thick coat of_____. **[1]**

a) Striated skin
b) Proactive skin
c) Keratinized skin
d) Blubber

9. The occurrence of different types of leaves on the same plant habitually in different growth phases or under a different environmental condition called _____. **[1]**

a) Heterophylly
b) Phylotaxy
c) Amphiphylly
d) Homophylly

10. Apophysis of moss is: **[1]**

a) Sterile filaments in male receptacle
b) Terminal part of capsule
c) Lower part of capsule
d) Part of peristome

11. The pH of human urine is approximately: **[1]**

a) 6.5
b) 7.5
c) 7
d) 6

12. Insect of the family Chironomidae like Chironomous larvae are also known as bloodworms since: **[1]**

a) They contain haemoglobin as their respiratory pigment
b) They are blood parasites
c) They contain haemocyanin as their respiratory pigment
d) They have only blood

13. **Assertion (A):** The intracapsular part of Radiolarians represent the reproductive part. **[1]**
Reason (R): Small vacuoles are present in the intracapsular part.

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.

14. **Assertion:** Respiratory part of the respiratory system transports the atmospheric air to the alveoli. **[1]**
Reason: This part, clears air from foreign particles, humidifies and also brings the air to body temperature.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c) Assertion is true but reason is wrong.
d) Assertion and reason both are wrong.

15. **Assertion:** Lipids are organic compounds containing an amino group and an acidic group as substituents on the same carbon. **[1]**

Reason: The R group in fatty acid could be hydrogen, a methyl group, hydroxymethyl, etc.

a) Assertion and Reason both are true and the Reason is correct explanation of Assertion.

b) Assertion and Reason both are true but Reason is not the correct explanation of Assertion.

c) Assertion is true but Reason is wrong.

d) Assertion and Reason both are wrong.

16. **Assertion (A):** Inspiration occurs due to muscular relaxation. **[1]**

Reason (R): During inspiration, the diaphragm and external intercostal muscle contract simultaneously.

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. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system. **[2]**
18. Frogs are beneficial for mankind, justify the statement. **[2]**
19. What is the role of second messenger in protein hormone action? **[2]**
20. What is a taxon? **[2]**
21. Write the equation to express Cornelius van Niel's findings. **[2]**

OR

Why is RuBisCo enzyme the most abundant enzyme in the world?

Section C

22. Write a brief note on numerical taxonomy. **[3]**
23. Differentiate between Exoskeleton and Endoskeleton: **[3]**
24. Do amino acids exist as Zwitter ion. Give its structure. Why is it formed? **[3]**
25. Name the categories of plant hormones concerned with each of the following and describe one other function of each of the three categories of plant hormones **[3]**

    i. Inhibition of seed germination

    ii. Promote flowering

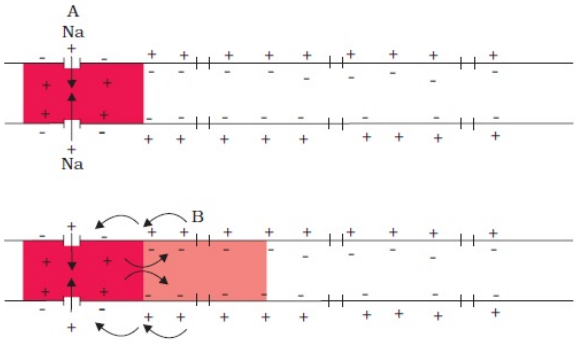
    iii. Cell division promoting activity.

26. What is arthritis and what are the causes of arthritis? **[3]**
27. Difference between Haemoglobin in corpuscles and Haemoglobin in Plasma. **[3]**

OR

Why the renal portal system is absent in mammals?

28. Examine the following diagram and answer the following questions: **[3]**



i. In which form impulse is carried from point A to point B in the given diagram?

ii. After an action potential, in which direction does current flow outside the membrane?

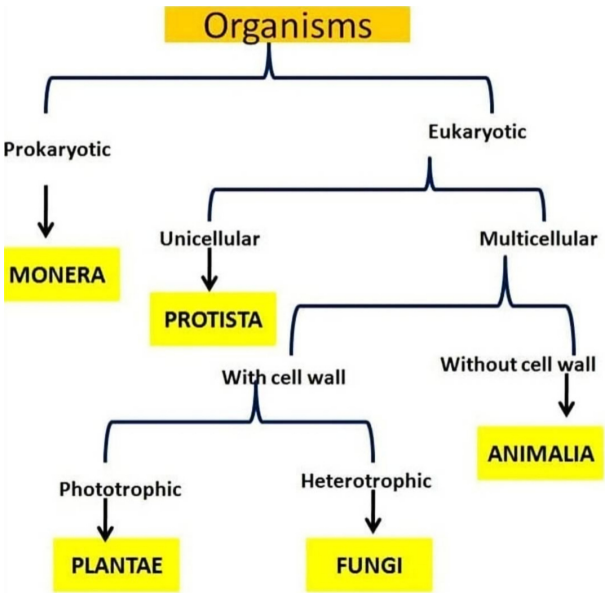
iii. When does given axonal membrane is impermeable to negatively charged proteins present in the axoplasm?

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

R.H. Whittaker proposed a Five Kingdom Classification. The kingdoms defined by him were named Monera, Protista, Fungi, Plantae, and Animalia. The main criteria for classification used by him include cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships. The three-domain system has also been proposed that divides the Kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in the third domain and there by a six kingdom classification. Earlier classification systems included bacteria, blue-green algae, fungi, mosses, ferns, gymnosperms and the angiosperms under 'Plants'. The character that unified this whole kingdom was that all the organisms included had a cell wall in their cells.

Robert H. Whittaker (1969)



i. Observe Robert H. Whittaker (1969) flow chart of classification and mention what type of organisms were included in Kingdom Animalia? (1)

ii. Mention two differences between prokaryotic and eukaryotic cells. (1)

iii. Linnaeus used which kingdom of classification? State two drawbacks of Linnaeus two kingdom classification. (2)

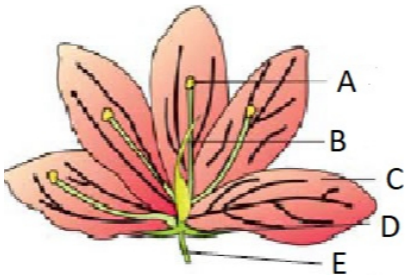
OR

Is Fungi- Autotrophic (Photosynthetic) and Heterotrophic the correct match? Also, Mention the difference between the walls of fungi and green plants. (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.



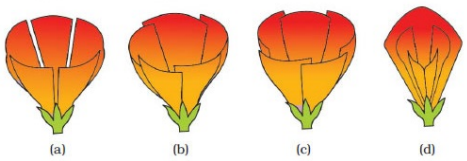
i. Observe the given figure mentioned A, B, C and D. Also mention its function. Identify D and mention its example. (1)

ii. Ganosepalous, Ganopetalous, 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. What are the various stages of meiotic prophase-I? Enumerate the chromosomal events during each stage? **[5]**

OR

Describe prophase I of meiotic cell division. How is it different from prophase II of meiosis?

32. Enumerate the assumptions that we have undertaken in making the respiratory balance sheet. Are these assumptions valid for a living system? **[5]**

OR

How do plants manage the exchange of gases? Give an overview of respiration in plants.

33. Does a group of smaller cells have a higher metabolic rate than a single large cell of the same volume? Explain. **[5]**

OR

Describe the structure of the membrane as proposed in fluid mosaic model.

Solution

Section A

1. **(a)** Both Plants and Animals
   Explanation:
   Since biology deals with both plants and animals, the international code of biological nomenclature is applied to both plants and animals. Hence, the correct option is Both plant and animals.

2. **(d)** Proteins
   Explanation:
   The end product of protein metabolism is typically nitrogenous waste in the form of ammonia, urea or uric acid. If it is not properly excreted from the body, these substances may build up in the body's systems and result in health issues.

3. **(c)** Benzene
   Explanation:
   An aromatic amino acid is an amino acid that contains an aromatic ring.

4. **(a)** Dicotyledonous leaves
   Explanation:
   Reticulate venation: In this type, the veins branch and unite forming a complicated network, All the veins are interconnected, like the strands of the net. Leaves of ‘Dicot plants’ generally have reticulate venation e.g., Hibiscus, Redgram.

5. **(c)** Pneumotaxic centre
   Explanation:
   A pneumotaxic centre in the pons region of the brain and a chemosensitive area in the medulla can alter respiratory mechanism.

6. **(c)** Photochemical phase
   Explanation:
   Light reactions or the ‘Photochemical’ phase include light absorption, water splitting, oxygen release, and the formation of high-energy chemical intermediates, ATP, and NADPH. Several complexes are involved in the process.

7. **(c)** Pronephric
   Explanation:
   The adult human kidney is metanephric, the third and final excretory organ that develops in a vertebrate embryo. First embryonic tubules formed in vertebrates during embryonic development are pronephric.

8. **(d)** Blubber
   Explanation:
   Whales can live in cold water as they have a thick coat of blubber. Blubber help in providing insulating coat beneath the skin that prevents loss of heat from the body.

9. **(a)** Heterophylly
   Explanation:

Heterophylly is the presence of differently shaped leaves on the same shoot or on different shoots of the same plant. Heterophylly occurs in many aquatic plants (for example, arrowhead, water crowfoot, water starwort, and some species of pondweed), in which the underwater leaves often differ sharply in form from those growing above the water.

10.

(c) Lower part of capsule

Explanation:

The sporophyte of moss is differentiated into three parts - foot, seta, and capsule. The capsule, in turn, is differentiated into 3 regions.

i. Apophysis - the sterile basal portion of the capsule, it is in continuity with seta
ii. Theca or body of capsule, which is the fertile region, and
iii. Operculum the apical region of capsule.

Apophysis is rich in chloroplast and thus the photosynthetic region of moss, it also provides nutrition to the developing sporangium.

11.

(d) 6

Explanation:

The pH of human urine is approximately 6.

12. **(a)** They contain haemoglobin as their respiratory pigment

Explanation:

Insects of family Chironomidae eg. Chironomus commonly known as the harlequin fly is a species of the non-biting midge. Their larvae are known by the common name of blood worm due to their red colouration. The red colouration is because they contain haemoglobin as their respiratory pigment.

13.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The intracapsular part of Radiolarians contains nuclei, small vacuoles and reserve food. It represents the reproductive part. Reproduction occurs through binary fission and swarm pores.

14.

(d) Assertion and reason both are wrong.

Explanation:

Assertion and reason both are wrong.

15.

(d) Assertion and Reason both are wrong.

Explanation:

Lipids are a family of organic compounds that are mostly insoluble in water. Composed of fats and oils, lipids are molecules that yield high energy. The R group is quite a long chain of a carbon atom surrounded by a hydrogen atom and a carboxylic acid group.

16. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Inspiration is the result of muscular contraction. The diaphragm and external intercostal muscle contract simultaneously. The lateral thoracic wall moves outward and upward.

Section B

17. On the basis of their structure and location, there are three types of tissue systems:

a. Epidermal tissue system. Epidermis, stomata.
b. Ground or Fundamental tissue system and: Parenchyma, Sclerenchyma and collenchyma
c. Vascular or conducting tissue system. Phloem and Xylem.

18. Frogs are beneficial for mankind in various ways. Some are as follows:
    i. Frogs eat many insects and pests. Thus, frogs help prevent damage to crops.
    ii. Frogs are important links in the food chain and thus are important component of the ecosystem for maintaining ecological balance.
    iii. In some countries, the muscular legs of frog are used as food by man.
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. A taxon is a group of (one or more) organisms, which a taxonomist adjudges to be a unit.
    Usually, a taxon is given a name and a rank, although neither is a requirement.
    It is a level of hierarchy in biological classification. Example: Family is a taxa.
21. $2H_2A + CO_2 \longrightarrow 2A + CH_2O + H_2O$

    OR

    RuBisCO enzyme: It is the most abundant protein of the biosphere. It was previously called carboxy-dismutase. It makes about 16 per cent of chloroplast proteins; app. 40% of leaf proteins but it is a slower enzyme having a **turn over** of $3CO_2$ moles per second. It occurs in the stroma on the outer surface of the thylakoid membrane.

Section C

22. It is carried out by quantitative assessment of similarities and differences in order to make objective assessments. It is now easily carried out using computers based process on all observable characteristics. Number and codes are assigned to all the characters and the data are then processed. In this way, each character is given equal importance and at the same time, hundreds of characters can be considered.
23. **Difference between Exoskeleton and Endoskeleton.are as follows:**

Exoskeleton	Endoskeleton
Hard protective covering present over the body of many animals.	Formed within the body of vertebrates.
Formed by the deposition fo hard protective material on the surface of the body. **Invertebrates, scales, nails, claws, and feathers are exoskeleton.**	Formed of **hard bone** and **cartilage.**
In arthropods like crab, prawn, etc. the exoskeleton is in the form of the **chitinous cuticle** (e.g. wings of insects also).	Forms framework of the body. It provides **shape and posture** to the body. It protects the delicate organs of the body.
Helps in protection and waterproof. It helps in a quick movement.	Helps in **movement.**

24. Yes, amino acids exist as Zwitter ion.

$$\underset{(A)}{H_3^+N - \overset{R}{\overset{|}{C}}H - COOH} \overset{+H^+}{\rightleftharpoons} \underset{(Zwitter\ ion)}{\underset{(B)}{H_3N - \overset{R}{\overset{|}{C}}H - COO^-}} \overset{-H^+}{\rightleftharpoons} \underset{(Deprotonated form)}{\underset{(C)}{H_2N - \overset{R}{\overset{|}{C}}H - COO^-}}$$

Representations of a Zwitter ion formation

    Zwitter ion formation is another particular property of amino acid. It is a neutral molecule (with positive and negative charge), having the ionisable nature of — NH2 and — COOH groups. Hence, in solutions of different pHs, the structure of amino acid changes variably.

25. i. **Inhibition of seed germination- Abscissic acid**
    Other Function- Gives signals for the closure of stomata in plants to prevent water loss during water stress.
    ii. **Promote flowering- Auxin**
    Other Function- It controls cell division and xylem differentiation.
    iii. **Cell division promoting activity- Cytokinin**
    Other Function- It helps in the growth of lateral buds and overcomes apical dominance.
26. Arthritis is inflammation of joints. This happens mostly in synovial joints. Because of ageing and wear and tear the synovial fluid dries up. This leads to corrosion of cartilage. At the end the movement of joints is not as smooth as it should be. This results in general discomfort while doing normal tasks and cause swelling and pain of the affected joint.
27.

Haemoglobin in corpuscles	Haemoglobin in plasma
As RBC are small rounded and in large quantity, so	In plasma, the exposed surface area for haemoglobin is very

haemoglobin is exposed with large combined surface area to absorb O_2.	limited in comparison to the RBCs the result is the absorption of O_2 in less amount.
When RBCs pass through the small one of capillaries of respiratory organs, one by one, they have ample time and surface, to absorb oxygen.	The haemoglobin dissolved in plasma has lesser time as it passes quickly, being liquid through the box of capillaries.

OR

The mammals have no renal portal system due to the following facts:

i. It is an evolutionary trend that fishes and amphibians have a well-developed renal portal system, while, in reptiles and birds this system gets reduced. Finally, in mammals, it ultimately disappears.

ii. The heart of mammals is four-chambered, due to which there is a total separation of oxygenated and deoxygenated blood.

iii. The posterior portion of the body gets oxygenated blood from the heart and after the oxidation process, etc., the blood does not contain so many impurities that it should go to the kidneys for filtration.

28. i. In the given diagram, the impulse is carried in the form of electric current.

ii. After an action potential, current flows from point B to point A outside the membrane.

iii. When the neuron is not conducting any impulse(resting), the axonal membrane is impermeable to negatively charge proteins present in the axoplasm.

Section D

29. i. All organisms are multicellular, eukaryotes with heterotrophic mode of nutrition.

ii.

Prokaryotic cell	**Eukaryotic cell**
Genetic material is not enclosed in a nuclear envelope and is present suspended in the cytoplasm in a region called nucleoid.	Genetic material is enclosed within the nucleus by a nuclear envelope and is not present in direct contact with cytoplasm.
Cell wall is made up of peptidoglycan.	Cell wall is made up of chitin in fungi and cellulose in plants.
Nucleolus is absent.	Nucleolus is present.

iii. Linnaeus used artificial system kingdom of classification.

Drawbacks of Linnaeus two kingdom classification:

- Linnaeus developed a Two Kingdom system of classification with Plantae and Animalia kingdoms.
- This system did not distinguish between eukaryotes and prokaryotes, unicellular and multicellular organisms, photosynthetic (green algae) and non-photosynthetic (fungi) organisms.

OR

No, Fungi-Autotrophic (Photosynthetic) and Heterotrophic is not correct match. The walls of the fungi were made of chitin, whereas the green plants had a cellulose cell wall.

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.

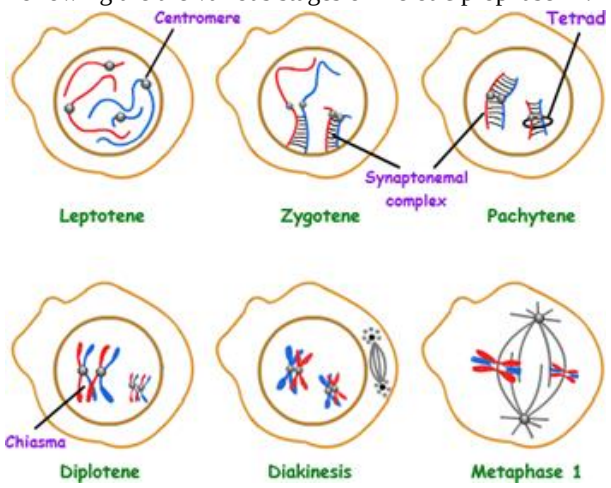
iii.
- When the margins of the petals are in contact with each other without overlapping, it is called **valvate aestivation**. For example, Calotropis.
- Contoured or **twisted estivation** occurs when the margin of one petal overlaps the margin of the next. Example - Hibiscus.

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. Following are the various stages of meiotic prophase - I:



i. **Leptotene:** During this stage, chromosomes become gradually visible under the light microscope. The compaction of the chromosome continues through this stage. The sister chromatids are so tightly bound that one cannot be differentiated from another.

ii. **Zygotene:** At this stage, chromosomes start forming pairs. This process is called synapsis. Formation of synapsis is accompanied by the formation of synaptonemal complex. Each pair is called a bivalent or tetrad.

iii. **Pachytene:** At this stage, the bivalent chromosomes become distinct. Recombination nodules appear on the tetrads. The recombination nodule is the site at which crossing over takes place. Crossing over takes place between non-sister chromatids of homologous chromosomes. Crossing over facilitates the exchange of genes between two homologous chromosomes.

iv. **Diplotene:** At this stage, the synaptonemal complex gets dissolved. The recombined chromosomes begin to separate from each other. But they are attached at the site of crossing over. This makes an X-shaped structure called chiasmata.

v. **Diakinesis:** Chiasmata is terminated at this stage. The nucleolus disappears and so does the nuclear membrane.

OR

Prophase I. Prophase of the first meiotic division is typically longer and more complex. It has been further subdivided into the following five phases based on chromosomal behaviour:

- Leptotene
- Zygotene
- Pachytene
- Diplotene and
- Diakinesis.

Leptotene. During leptotene stage the chromosomes become gradually visible under the light microscope. The compaction of chromosomes continues throughout leptotene.

Zygotene:

- During this stage chromosomes start pairing together and this process of association is called synapses. Such paired chromosomes are called homologous chromosomes.
- The chromosome synapses is accompanied by the formation of complex structure called synaptonemal complex.
- The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad.
- The first two stages of prophase I are relatively short-lived compared to the next stage that is pachytene.

Pachytene:

- During this stage bivalent chromosomes now clearly appear as tetrads.
- This stage is characterized by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes.
- Crossing over is the exchange of genetic material between two chromosomes. Crossing over is also an enzyme-mediated process and the enzyme involved is called recombinase.
- Crossing over leads to recombination of genetic material on the two chromosomes.
- Recombination between homologous chromosomes is completed by the end of pachytene, leaving the chromosomes linked at the sites of crossing over.

Diplotene. The beginning of diplotene is recognized by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the sites of crossovers. These X-shaped structures are called chiasmata.

Diakinesis. The final stage of meiotic prophase I is diakinesis. This is marked by terminalisation of chiasmata. During this phase

the chromosomes are fully condensed and the meiotic spindle is assembled to prepare the homologous chromosomes for separation. By the end of diakinesis, the nucleolus disappears and the nuclear envelope also breaks down. Diakinesis represents transition to metaphase.

Difference between prophase I and prophase II. During prophase I recombination of genes takes place, while in prophase II no such event happens. Prophase I is longer and more complicated compared to prophase II.

32. **Respiratory Balance Sheet:** Some assumptions in preparing respiratory balance sheet are :
    i. None of the **intermediates** produced in this pathway is used to make any other compound.
    ii. Only glucose is being respired—no other alternative substrates enter in the pathway at any of intermediary stages in any case.
    iii. There seems to be a **sequential, orderly pathway** that is functioning, with a single **substrate** forming next as well as with glycolysis. Kreb's cycle and ETS pathway following one after the other pathway.
    iv. **NADH synthesised in glycolysis** transferred to mitochondria; it undergoes oxidative phosphorylation also.

    This assumption is not really valid in a living system since all the pathways work simultaneously; moreover, the substrates enter pathways and also are withdrawn from the pathways as and when required; ATP used when needed and enzymes control the reactions also. It is only useful in the extraction and storing energy; there is a net gain of 36 ATP mols in aerobic respiration for one mol of glucose.

    OR

    Plant Respiration

    - Plants, unlike animals, have no specialized organs for gaseous exchange but they have stomata and lenticels for this purpose. There are several reasons why plants can get along without respiratory organs.
    - Each plant part takes care of its own gas-exchange needs. There is very little transport of gases from one plant part to another.
    - Plants do not present great demands for gas exchange. Roots, stems and leaves respire at rates far lower than animals do. Only during photosynthesis are large volumes of gases exchanged and, each leaf is well adapted to take care of its own needs during these periods. When cells photosynthesize, availability of O_2 is not a problem in these cells since O_2, is released within the cell.

    Overview of respiration in plants

    Plants undergo aerobic respiration. Glucose is broken down into Pyruvic acid during glycolysis. Pyruvic acid is transported into the mitochondria where it is converted into acetyl CoA with the release of CO_2. Acetyl CoA then enters the tricarboxylic acid pathway or Kreb's cycle. NADH + H + and FADH2 are generated in the Krebs cycle. The energy in these molecules as well as that in the NADH + H + synthesised during glycolysis are used to synthesise ATP. This is accomplished through electron transport system (ETS) located on the inner membrane of the mitochondria of the plant cell. The electrons, as they move through the system, release enough energy that are trapped to synthesise ATP. This is called oxidative phosphorylation. In this process, O_2 is the ultimate acceptor of electrons and it gets reduced to water.

33. **Cell Size and Metabolic Rate:** Size of the cells vary considerably as we have already seen. But in most of the cells, size ranges between 3 to 30 microns.

    The group of smaller cells have a higher metabolic rate than a larger cell because of the following factors:

    i. **Nucleocytoplasmic ratio:** We know that that nucleus controls all the metabolic activities of the cell including growth, development, etc. However the nucleus cannot extend its control over an indefinitely large area and without the control of the nucleus, the cell cannot function. If the size increases, the metabolic rate decreases.
    ii. **Surface area of the cell:** The substances required for metabolism pass into the cell through the cell membrane, for example, oxygen. If the size of the cell is big, all the areas of the cell may not get the required amount of oxygen. Hence metabolism shall decrease. It is on this account that the group of smaller cells have a higher metabolic rate than the bigger single cell of the same size.

    OR

    Structure of Plasma Membrane: Fluid mosaic model of the plasma membrane was suggested by S. Singer and G. Nicholson in 1972. According to this model, the lipids and proteins are arranged in a mosaic fashion. The matrix is the highly viscous fluid of two layers of phospholipids having two types of protein molecules-extrinsic and intrinsic proteins. The phospholipids layer is bimolecular and their hydrophilic ends are pointed towards top and bottom respectively. Peripheral 0extrinsic) proteins are superficially arranged on either side and can be easily separated. They have enzymatic properties and also make membrane as selectively permeable. Integral (intrinsic) proteins are tightly held in place by strong hydrophilic or hydrophobic interactions or both are difficult to remove from the membranes.