SAMPLE QUESTION PAPER - 2
BIOLOGY (044)
CLASS XI

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. As we go from species to kingdom in a taxonomic hierarchy, the number of common characteristics **[1]**

   a) Will increase
   b) May increase or decrease
   c) Remain same
   d) Will decrease

2. Filtration of the blood takes place at: **[1]**

   a) DCT
   b) Glomerulus
   c) Collecting ducts
   d) PCT

3. Enzymes catalyzing in the link together of two compounds are _____. **[1]**

   a) Ligases
   b) Lyases
   c) Hydrolases
   d) Isomerases

4. Upper surface of leaf is: **[1]**

   a) Abaxial epidermis
   b) Palisade parenchyma
   c) Mesophyll cell
   d) Adaxial epidermis

5. Which is the main organ of respiration in amphibians? **[1]**

   a) Lungs
   b) Skin
   c) Gills
   d) Both Skin and Lungs

6. Plants are known as purifiers of air due to the process of_____. [1]

a) Respiration
b) Photosynthesis
c) Transpiration
d) Desiccation

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

a) Proteins
b) Vitamin
c) Fats
d) Carbohydrates

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

a) Keratinized skin
b) Striated skin
c) Blubber
d) None of these

9. Growth can be measured in various ways. Which of these can be used as parameters to measure growth? [1]

a) Increase in cell size
b) All of these
c) Increase in length and weight
d) Increase in cell number

10. Some plants are dependent on the larger plant for space only. Such plants are called as _____. [1]

a) None of these
b) Epiphytes
c) Mesophytes
d) Halophytes

11. Urea cycle operates in: [1]

a) Liver
b) Lungs
c) Skin cells
d) Sweat glands and sebaceous glands

12. Where does the exchange of gases take place in the respiratory system? [1]

a) Bronchioles
b) Alveoli
c) Bronchi
d) Pulmonary Artery

13. **Assertion (A):** Sporodochium is an asexual fruiting body found in Basidiomycetes. [1]
Reason (R): Upper part of sporodochium contains conidiophores.

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 (A):** A person has died because of carbon monoxide poisoning. [1]
Reason (R): A person slept in a closed room with a lamp burning.

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.

15. **Assertion (A):** Monellin is the sweetest chemical. [1]
Reason (R): Monellin is a protein.

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):** Receptors associated with the aortic arch and carotid artery also can recognize changes in CO_2 and H^+ concentration. [1]
Reason (R): It sends necessary signals to the rhythm centre for remedial actions.

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. Mention the functions of cortex region of monocot root. [2]

18. How does a gap junction facilitate intercellular communication? [2]

19. Define the following: [2]
a. Exocrine gland
b. Endocrine gland
c. Hormone

20. Write any three advantages of scientific names. [2]

21. Cyanobacteria and some other photosynthetic bacteria don't have chloroplasts. How do they conduct photosynthesis? [2]

OR

In chloroplast what are sites for light reactions and dark reactions?

Section C

22. What is the habitat of ferns. Describe their plant body. Explain the nature of spores ferns have. List out some common ferns. **[3]**

23. Classify the following group: **[3]**

i. Honey bee

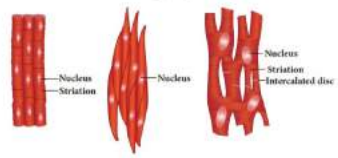
ii. Duck

iii. Prawn

24. Give any four steps involved in enzymatic catalytic action. **[3]**

25. Growth is an important phenomenon of living. Justify the statement with reasons. **[3]**

26. Given below is a diagram of different types of muscles. Based on the diagram answer the following questions: **[3]**



i. Out of these muscles, which is closely associated with the skeleton?

ii. Why smooth muscle is regarded as visceral muscle?

iii. Muscles are typically arranged in antagonistic pairs. Give two examples.

27. Difference between Heartbeat and Pulse. **[3]**

OR

Explain double circulation.

28. Enumerate the different types of nerve fibres according to their nature and function. **[3]**

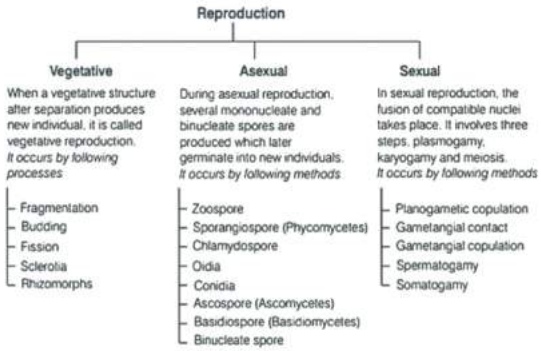
Section D

29. **Read the text carefully and answer the questions:** **[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.

OR

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

(ii) What is Rhizopus? Also, mention Rhizopus - wheat rush a correct match?

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

30. **Read the text carefully and answer the questions:** **[4]**

The flower is the reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle. These are calyx, corolla, androecium and gynoecium. Calyx and corolla are accessory organs, while androecium and gynoecium are reproductive organs. In symmetry, the flower may be actinomorphic (radial symmetry) or zygomorphic (bilateral symmetry). Based on the position of calyx, corolla and androecium in respect of the ovary on the thalamus, the flowers are described as hypogynous, perigynous and epigynous. A flower may be trimerous, tetramerous or pentamerous when the floral appendages are in multiple of 3, 4 or 5, respectively.

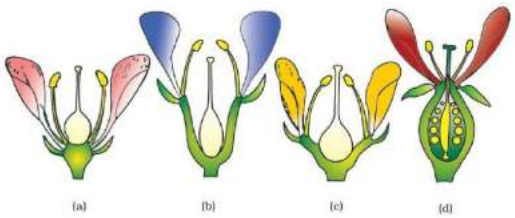
(i) Observe the diagram given below. and mention what happens after the given stage.

(ii) Is Actinomorphic - datura the incorrect match?

(iii) When the ovary is superior it is called?

OR

Which of the following represents epigynous? Also, mention what an epigynous flower is.



Section E

31. Comment on the statement - Meiosis enables the conservation of specific chromosome number of each species even though the process per se, results in reduction of chromosome number. **[5]**

OR

Explain meiosis-II in an animal cell.

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

OR

Give the various steps involved in Glycolysis.

33. Describe the structure of the following with the help of labelled diagrams. **[5]**

i. Nucleus

ii. Centrosome

OR

Give the biochemical composition of plasma membrane. How are lipid molecules arranged in the membrane?

Solution

Section A

1. **(d)** Will decrease
   Explanation: Number of common characters is maximum among members of a particular species. On the other hand, number of common characters is minimum among members of a particular kingdom.
2. **(b)** Glomerulus
   Explanation: The first step in urine formation is the filtration of blood, which is carried out by the glomerulus and is called glomerular filtration.
3. **(a)** Ligases
   Explanation: Ligases catalyze the linking together of 2 compounds, e.g., enzymes that catalyze joining of C-O, C-S, C-N, P-O, etc. bonds.
4. **(d)** Adaxial epidermis
   Explanation: Epidermal cells are present on both sides of the leaves. The lower side contains more stomata. The upper surface of the leaf is called the adaxial epidermis.
5. **(a)** Lungs
   Explanation: Amphibians have evolved multiple ways of breathing. Young amphibians, like tadpoles, use gills to breathe, and they do not leave the water. As the tadpole grows, the gills disappear and lungs grow (though some amphibians retain gills for life). These lungs are primitive and are not as evolved as mammalian lungs. Adult amphibians are lacking or have a reduced diaphragm, so breathing through the lungs is forced. The other means of breathing for amphibians is diffusion across the skin.
6. **(b)** Photosynthesis
   Explanation: Plants are known as purifiers of air because plants take carbon dioxide out of the air, and turn it into oxygen through a process called photosynthesis.
7. **(a)** 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.
8. **(c)** 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. **(b)** All of these
   Explanation: Growth can be measured in various ways. An increase in cell number, increase in cell size and increase in length and weight are used as parameters to measure growth.

10.

(b) Epiphytes

Explanation: Epiphytes are dependent on other large plants for space or physical support. It remains to attach with other plants but does not obtain food or another nutrient from it so they are not parasitic on the supporting plants.

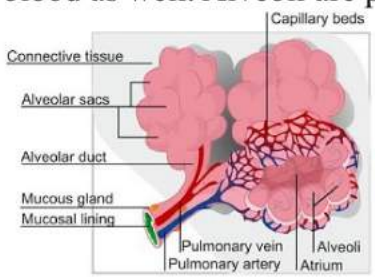
11. **(a)** Liver

Explanation: Urea cycles operate in the liver, where ammonia is converted into urea. Sometimes urea cycle also occurs in the kidney.

12.

(b) Alveoli

Explanation: Lung alveoli are the ends of the respiratory tree, branching from either alveolar sacs or alveolar ducts, which like alveoli are both sites of gas exchange with the blood as well. Alveoli are particular to mammalian lungs.



13.

(d) A is false but R is true.

Explanation: The sporodochium is a hemispherical or barrel-shaped asexual fruiting body found in some imperfect fungi (Deuteromycetes). It consists of two parts, the upper and the lower. The lower or the basal part is a cushioned stroma-like mass of hyphae. From the exposed upper surface arise the conidiophores which bear conidia at their tips. The conidiophores constitute the upper part of the sporodochium.

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

Explanation: In a closed room with lamp burning, the absence of sufficient amount of oxygen causes an incomplete combustion of carbon and produces carbon monoxides in the room. As the person inhales carbon monoxides, it diffuses from the alveolar air to the blood and binds to hemoglobin forming carboxyhaemoglobin. The latter is a relatively stable compound and can not bind any oxygen. So, the amount of haemoglobin available for oxygen transport is reduced. The resulting deficiency of oxygen causes headache, dizziness, nausea and even death.

15.

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

Explanation: Monellin is the sweetest chemical which is actually a protein obtained from an African berry. The protein is 2000 times as sweet as sucrose.

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. The cortex of a monocot root has three following functions

i. Conduction of water from the root hairs to the inner tissues.

ii. Storage of food.

iii. The outermost layer of the cortex produces protective exodermis in the older roots.

18. Gap junctions are fine hydrophilic channels between two adjacent animal cells. These are formed with the help of two protein cylinders; called connexions. Gap junctions allow small signaling molecules to pass from one cell to another and thus they facilitate intercellular communication. Movement through gap junctions is controlled by pH and Ca^{2+} concentration.

19. a. **Exocrine glands.** These glands have ducts. They secrete their secretions through ducts.
    b. **Endocrine glands.** Endocrine glands do not have ducts. They directly secrete their secretions.
    c. **Hormone.** Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts.

20. Advantages of scientific names are:
    i. These are acceptable in every part of the world.
    ii. These are assigned on agreed principles by scientists.
    iii. These are very specific. It means no two organisms can have the same name.

21. Cyanobacteria and some other photosynthetic bacteria do not have chloroplasts. But they have folds in their inner membrane where photosynthesis occurs. They have bluish pigment phycocyanin which captures solar energy to carry out photosynthesis.

OR

There is a clear division of labour in chloroplasts. The membrane system is responsible for Light reactions. Light energy is trapped by the membrane system and synthesis of ATP and NADPH takes place over there.

The stroma utilizes CO_2 to synthesize sugar ATP and NADPH from light reaction are also utilized by stroma.

Section C

22. Ferns are widely distributed all over the world in warm, moist and shady places. The main plant body of ferns is sporophyte, which is differentiated into underground stem called rhizome, roots and aerial shoots with leaves. Ferns are homosporous (e.g., Dryopteris, etc.) or heterosporous (e.g., Marsilea). Spores are born in the sporangia which are grouped in sori. Some common ferns are Dryopteris, Pteridium, Pteris, etc.

23. i. **Classification of honey bee (Apis)**
    Kingdom - Animalia
    Phylum - Arthropoda
    Class - Insecta
    Type - Honey bee (Apis)
    ii. **Classification of Duck:**
    Kingdom - Animalia
    Phylum - Chordata
    Class - Vertebrata
    Type - Duck (Anas)
    iii. **Classification of Prawn:**
    Kingdom - Animalia
    Phylum - Arthropoda

Class - Crustacea
Type - Palaemon (Prawn)

24. **Four steps Involved in Enzymatic Catalytical Action:**
    i. **First Step: Binding of the substrate (S)** takes place at the active site of an enzyme. The substrate is fitted into an active site.
    ii. **Second Step:** The first step induces **enzyme (E)** to change its shape that is around that substrate enzyme is tightly fitted.
    iii. **Third Step:** Formation of **new enzyme** product complex after breaking up of chemical bonds of a sustainable.
    iv. **Fourth Step:** Release of **products (P)** of reaction; the enzyme becomes free to bind to other substrate and run the catalytic cycle again.

25. **Growth:** It is a fundamental property of all living organisms. Growth is "the sum total of various processes in living organisms which combine to cause an irreversible increase in mass, weight and volume The cells differentiated to form tissues and organs and thus they are important aspects of growth and development. In plants, it is localized in meristems only. There are three periods of growth :
    i. **formative**
    ii. **elongation**
    iii. **maturation**

26. i. Skeletal muscle is attached with the skeleton.
    ii. Smooth muscle is regarded as a visceral muscle because they occur in the internal organs and responsible for their movements.
    iii. The example of antagonistic pairs are Flexors-Extensors(biceps-triceps) and Abductors-Adductors.

27.

Heart beat	Pulse
Alternate systole and diastole of heart chambers.	Alternate contraction and expansion of superficial arteries in the body.
Hormones, autonomic nervous system, exercise and emotions, etc., influence heartbeat.	Related to the rate of heartbeat.
Occurs due to impulses produced by SA and AV nodes.	Rhythmic pumping of oxygenated blood into the arterial system by the left ventricle.
Heartbeat is created by cardiac muscles.	Rhythmic distension of the arteries is related to the smooth muscle fibres.

OR

Double Circulation. The heart is the pumping organ. It pumps blood to the various body organs, through closed vessels. From the left ventricle, blood goes with **aorta** which sends it to the arteries for supplying the body organs. From the body tissues, blood is returned to the right atrium through two veins superior and inferior vena cava. This type of circulation is known as **systemic circulation.**

From the right ventricle, blood is pumped into the pulmonary trunk which divides into the **pulmonary arteries** each of which goes to the lung. Here the blood is oxygenated. The

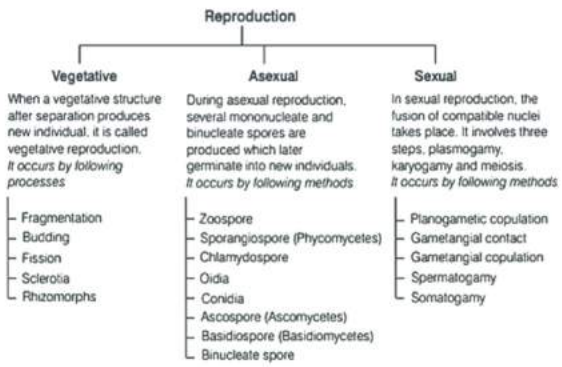
oxygenated blood is returned to the left atrium through **pulmonary veins. This is called pulmonary circulation.**

28. **Types of Nerves:** According to their nature and functions, nerves are of two types:
    i. **Sensory (afferent) nerve:** Fibres enter the spinal cord from the dorsal side of the body. They conduct messages from the receptor organ to the brain or spinal cord for necessary action.
    ii. **Motor (efferent) nerve:** Leave the spinal cord on the ventral side. They carry nerve impulses from the brain or spinal cord to the effector organs such as muscles or glands for performing specific function or activity.
    The afferent and efferent nerve fibres combine together to form the spinal nerves.

Section D

29. **Read the text carefully and answer the questions:**
    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) **The sexual cycle of fungi involves the following steps :**
    i. The fusion of protoplasms between two motile or non-motile gametes is called plasmogamy.
    ii. The fusion of two nuclei is called karyogamy.
    iii. Meiosis in zygote results in haploid spores.

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.

(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.

30. **Read the text carefully and answer the questions:**

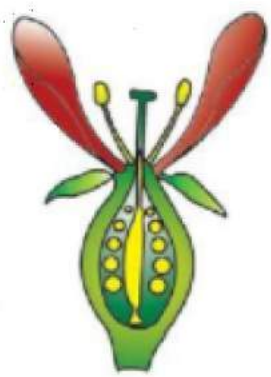
The flower is the reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle. These are calyx, corolla, androecium and gynoecium. Calyx and corolla are accessory organs, while androecium and gynoecium are reproductive organs. In symmetry, the flower may be actinomorphic (radial symmetry) or zygomorphic (bilateral symmetry). Based on the position of calyx, corolla and androecium in respect of the ovary on the thalamus, the flowers are described as hypogynous, perigynous and epigynous. A flower may be trimerous, tetramerous or pentamerous when the floral appendages are in multiple of 3, 4 or 5, respectively.

(i) Ovary develops into a fruit and ovules into seeds.

(ii) Mustard, datura, and chili are the actinomorphic flowers as they are divided into two half from any plane.

(iii)When the gynoecium is present in the topmost position of the thalamus, the ovary is known as: superior.

OR



Epigynous flower: The margin of the thalamus grows over and encloses the ovary completely. The margins of the flower get fused with the other parts of the flower which rise above the ovary.

Section E

31. Meiosis is called reduction division because the number of chromosomes in daughter cells becomes half of the number of chromosomes in mother cells. In spite of this, meiosis enables the conservation of specific chromosome number of each species. In fact, has there been no meiosis, organisms would not have been able to evolve to sexual mode of reproduction. We know that fertilization involves fusion of male and female gametes. Thus, zygote gets the chromosome pool from two cells and the number of chromosomes in a zygote becomes double that of the gametes. To ensure conservation of specific chromosome number after fertilization, it is necessary that the gametes should have half the number of chromosomes compared to what it is in somatic cells.

OR

All these happen in the two haploid nuclei simultaneously.

i. **Prophase-II** takes a short time. Spindle formation begins and the chromosomes become short. Two chromatids are joined to a single centromere. Nuclear membrane and nucleolus disintegrate.

ii. **Metaphase-II** At the equator, the chromosomes align at the equator and spindle is formed. The centromere of every chromosome is joined to the spindle fibre and centromere also divides.

iii. **Anaphase-II** The daughter chromosomes are formed. Chromatids move towards their poles with the spindle fibres.

iv. **Telophase-II** Reaching the poles, chromosomes from nuclei which are haploid (n) daughter nuclei. Again nuclear membrane is constructed. Nucleolus now becomes clearly visible.

v. **Cytokinesis** Occurs and four daughter cells are formed which are haploid (n). It may occur once or twice (i.e., in meiosis-I and II) or only after the meiosis-II cell division.

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.

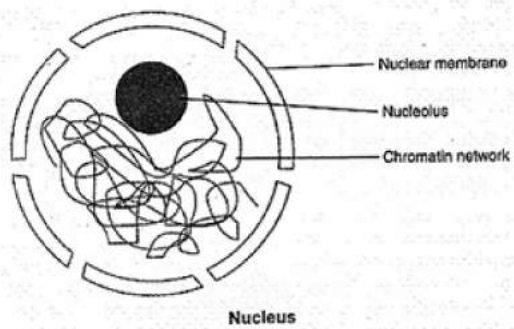
This assumption is not really valid in a living system since all the pathways work simultaneously; moreover, the substrates enter pathways and also are withdrawn from the pathways as and when required; ATP used when needed and enzymes control the reactions also. It is only useful in the extraction and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

OR

Step(s)	Substrate	Enzyme	End product(s)
Phosphorylation	Glucose + ATP	**Hexokinase (Mg^{2+})**	Glucose-6-Phosphate + ADP

Isomerisation	Glucose-6 - Phosphate	**Phosphoglucoisomerase**	Fructose-6-Phosphate
Phosphorylation	Fructose-6-Phosphate + ATP (Phosphate donor)	**Phosphofructokinase (cofactor Mg^{2+})**	Fructose-1, 6-Diphosphate+ADP
Cleavage (splitting)	Fructose-1, 6-Diphosphate	**Fructose diphosphate**	3-Phosphoglyceraldehyde Dihydroxyacetone phosphate
Phosphorylation Dehydrogenation	3-PGAL + H_3PO_4 1, 3-PGAL + NAD^+	Phosphoglycerokinase Glyceraldehyde-phosphate dehydrogenase	1, 3 Diphosphoglyceraldehyde. 1,3 Diphosphoglycerate + NADH + H^+
Dephosphorylation	1, 3-DPGA + ADP	Diphosphoglycerokinase (Mg^{2+})	ATP + 3-Phosphoglycerate.

33.



Nucleus

i. **Nucleus:** Nucleus is a double membrane structure, with minute pores in the membrane. The pores work like channels for passage of substances. The fluid-filled in the nucleus is called nucleoplasm. There is usually one nucleolus inside the nucleus. Sometimes many nucleoli can be found. There is a fine network of a thread like chromatins inside the nucleus. During the resting stage of a cell, structures inside the nucleus cannot be seen. They become visible only during cell division.

ii. **Centrosome:** In chromosome, there is one primary constriction, which contains two centromeres. These centromeres comprise the centrosome. Centrosome plays an important role during cell division.

OR

Chemically the plasma membrane consists of proteins (20-70%), lipids (20-79%), carbohydrates (1-5%) and water (20%). Nucleic acids (DNA and RNA) are absent in the plasma membrane. The lipids present in the plasma membrane are phospholipids, glycolipids (sugar lipids) and sterols.

Each lipid molecule consists of a three carbon glycerol poles (head) which is hydrophilic (water-loving) in nature and two long tails of fatty acids which are hydrophobic (water-fearing) in nature.

The hydrophilic glycerol poles of lipid are located towards the outside of the lipid bilayer whereas, the hydrophobic fatty acid tails are repelled by water and face towards the inner side of the membrane.

The hydrophilic and hydrophobic forces in lipid molecules cause the membrane to become a bilayer.