SAMPLE QUESTION PAPER - 1
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. Carolus Linnaeus is associated with: **[1]**

   a) Law of limiting factor
   b) Binomial nomenclature
   c) Origin of species
   d) Inheritance of acquired character

2. The epithelial cells of Bowman's capsule are called: **[1]**

   a) Calyces
   b) Filtration slits
   c) Podocytes
   d) Slit pores

3. Base pairs found in 5 turns of DNA spirals are _____. **[1]**

   a) 50
   b) 100
   c) 10
   d) 20

4. In dicot stems, the cells of cambium present between the primary xylem and primary phloem are: **[1]**

   a) Vascular cambium
   b) Interfascicular cambium
   c) Medullary cells
   d) Intrafascicular cambium

5. What is the residual volume of air in a normal human? **[1]**

   a) 1.4 to 1.6 litre
   b) 0.7 to 0.9 litre
   c) 1.0 to 1.2 litre
   d) 1.2 to 1.4 litre

6. Which is the first product formed during the Calvin cycle? **[1]**

a) 5-PGA
b) 2-PGA
c) 3-PGA
d) 4-PGA

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

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

8. Platelets are formed from the_____. **[1]**

a) Haemocytes
b) Microkayocytes
c) Thrombocytes
d) Megakaryocytes

9. Ethylene is used for: **[1]**

a) Slowing down ripening of apples
b) Both Hastening of ripening of fruits and Slowing down ripening of apples
c) Retarding ripening of tomatoes
d) Hastening of ripening of fruits

10. Which one is peat moss? **[1]**

a) Marchantia
b) Sphagnum
c) Equisetum
d) Chara

11. Rahul is anaemic and a few days ago suffered from massive haemorrhage. Now, what problems he may face: **[1]**

a) No glomerular filteration
b) Accumulation of waste products in body
c) All of these
d) Very low blood pressure

12. The condition favourable for dissociation of oxygen from oxyhemoglobin in the tissues is: **[1]**

a) Low pO_2, high pCO_2, low H^+ concentration, and higher temperature
b) High pO_2, low pCO_2, high H^+ concentration, and lower temperature

c) Low pO_2, high pCO_2, high H^+ concentration, and higher temperature

d) High pO_2, low pCO_2, low H^+ concentration, and lower temperature

13. **Assertion (A):** Exobasidium vaccinii causes **blister blight of tea**. **[1]**
Reason (R): Blisters appear on the stem surface.

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):** Gill-lamellae in aquatic animals help in exchange of gases. **[1]**
Reason (R): Each gill lamella carries many blood capillaries.

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):** Restriction endonucleases are used in genetic engineering. **[1]**
Reason (R): They are enzymes.

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):** During expiration, volume of thorax decreases and air is expelled out. **[1]**
Reason (R): This happens due to the contraction of expiratory muscles.

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. Where is the Bidder's canal located and how is it useful in frog? **[2]**

19. Diagrammatically indicate the location of the various endocrine glands in our body. **[2]**

20. Differentiate between obligate categories and intermediate categories. Demonstrate with the help of a flowchart. **[2]**

21. $3CO_2 + 9ATP + 6NADPH + Water \rightarrow$ glyceraldehyde 3–phosphate +9 ADP+6 $NADP^+$+ 8 Pi **[2]**

Analyze the above reaction and answer the following questions:

i. How many molecules of ATP & NADPH are required to fix one molecule of CO_2?

ii. Where in the chloroplast does this process occur?

OR

Differentiate between stroma and grana of chloroplasts.

Section C

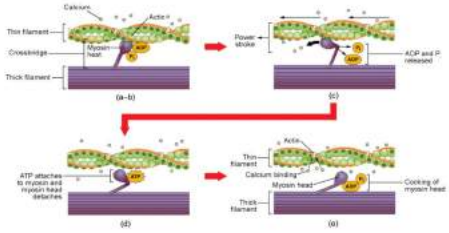
22. Each plant or group of plants have some phylogenetic significance in relation to evolution: Cycas, one of the few living members of gymnosperms is called as the 'relic of past'. Can you establish a phylogenetic relationship to Cycas with any other group of plants that justifies the above statement? **[3]**

23. List the main features of class Reptilia. **[3]**

24. Enlist three properties of enzymes. **[3]**

25. State any three functions of indole acetic acid in plants. **[3]**

26. Given below is the diagram of muscle contraction. Based on the diagram answer the following questions: **[3]**



i. Which filament slides in a sarcomere during contraction?

ii. Name the functional contractile unit of muscle.

iii. Which are the filaments that form the cross-bridges during muscle contraction?

27. Draw a standard ECG and explain the different segments in it. **[3]**

OR

Differentiate between pulse rate and blood pressure:

28. Which nerve tract connects the right and left hemispheres of the cerebrum? Which four lobes in each hemisphere divided? **[3]**

Section D

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

The morphology of the mycelium, mode of spore formation, and fruiting bodies form the basis for the division of the fungi kingdom into various classes which include four sub-division Phycomycetes, ascomycetes, basidiomycetes, Deuteromycetes. Members

of Phycomycetes are found in aquatic habitats and on decaying wood in moist and damp places or as obligate parasites on plants, ascomycetes are mostly multicellular. The asexual spores are conidia produced exogenously on the special mycelium called conidiophores. Basidiomycetes are mushrooms, bracket fungi or puffballs. They grow in soil, on logs and tree stumps and in living plant bodies as parasites. The basidiospores are exogenously produced on the basidium.

Classification of Fungi			
Phycomycetes (Lower Fungi)	**Ascomycetes (Sac Fungi)**	**Basidiomycetes (Club Fungi)**	**Deuteromycetes (Fungi imperfecti)**
Saprolegnia	Yeast	Agaricus	Cercospora
Rhizopus	Aspergillus	Polyporus	Collectotrichum
Mucor	Pencillium	Puccinia	Trichoderma
Albugo	Neurospora	Ustilago	Pyricularia
Pythium	Peziza	Lycoperdon	Fusarium

(i) Observed given table of Classification of Fungi and identify the class of fungi in which asexual spores are not found, vegetative reproduction occurs by fragmentation, and sexual organs are absent.

OR

Identify the figure given below. Also, mention its characteristics.

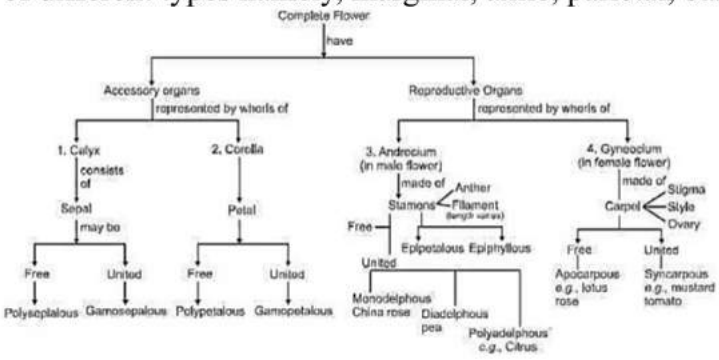
(ii) Where are Members of Phycomycetes found?

(iii) What is ascomycetes? What is the characteristic feature of ascomycetes and basidiomycetes?

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

Each flower normally has four floral whorls, viz., calyx, corolla, androecium and gynoecium. The gynoecium is the female reproductive part of the flower and is made up of one or more carpels. A carpel consists of three parts namely stigma, style and ovary. The ovary is the enlarged basal part. The style connects the ovary to the stigma. The stigma is usually at the tip of the style and is the receptive surface for pollen grains. After fertilisation, the ovules develop into seeds and the ovary matures into a fruit. The arrangement of ovules within the ovary is known as placentation. The placentation are

of different types namely, marginal, axile, parietal, basal, central and free central.



(i) Observe the given flow chart and mention the male and female parts of the flower. Explain shortly.

(ii) What is aestivation?

(iii) Some statements mention given below observe this and find out incorrect statements and correct it?

- Each ovary bears one or more ovules attached to a flattened, cushion-like placenta.
- In mustard one carpel is present which may be free.
- Ovary is the enlarged basal part, on which lies the elongated tube, the stigma.
- After fertilisation, the ovules develop into seeds and the ovary matures into a fruit.

OR

What is basal placentation give one example.

Section E

31. Distinguish anaphase of mitosis from anaphase I of meiosis. **[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. Give an account of Glycolysis. Where does it occur? What is the end product? Trace the fate of these products in both aerobic and anaerobic respiration. **[5]**

OR

Explain glycolysis.

33. Discuss the basic structural organisation of a typical cell. **[5]**

OR

The cells of a unicellular organism are usually spherical whereas those of multicellular tend to be many-sided. Why?

Solution

Section A

1. **(b)** Binomial nomenclature
   Explanation: Carolus Linnaeus is associated with Binomial nomenclature in which the name of the organism consists of the genus name and species name.
2. **(c)** Podocytes
   Explanation: Podocytes are cells in the Bowman's capsule in the kidneys that wrap around capillaries of the glomerulus. The Bowman's capsule filters the blood, retaining large molecules such as proteins while smaller molecules such as water, salts, and sugars are filtered as the first step in the formation of urine.
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. **(d)** Intrafascicular cambium
   Explanation: Intrafascicular Cambium is primary meristem. It develops from the procambium of the stem apex. It is located inside the open vascular bundles, between phloem and xylem patches.
5. **(c)** 1.0 to 1.2 litre
   Explanation: Residual volume (RV) is about 1100 ml to 1200 ml which is the volume of air still remaining in the lungs after the expiratory reserve volume is exhaled.
6. **(c)** 3-PGA
   Explanation: The first step in the Calvin cycle is the fixation of CO_2. The CO_2 molecule condenses with ribulose 1,5-bisphosphate to form an unstable six-carbon compound, which is rapidly hydrolyzed to two molecules of 3-phosphoglycerate (3-PGA).
7. **(c)** 6
   Explanation: The pH of human urine is approximately 6.
8. **(d)** Megakaryocytes
   Explanation: Platelets are a little piece of blood cells that help wound healing and prevent bleeding by forming a blood clot. It is formed from the megakaryocytes.
9. **(d)** Hastening of ripening of fruits
   Explanation: Ethylene is highly effective in fruit ripening.
10. **(b)** Sphagnum

Explanation: Sphagnum is also known as peat moss as it provides peat that has long been used as fuel.

11. **(c)** All of these
Explanation: If the anaemic person suffered from massive haemorrhage, the problem he may face includes very low blood pressure, accumulation of wastes products in the body, and no glomerular filtration in the kidney.

12. **(c)** Low pO_2, high pCO_2, high H^+ concentration, and higher temperature

Explanation: In tissues, low pO_2, high pCO_2, high H^+ concentration, and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

13. **(c)** A is true but R is false.
Explanation: Exobasidium vaccinii, which is an obligate parasite, causes the most destructive-disease of tea (Thea sinensis) leaves called "blister blight". Infected leaves curl and get deformed. The infection often causes hypertrophy (increase in number of cells) of host cells resulting in the formation of galls. Blisters start appearing after three days of infection.

14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Gills are the main respiratory organs of aquatic animals. Each gill bears rows of comb-like, soft, thin gill-filament, each gill filament bears many flat, parallel membranelike gill-lamellae. Each gill lamella carries many blood capillaries. Water taken through the mouth, is made to flow from the pharynx in a single direction between the gill lamella. This greatly helps in the gaseous exchange across the lamellar membrane between the capillary blood and the flowing water.

15. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation: Restriction endonucleases are enzymes that are used to break DNA at specific sites producing sticky ends. The enzymes are highly important for genetic engineering. Recombinant DNA is based on the use of restriction endonucleases, which are enzymes that recognize specific nucleotide sequences and cut DNA.

16. **(c)** A is true but R is false.
Explanation:
Expiration (breathing out) is carried out passively by relaxation of the diaphragm and inspiratory muscles. As they relax the diaphragm moves up towards the thorax while inspiratory muscles move the lateral thoracic walls inward and downward. Thus the volume of the thorax decreases and the pressure inside thorax and lungs increases which causes air to be expelled from lungs to the atmosphere. On the other hand expiratory muscles are some intercostal and abdominal muscles which contract to reduce the volume of thorax more than that in ordinary expiration i.e. during forceful expiration, which causes larger volume of air to be breathed out.

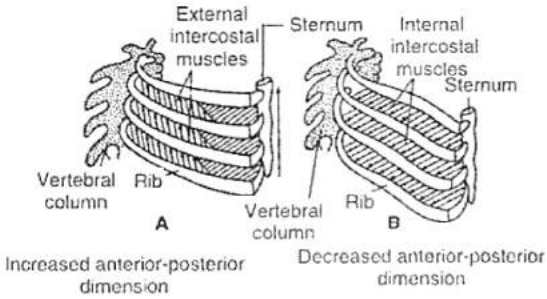
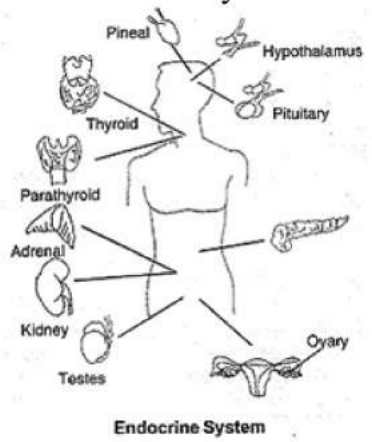


Fig. A, Showing contraction of external intercostal muscles during inspiration.
Fig. B, Showing contraction of internal intercostal muscles during expiration.

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. Bidder's canal is present in the kidney of a frog. It communicates with the ureter, which leaves the kidney near its end and opens into the cloaca.
19. 

Endocrine System

20.

Obligate Categories	Intermediate Categories
Kingdom	Subkingdom
Phylum or Division	Subphylum or subdivision and superclass
Class	Infra class and subclass
Order	Superorder and suborder
Family	Subfamily and tribe
Genus	Subgenus
Species	Subspecies, variety or race

The flow chart is as follows:

Kingdom
Phylum
Subphylum
Superclass
Class
Subclass
Infraclass
Cohort
Superorder
Order
Suborder
Infraorder
Superfamily (–oidea)
Family (–idae)
Subfamily (–inae)
Tribe (ini)
Subtribe (–ina)
Genus
Subgenus
Species
Subspecies

21. i. 3 molecules of ATP are required for phosphorylation and 2 molecules of NADPH are required for reduction of carbon dioxide.
    ii. This reaction occurs in the stroma of chloroplast.

OR

Stroma	Grana
It is the jelly-like matrix of the chloroplast.	These are formed of stacks of thylakoids.
Dark reaction takes place here.	Light reaction takes place here.

Section C

22. Cycas is called **living fossil** since it has many characters of extinct pteridophytes and cycads. Cycads have fern-like foliage, leaf bases persistent; secondary growth occurs; dioecious plants have micro and megasporophylls on separate plants; **sporophylls** aggregated to form cones (strobila) (the exception is megasporophyll of Cycas), sperms are motile, plants are xerophytic found in warm weather. Cycads are grown for **ornamental appeal.**
23. **Main features of class reptilia are:**
    i. They are the **first truly terrestrial vertebrates.**
    ii. They have **dry skin** covered with scales.
    iii. They are **tetrapods** and **pentadactyl.**
    iv. The hands and feet **have claws.**
    v. **Lungs** are well-developed and reptiles never breathe by gills.
    vi. There is vo larval stage in its development.
    vii. The ventricle of the heart is partially divided into two by an incomplete septum but this division is complete in the crocodiles.
24. **Properties of enzymes :**
    i. An enzyme is specific for a **substrate** and catalyzes only a particular reaction; this is because of the specific shape of the **active site** and **substrate.**

ii. Every enzyme requires an **optimum temperature** for its functioning, at low temperatures, the enzyme is not activated and at high temperatures, the protein is denatured.

iii. The enzymes are sensitive to pH and each enzyme show s its maximum activity, at a specific pH, called optimum pH. It is because of the fact that pH changes in the medium bring about changes in the conformation of proteins, leading to the folding of proteins such that the active sites are hidden exposed.

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. i. Actin slide in a sarcomere during contraction.

ii. The functional contractile unit of muscle is the sarcomere.

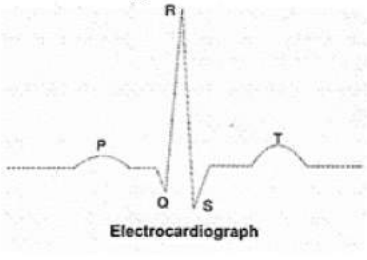
iii. The filaments that form the cross-bridges during muscle contraction are actin-myosin.

27. 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 the normal state (repolarization). The end of the T-wave marks the end of systole.

Obviously, by counting the number of QRS complexes that occur in a given time period, one can determine the heartbeat rate of an individual. Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease. Hence, it is of great clinical significance.



Electrocardiograph

OR

Pulse Rate	Blood Pressure
The heart pumps blood which results in producing rhythmic contraction in the superficial arteries as jerks. This feeling of regular jerks in arteries corresponds to the heart contraction is known as pulse rate.	It is the pressure with which blood pushes against the elastic blood vessels. It is measured on a column of mercury with the help of sphygmomanometer.
Its value is normally 65-72 times per minute.	In the normal human being, the systolic and diastolic pressure is 120/80 mm Hg.

28. Right and left cerebral hemispheres are connected by 10 cm long bundles of densely packed nerve fibres called **corpus callosum.** Other grooves divide the surface of each

cerebral hemisphere into four lobes. These lobes are **frontal lobe, temporal lobe, parietal lobe,** and **occipital lobe.** Each lobe has specific functions.

Section D

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

The morphology of the mycelium, mode of spore formation, and fruiting bodies form the basis for the division of the fungi kingdom into various classes which include four sub-division Phycomycetes, ascomycetes, basidiomycetes, Deuteromycetes. Members of Phycomycetes are found in aquatic habitats and on decaying wood in moist and damp places or as obligate parasites on plants, ascomycetes are mostly multicellular. The asexual spores are conidia produced exogenously on the special mycelium called conidiophores. Basidiomycetes are mushrooms, bracket fungi or puffballs. They grow in soil, on logs and tree stumps and in living plant bodies as parasites. The basidiospores are exogenously produced on the basidium.

Classification of Fungi			
Phycomycetes (Lower Fungi)	**Ascomycetes (Sac Fungi)**	**Basidiomycetes (Club Fungi)**	**Deuteromycetes (Fungi imperfecti)**
Saprolegnia	Yeast	Agaricus	Cercospora
Rhizopus	Aspergillus	Polyporus	Collectotrichum
Mucor	Pencillium	Puccinia	Trichoderma
Albugo	Neurospora	Ustilago	Pyricularia
Pythium	Peziza	Lycoperdon	Fusarium

(i) In basidiomycetes asexual spores are not found, vegetative reproduction occurs by fragmentation, and sexual organs are absent.

OR

- Agaricus
- Agaricus is a fleshy saprophytic fungus with over 300 species and contains both edible and poisonous species. It is found in wet and damp climates. It grows on wood and in humus-rich soil.

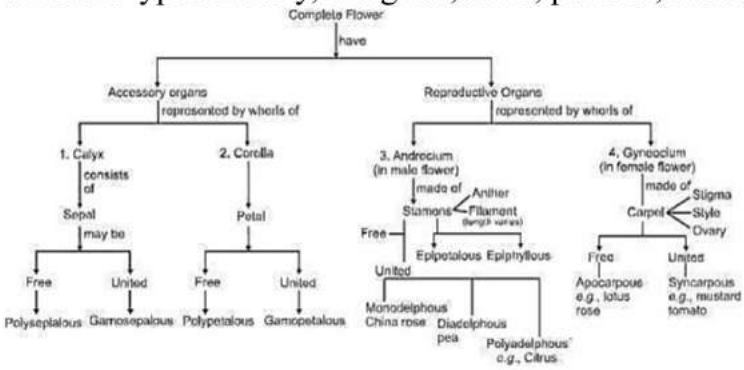
(ii) i. Aquatic habitats
ii. On decaying wood

(iii)
- Ascomycetes are commonly known as sac-fungi as they are produced in a sac-like structure known as ascus.
- Dikaryon formation is the characteristic feature of ascomycetes and basidiomycetes.

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

Each flower normally has four floral whorls, viz., calyx, corolla, androecium and gynoecium. The gynoecium is the female reproductive part of the flower and is made up of one or more carpels. A carpel consists of three parts namely stigma, style and ovary. The ovary is the enlarged basal part. The style connects the ovary to the stigma. The stigma is usually at the tip of the style and is the receptive surface for pollen grains. After

fertilisation, the ovules develop into seeds and the ovary matures into a fruit. The arrangement of ovules within the ovary is known as placentation. The placentation are of different types namely, marginal, axile, parietal, basal, central and free central.



(i) A. The **calyx** forms the outermost whorl of a flower, which contains sepals. They are green, leaf-like structures that cover and protect the flowers during the bud stage. When the sepals of a flower are free, they are called polysepalous, while fused sepals of a flower are called gamosepalous.

B. The **corolla** of a flower is a layer that lies inside the calyx. It contains beautifully coloured petals, which help in attracting insects for pollination. When the petals are free, they are called polypetalous, while fused petals are called gamopetalous.

C. The **androecium** or the stamen is the male reproductive part of a flower. It consists of two parts, the filament and the bilobed anther. The bilobed anther is the site for meiosis and the generation of pollen grains.

D. **Gynoecium** represents the female reproductive part of a flower. It consists of an ovary. The ovary is connected by a long tube (called style) to the stigma. The ovary bears numerous ovules attached to the placenta.

(ii) The arrangement of sepals or petals in floral bud is called Aestivation.

(iii)
- In mustard one carpel is present which may be free.
  Correct statement: Mustard has two carpels that are fused together.
- Ovary is the enlarged basal part, on which lies the elongated tube, the stigma.
  Correct statement: The ovary is the enlarged basal part, on which lies the elongated tube, the style.

OR

Basal placentation: A single ovule is linked to the placenta, which develops at the base of the ovary. Marigold is an example.

Section E

31.

Anaphase of mitosis	Anaphase I of meiosis
The centromere of every chromosome divides.	The centromere does not divide.
Separation of sister chromatids takes place.	Homologous chromosomes are separated.
Only one chromatid of every chromosome moves to the pole. The number and types of chromosomes at each pole is the same as in	Each homologous pair of chromosomes moves to the pole with both the

the parent nucleus. Chromosomes are single-stranded	chromatids.chromosomes are double-stranded
The chromatids moving to one pole are genetically identical to those moving to the opposite pole.	The chromosomes moving to one pole are not genetically identical to those moving to the opposite pole.

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.

32. Glycolysis occurs in the cytoplasm of the cell and is present in all living organisms. In this process, glucose undergoes partial oxidation to form two molecules of pyruvic acid. The following are the important step of glycolysis.
    - Glucose undergoes phosphorylation to produce glucose- 6 -phosphate.
    - Fructose-6-phosphate is then converted into PGAL. (Phosphoglyceraldehyde).
    - Each molecule of PGAL then undergoes several steps to produce Pyruvic Acid.
    - There is a net gain of two molecules of ATP during glycolysis of one molecule of glucose.

    Fate of Pyruvate: Aerobic Respiration: Pyruvic acid is completely oxidized to produce carbon dioxide and energy.

    Anaerobic Respiration: Depending upon the availability of oxygen in some organisms. pyruvic acid is converted into ethanol and carbon dioxide when there is a complete absence of oxygen. In some other organisms, pyruvic acid is converted into lactic acid when there is an incomplete oxygen supply.

    OR

    Glycolysis
    - The term glycolysis has originated from the Greek words, glycos for sugar, and lysis for splitting. The scheme of glycolysis was given by Gustav Embden, Otto Meyerhof, and J. Parnas, and is often referred to as the EMP pathway.
    - Glycolysis occurs in the cytoplasm of the cell and is present in all living organisms.
    - In this process, glucose undergoes partial oxidation to form two molecules of pyruvic acid. In plants, this glucose is derived from sucrose.
    - Sucrose is converted into glucose and fructose by the enzyme invertase, and these two monosaccharides enter the glycolytic pathway.
    - Glucose and fructose are phosphorylated to give rise to glucose-6-phosphate by the activity of the enzyme hexokinase.

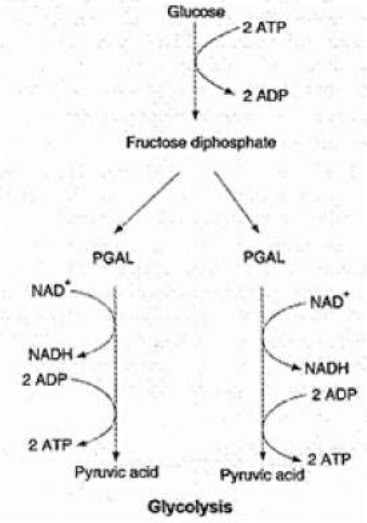
- This phosphorylated form of glucose then isomerises to produce fructose -6-phosphate.
- Subsequent steps of metabolism of glucose and fructose are the same.
- The various steps of glycolysis are depicted in the following figure:

In glycolysis, a chain of ten reactions, under the control of different enzymes, takes place to produce pyruvate from glucose.

Utilization of ATP During Glycolysis:

i. During the conversion of glucose into glucose-6-phosphate

ii. During the conversion of fructose-6-phosphate to fructose-1, 6-diphosphate.



33. 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.**

OR

It is true that the cells of unicellular organisms tend to be spherical. It is because of the following reasons:

i. **Surface tension:** Surface tension shapes the spherical way as in the case in air-borne soap bubbles.

ii. The free-floating cells with thin membranes tend to be spherical as it is the most economical shape that can confine a given mass of protoplasm. The shape and the size of the cell depend upon the place where they are present and the functions they have to perform. In multicellular animals, the cells tend to become faceted as they come in contact with each other in the same way as the spherical soap bubbles become flattened when they are jammed together in a small space.