

PAPER –2

- Q. 1 (A) Answer in short:** **4**
- (1) Explain trypsin therapy.
 - (2) Why sale of iodised salt is compulsory?
 - (3) What is cholesterol? Give its significance.
 - (4) Name two growth inhibitors in plants.
- (B) Explain in brief:**
- (1) Give structural formulae of Purines and pyrimidines of RNA.
 - (2) Co. enzymes and co. factor in enzymatic activity.
 - (3) Biological importance of copper and calcium.
 - (4) Distribution of water in living organisms.
- (C) Describe in detail : (Any two)** **8**
- (1) Hormones of adrenal gland.
 - (2) Classification of enzymes.
 - (3) Biological importance of Proteins.
- Q. 2 (A) Answer as brief:** **4**
- (1) Mention function of style.
 - (2) Define Placentation.
 - (3) What is anti-transpirant?
 - (4) State location and functions of Motor cells.
- (B) Answer as directed:** **8**
- (1) Describe experiment to demonstrate transpiration with diagram.
 - (2) Write a note on: Conducting tissue system in Maize root.
 - (3) Describe types of Meristematic Tissue. (Diagram not necessary)
 - (4) Differentiate between Stem thorn and leaf spine.
- (C) Answer in detail: (Any two)** **8**
- (1) Describe capsella type of embryo development.
 - (2) Structure of Non-endospermic seed.
 - (3) Process that occurs in grana in presence of NADP and light.
- Q. 3 (A) Answer in short:** **6**
- (1) How is Jelly formed?
 - (2) State the function of Endoskeleton.
 - (3) Location and function of Basal granules.
 - (4) What is peristalsis?
 - (5) State from which embryonic layer kidney and urinary bladder are derived?
 - (6) State three major veins which join to form precaval vein.

- (B) Answer the following questions:** 6
- (1) Describe : Cardiac muscular tissue.
 - (2) Write a note on Autonomous Nervous system.
 - (3) Functions of liver with respect to excretion.
- (C) Describe in detail: (Any two)** 8
- (1) Organogenesis from mesoderm
 - (2) Excretory system of frog.
 - (3) Internal structure of skin and its function.
- Q. 4 (A) Answer briefly :** 4
- (1) What are Contained genes ?
 - (2) Why petite mutant yeast produces fewer ATP molecules ?
 - (3) What is Philadelphia syndrome ?
 - (4) What are okazaki fragments ?
- (B) Complete linkage rarely occurs – Explain through Morgan's experiment on Drosophila.** 3
- (C) Answer as directed: (Any two)** 8
- (1) Explain in detail operon model gene regulation.
 - (2) Explain the phenomenon of sex determination in man.
 - (3) Inheritance of Kappa particler in Paramecuim.
- (D) Draw labeled diagram: (Any one)** 5
- (1) Pectoral girdle.
 - (2) Open Buccopharyngeal cavity of frog.
- Q. 5 (A) Answer briefly:** 6
- (1) What is anaphylactic shock?
 - (2) Explain green house effect.
 - (3) State full form of **ELISA** and **POM**.
 - (4) Name the carcinogens causing cancer of liver.
 - (5) What is social forestry?
 - (6) What is the contribution of Cohen?
- (B) Answer as directed: (Any two)** 8
- (1) Role of micro-organisms in nitrogen cycle.
 - (2) Symptoms of hepatitis.
 - (3) Functions of health centers.
 - (4) Write a note of tissue culture technique.
- (C) Answer any two :** 6
- (1) What are B cells? How do they react against an antigen?
 - (2) Cancer therapy.
 - (3) Write a Note on AIDS.

ANSWER

A. 1 (A) Answer in short.

- (1) Explain trypsin therapy.

Trypsin is an enzyme secreted by the pancreas, which in pure form, is given to the patient to cure ultres. This is known as trypsin therapy.

- (2) Why sale of iodised salt is compulsory?

Iodine is an essential constituent of thyroxius – a thyroid hormone secreted by the thyroid gland. Its deficiency affects the physical, mental and reproductive development. Hence Government insists on the sale of iodised salt.

- (3) What is cholestrol? Give its significance.

Cholestrol is a sterol (an important type of lipid.) It is a common structural material of the nervous tissue. It is also present in meet, liver animal fat. If its amount increases in the blood, the walls of the blood vessels become stiff and the flow of the blood through the vessels is impaired.

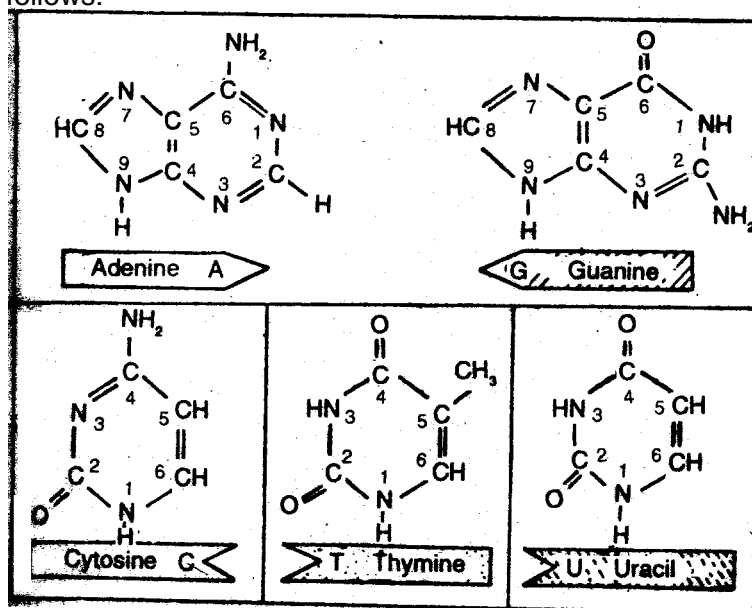
- (4) Name any two growth inhibitors in plants.

(i) Ethylene (ii) Abscissin

A. 1 (B) Explain in brief.

- (1) Purines and pyrimidines of RNA.

RNA has two purines Adenine and Guanine, and two pyrimidines cytosine and uracil. Their structure are as follows:



- (2) Coenzymes and co-factors are the prosthetic groups or the non-protein part of an enzymes. Some enzymes become active only in the presence of a prosthetic group. Coenzymes are organic compounds. Which act as hydrogen – acceptors and get reduce while participating in the enzymatic reaction.

Examples of coenzymes include:

NAD – Nicotinamide adenine dinucleotide

NADP – Nicotinamide adenine dinucleotide phosphate

FMN – Flavin mononucleotide

FAD – Flovin adenine dinucloetide

Co-factors : Co-factors are mineral ions which activate the enzymes. e.g.s. of co-factor are

magnesium, calcium, Zinc manganese copper etc. Enzymes enolase is activated only in the presence of Mg^{++} , Manganese and Zinc.

- (3) Biological importance of copper and calcium.

Copper: is important in the synthesis of haemoglobin and chlorophyll. Enzymes like tyrosinase have copper as a structural component. Copper is present in haemocyanin a respiratory pigment in certain arthropods.

Calcium: In animals, calcium is the main component of bones and teeth.

It is an indispensable element for (1) blood co. agulation (2) maintenance of PH, (3) excitation of nerves and muscles and (4) development of bones.

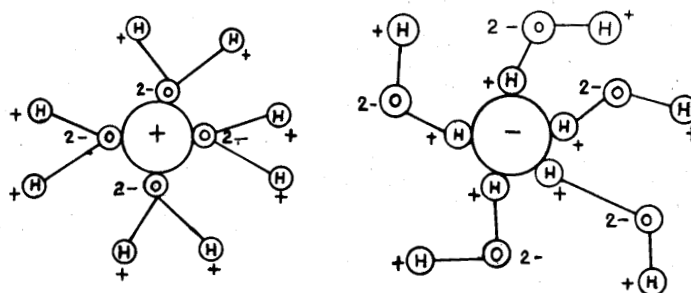
In plants it plays an important role in.

- (1) Structural architecture of cell wall
 - (2) Permeability of cell membrane.
 - (3) Converting organic toxins to non toxic forms.
- (4) Distribution of water in living organisms.

In living organisms, water is distributed as (1) extracellular water and (2) intracellular water.

Water in the blood plasma, intercellular fluid, cerebro-spinal fluid, optic fluid and lymph is extracellular water. Intracellular water molecules are in two forms : Bound form and free form. Water molecules surrounding certain protein or other large molecules or their groups are in the bound form. Water has the property of polarity due to which molecules or their groups present in solution are arranged in a specific order, which forms the bound form of water. Certain ions are firmly bound to water molecules while others are loosely bound.

The protoplasm is the main structural support of the cells of living organisms. In fact, chemically it is most complex. This form is either positively or negatively charged. Hence water molecules are arranged in specific manner only. Due to their polarity, the ions present in water get arranged in two layers.



Arrangement of water molecules in the complex

(C) Describe in details: (any two)

- (1) Hormone of adrenal gland

The adrenal gland is imbedded in the tissue of the kidneys in frog. It has two parts (1) the medulla and (2) the cortex. The **medulla of adrenal gland** secretes **adrenaline** and **non adrenaline**. Adrenaline regulates the heart beats, constriction – dilation of blood vessels and blood supply to voluntary muscles, It also includes conversion of glycogen to glucose, increases rate of respiration, retards peristaltic movement of stomach and intestine wall. It also enhances the production of ACTH in the anterior pituitary.

Non- adrenaline regulates the constriction – dilation of blood vessels to maintain blood pressure.

The **cortex of the adrenal gland** secretes Aldosterone corticosterone and hydrocorticosterone.

Aldosterons influence the rate of reabsorption of minerals and water in the urinary tubules. Its secretion is not influenced by the level of ACTH.

Corticosterone and **hydrocortisone** affect the induction of proteins and lipid metabolism through carbohydrate metabolism. Their secretion is regulated by ACTH.

Deficiency of corticosteroids causes loss of sodium and water in the body resulting in fatigue, feeling of thirst and lack of maintenance of blood glucose level.

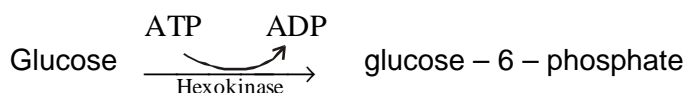
(2) Classification of enzymes :

According to the International Union of Biochemistry, enzymes are classified into six groups, these are:

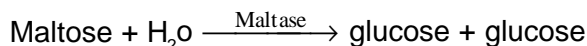
(1) Oxidoreductases (2) transferases (3) Hydrolases (4) lyases (5) Isomerases (6) ligases or synthetases

(1) **Oxidoreductases:** This group of enzymes are associated with Oxidation-reduction reaction in the cell. The enzymes which remove hydrogen from the substrate are known as **dehydrogenase** and the ones which add oxygen are known as oxidases e.g. Succinic dehydrogenase, cytochrome oxidase of ETS.

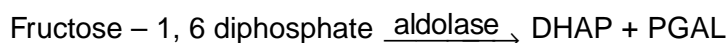
(2) **Transferases :** These enzymes bring about the transfer of a group from one substrate to another substrate. Eg. Hexokinase which transfers phosphate group of ATP to a hexose sugar in the first reaction of glycolysis.



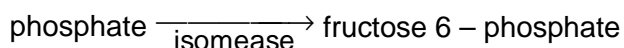
(3) **Hydrolases :** Split complex organic substance by adding a molecule of water



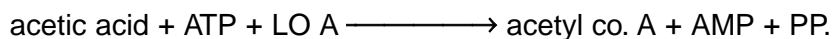
(4) **Lyases :** Cleave macromolecules without adding water e.g. aldolase



(5) **Isomerases :** Catalyze the changes in the molecular structure of the substrate of glucose - 6 - phosphate



(6) **Ligase :** These enzymes synthesize a new molecule by joining two molecules with the help of ATP or acetyl co. A synthase.



(3) Biological Importance of Proteins :

- (1) Proteins are the main structural components of the membranes of cell organelles.
- (2) They are the chief constituents of protoplasm, and they also occur in extracellular fluids.
- (3) All enzymes and certain animal hormones are proteins. The hormones of pancreas, pituitary and parathyroid glands are peptides in nature.
- (4) Haemoglobin, is important for the exchange of O_2 and CO_2 .
- (5) Immunoglobulin in blood plasma has the property of immunity.
- (6) Rhodopsin, essential for vision, is a protein.
- (7) The contractile proteins like (i) actin and myosin in muscles and globular protein in cilia and flagella are responsible for movements.
- (8) Melanin, a colour giving pigment, is a protein.
- (9) Fibrinogen and thrombin help in the coagulation of blood.

- (10) The egg protein and casein in mammalian milk is used for the development of embryo.
- (11) Any two individulas do not resemble completely in their protein structure. Hence variations are seen in alliving organisms.

A. 2 (A) Answer in Brief :

(1) Mention function of style :

It is a solid, delicate, filamentous structure connecting stigma with ovary.

It arranges stigma in such a way as to enable it to receive the pollen grains and forms a passage for the pollen tube.

(2) Define : Placentation.

The arrangement of placentae and the ovules in relation to the ovary in called placentation.

(3) What is antitranspirant ?

Liquid wax of low density is sprayed on the plants to minimize the rate of transpiration without affecting the process of photosynthesis. Such a chemical substance is described as anti transpirant.

(4) State location and function of Motor cell.

Location: They are located in the upper epidermis of maize leaves in group of 2-5 cells having a small, unicellular curved trichome on each lateral side.

Function: These cells loose water in dry atmosphere and decrease the leaf surface area by causing the coiling of leaf margins and thus regulate the rate of transpiration.

(B) Answer As Directed.

(1) Describe experiment to demonstrate transpiration with diagram.

Pieces if filter paper soaked in 5% cobalt chloride solution become dark blue when dried, when this paper comes in contact with water or vapour it turns pink.

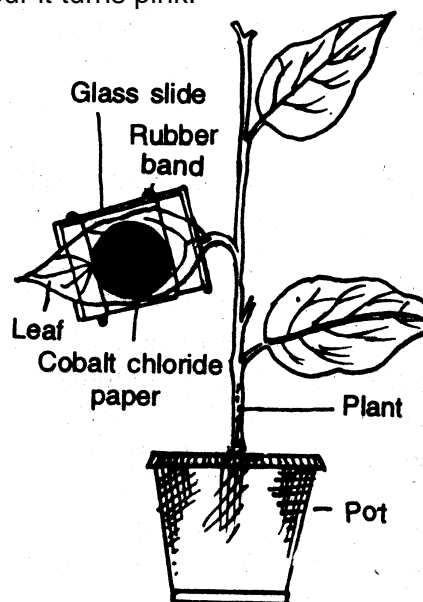
Two pieces of CoCl_2 paper of equal size are kept on both the surfaces of a leaf of a potted plant and then are covered by glass plates and fixed together by clips or rubber bands. Then the edges of the glass plates should be covered by a ccoat of Vaseline.

After a few hours it is observed that the CoCl_2 paper on the lower surface of leaf turns pink more rapidly. It can be inferred from this observation that the rate of transpiration is higher from the lower surface as compored to that from the upper surface of leaf because of large number of stomata on the lower surface.

This phenomenon can also be demonstrated by the 4 – leaf experiment.

(2) Write a note on Conducting tissue system in Maize root.

It is located in the stele and possess xylem and phloem bundles. In maize root nearly 20 xylem and an equal number of phloem bundles exist. These bundles of xylem and phloem are located below the pericyele and are alternatively arranged in the peripheral region of the stele. Such On arrangement is known as alternate and radial arrangement.



Diag Experiment to demonstrate transpiration.

Since there are several xylem and phloem bundles in stele the stele is described as polyarch stele.

Each xylem bundles consist one metaxylem vessel towards medulla and two protoxylem vessels towards the periphery of stele. The metaxylem is surrounded by a layer of sclerenchymatous cells.

Since the protoxylem is towards periphery and metaxylem towards the inner side, the xylem is described as exarch xylem. Phloem possess companion cells, sieve tubes and phloem parenchyma in maize root.

(3) Describe types of Meristematic Tissue. (No diagram)

On the basis of position in the plant body meristems are classified into 3 types namely,

- (A) Apical meristems,
- (B) Intercalary meristems
- (C) Lateral meristems

(A) APICAL MERISTEMS :

- It is located at the stem tip, root tip, branch tip, which are the growing points of the plant body.
- Apical meristem result in growth and elongation of stem, root and branches.
- The apical and axillary buds of stem shows three regions in their longitudinal section.
- They are an outer most unilayered **epiblem** or **dermatogen**, a central multilayered **plerome** and a multilayered **periblem** between these two the apical region of stem also possess a pair of prophylls.
- The apical region of root apex shows epiblem, periblem and plerome. Apart from this, root apex shows **calyptrogen** a multilayered meristematic tissue, which gives rise to **root cap**.

(B) INTERCALARY MERISTEMS :

- These are the meristems present between the permanent tissue.
- These are actually the portions of apical meristems which gets separated from the apex during the growth of the axis, and get arranged between permanent tissues.
- This tissue is short lived shows meristematic property for a short time and merge with permanent tissue, after getting differentiated.
- This tissue are seen in internodes, sheathing leafbases of grasses and in equisetum, a pteridophyte.
- It result in rapid elongation of internodal portion of the shoot (or) stem.

(C) LATERAL MERISTEM :

- This type of meristem is found on the lateral sides of stem and root.
- It is responsible for the formation of secondary tissues.
- Its activity result in **secondary growth** due to which organs like stem and roots increases in diameter.
- **Primary intravascular cambium, secondary intervascular cambium** and **cork cambium** of flowering plant are example of lateral meristems.

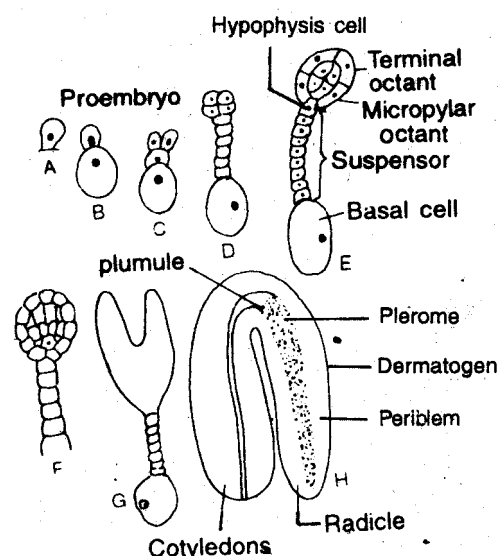
(4) Differentiate between : stem thorn & leaf spine.

Stem thorn	Leaf Spine
(1) Modification of axillary or apical bud of the stem into a sharp structure for protection is called stem thorn. They may possess flowers and leaves.	(1) Modification of stipules of leaf into a sharp structure is called leaf spine. They never possess flowers and leaves.
(2) A leaf or bud is not present in its axil.	(2) A leaf or bud is present in its axil.
(3) Stem thorns are branched (carissa) or unbranched (pomegranate).	(3) Leaf spines are branched.
(4) Stem thorns are endogenous in origin. e.g Thorns of Carissa & Pomegranate.	(4) Leaf spines are exogenous in origin e.g. Zizyphus, Acacia

(C) Answer In Detail :

(1) Describe capsella type of embryo development.

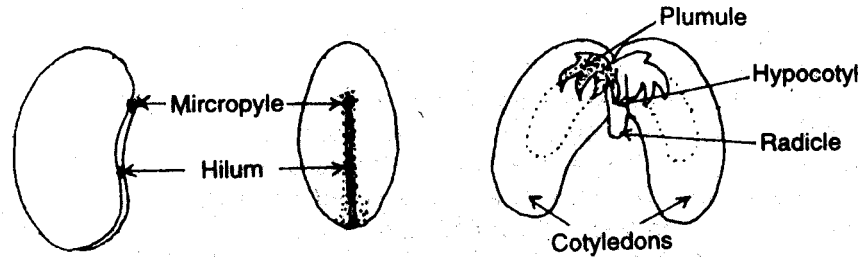
- The development of the embryo and the endosperm occurs simultaneously.
- The type of development described herein is capsella type of embryo development.
- In this type of development the zygote divides transversely into two unequal cells.
- The larger cell towards the micropyle is called **basal cell**, while the other smaller cell towards the center of embryo sac is called **apical cell**.
- The basal cell divides transversely once again into two unequal cells, while apical cell divides longitudinally into two apical cells. These four cells are arranged in \perp shape together form a **proembryo**.



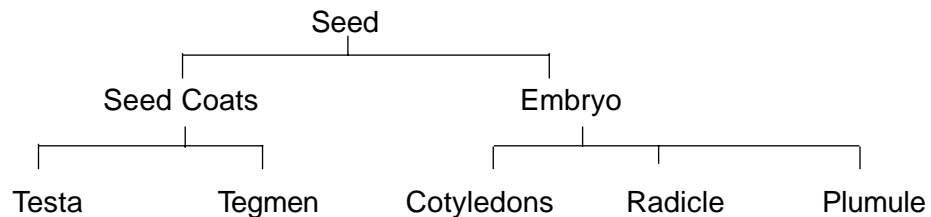
Diag Development of embryo

- In the proembryo the largest and lowermost cell is called a basal cell which does not divide any more. Above the basal cell there is a single middle cell above which are two apical cells.
- The middle cell of the proembryo repeatedly divides transversely and produces a 15 to 20 celled long filamentous structure called **suspensor**. Due to the formation of suspensor the apical cells are pushed towards the endosperm so that the nutritional need of the developing embryo is satisfied.
- The lowermost cell of the suspensor, towards the micropylar end is the largest and called **basal cell** which anchors the proembryo with the wall of embryo sac at the micropylar end.
- The two apical cells first divide longitudinally and then transversely into eight cells forming an **octant** (a group of 8 cells).
- The terminal cell of the suspensor which is closely associated beneath the octant is called **hypophysis cell**.
- The cells of the octant divide peripherally to form **16 – celled embryo**. Its upper mass of eight cells is called a **terminal or chalagap octant**, while the lower mass of eight cells is called a **micropylar octant**.

- The **terminal octant develops** into **two cotyledons** and the **plumule**, while the **micropylar octant gives rise** to the **hypocotyl** and the **stelar region (plerome)** of the radicle.
 - The hypophysis cell divides repeatedly and the cells so formed give rise to the **epiblem (dermatogen)** and periblem as well as calyptragen and the root cap regions of the radicle.
 - The suspensor degenerates when the embryo development is completed.
- (2) structure of Non- endopermic seed.



- Bean seed is flat, kidney shaped structure with a notch on one side.
- Along the notch a long white scar exists, in which hilum is present.
- Seed remains attached to the inner margin of the fruit with the hilum.
- A small pore known as **micropyle** is located at one end of the hilum. Through **micropyle** only the water enters into bean seed when it is placed in moist soil.
- Structurally bean seed possess the following part :-



SEED COATS:

- Two seed coats exist around bean seed. The outer seed coat is known as **testa**, it is thick leathery and relatively strong. The inner seed coat is known as **tegmen**, it is thin and membranous both the testa and tegmen are more or less united.

EMBRYO:

- It is the juvenile form of the plant that remain protected in seed.
- Embryo consists two cotyledons & embryo – axis.
- Embryo- axis possess plumule, hypocotyl & radicle.
- Embryo- axis remain enclosed between two cotyledons in bean seed.

(a) Plumule:

- It is the first embryonic **apical** bud having a growing point covered by delicate under developed leaves. Plumule is connected to **radicle** through **hypocotyl**. During seed germination **plumule** and **hypocotyl** gives rise to **shoot system**.

(b) Radicle:

- It is a small, rod shaped part of the **embryo axis**, it is located towards **micropyle** region of the seed. During germination, radicle emerge out first through the **micropyle** and develops **primary root**, which in turn gradually establishes tap root system.

COTYLEDONS:

- Bean seed possess two cotyledons. These structures are fleshy due to stored food in them. Protein and starch grains exists as stored food. In bean seed, during embryonic development

cotyledons enclose nutritive endosperm tissue, therefore separate endosperm does not exist in bean seed. Such seeds are therefore known as **exalbuminous** or **non – endospermic** seeds. Since cotyledons nourish the embryo during seed germination they are known as nurse leaves.

(3) Process that occurs in grana in presence of NADP and light.

Presence of light is necessary for light reaction. It occurs in the grana of Chloroplasts. In this process release of O_2 , reduction of NADP and synthesis of ATP (photophosphorylation) occurs.

- Robert Hill proved that photolysis of water occurs with the help of photons of sunlight and the H^+ ions released in this process reduce the hydrogen acceptor such as NADP.
- The oxygen molecules released in this process are not released from CO_2 but only from H_2O . This was shown experimentally using the radioactive isotope O^{18} .
- Light reaction occurs in two phase as follows :
 - (1) Cyclic photophosphorylation.
 - (2) Non – cyclic photophosphorylation.
- Photophosphorylation is the process of synthesis of ATP molecules by the combination of ADP with inorganic phosphate by the indirect utilization of solar energy.

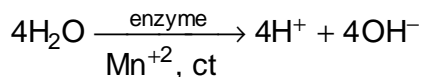
(i) CYCLIC PHOTOPHOSPHORYLATION :

- In this process only PS-I participates.
- PS-I (P_{700}) is stimulated by absorbing 4 photons from sunlight. As a result 4 energy rich electrons ($4e$) are set free from PS-I.
- The $4e$ liberated from PS-I sequentially pass through different electron carriers viz. unknown electron carrier x, Ferredoxin reducing substance (FRS), Ferredoxin (FD), Cytochrome – b₆, cytochrome – f and plastocyanin (PC) respectively and finally return to PS-I.
- During this course of electron transport one ATP molecule is formed when electrons pass from Fd to cytochrome – b₆ and another ATP is formed when electrons pass from cytochrome b₆, to cytochrome. The energy required for synthesis of ATP are synthesized during cyclic photophosphorylation.

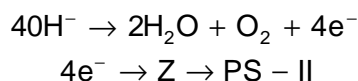
During this process photolysis of water, reduction of NADP and evolution of O_2 does not occur.

(ii) NON – CYCLIC PHOTOPHOSPHORYLATION:-

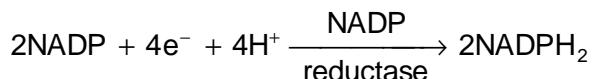
- Both PS-I and PS-II participate in this process.
- In this process, 4 photons of sunlight stimulate PS-II (P_{680}). As a result four energy rich electrons ($4e$) are released from PS-II. These electrons enter into PS-I instead of returning to PS-II.
- Moreover, the $4e$ released by the stimulation of PS-I neither go back to PS-I nor to PS-II, but are utilized for the reduction of NADP.
- During non – cyclic photophosphorylation the process such as photolysis of water release of O_2 , reduction of NADP and synthesis of one molecule of ATP occur. These can be shown as under:
 - (1) Under the influence of 4 photons of sunlight the PS-I becomes stimulated and release $4e$. These electrons sequentially pass through various electrons carriers known as x, FRS and FD. Finally the $4e$ liberated from FD join with NADP & activate it.
 - (2) Simultaneously 4 photons of sunlight also stimulate PS-II. AS a result $4e$ from PS-II are released which sequentially pass through various electron carriers known as guinone (Q), unknown electron carrier y, plastoquinone (Pq), cytochrome – f and plastocyanin (PC) and finally enter into PS-I.
 - (3) Photolysis of water with help of unknown enzymes and in the presence of Mn^{+2} and Ct, 4 molecules of water gets dissociated into $4H^+$ and $4OH^-$.



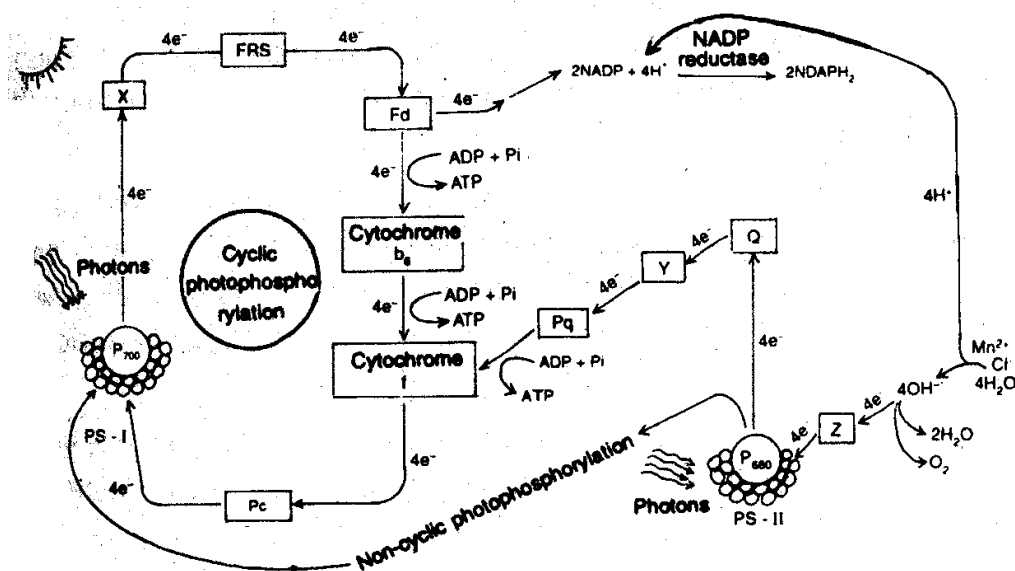
- (4) The 4OH^- so released in the above process form $2\text{H}_2\text{O}$, 4e^- and a molecule of O_2 . The O_2 molecule is released into the atmosphere. But the 4e^- pass through an **unknown electron carrier Z** and then enter the PS-II.



- (5) The 4H^+ ions released as a result of photolysis of water join with activated 2 NADP molecules with the help of enzyme **NADP reductase** and reduce it to 2NADPH_2 .



- (6) When 4e^- pass from electron carrier Pq to cytochrome - f. they lose some energy which is used to synthesise one molecule of ATP.



A. 3 (A) ANSWER IN SHORT :

- (1) How is Jelly formed ?

The eggs when pass through oviduct are enveloped by liquid, viscous albumin which swells by absorbing water, when comes in contact with it, and becomes very thick transparent and colorless jelly. This Jelly does not permit the entry of any sperm through it.

- (2) State the function of endoskeleton.

The functions of endoskeleton are as follows :

- (1) It gives shape to and maintains the shape of a body.
 - (2) It provides support and protection to the soft parts.
 - (3) It provides surface for the attachment of muscles
 - (4) It acts as a lever system.
- (3) Location and function of Basal granules.

Location – They located in the cytoplasm of ciliated epithelium.

Function – They give rise to cilia.

- (4) What is peristalsis?

The passage of food through the alimentary canal or digestive system due to the rhythmic

contraction and relaxation of the muscles of the wall of alimentary canal is called peristalsis.

- (5) State from which embryonic layer kidney & urinary bladder are derived?

Kidney is derived from mesoderm and urinary bladder is derived from endoderm.

- (6) State three major veins which join to form precaval vein.

External jugular, innominate and subclavian vein.

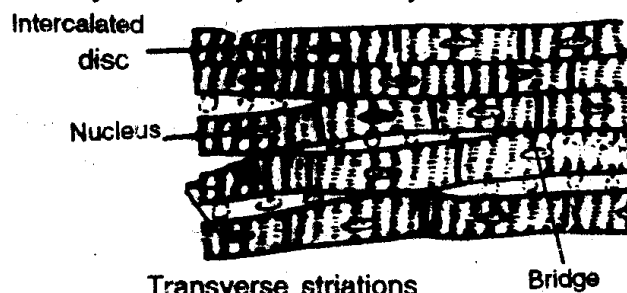
(B) ANSWER THE FOLLOWING QUESTION:

- (1) Describe : Cardiac muscular tissue

This is a special type of muscular tissue that forms the wall of the heart. It is also an involuntary muscular tissue. Its contraction and relaxation occurs rhythmically and never get fatigued. Its fibres, like that in striated muscles, show A and I bands but the sarcolemma is relatively less developed and the nucleus is embedded in the

cytoplasm as in non-striated muscle fibres. As special features the cardiac muscles are not as separate fibres but form a continuous reticulate structure because of the oblique cytoplasmic bridges connecting the adjacent fibres at several places. In addition, the fibres show thick and dark transverse bands, called intercalated discs at regular intervals. Each fibre contains several nuclei but a single nucleus between two consecutive intercalated discs. These muscles are innervated by nerve fibres from the vagus nerve and also from autonomous nervous system.

Controlled by voluntary nervous system.



14.11 : Cardiac muscular tissue

Cardiac muscular tissue

- (2) Write a note on Autonomous Nervous System.

The autonomous nervous system comprises of

- Sympathetic Nervous System &
- Parasympathetic Nervous System.

(a) Sympathetic Nervous System:-

- It is formed of sympathetic ganglia, sympathetic cords and the non-medullated nerve fibres arising from the sympathetic ganglia.
- A pair of sympathetic chains run along the outer sides of & parallel to the systemic arch & dorsal aorta.
- Anteriorly these chains enter the cranium & join with the gasserian ganglia. Each gasserian ganglion is also connected with the vagus ganglion.
- The sympathetic nervous system forms a cardiac plexus around the heart and the associated parts anteriorly & forms a solar plexus posteriorly.

(b) Parasympathetic Nervous System:-

- It is divided into (1) a Cranial section & (2) a Sacral section.
- Very fine nerve fibres arising from some of the cranial nerves form a nerve plexus which constitutes the cranial section.
- While the fine nerves fibres arising from the posterior spinal nerves form a nerve plexus that constitutes the sacral section.

- The sympathetic and the parasympathetic nervous systems are functionally complementary & contradictory to each other. e.g The rate of heart beats increases when the parasympathetic nervous system is excited while it decreases when the sympathetic nervous system is excited.

(3) Functions of liver with respect to excretion.

Excretory Function:

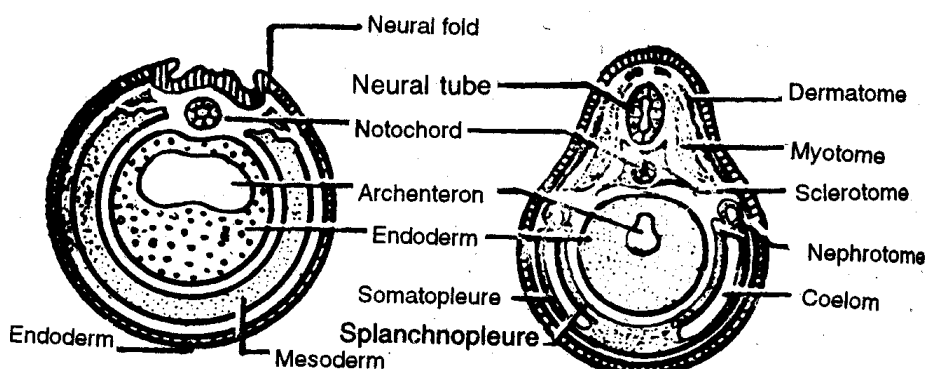
- The toxic ammonia produced due to protein digestion when brought by the blood into liver is converted in harmless urea.
- The NH_2 produced due to deamination of surplus amino acids in liver, is converted by the liver into harmless urea.
- Liver facilitates disintegration of haemoglobin released into the blood due to haemolysis of RBC and converts it into bile pigments known as bilirubin & biliverdin which will be excreted out of the liver along with the bile juice.
- Liver excretes calcium salts and cholesterol along with the bile juice.
- Indole, Cresole, Skatole & carbolic acid are the toxic gaseous substances produced due to incomplete oxidation of proteinous faecal matter by the bacteria in the rectum of digestive system. When these toxic wastes are brought by blood from rectum into liver they are decomposed to form harmless urea.
- Liver also disintegrates old damaged R.B.C.'s.

(C) DESCRIBE IN DETAIL:

(1) Organogenesis from mesoderm :

The mesodermal cells lying above the archenteron and beneath the neural plate get differentiated into vacuolated cells that form a compact, elastic rod-like structure called notochord. The formation of the notochord is called notogenesis. The notochord, now, becomes distinctly distinguishable from the rest of the mesoderm.

The mesoderm that lies on both the lateral sides of the notochord forms a thick, solid layer which gradually encloses the entire archenteron. Two longitudinal grooves develop along each of the lateral sides that divide the mesoderm into an epimere a mesomere and a hypomere. The epimere lies dorsally close to the notochord and divides into a few solid, more or less cuboidal



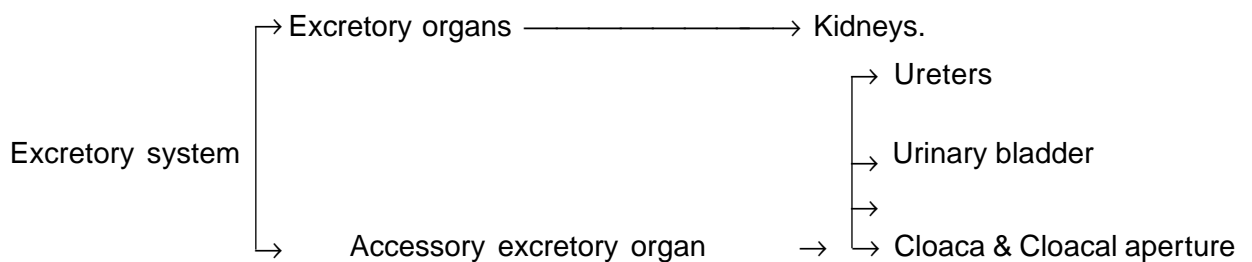
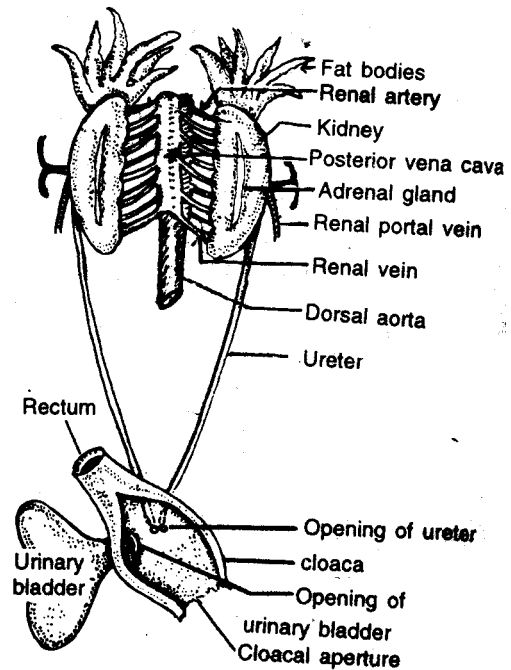
Differentiation in mesoderm

mesodermal somites, arranged in a linear row on each side of the notochord. Such an arrangement of somites is called metameric segmentation. Gradually each somite gets differentiated into an outermost dermatome, a myotome and the innermost sclerotome from which the dermis of the skin, muscles of the dorsal body wall and the skull as well as vertebral column develop respectively. The mesomere is also termed as nephrotome from which the reproductive organs

as well as excretory organs, other than urinary bladder, develop. The hypomere is, initially, a solid band of mesoderm. In the hypomere. On each side, there develops a longitudinal slit that splits the hypomere into two layers, the outer known as somatic mesoderm and the inner, splanchnic mesoderm. The space between these two layers gradually enlarges and forms the body cavity (coelom). The dermis of the skin of the ventral and lateral body wall, the muscles of the body wall, the appendicular skeletal tissue and other connective tissues develop from the somatic mesoderm, while the muscles and connective tissues of the alimentary canal develop from the splanchnic mesoderm. The somatic mesoderm joins with the ectoderm and forms somatopleure, while the splanchnic mesoderm joins with the endoderm and forms splanchnopleure. The mesoderm on the ventral side of the archenteron gives rise to the entire circulatory system.

(2) Excretory system of frog.

- The organs engaged in the removal of nitrogenous wastes like urea, uric acid, ammonia, creatinine, creatine, etc. from the body, together form the excretory system.
- The excretory system of frog possessing the following structures:



KIDNEYS:

- Each kidney is dorsoventrally flattened & oblong in shape.
- They are dark red in colour.
- The outer margin or surface is simple & slightly convex while the inner margin possesses several notches.
- A yellow streak like adrenal gland is located on the mild-ventral surface of kidney which runs longitudinally.
- Kidneys are located in the subvertebral lymph sinus dorsally to, & outside the body cavity.
- The ventral surface of each Kidney is covered by peritoneum.
- Funnel shaped ciliated bodies known as nephrostomes are located on the ventral side of the kidneys.

- Nephrostomes are wide externally & narrow internally.
- The broad end opens into body cavity & the narrow end opens into renal reins,

URETERS:

- They arise from the anterior end of kidney & run inside the kidney along the outer margin and emerge posteriorly.
- They move downwards and finally open into cloaca from its dorsal side.

URINARY BLADDER:

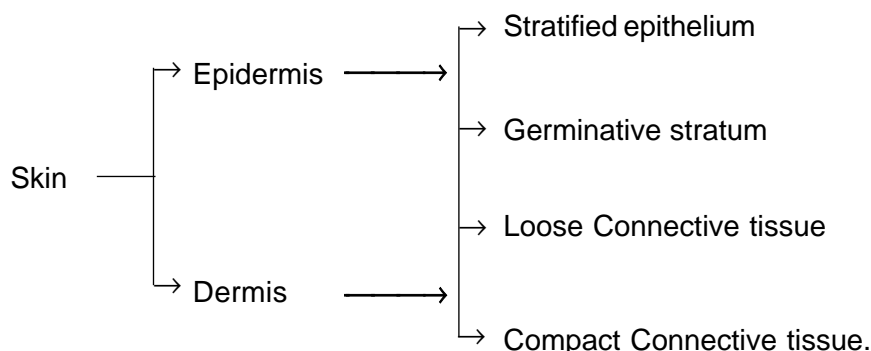
- It is thin walled, bilobed sac-like structure possessing non – striated muscles in its wall.
- It is located at the ventral wall of the cloaca.
- It opens into ventral wall of cloaca through a large aperture.
- Urinary bladder store urine for expulsion.

CLOACA:

- It is the hindermost part of the alimentary canal.
- The ureters, urinary bladder & in female frog the oviducts open into it.

(3) INTERNAL STRUCTURE OF SKIN & ITS FUNCTIONS.

- The skin of frog is thin, moist, slimy, highly vascularised and devoid of any type of exoskeleton.
- Histologically it can be divided into two regions:-

(1) The Epidermis & (2) The Dermis**EPIDERMIS :**

- It is formed of stratified epithelium which arises from the ectoderm.
- It forms the outer compactly cellular region of the skin.
- The innermost layer of cells of the epidermis rests on basement membrane and consists of – more or less columnar cells having large distinct nuclei.
- The cells of this layer being capable of dividing the layer is called germinative stratum or Malphigian layer.
- Its cells divide & produce new cells which do not divide but are pushed continuously toward the outer side and therefore become more & more flat with diminishing activity.
- The outer layer of cells form the stratified squamous epithelium which is protective in function.
- The outermost layer is removed by friction & replaced by the new cells from within.
- The surface of the epidermis possesses a large number of pores – the openings of the mucous glands.

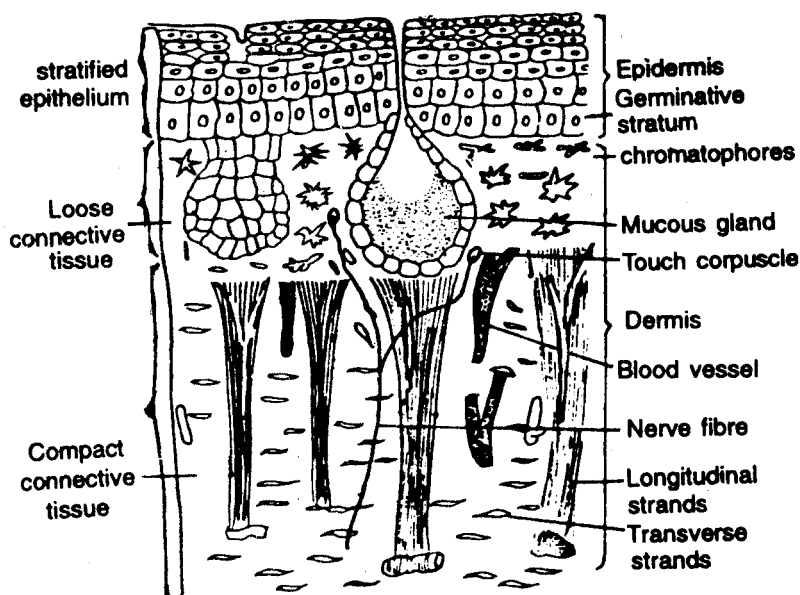
DERMIS:

- It is mesodermal in origin.
- It chiefly consists of connective tissue.

- The dermis consists of an outer, relatively thin layer of loose connective tissue and an inner thicker layer of compact connective tissue containing tissue containing transverse & longitudinal strands of muscles, blood vessels & nerve fibres.
- A large number of flask – shaped mucous glands arise from the epidermis.
- The bulbous part of these glands extends in the loose connective tissue of dermis while the narrow neck remains in the epidermis and opens on the outer surface by a pore.
- The nerve fibres have their nerve endings in the loose connective tissue forming **touch corpuscles**.
- The blood vessels capillaries profusely in the loose connective tissue close to the epidermis.
- There are several chromatophores containing melanin pigments beneath the epidermis especially in the skin of the dorsal & dorsolateral sides of frog.
- The chromatophones impart colour to the skin of frog.

FUNCTIONS OF SKIN :

- (1) It forms a complete envelope around the body & renders protection to the internal soft parts of the body.
- (2) The slimy covering over the epidermis protects the body against bacteria & fungi & helps to escape easily from the grip of enemies.
- (3) The skin can change its colour to some extent in order to match the surroundings and protect the animal from the enemies.
- (4) The frog does not drink water but absorbs it through the skin.
- (5) The skin acts as a general sense organ.
- (6) It is a chief respiratory organ when the frog is on land & the sole respiratory organ when the animal is in water & in soil.
- (7) The skin of ready to hatch tadpole secretes an enzymes that soften and partly dissolves egg membrane to facilitate hatching.



A. 4 (A) Answer briefly.

- (1) Contained genes :
When a single gene segment has other genes in it, such genes are called contained genes. Such genes are observed in PHI(ϕ)X-174 virus.
- (2) Why petite mutant yeast produces fewer ATP molecules.
Petite mutant yeast have abnormal mitochondria. The inner mitochondrial membrane lacks the cytochrome system thus producing fewer ATP molecules.
- (3) What is Philadelphia syndrome?
When there is loss or deletion of a small segment of the long arm of chromosome 22, it results in Philadelphia syndrome in children such children may have leukemia.

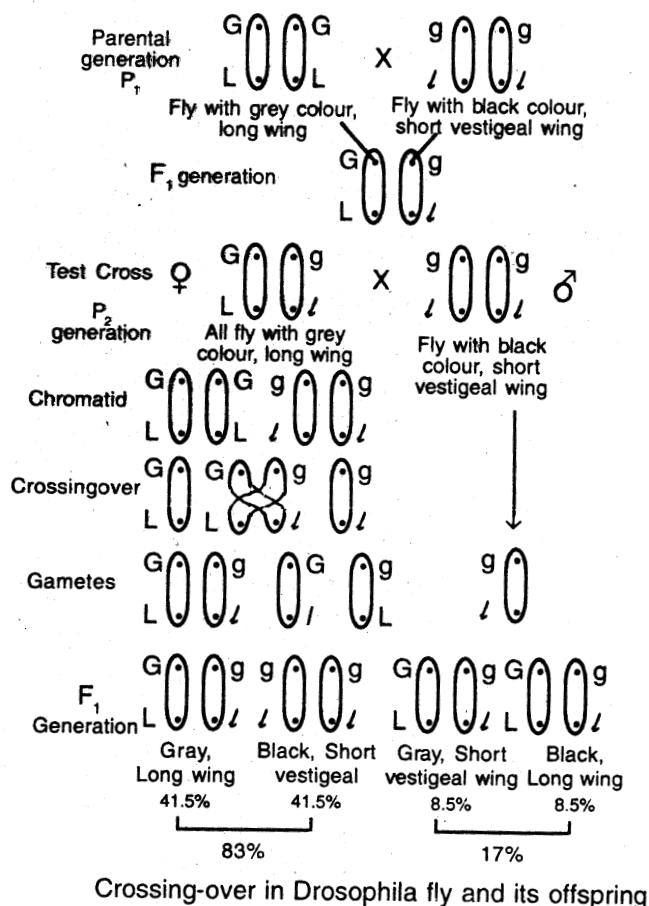
(4) What are okazaki fragments.

During DNA replication, the lagging strand cannot be synthesized straight but is synthesized discontinuously in short piece of 1000 to 2000 nucleotides. These pieces are called okazaki fragments.

(B) Complete Linkage rarely occurs explain through Morgan's experiment on Drosophila.

In *Drosophila melanogaster* the gene for body colour is linked to the gene for wing length. Gene G is for grey colour and gene g for black colour. Gene L is normal long wings and the l for short vestigial wings. Genes G and L are dominant genes.

When *Drosophila* with grey body and long wings (GGLL) are crossed with species of black colour and short wings (ggll) the off springs of F₁ generation are all grey with long wings. During test cross with recessive parent. Four different phenotypes are seen in F₂ generation but not in the Mendelian ratio of (1:1:1:1), 83% resemble the parents while only 17% show two different characters.



Crossing-over in *Drosophila* fly and its offspring

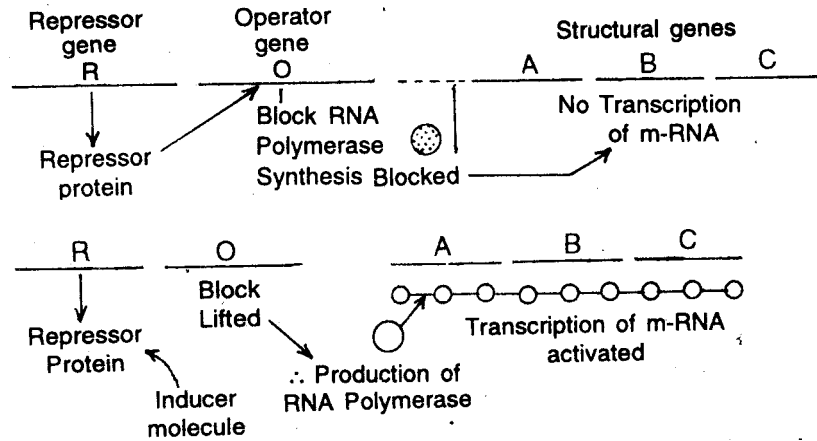
Morgan explained that though genes of colour and length are Linked genes and are inherited together in most *Drosophila* making them resemble their parents but complete linkages rarely occurs. During meiosis, in pachytene stage of prophase I. Crossing over occurs and chiasma is formed when repulsion occurs during the dickineris substage exchange of genes occur resulting in alteration of genetic configuration of both homologous chromosome. Thus the 17% *Drosophila* differing from their parents are the result of crossing over this shows complete linkage rarely occurs.

(C) Answer as directed : (any two)

(1) Explain in detail operon model of gene regulation.

Jacob and Monod studied in detail the regulatory mechanism of gene expression in *E. coli* and came to the conclusion that other genes are also involved in the expression of one or more genes.

Structural genes A, B, and C are three associated genes which are controlled by one operator gene (O) and a repressor gene (R). A repressor protein produced by repressor gene (R) blocks the operator gene (O) thereby inhibiting the synthesis of RNA polymerase. Thus transcription cannot take place on structural gene A, B, C...



Thus when protein synthesis is required inducer molecules inhibits the repressor protein to stimulate the functioning of operator genes RNA polymelase is synthesized to transcribe in RNA.

(2) Explain the phenomenon of Sex determination in man.

In man, the female chromosome constitution is 2A + XX producing egg cells of A + X chromosomal constitution.

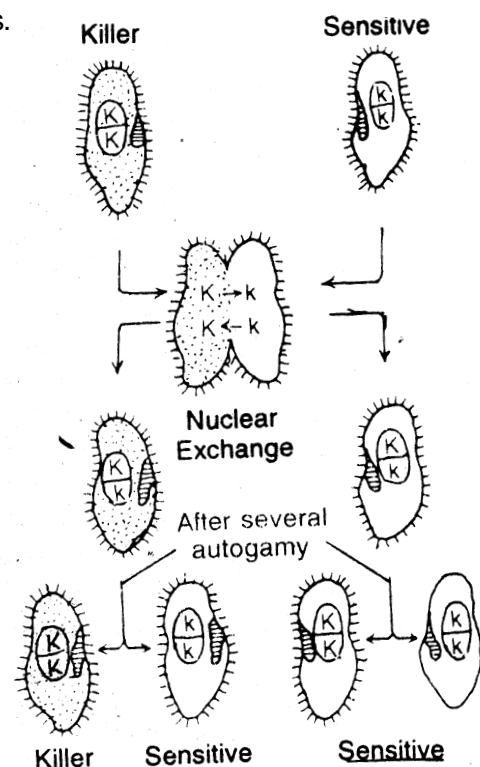
The male has 2A + XY chromosomes man produce sperms of two types – A+X and A + Y.

- Sex determination in man depends upon the type of sperm that fertilizes the egg cell.
- During the 6th week of embryo development, the gonads are simple, un differentiated and bipotential.
- The presence of Y chromosome and the gene TDF (Testis determining factors) are responsible for the development of male gonads (testis) and maleness.
- At the 8th week of embryonic development TDF causes the inner medulla of geiminal layer to form a testis.
- It then starts the secretion of androgens which cause development of male internal reproductive organs and external genetalia
- Sertoli cell of testis secrete MIS (Mullerian inhibitory factor) which suppresses development of female duct system.
- In the absence of Y chromosome the cortical regions of germinal layers differentiates to form an ovary.
- In absence of androgens and MIS, the female duct system develops.
- In this way during fertilization sex detemination occurs.

(3) Extra-nuclear inheritance in Animals

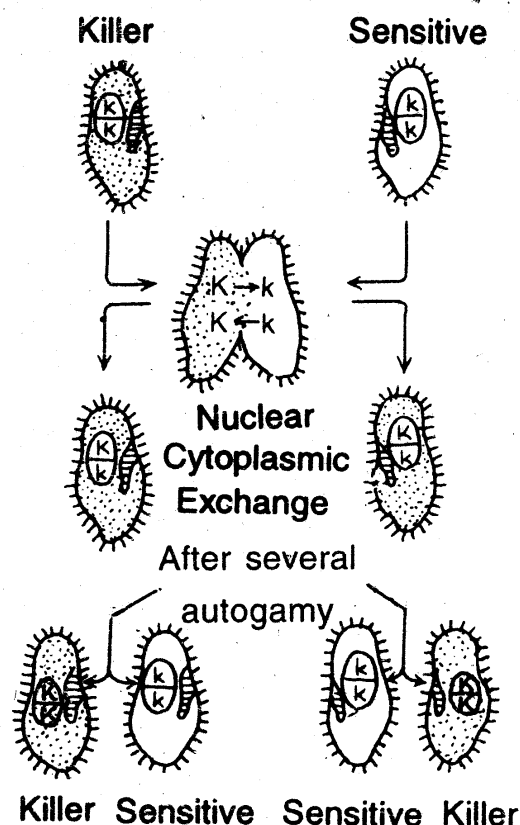
According to molecular genetics, kappa particles appear to be like virus particles, which consist DNA within. Their number increases by multiplication. These particles produces poisonous, water soluble protein, named paramecin. The paramecium not possessing kappa particles is killed by its toxic effect when particles diffuse in water. Thus paramecium with kappa particles is a ``killer'' strain and the paramecium without kappa particles, which is killed by the toxic effect of these particles, is known as ``sensitive'' strain.

The maintenance of such particles is under the control of a dominant allele K. The



recessive allele is k . it is found that dominant allele K in the form of homozygous genotype (KK), recessive allele k in the form of homozygous genotype (kk) or heterozygous genotype (Kk) is present in the nucleus of these species of paramoecium.

Paramoecium reproduces in 2 ways asexually and sexually. Most often paramoecium reproduces asexually through binary fission to produce a progeny of Paramoecium, which bears its parental characters. Periodically paramoecium reproduces sexually by conjugation. The chromosomal constituents of young paramoecia is changed due to meiosis which occurs during conjugation. In paramoecia, this conjugation can take place for a short duration or longer duration.

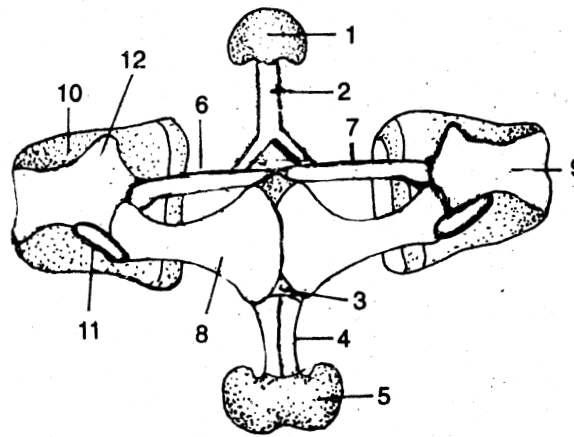


If a homozygous dominant (KK) paramoecium with kappa particles (Killer strain) and a homozygous recessive (kk) paramoecium without kappa particles (sensitive strain) are allowed to conjugate for short duration, there is only an exchange of nuclei, but there is no exchange of cytoplasm. After which separated exconjugants genotypes become Kk (heterozygous). Even the killer paramoecium with kappa particles remains killer, while the other paramoecium without kappa particles remains sensitive (heterozygous). After conjugation each paramoecium reproduces similar type of paramoecium for several generation by binary fission. This suggests that there is no relationship between dominant allele Kk , and the production of kappa particles.

If the process of conjugation takes place between the above mentioned two different strains of paramoecium for a longer period of time, then along with the exchange of nuclear material, cytoplasmic exchange also occurs, the kappa particles of killer-strain paramoecia thus enter into the sensitive strains and both turn into killer strains and the genotype of both turn into killer strains and the genotype of both paramoecia becomes Kk (heterozygous). Both the separated paramoecia reproduce killer paramoecia by binary fission, after the conjugation is completed. Once the conjugation between heterozygous (Kk) paramoecia is over, one of the separated offsprings of paramoecium is a killer because it consists kappa particles, even though it has homozygous recessive (kk) genotype. But after several generation the offsprings produced by binary fission become sensitive (without kappa particles), while the offsprings of paramoecium with KK (homozygous dominant) and Kk (heterozygous) genotype remain killer. This shows that the dominant allele K in paramoecium is necessary for the maintenance of kappa particles as well as for the production of paramecin substance.

(D) Draw labeled diagram: (Any one)

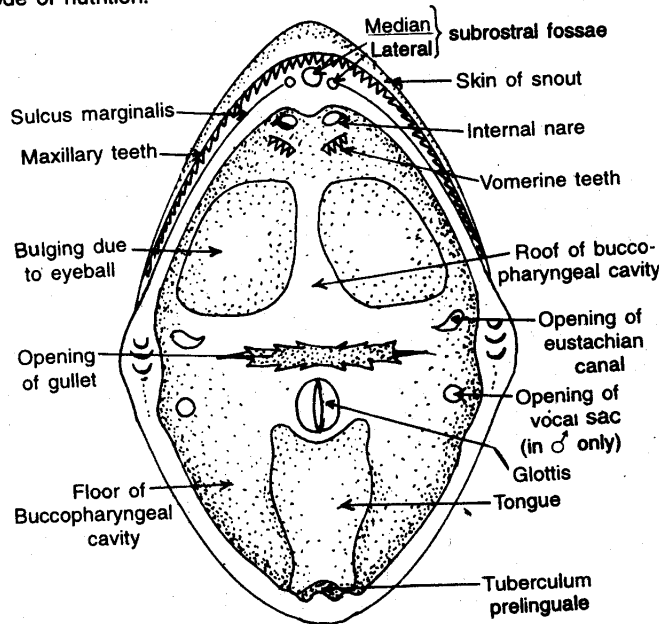
(1) Pectoral girdle.



1. Episternum 2. Omosternum 3. Epicoracoid 4. Mesosternum
5. Xiphisternum 6. Precoracoid 7. Clavicle 8. Coracoid 9. Scapula
10. Suprascapula 11. Glenoid cavity 12. Acromion process
Pectoral girdle

(2) Open Buccopharyngeal Cavity of frog.

The frog, like man, takes solid food and hence it shows holozoic mode of nutrition.



Open Buccopharyngeal Cavity

A. 5 (A) Answer briefly.

(1) What is anaphylactic shock?

During severe allergic reactions, sometimes death of patient occurs. Due to super sensitivity to an allergen. This is called anaphylactic shocks eg. Injection of penicillin., sting of scorpion or honey bee.

(2) Explain green house effect.

Solar radiation reaching the earth surface are reflected as infra red rays. Due to accumulation of CO₂ other harmful chemicals in the atmosphere. These radiations are absorbed causing the rise in temperature and melting of ice in polar regions. This is called green house effect.

(3) State the full form of ELISA and SPET.

ELISA stand for enzyme linked immuno absorbent assay.

POM : Polycyclic Organic Matter

- (4) Name the carcinogens causing cancer of liver.
Aflatoxins and Vinyl chloride (VCM) are the carcinogens that can cause cancer of liver.
- (5) What is social forestry?
The phenomenon of developing forests on the common. Part of the village and other non-productive land with the help of local people is called social forestry.
- (6) Cohen synthesized c-DNA, which is functionally active for the recombination of genes, and prepared "**Somatostatin**" with its help.

(B) Answer as directed (any two)

- (1) Role of micro organisms in nitrogen cycle.
Rhizobium, Azotobacter clostridium and Anabaena. fix atmospheric nitrogen and. Nitrifying bacteria convert ammonia to nitrites and nitrates which can be utilized by plants. Denitrifying bacteria such as Pseudomonas convert nitrates to atmospheric nitrogen to complete the biogeochemical cycle of nitrogen.
- (2) Symptoms of hepatitis
Inflammation of liver, yellowish appearance of skin and the sclerotic coat of eyes, rise of bilirubin in blood, rise in body temperature nausea vomiting, pain in the abdomen, dark yellow urine, pale yellow stools, fatigue and weakness are the symptoms of hepatitis.
- (3) Functions of health centres.
The function of health centre is to maintain good physical, mental and social health of every individual of the community. Main function of health centre are Medical care, Health related training, Establishment of clean environment, Control and Treatment of infectious Diseases - Vaccination and Mother - Child health care and Family welfare.
- (4) Write a note on tissue culture technique.
In tissue culture technique the cells of desirable quality of plant and cells of plant that can normally grow in that environment are fused with each other to produce new hybrid cell type. These hybrids are cultured in suitable media to get numerous such desired plants.

(C) Answer any two :

- (1) What are B cells? How do they react against an antigen.
The Lymphocytes produced in the bone marrow remain in the bone marrow for maturation are termed B cells. When any antigen invades the body fluid, the B-cells get induced to produce antibodies against it. Several different types of B-cells are present in the body which are capable of fighting against definite types of antigens. The cell membrane of each type of these cells becomes sensitive once it comes in contact with a particular type of antigen. In case the B-cells fail to become sensitive they become useless and ineffective. The B-cells are continuously produced in the body. Once the B-cells come in contact with the antigen, they start producing thousands of cells possessing specific type of antibodies in the blood plasma. However, the presence of antigen is inevitable for the production of antibodies. The antibody is a specific type of protein called immunoglobulin (Ig). Its polypeptide shows specific type of fold for a specific type of antigen. This fold is known as antigen-binding site. The antibody binds with the specific antigen and converts it into insoluble form through the process of agglutination. The other cells of the immune system render them ineffective and destroy. Specific type of immunoglobulin molecules spread over the surface of antigen to facilitate the phagocytes to identify and engulf them. This phenomenon is known as opsonisation. Immunoglobins such as Ig-G and Ig-A activate certain enzymes which

act as complement or complement system. The activated enzymes destroy the invading cells by forming pores in their plasma membrane.

(2) Cancer Therapy :

If early detection and regular treatment is carried out in time, about 80% of cancer patients can be cured. The cure of cancer depends on the type of cancer and the progress of cancer. There are three major ways in which treatment of cancer can be carried out.

(1) Surgery : A part of the cancerous tissue can be removed surgically i. e. by operation. This method can be applied in the primary stages of cancer of the breast, cheek, anterior portion of the tongue, larynx, uterus and skin.

(2) Radiation therapy : X-rays, cobalt rays, high density electron beams can be administered as therapy in various types of cancers. In most of the cancers involving the throat, only sonic or thermal beams may be applied, while in other cases, this therapy may be used after surgery. In cases of uterine or cervical cancers, pellets emitting radiation are placed using special instrument. In Radiation therapy β or γ rays are used. The principle behind such radiation therapy is that the radioactive isotopes like Radium and Cobalt emit β and γ rays respectively which penetrate the skin and reach the internal part of the body tissues. Radiation affects the cancer cells more significantly than it does to normal cells. This special property of cancer cells being more sensitive to radiation is made use of, in radiation therapy. Within several hours after administration of a specific dose of radiation, the cells stop dividing or cell division is arrested. Within one week of proper radiation therapy, cancer cells stop proliferating and starts dying (necrosis).

(3) Chemotherapy : Besides surgery and radiation, certain anticancer chemicals are used to treat cancer. This is termed as chemotherapy. These chemicals or drugs selectively act on cancer cells and inhibit their cell division and cell growth. These drugs impart their destructive effect more on cancer cells than on normal cells. Hence, these drugs are known as 'Anti-cancer drugs.' Several other like anthromycin, cebrumycin and few other specific antibiotics are used to inhibit the activities of cancerous cells.

Besides above mentioned three major procedures utilized for treating cancer, other techniques such as using certain hormones, antibodies or Immunotherapy have been developed. Certain types of cancers of the breast, uterus and prostate gland can be treated by hormone therapy.

(3) Note on AIDS.

AIDS stands for Acquired immuno deficiency syndrome, human immunodeficiency virus HIV is the causative agent. HIV-1 and HIV-2 are two types of viruses. These viruses on entering the T-cells, multiply in them and destroy them. The symptoms of the disease may not be apparent for quite some time though by blood test, presence of HIV can be detected.

AIDS is spread by sexual intercourse with HIV positive person. It can also be caused by blood transfusion, infected organ transplanted by using contaminated syringes and needles. An infected pregnant woman can transmit the disease through the placenta to the foetus.

AIDS can be diagnosed by ELISA test or using Western Blot technique. There is no treatment to completely cure AIDS. Precautions is only way to protect one self from AIDS.