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**Grand
Test**

**HSC Examination
Biology Code - Set - A**

SOLUTIONS

SECTION - A

[A] Answer the following questions : (One mark each) [1 × 8 = 8]

1. (A) t-RNA
2. (B) protogyny
3. (C) Optic
4. (A) Bombyx mori
5. The precipitation of water soluble inorganic nutrients in the form of salts inside the soil horizon is called leaching.
6. Steward Linn and Werner Arber isolated two enzymes 1963 which restricted the growth of bacteriophage in bacterium *E. coli*.
7. Failure of testes to descend from abdomen into scrotum leads to sterility called cryptorchidism.
8. Charas is derived from the plant '*Cannabis sativa*'.

SECTION - B

[B] Answer the following questions : (Two marks each) [2 × 10 = 20]

9. In the sea, phytoplanktons are found in large number. However, their biomass is always less than the biomass of fishes which are dependent upon these phytoplanktons. Hence, the pyramid of biomass in the sea is inverted. [2 M]
10. The process by which non-coding regions (introns) on hnRNA are removed and coding regions (exons) are joined to produce mRNA is called splicing. [1 M]
Splicing is necessary in eukaryotic to remove the non-coding introns from hnRNA to produce a meaningful functional mRNA. [1 M]
Prokaryotes do not have introns in the mRNA.
11.
 - i. Ribosomes are granular organelles which do not have any enclosed membrane. Ribosomes are present in both prokaryotes and eukaryotes and are associated with protein synthesis. **[½ M for each point]**
 - ii. Ribosomes are composed of approximately 65% r-RNA and 35% proteins.
 - iii. Each prokaryotic ribosome has two subunits with 30S and 50S sedimentation coefficient, which combine to form 70S type of ribosome.
 - iv. Similarly, eukaryotic ribosome has two subunits with 40S and 60S sedimentation coefficient, which combine to form 80S type of ribosome.

12.

No.	Class of characters	Contrasting form / traits	
		Dominant	Recessive
i.	Height of stem	Tall (TT)	Dwarf (tt)
ii.	Colour of flower	Coloured (CC)	White (cc)
iii.	Position of flower	Axial (AA)	Terminal (aa)
iv.	Pod shape	Inflated (II)	Constricted (i
v.	Pod colour	Green (GG)	Yellow (gg)
vi.	Seed shape	Round (RR)	Wrinkled (rr)
vii.	Seed colour (cotyledon)	Yellow (YY)	Green (yy)

[2M]

13. Microbes play a significant role during secondary and tertiary sewage treatment.

- i. During secondary treatment, primary effluent is continuously agitated in a large tank due to which vigorous growth of useful aerobic microbes into flocs takes place. These microbes consume a major part of the organic matter in the effluent as they grow. Due to this, BOD of the effluent is significantly reduced. [1 M]
- ii. During tertiary treatment, bacterial flocs are allowed to sediment. A small part of its is passed back into the aeration tank and a major part is pumped into large tanks called anaerobic sludge digesters. These anaerobic bacteria digest the bacteria and fungi in sludge. [1 M]
- iii. Thus, use of microbes in sewage treatment helps to remove organic matter and reduce of BOD from waste water before it is discharged in natural water bodies like rivers.

14. Transgenic animals are those animals which have their DNA manipulated to possess and express foreign gene. Transgenic animals are useful to the human beings in the following ways: [1 M]

- i. **To serve as a model for study of diseases:** [½ M]

Transgenic animals help us to study how genes contribute to the development of diseases and for investigation of new treatments for diseases. Transgenic animals are now available to study cancer, rheumatoid arthritis, cyclis fibrosis, Alzheimer's disease, etc. [1 M]

- ii. **To act as bioreactors for obtaining biological products:** [½ M]

Transgenic animals are created to produce various various biological compounds, pharmacologically important proteins or molecule, into the animaland using these animals are bioreactors to produce important bio-products.e.g Rosie, the first transgenic cow produced milk containing human protein, alpha lactalbumin, transgenic animals produce $\alpha - 1 -$ antitryp sin which is used to treat emphysema

15.
 - i. In MOET technology, cow is administered with follicle stimulating hormone (FSH).
 - ii. It induces follicular maturation and super-ovulation is brought about. [½ M for each point]
 - iii. By this technique, in each cycle, 6-8 eggs mature simultaneously.
 - iv. Cow is either mated with elite bull or artificially inseminated.
 - v. Blastocysts at 8-32 cell stage are recovered non-surgically and transferred to surrogate mother.
 - vi. Genetic mother is available for another round of super ovulation. *[Any four correct points - 2 marks]*

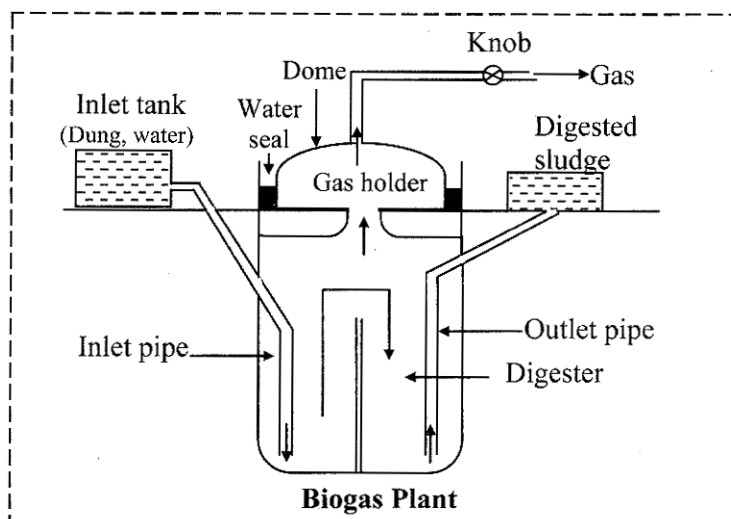
16. Commensalism is an interspecific interaction in which one species is benefited and the other one is neutral (neither benefited nor harmed). [1 M]Two examples of commensalism are : [1 Mark - ½ each example]

- i. An orchid plant growing as an epiphyte on a mango tree.
- ii. Sea anemone and hermit crab.

17. i. Excretion of guanine (a nitrogen base) is called guanotelism. [1 M]
 ii. Animals showing guanotelism are called guanotelic. [2 Examples 1 M]
 iii. Guanotelism is seen in spiders, scorpions and penguins.

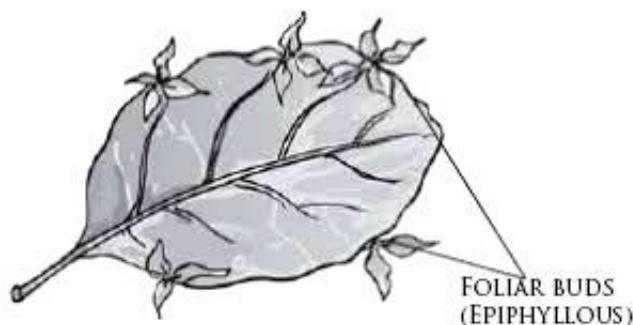
OR

17. Composition of urine :
- i. Amount of urine produced depends upon the food and fluid consumed by the individual.
 ii. About 1.2 to 1.5 litres of urine is produced per day. [½ M]
 iii. The yellow colour of urine is due to presence of pigment called urochrome. [½ M]
 iv. It shows the presence of 95% water, organic substances like urea (2.5%), uric acid, creatinine (formed in muscles). [1 M]
18. [Diag. 1 M, 4 labels 1 M]



SECTION - C

- [C] Answer the following questions : (Three marks each) [3 × 9 = 27]
 19. Vegetative propagation by leaf : e.g. *Bryophyllum*, *kalamchoe*, *Begonia*. [½ M ex.]



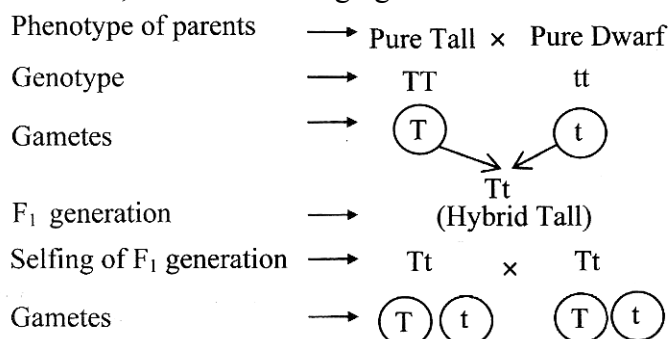
[1 M]

- i. In some plants, leaves also take part in vegetative propagation. [½ M explanation]
 ii. In *Bryophyllum*, leaves are succulent with notched or crenate margin.
 iii. Adventitious buds called epiphyllous buds are developed on the leaves. These buds start sprouting on the leaf to form the plantlets.
 iv. These plantlets fall off from parent plant to continue their growth in the wet soil.

- v. In some species of *Bryophyllum*, the new plants are formed from the leaf only when the leaf is separated from the parent plant and fall on the wet soil.
- vi. In *Begonia*, foliar buds are formed on the leaf surface.
20. Law of segregation states that "Members of allelic pair in a hybrid remain together without mixing with each other and separate or segregate during gamete formation. [1 M]

Explanation : [2 M]

- Each organism contains two factors for each trait in its diploid cells and the factors segregate during the formation of gametes.
- Each gamete then contains only one factor from each pair of factors and are pure for a given a trait.
- When fertilization occurs, the new organism has two factors for each trait, one from each parent.
- When Mendel crossed a homozygous tall plant (TT) with a homozygous dwarf plant (tt), the offspring was found to be a hybrid tall (Tt).
- The hybrid tall thus produced has two alleles, viz. 'T' (tallness) and 't' (dwarfness). During gamete formation, the two alleles, viz. 'T' and 't' segregate as shown below.



The two alleles (contrasting characters) do not mix, alter or dilute each other and the gametes formed are 'pure' for the characters which they carry. Hence, this law is also called the law of purity of gametes.

21. The biological tools used in recombinant DNA technology are as follows:

- i. **Enzymes :** It requires use of different enzymes such as : [Name of tools 1 M & explanation 2 M]

No.	Class of enzyme	Examples
a.	Lysing enzyme	Lysozyme
b.	Cleaving enzymes (Molecular scissors)	Restriction endonucleases
c.	Synthesizing enzymes	Reverse transcriptase; DNA polymerase
d.	Joining enzyme	DNA lipase
e.	Manipulating enzyme	Alkaline phosphatase

- Vectors :** It is a carrier DNA molecules to which the fragments of desired DNA are attached and carried to the required site.
It may be a plasmid or cosmid DNA or bacteriophage DNA or DNA from plant and animal viruses or artificial DNA, etc.
- Target DNA or Foreign DNA or Desired Gene :** The desired fragments of DNA (gene or genes) which are to be transferred from one organism to the other by using some vector is called target DNA. e.g. Nif gene, insulin gene, etc.
The cell or the organism from which the desired gene is taken is called 'donor'.
- Host :** It is the cell where recombinant DNA is allowed to multiply to produce several copies. e.g. Bacteria, yeast, etc.
The host should be non-pathogenic, harmless microorganism which is easy for cultivation.
The bacterium *Escherichia coli* is the most commonly used host in recombinant DNA technology.

22. The different steps involved in tissue culture technique are : **[Main points 1 M, Explanation 2 M]**
- i. Explant culture :**
Tissue or plant part that is excised from the original plant and is used for initiation of a culture is known as explant. e.g. root apex, shoot apex, pollen grains, etc. The explants are sterilized properly and placed on solid nutrient medium. The cell from explants absorb nutrients and start multiplying.
 - ii. Callus formation and its culture :**
Callus is unorganized mass of loosely arranged parenchyma cells which develop from explant tissue due to proliferation of cells.
All the cells of callus are identical because they are produced by mitosis only.
 - iii. Organogenesis :**
Growth hormones like auxins and cytokinins in proper proportion are provided to the callus to induce formation of organs.
If auxins are more, roots are formed (rhizogenesis) and if the cytokinins are in more quantity, then the shoot system begins to develop (caulogenesis).
 - iv. Formation of cell or suspension culture :**
Callus is transferred to liquid nutrient medium and then it is agitated constantly at 100-250 rpm. Due to agitation, cells from callus get separated.
Agitation prevents the aggregation of cells, also serves the purpose of aeration and mixing of medium. Suspension culture grows much faster than callus culture. They need to be sub-cultured every week.
 - v. Transplanting :**
The healthy plantlets are transferred to soil in pots. They are kept in growth chambers and then in glass houses. Gradual exposure of plantlets to the environment is called hardening. The hardened plants are then transferred to the field.
23.
 - i. The process which produces recombination of genes by exchanging corresponding segments between non-sister chromatids of homologous chromosomes is called 'Crossing over'. **[Definition 1 M]**
 - ii. The process of crossing over involves four steps - synapsis, tetrad formation, crossing over and terminalization.
 - iii. Synapsis occurs in the zygotene stage of prophase I of meiosis. **[Explanation 1 M]**
 - iv. Homologous chromosomes (bivalent) form a pair called synapsis.
 - v. **Crossing over** occurs in Pachytene stage of Prophase-I of meiosis.
 - vi. In this process, two non-sister chromatids of the bivalent first break at the corresponding points due to the activity of the nuclear enzyme endonuclease.
 - vii. The two non-sister chromatids cross each other at the point of break and exchange segments leading to recombination.
 - viii. The points where crossing over takes place are called Chiasma or Chiasmata.
24. *Australopithecus* can be considered as connecting link between ape and man because of the following ape-like and man-like characters: **[Explanation and 6 points 3 M]**
- i. The ape-like characters of *Australopithecus* :
 - a. The jaws and teeth are larger than those of modern man.
 - b. Face was prognathous and a chin was absent.
 - c. The eye-brow ridges projected over the eyes.
 - d. Their cranial capacity ranged from 450-600 cc.

- ii. The man-like characters of *Australopithecus*:
- It was about four feet in height, walked nearly or completely straight.
 - The vertebral column has a distinct lumbar curve with broad basin like pelvic girdle.
 - Dentition was man like because the dental arch was smoothly rounded parabola and a simian gap was absent.
 - Hands were used for non-locomotory functions like making tools. They used weapons of bones.

Thus, *Australopithecus* is rightly described as a man with ape brain.

25. Turner's syndrome (Sterile female) :

- It was described by H.H. Turner.
- Turner's syndrome is caused by non-disjunction of XX chromosomes due to monosomy, i.e. loss of one chromosome from the pair ($2n - 1$). [1 M]
- The sufferer possesses 45 chromosomes instead of 46, with only one sex chromosome (X).
- When an abnormal egg without any X chromosomes is fertilized by a sperm with X chromosome, the resulting baby contains XO chromosomes, i.e. 44 : XO.
- The phenotype of these patients is female.
- Symptoms :** [2 M (any 6 points)]
 - The baby is sterile and has a short stature.
 - Normal phenotypically, but no development of secondary sexual characters or menstruation at puberty.
 - Ovaries do not develop into a functional tissue.
 - Female sex hormone secretion is low.
 - The chest is broad and breasts are poorly developed.
 - Mental retardation.
 - Body height is less.
 - Webbing of skin on the neck, i.e. folds of skin are seen.
 - Uterus is very small.
 - Posterior hair line is low.

26. i. **Definition :** Ringworm is a clinical condition caused by fungal infection of the skin in humans, pets such as cats and domesticated animals such as sheep and cattle. [½ M]
- ii. **Causative agents :** Dermatophytes of the genera *Trichophyton* and *Microsporum* are the most common causative agents of ringworm. [½ M]
- iii. **Signs and Symptoms :** [4 symptoms - 1 M]
- Infection on the body shows typical enlarged raised rings of ringworm.
 - The groin is the common area of infection. As the rash gradually expands, it appears like a ring. The area sometimes become itchy and is termed as jock itch.
 - Ringform of foot is also called athlete's foot. It appears as a scaling or cracking of the skin especially between the toes
 - Ringworm of the nails (onychomycosis), causes the affected nails to become thicker, discoloured and brittle or become chalky and disintegrate.
- iv. **Treatment :** Antifungal lotion / cream / tablet [½ M]
- v. **Preventive measures :** [½ M any 2 points]
- Avoid sharing clothes, sports equipments, towels or sheets.
 - Avoid wearing barefooted and wear protective shoes and sandals
 - Washing clothes in hot water with fungicidal soap after suspected exposure to ringworm.
 - Keep common use areas clean, especially in school, day care centres, gyms and locker rooms
 - Disinfect sleeping mats and gym mats after each use. Do not share clothing towels, hair brushes or other personal items

27. i. **Blood Pressure** : Lateral pressure or force that the flowing blood exerts on the wall of arteries is called arterial blood pressure **[Explanation of blood pressure 2 M]**
- Systolic Blood Pressure** : (GK. Systole = contraction) : The maximum blood pressure during the contraction or systole of left ventricle is called systolic blood pressure. Its normal reading is 120mm Hg.
 - Diastolic Blood Pressure** : (GK. Diastole = Expansion) : The minimum blood pressure during the relaxation of heart muscles (ventricular diastole) is called diastolic blood pressure. Its normal reading is 80 mm Hg
- ii. **Instrument** : Sphygmomanometer is used to measure the blood pressure.
- iii. **Hypertension**: Blood pressure above normal range is called high blood pressure. (high BP) or hypertension. It is about 140 mm Hg/90 mm Hg or more.
- iv. **Factors Responsible for hypertension:** **[Hypertension 1 M]**
- Cholesterol rich diet
 - Smoking and Alcoholism.
 - Physical or emotional stress.
 - Old age.
 - Obesity.
 - Atherosclerosis and arteriosclerosis.
 - Increased secretion of renin, epinephrine or aldosterone, etc.
- v. **Hypertension is also called a silent killer.**

OR

27. i. **Atherosclerosis** **[1 M]**
- It is the condition in which there is deposition of saturated fats inside the inner wall of coronary artery or its branches.
 - This results in the formation of atherosclerotic plaque that decreases the size of the arterial lumen.
 - It leads to blockage in the artery and subsequently decrease blood flow to the heart.
- ii. **Pace maker** **[2 M]**
- A specialised patch of cardiac muscle present in the wall of right atrium near the right side of right atrium [opening of precaval vein] is known as SA node or SAN
 - Sinoatrial node has the highest degree of rhythmicity.
 - It is also called **pacemaker**, as it has the power of generation of wave of contraction. It initiates and maintains the rhythmicity of the heart
 - Artificial pacemaker is an electronic device, surgically fitted when the heart produces arrhythmic impulses
 - It is connected to sinu atrial node by wires
 - The device is preprogrammed to give rhythmic impulses
 - The device has a life of few years i.e. 3-7 years

SECTION - D**[D] Answer the following questions : (Five marks each)****[5 × 3 = 15]****28. Photorespiration :****[1 M]**

The process of respiration (oxidation) that is initiated in the chloroplast and takes place in the presence of light (i.e. only during daytime) is called photorespiration.

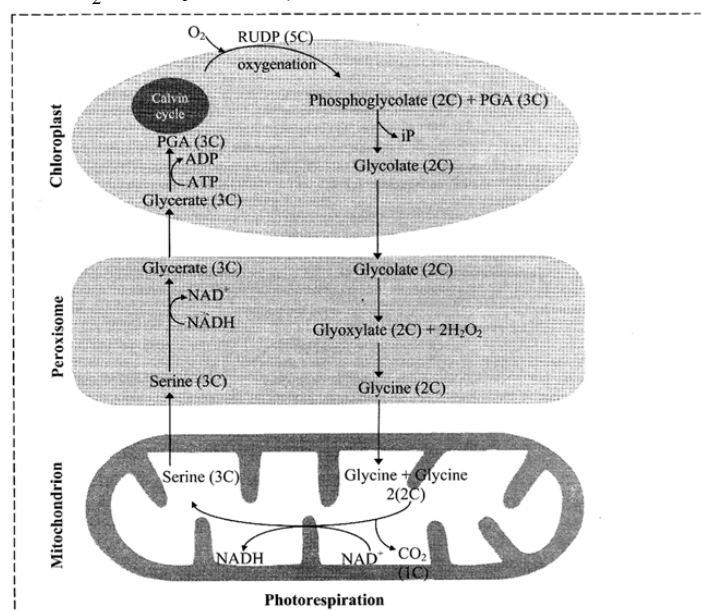
Mechanism :**[2 M]**

- Ribulose biphosphate carboxylase (main enzyme of Calvin cycle) has the ability to combine both CO_2 (carboxylation) and O_2 (oxygenation) with ribulose biphosphate (RUBP). Hence, the enzyme is called ribulose biphosphate carboxylate oxygenase (RuBisCO).
- At high temperature, intense light, low concentration of CO_2 (less than 1%) and increased concentration of O_2 , the enzyme brings about oxygenation of RUBP to phosphoglycolate (2C) and PGA (3C).
- Phosphoglycolate loses phosphate group to form glycolate within the chloroplast and PGA is used in Calvin cycle.
- Glycolate synthesized in the chloroplast is an early product which moves to peroxisomes. Glycolate is oxidized to glyoxylate and hydrogen peroxide with the help of enzyme oxidase.
- Glyoxylate is converted into amino acid glycine by transamination reaction in presence of the enzyme transaminase.
- Glycine is then transported to the mitochondria, where two molecules of glycine interact to form one molecule of CO_2 and one molecule of serine.
- Serine is taken up by peroxisome and through a series of reactions. It gets converted into glycerate which enters the chloroplast and get phosphorylated to form PGA, PGA enters Calvin cycle to make carbohydrates. In this process, one ATP molecules gets converted into ADP. Thus, 75% of the carbon lost by oxygenation of RUBP is recovered, but 25% is lost as release of one molecule of CO_2 .
- Photorespiration is also called photosynthetic carbon oxidatino cycle. It protects the plants from photo-oxidative damage.
- Photorespiration works to undo the act of photosynthesis as no energy rich compound (neither ATP nor NADPH_2) is produced in this process. Thus, it is a wasteful process.

In high temperature and oxygen concentration, affinity of RUBP carboxylase for CO_2 decreases and for O_2 increases.

Thus, photorespiration interferes with the process of photosynthesis.

(In C_4 plants, photorespiration does not occur because they have the mechanism that increase the concentration of CO_2 at enzyme side).

**[2 M]**

28. **C₄ pathway (Hatch and Slack Pathway) or H.S.K. Pathway or dicarboxylic acid cycle :**
[Explanation of HSK pathway 3 M, Diagram 2 M]

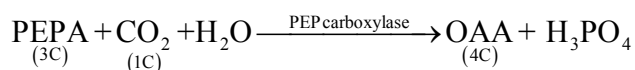
- i. Certain tropical plants like maize, sugarcane, jowar, *Amaranthus*, *Portulaca*, *Chenopodium*, *Atriplex*, etc. thrive in conditions having low concentration of CO₂ due to which they follow alternative pathway.
- ii. This pathway is known as C₄ pathway as the first compound is a 4-carbon compound, i.e. Oxaloacetic acid (OAA), due to which it is also called dicarboxylic acid cycle.
- iii. It is also called HSK pathway as it was discovered by **Hatch, Slack and Kortschak**.

The reactions occurring in this pathway are completed in two parts at two different sites as given below :

Part I (Reactions in mesophyll chloroplasts) :

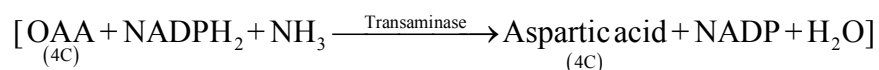
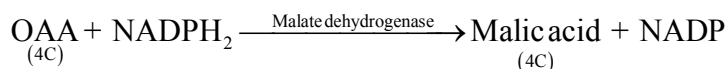
- i. Carboxylation (First CO₂ fixation) :

Initially, the atmospheric CO₂ entering the mesophyll chloroplasts is accepted by PEPA (phosphoenol pyruvic acid), a 3-carbon compound to form a 4-carbon compound called oxaloacetic acid in the presence of water and PEP carboxylase enzyme.



- ii. Reduction :

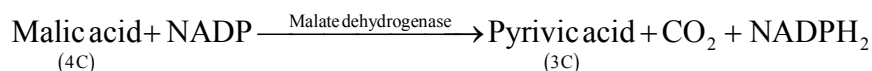
Oxaloacetic acid is reduced to malic acid by the enzyme malate dehydrogenase in the presence of NADPH₂ or changed to aspartic acid by amination, in the presence of NADPH₂ and the enzyme transaminase.



Part II (Reactions in bundle sheath chloroplasts)

- i. **Decarboxylation :**

Malic acid or aspartic acid is then transported to the bundle sheath chloroplasts where it undergoes decarboxylation in the presence of NADP to form pyruvic acid with the release of CO₂.

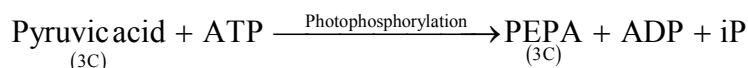


Note : In case if aspartic acid is formed, it undergoes deamination to form pyruvic acid.

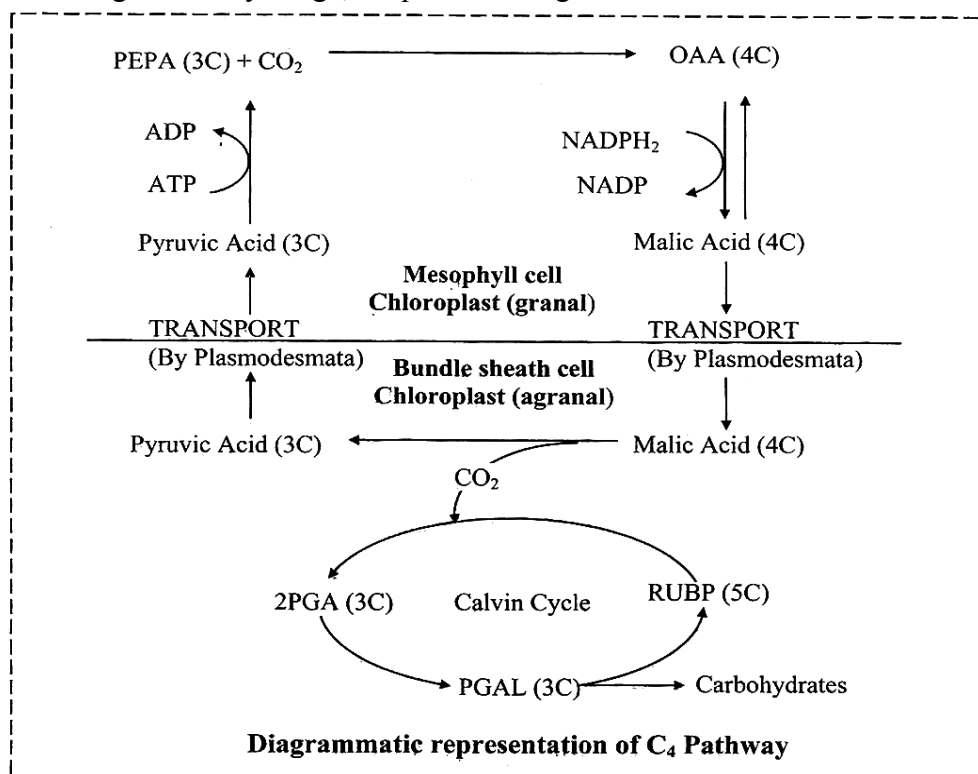
- ii. Second CO₂ fixation :

The released CO₂ is accepted by RUBP (second CO₂ acceptor). It enters the Calvin cycle and eventually forms glucose which is stored in bundle sheath chloroplast.

Pyruvic acid produced due to decarboxylation of malic acid is transported to mesophyll cells where it undergoes phosphorylation to regenerate PEPA as shown below.



- iii. Thus, it is obvious that in C_4 plants, CO_2 is fixed twice, in two different cells during the day time. CO_2 fixation in C_4 plants can occur at very low concentration of CO_2 . C_4 plants can carry out photosynthesis even if the light intensity is high, temperature is high and the amount of available water is less.



29. In humans, photoreceptors or the organs of sight are the two large eyes.

[Diagram 2 M, Structure 2 M, Mechanism 1 M]

Location : Human eyes are located in the sockets of skull called orbits.

Structure: Each human eyeball is nearly spherical and formed of three layers.

i. **Sclera:**

It is formed by the outer layer of dense connective tissue. It is white and opaque and popularly called white of the eye

Function : It protects and maintains the shape of the eye ball.

ii. **Cornea :**

The transparent anterior portion of sclera is termed as cornea.

It is non-vascular and convex anteriorly.

The cornea is transparent because of the collagen fibres in this region.

Conjunctiva is the thin transparent membrane present in front of cornea

Function : It refracts the incident light rays to focus on the retina.

iii. **Choroid** is the middle layer, bluish in colour and contains many blood vessels.

The posterior two third region of choroid layer is thin, whereas the anterior part is thick forming the **ciliary body**

iv. The forward segment of the ciliary body is termed as iris which is pigmented and opaque

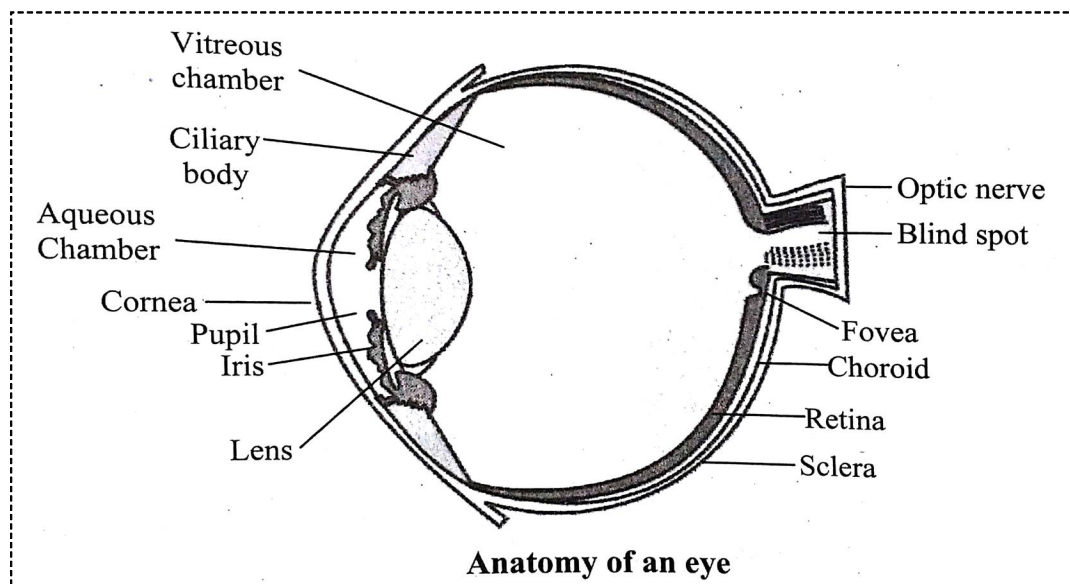
v. Lens is the transparent crystalline structure, present anteriorly and is held by ligaments of ciliary body.

vi. The aperture surrounded by the iris in front of the lens is known as **pupil**. The muscle fibres of iris regulate the movement of the pupil

- vii. The innermost layer of the eye is the **retina**. It is formed of three sub-layers ganglion cells, bipolar cells and photo-receptor cells. These cells are sensitive to light. Photo-receptor cells are of two types called as rods and cones. They contain light sensitive proteins termed as photopigments. Cones are responsible for photopic (day light) vision and colour vision while rods are responsible for scotopic (dim-light) vision. Rods contain photosensitive pigment rhodospin. Cones are three types containing characteristic photopigments that respond to red, green and blue lights.
- viii. **Blind spot or optic disc**: The optic nerves leave the eye at a point slightly away from the median posterior pole of the eyeball. The rods and cones are absent in this region hence, it is known as blind spot. Therefore no image is seen here.
- ix. **Macula lutea**, a yellowish pigmented spot is present lateral to the blind spot.
- x. Fovea is the central pit located in the macula of the retina. It is the thinned out portion of retina where only the cones are densely packed and thus, the **visual acuity** (resolution) is the greatest at this point.
- xi. The space between the cornea and the lens is the **aqueous chamber**. It contains a thin watery fluid known as aqueous humor.
- xii. The space between the lens and retina is termed as vitreous chamber which is filled with the transparent gelatinous fluid called as vitreous humor.
- xiii. The aqueous humor and vitreous humor maintain the shape of the eyeball.

Mechanism :

- i. Light rays from the objects pass through the cornea and the lens.
- ii. Rods and cones contain photopigments which are conjugated proteins composed of opsin (a protein) and retinoid (vitamin A derivative).
- iii. Light induces dissociation of retinoid from opsin, resulting in a change in the structure of opsin.
- iv. It ultimately changes permeability of retinal cell and generates action potential.
- v. Action potential is carried, via bipolar cells and ganglion cells, and further by optic nerves to visual cortex.
- vi. Neural impulses are analysed and image formed on retina is recognized based on earlier memory and experience.



Anatomy of an eye

OR

- 29. i. **Adrenal Glands**: [Histological structure 1 M, Adrenal cortex 2 M, Adrenal medulla 2 M]
Adrenal glands are also called suprarenal glands. Adrenal glands are located above each kidney, hence called suprarenals. They are located on the upper border of kidneys.
- ii. **Histological Structure**:
 - a. Adrenal gland is covered by connective tissue capsule.

- b. It is differentiated into two parts : Outer larger adrenal cortex and Inner Medulla.
- c. **Adrenal cortex** has 3 zones (form bulk, derived from mesoderm).
- Zona glomerulosa** : (Outer) secretes mineralocorticoids. eg. Aldosterone (95%)
 - Zona fasciculata**: (Middle) widest zone, secretes glucocorticoids. eg. Cortisol (most abundant 95%), corticosterone, cortisone.
 - Zona reticularis** : (Inner) produces androgens eg. DHEA (dehydro epiandrosterone)
- d. **Adrenal Medulla** : The adrenal medulla is the central part of adrenal gland and is derived from ectoderm. Secretes catecholamines
- iii. **Adrenal Cortex Secretion and Function**: mineralocorticoids, glucocorticoids, and small amounts of androgenic steroids
- a. **Mineralocorticoids : Zona glomerulosa secretes mineralocorticoids**
- Aldosterone is the main mineralocorticoid
 - It acts mainly on renal tubules and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions
 - The aldosterone helps in the maintenance of electrolytes, body fluid volume, osmotic pressure, blood pressure
- b. **Glucocorticoids** : Zona fasciculata secretes glucocorticoids. Cortisol is the main glucocorticoid.
- Functions** :
- Stimulate liver cells to convert amino acids to glucose (gluconeogenesis, ie. conversion of non carbohydrate to glucose).
 - Breaks down proteins in muscles
 - Lipolysis (break down triglycerides from fatty tissue to fatty acid.)
 - Cortisol plays an important role in maintaining cardiovascular system and kidney functions.
 - Cortisol stimulates the RBC production
 - Inhibits cellular uptake and utilization of amino acids
 - It is also involved in anti-inflammatory reactions and suppresses the immune response
- c. **Androgens** :
- Androgens help in development of secondary sexual characters in males like growth of pubic hairs, facial hairs.
 - In female, they contribute to sex drive (Libido).
- iv. **Adrenal medulla Secretion and Functions : adrenaline and nonadrenaline**
Adrenaline (epinephrine) and Noradrenaline (norepinephrine) : They are called as catecholamines. These hormones are also called as emergency hormones as they are secreted in the stress condition or hormones of fight or flight and adrenal glands are called glands of emergency.
- Functions** :
- Both hormones increase alertness, pupillary dilation, piloerection, sweating etc.
 - Both hormones increase rate and strength of heart beat, contraction and rate of respiration
 - They also stimulate the breakdown of glycogen, lipids and proteins, thereby increasing blood glucose level.
30. a. **Syphilis** : This disease is caused by a bacterium, *Treponema pallidum*.
- It spreads by sexual contact with infected person. **[Syphilis 2½ M, Gonorrhoea 2½ M]**
 - Incubation period is 3-4 weeks.
 - The parasite first causes a primary lesion called chancre.
 - Chancres are formed on the external genitalia, but in women, it may be formed in vagina.
 - Primary lesions change into hard ulcers which heal spontaneously.

- vi. Secondary lesions appear in the form of a rash anywhere on the body.
- vii. After many years, tertiary lesions appear in skin, bones and liver.
- viii. Degenerative changes occur in the heart and brain.
- ix. It can be transmitted from mother to child.

Symptoms of Syphilis :

- i. Lesions in the mucous membrane of urinogenital tract, mouth or throat
- ii. Skin, tissues and bones are affected
- iii. It can lead to death in the late stage.

Methods of Control :

- i. Prompt treatment of discovered areas
- ii. Prevention by avoiding prostitution and multiple sex partners
- iii. Finding the source of infection and treating them
- iv. Sex hygiene
- v. Prophylaxis

Treatment of Syphilis : Syphilis is cured with big doses of antibiotics prescribed by the doctors

b. **Gonorrhoea :** This disease is caused by a bacterium, *Neisseria gonorrhoea*

- i. It spreads by sexual intercourse with infected people
- ii. Incubation period is 2-14 days in males and 7-21 days in females.

Symptoms :

- i. Swelling (inflammation) of mucous membrane in urinogenital tract.
- ii. Burning on urination and pain around genitals.
- iii. Infection may spread to other body parts and causes arthritis and female sterility
- iv. Child born to infected mother may suffer from eye infection and gonococcal vulvovaginitis.

Treatment : It can be cured by antibiotics

OR

30. These methods are of 2 main types : Temporary and Permanent. **[Types 2M, Explanation 3 M]**

- i. Safe period (Rhythm Method):** A week before and a week after menstrual bleeding is considered as the safe period for sexual intercourse. This method reduces the chances of pregnancy by about 80%.
- ii. Coitus Interruptus :** It is the oldest method of birth control. It involves withdrawal of the penis by the male before ejaculation so that semen does not deposit in the vagina and there is no fertilization. This method also has some drawbacks. Before final ejaculation, male produces some pre-ejaculating fluid. This fluid may cause fertilization.
- iii. Chemical Means (Spermicides):** Foam tablets, jellies, pastes and creams, if introduced into the vagina before sexual intercourse, adhere to mucous membrane and immobilize and kill the sperm.
- iv. Mechanical Means :** These are of 3 types :
 - a. Condom :** It is rubber sheath to cover the erect penis.
It is cheap and easily available. "Nirodh" is the most widely used contraceptive by males.
It checks pregnancy by preventing deposition of semen in the vagina. Condom should be used before starting coital activity. It also prevents AIDS and other sexually transmitted diseases.

- b. **Diaphragm and cervical cap** : These are rubber plastic covers that are fitted on the cervix in the female's vagina and check the entry of sperms into the uterus. These should be kept fitted for at least six hours after sexual intercourse.
- c. **Intrauterine contraceptive device (IUCD)** : These are plastic or metal objects placed in the uterus by a doctor. These include loop, copper-T, Spiral; ring, bowl, shield, etc. They prevent fertilization of the egg of implanatation of the embryo.
- v. **Physiological (oral) Devices** : Birth control pills (oral contraceptive pills) check ovulation as they inhibit the secretion of follicle stimulating hormone (FSH) and luteinizing hormone (LH) that are necessary for ovulation. Thus, go eggs are released in a woman on taking the pill and conception cannot occur. This pill 'Saheli' is taken weekly.
- vi. **Other Contraceptives** : Certain contraceptive are implanted under the skin of the upper arm. They prevent pregnancy for 3 to 4 years.
- vii. **Permanent Method** : Surgical methods calle sterilization or advised for males and females Surgical intervention blocks gamete transport and prevents pregnancy.
Vasectomy → In males; Tubectomy → In females.