

SENIOR SECONDARY EXAMINATION, 2017 BIOLOGY

Time allowed : 3¼ hours

Maximum Marks : 56

General Instructions :

- (i) Candidate must write first his / her Roll No. on the question paper compulsorily.
- (ii) All questions are compulsory.
- (iii) Write the answer to each question in the given answer-book only.
- (iv) For questions having more than one part, the answers to those parts are to be written together in continuity
- (v) If there is any error / difference / contradiction in Hindi & English versions of the question paper, the question of Hindi version should be treated valid.
- (vi)

Q. Nos.	Marks per question
1-13	1
14-24	2
25-27	3
28-30	4
- (vii) Question Nos. 24, 27, 28, 29 and 30 have internal choices.

SECTION-A

Q 1. What are the morphologically and genetically alike individuals called ?

Ans.1 Clone

Q 2. Define embryogenesis

Ans.2 Entire series of event that causes development of zygote to form complete embryo is known as embryogenesis

Q 3. Write the importance of colostrum.

Ans.3 The milk produced during the initial few days of lactation is called colostrum. which contains several antibodies which is absolutely essential to develop resistance for the new-born babies.

Q 4. Write the full form of IVF.

Ans.4 IVF – In vitro fertilization.

Q 5. Name any one Intra uterine device.

Ans.5 Intra Uterine Devices (IUDs) are inserted by doctors or experts nurses in the uterus through vagina. IUDs are presently available as the non-medicated IUDs.
Eg → Copper releasing IUDs – CuT, Cu7, multiload 375.

Q 6. What is the genotype of a person having klinefelter syndrome.

Ans.6 klinefeller's syndrom

→ This genetic disorder is also caused due to the presence of an additional copy of x-chromosome. resulting into a karyotype of 47 – xxy.

→ Such an individual has over all masculine development. however, the feminine development. (development of breast : - Gynaecomastia)

Q 7. 'Genetic code is unambiguous and specific.' Explain.

Ans.7 One codon codes for only one amino-acid, hence it is unambiguous and specific :

Q 8. Who propounded the biological evolution theory of use and disuse of organs.

Ans.8 Lamark

Q 9. Mention the importance of blue - revolution.

Ans.9 Blue revolution – In this revolution fisheries has important place in Indian economy. It provides income and development to millions of fisherman and farmers, particularly in the coastal state.

Q 10. How do ultraviolet rays coming from sun affect the living organisms.

Ans.10 The spectral quality of solar radiation is also important for life. The UV component is the spectrum is harmful to many organisms. as it is a carcinogen.

Q 11. What are the ill effects of Algal blooms.

Ans.11 Presence of large amounts of nutrients in waters also causes excessive growth of planktonic (free-floating) algae, called an algal bloom, which imparts a distinct colour to the water bodies. Algal bloom cause deterioration of the water quality and fish mortality. some bloom-forming algae are extremely toxic to human beings and animals.

Q 12. Define Recombinant DNA.

Ans.12. Recombinant DNA or rDNA is the term used to describe the combination of two DNA stands that are constructed artificially.

Genetic scientist can do this to create unique DNA stand for different purposes. using several types of techniques.

Q 13. The Bt toxin produced by Bt does not kill bacillus but kills insect. Why?

Ans 13. Bt toxin is produced by a soil bacterium called *Bacillus thuringiensis*. This toxin does not kill the bacteria because when it is present in the bacteria, it is in an inactive and crystalline form. It becomes active and toxic when it is consumed by insects such as lepidopterous, dipterans etc. The activated toxin (delta endotoxin) binds to the epithelial cells in the midgut in insect and creates pores that cause lysis & swelling, eventually killing the insect.

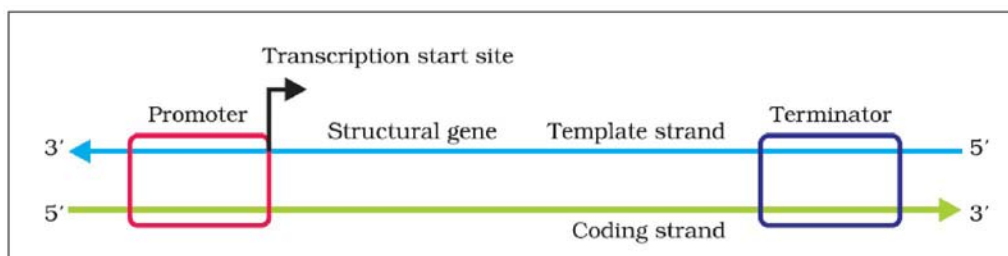
SECTION-B

Q 14. What is spermiogenesis? Demonstrate diagrammatically the process of spermatogenesis.

Ans.14 Spermiogenesis → It is the final stage of spermatogenesis the spermatids are transformed into spermatozoa (sperms) by the process of spermiogenesis.

Q 15. What is transcription? What are the different parts of a DNA transcription unit? What is their role in the process of transcription?

Ans.15 Transcription → The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.



Units of transcription

- (i) A promoter
- (ii) The structural gene
- (iii) A Terminator.

Functions of Units

- (i) Promotor → It is a DNA sequence that provides binding site for RNA polymerase.
- (ii) The structural gene → Genes that code for amino acid sequence are known as structural genes.
- (iii) Terminator → The terminator is located towards 3'-end of the coding strand and it usually defines the end of the process of transcription.

Q 16. With the help of examples explain the process of biological evolution on the basis of morphological evidences.

Ans.16 Comparative anatomy and morphology shows similarities and differences among organisms of today and those that existed years ago.

Morphological evidences. – Homologous organ

- (a) Divergent evolution → Structures are homologous having same structure or origin and function is different.

Ex. → Thorn and tendrils of Bougainvillea and cucurbita.

- (b) Convergent evolution Structure are analogous having different origin and same function.

Ex. → wings of butterfly and of birds look alike.

Q 17. Write down in sequence the main steps of plant breeding. What is its importance?

Ans 17. Plant breeding is the purposeful manipulation of plant species in order to create desired plant types that are better suited for cultivation, give better yields and are disease resistant.

The main steps in breeding a new genetic variety of a crop are –

- (i) Collection of variability :

– Collection and preservation of all the different wild varieties, species & relatives of the cultivated

- species is a pre-requisite for effective exploitation of natural genes available in the population.
- (ii) Evaluation and selection of Parents :
 - Germplasm of a plant is evaluated for desirable character. The plants so selected are multiplied, pure lines are created and further use in hybridisation.
 - (iii) Cross hybridisation among the selected parents:
 - This step involves cross hybridisation of two parent plant with desirable character to produce hybrids that genetically combines the desired characters into one plant. It is a time consuming step.
 - (iv) Selection and testing of superior recombinants :
 - This step consists of selecting, among the progeny of the hybrids, those plants that have the desired characters and is superior to both parents.
 - (v) Testing, release and commercialisation of new cultivars :
 - The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance etc. Evaluation is done first in research field followed by farm field.

Importance of plant breeding :

Plant breeding is the process by which humans change the characteristics of plants over time to make them better crops and more nourishing food.

The most important factor for plant breeding is genetic variation in the desired characteristics.

- In tropical climates a wide range of fungal, bacterial and viral pathogens, affect the yield of cultivated crop species. Plant breeding causes :-
- Resistance of host plant from fungal, bacterial and viral pathogens.
- For developing resistance to insect pests.
- For improved food quality.

Q 18. What suggestion will you give a farmer to increase the productivity of his field? Explain.

Ans.18 Suggestion to increase the productivity are :-

- (a) made crop more tolerant to abiotic stresses (cold, drought, salt, heat).
- (b) reduce reliance on chemical pesticides (pest- resistant crops).
- (c) helped to reduce post harvest loss.
- (d) Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).

Q 19. With reference to fermented beverages explain the role of microbes in Industrial products.

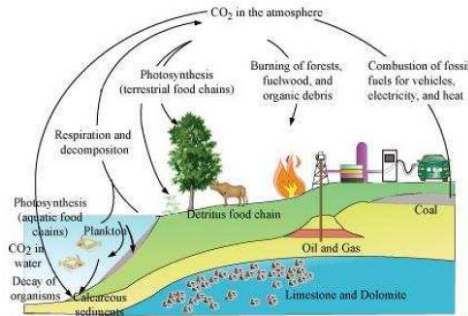
Ans. Even in industry, microbes are used to synthesise a number of products valuable to human beings. Beverages is example which production on an industrial scale, requiring growing microbes in very large vessels called fermentors.

In fermented beverages microbes especially yeasts have been used from time immemorial for the production of beverage like wine, beer, whisky, brandy or rum.

For this purpose the same yeast *Saccharomyces cerevisiae*. used for bread making. and commonly called brewer's yeast is used for fermenting malted cereals and fruit-juice.

Q 20. Explain carbon cycle in ecosystem. Give a linear diagram of carbon cycle.

Ans 20. Carbon cycling occurs through atmosphere ocean and through living and dead organisms. According to one estimate 4×10^{13} kg of carbon is fixed in the biosphere through photosynthesis annually. A considerable amount of carbon returns to the atmosphere as CO_2 through respiratory activities of producers and consumers. Decomposers also release CO_2 into atmosphere by decomposing waste materials & dead organic matter some amount of fixed carbon is lost to sediments & removed from circulation. burning of wood, forest fire, fossil fuel etc are additional source for releasing of CO_2 in the atmosphere.



Q 21. What is adaptation? Explain physiological adaptation taking an example of altitude illness.

Ans 21. Adaptation is any attribute of the organism (morphological, physiological, behavioural) that enables the organism to survive & reproduce in its habitat. In high altitude, low atm. pressure is present due to which body does not get sufficient oxygen & causes heart palpitation called as altitude sickness. In order to overcome this situation, RBC production increased by body, binding affinity of haemoglobin decreases and by increasing breathing rate.

Q 22. Give four attributes of a population. Explain in detail the process of Mutualism.

Ans 22. Four attributes of a population are :- Organism

- (i) Birth rates → Increase the number of with respect to members of the population.
- (ii) Death rates → Decrease the number of organism with respect to members of the population.
- (iii) Sex-ratio → An individual is either a male or a female but a population has a sex ratio (e.g. 60%- female and 40% - male)
- (iv) Density → Density is expressed as total number of individuals present per unit area or volume at a given time.

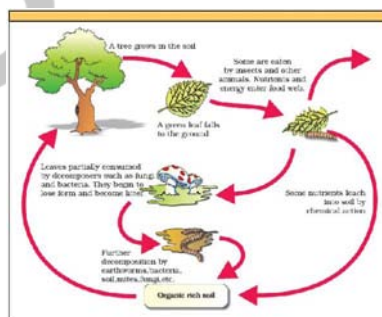
Mutualism.

- An association of two species in which both species are benefitted is called mutualism.
- Mutualism may not involve close physical association between the individuals of pairs of species or it may sometimes do it.
- Physical association between the individuals of a pair of species is called symbiosis.
- Obligate mutualism is exemplified by nitrogen fixing bacteria (Rhizobium) living in root nodule of legumes.

Q 23. What is decomposition? Write down its steps. Give a diagrammatic representation of decomposition cycle in a terrestrial ecosystem.

Ans 23. The process in which decomposer break down complex organic matter into inorganic substance like carbon dioxide) water and nutrients, in called decomposition. following steps are involve in deomporition.

- (1) fragmentation : Breaking down of detritus into smaller particles by detrivores.
- (2) Catabolism : Bacterial & fungal enzymes degrade detritus into simples inorganic substance.
- (3) Humfication : leads to accumulation of a dark coloured amorphous substance called humus. It is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.
- (4) Mineralisation : Degradation of humus by some microbes which release inorganic nutrients.



Q 24. Give four causes of loss in biodiversity. Explain the adverse effects on native species on invasion of Alien species in a habitat.

OR

How is conservation of biodiversity done? How will we conserve an animal to save it from extinction.

Ans 24. Biodiversity is a combined diversity at all the levels of biological organisation.

– Following are the causes for the low of biodiversity :

(i) Habitat loss and fragmentations:

– This is the most important cause driving animals & plants to extinction. the degradation of many habitats by pollution & human activities also threatens the survival of many species.

(ii) Over exploitation :

– When dependency of human on nature turns to greed, it leads to over exploitations of natural resources. Presently many marine fish populations are over-harvested, endangering continued existence of some commercially important species.

(iii) Co – extinctions :

– When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.

(iv) Alien species invasions:

– When alien species. are introduced unintentionally or deliberately, some of them turn invasive & cause decline or extinctions. of indigenous species for eg. The Nile perch introduced into Lake Victoria in East Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake. Recent illegal introduction of the African catfish for aquaculture purposes has become a threat to the indigenous catfishes in our rivers.

OR

Biodiversity is conserve by some reasons :-

– The various reasons for conserving biodiversity can be grouped into three categories :-

1. The narrow utilitarian – view for conserving biodiversity is to derive direct economic benefits in industrial products of medicinal importance with increasing resources put into “bioprospecting”

2. The broadly utilitarian – argument conveys that biodiversity plays a major role in many ecosystem services that nature provide.

→ Other major ecosystem services include :

(i) Hydrological cycle

(ii) Stabilization of Soil.

(iii) Nutrient cycling.

(iv) Control of pollution.

(v) Climate regulation.

3. The ethical or moral – View guides us that all living organisms have a right to live and it is our moral duty to care for their well-being and pass on our biological legacy to future generation.

→ There are two basic strategies of biodiversity conservation.

(a) In situ (on site) conservation.

(b) Ex situ (off site) conservation.

(a) In situ conservation –

→ Faced with the conflict between development and conservation, many nations find unrealistic and economically not feasible to conserve all their biological wealth. They identified for maximum protection certain ‘biodiversity hotspots’. regions. with very high levels of species richness and high degree of endemism.

India has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries.

Ex → Corbett National park – Tiger, Elephant, Sultanpur Lake Bird Sanctuary – Crane, Sarus, Duck.

(b) Ex-situ conservation :

→ In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.

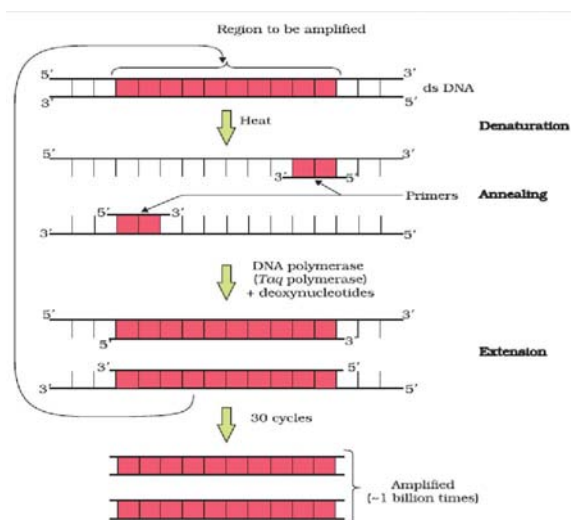
→ In recent years ex-situ conservation has advanced beyond keeping threatened species in enclosures.

Ex → Zoological, Botanical gardens, wild life safari parks.
 Indicating that DNA was the material that passed from the virus to Bacteria, while the Bacteria infected with virus with radioactive protein were not radioactive.
 This indicates that proteins did not enter the bacteria from the viruses. DNA is therefore the genetic material that is passed from virus to bacteria.

SECTION-C

Q 25. How is the amplification of gene done using the technique of PCR? Explain with the help of diagram.

Ans 25.



PCR – Polymerase chain Reaction is a technique of synthesizing multiple copies of the desired gene (DNA) in vitro. This technique was developed by Kary Mullis, 1985. The basic requirements of PCR are: DNA template, two nucleotide primers (120 nucleotides long), DNA Polymerase which is stable at high temperature eg. Taq polymerase. PCR involves three steps:

- Denaturation:** The target DNA is heated to high temperature (94°C). Heating results in the separation of two strands of DNA. Each of the two strands of the target DNA now act as template for synthesis of new DNA strand.
- Annealing:** Two oligonucleotide primers hybridize to each of single stranded template DNA, in presence of excess of synthetic oligonucleotide. This step is carried out at low temperature (40° – 60°C).
- Extension:** During this step, the enzyme DNA polymerase synthesizes the DNA segments between the primers. Thermally Stable taq polymerase isolated from bacteria *Thermus aquaticus* is used.

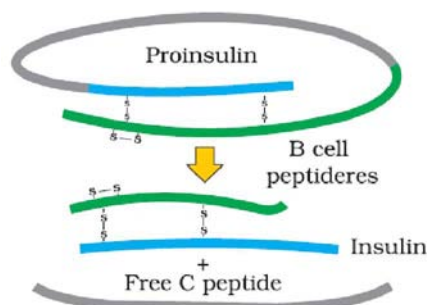
The two primers extend towards each other in order to copy the DNA segment lying between the two primers. The above mentioned three steps complete the first cycle of PCR. If these cycles are repeated many times, the DNA segment can be amplified to approx billion times.

- Applications –
- DNA fingerprinting
 - In gene therapy.

Q 26. What is the importance of biotechnology application in medicine? How does biotechnology help in the production of human insulin.

Ans 26. Application of Biotechnology in Medicines.

– the recombinant DNA technological processes have made immense impact in the area of healthcare by enabling mass production of safe & more effective therapeutic drugs. Recombinant therapeutics do not induce unwanted immunological responses. Some of the recombinant therapies are:



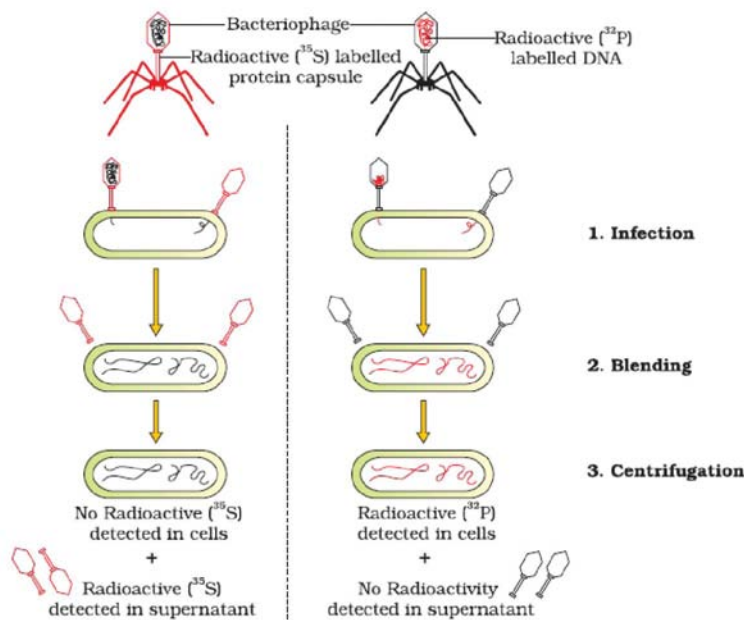
- (a) Gene therapy – To treat genetical disorder like ADA deficiency.
- (b) Molecular diagnostics – Reso recombinant DNA technology PCR & Enzyme linked Immunosorbent Assay are techniques which helps in early diagnosis.
- (c) Genetically engineered insulin.
 - In 1983, Eli Lilly an American company prepared into DNA sequence corresponding to A and B chains of human insulin and introduced them in Plasmids of E-coli to produce insulin chains. chains A and B were produced separately & combined by creating disulfide bonds to form humans insulin.

Q 27. 'DNA is a genetic material. 'Prove it with the help of Hershey - Chase experiment. Draw a linear diagram of the experiment.

OR

'DNA replicates semiconservatively'. Prove it with the help of Matthew Meselson and Franklin stall experiment. Draw the linear diagram of the experiment.

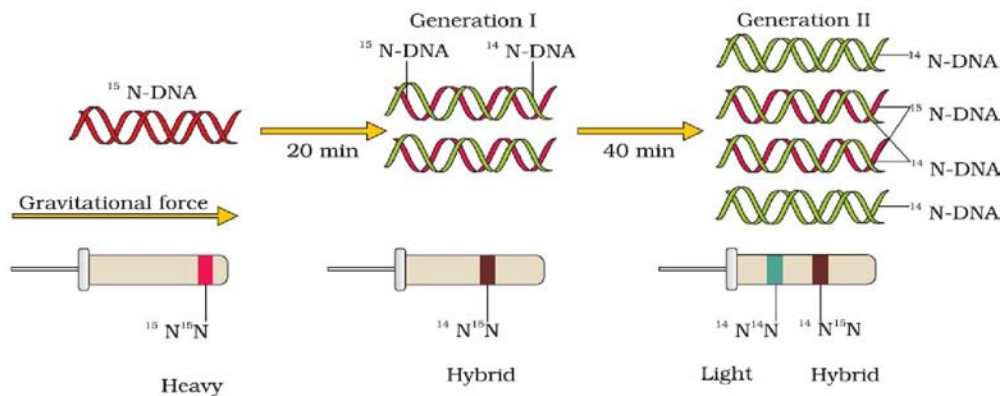
Ans 27.



DNA is a genetic material is proved from the experiments of Alfred Harshey & Martha Chase (1952). They worked with viruses that infect bacteria called bacteriophage. They grew some viruses on a medium, that contained radioactive phosphorus & some others on mediums that contained radioactive sulfur. Radioactive phosphorus in virus will be present in DNA only while Radiocutive sulfur will be present in protein coat of virus only. Radioactive phages were allowed to attach to E-coli bacteria. As, the infection proceeded, viral coats were removed from the bacteria by agitating them in a blender. The virus particle were separated from the bacteria by spinning them in centrifuge.

Bacteria which was infected with virus that had radioactive DNA were radioactive,

OR



(Separation of DNA by Centrifugation)

DNA replicates semi conservatively was first experimentally proved by Matthew meselson and Franklin stahl in 1958. The experiment is as follows:

- They grew E-coli in a medium containing $^{15}\text{NH}_4\text{Cl}$ as the only nitrogen source for many generations. As a result N^{15} was incorporated into newly synthesised DNA. This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cscI density gradient.
 - Then they transferred the cells into a medium with normal $^{14}\text{NH}_4\text{U}$ and took samples at various definite time interval as the cells multiplied the samples were separated independently on cscI gradient to measure DNA density.
 - Thus, the DNA that was extracted from the culture one generation after the transfer from ^{15}N to ^{14}N mediums, had a hybrid or intermediate density. while the DNA extrated from second generation was compound of equal amounts of this hybrid DNA and of light DNA.
- this experiment thus proves that DNA in chromonomes replicates semi conservatively.

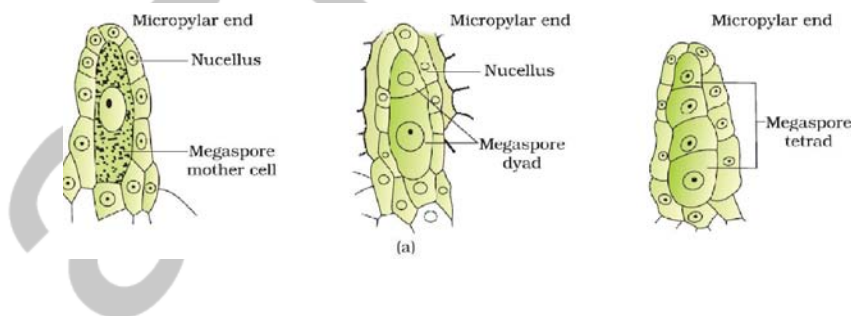
SECTION-D

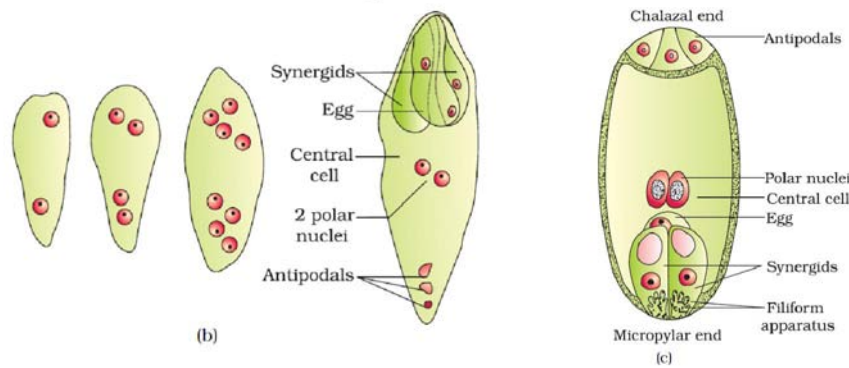
Q 28. Explain in detail the process of development of female gametophyte. Draw diagram.

OR

Explain the structure of microsporangium and write the functions of its different layers. Draw diagram of microsporangium showing wall layers.

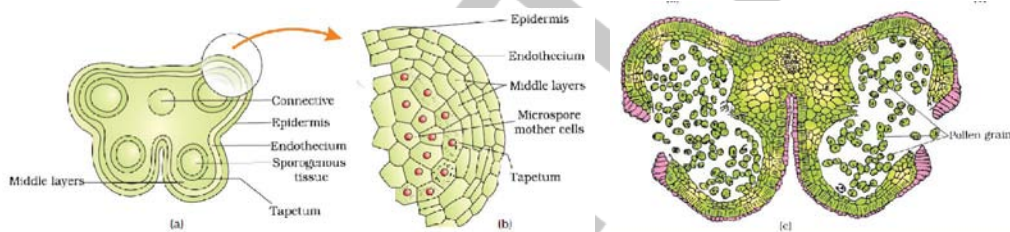
Ans 28.





- The female gametophyte or embryosac in most of the Angiosperm is monosporic and polygonum type.
- Entire embryosac develops from single megaspore.
 - Three micropylar megaspore degenerate and only chalazal end megaspore remains functional.
 - The functional megaspore undergoes karyokinesis. the large central vacuole develops and both the nuclei are pushed to terminal or opposite pole. Second mitotic divisions occur and both end has 2-2 nuclei and their 3rd mitotic division occur and both terminal end has 4-4 nuclei. from each pole one-one nuclei migrate to centre, after that cytokinesis occur.
 - At micropylar end has one egg cell and two synergids. At chalazal end after arranging 3 cells form Antipodal cells and in centre central cells occur.
 - The entire structure which is formed from megaspore called embryo-sac. It is 8-nucleated and 7-celled structure.

OR



In young anther shows 4 immature lobes, single epidermal cells which is outer are protective. sterile connective tissue is present, Archesporial tissue is present which is central mass of tissue.

- As anther matures, it forms is distinct lobe.
- At 4 lobes 4 sporangia develops.
- Archesporial tissue undergoes division and Archesporial tissue forms sporogeneous tissue. This sporogeneous tissue is covered by single layer of cell called primary parietal layer.
- By division in primary parietal layer, outermost layer of cell is formed which is called endothecium. And inner layer is called secondary parietal layer.

Now secondary parietal layer undergoes division and it forms :

- (a) outer layer – Middle layer
- (b) inner layer – Tapetum

– Entire sporangia is covered by 4 layered structure.

- (i) Epidermis (ii) Endothecium (iii) Middle layer (iv) Tapetum.

Parts of Mature Anther

- (1) Epidermis – outermost protective single layer.
- (2) Endothecium – Single layer made up of radial elongated cells. α -cellulose is deposited on radial wall of cells from inside to outside in fibre like manner. This α -cellulose is hygroscopic in nature. It absorbs water and swell, so endothecium helps in dehiscence of sporangia.

- Inner side of sporangia, alpha-cellulose does not deposit and it forms stomium, it easily degenerate to liberate pollen grains.
- (3) Middle layer – It is made up of Parenchymatous cells. intially it is single layer but in mature stage, it is 2-3 layers thick. function is storage of food.
 - (4) Tapetum – It is most important layer. It functions as a nutritive tissue so that sporogenous tissue can undero meiosis.

Q 29. Describe AIDS disease on the basis of following points –

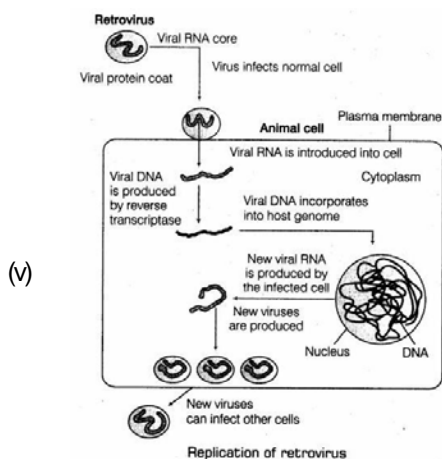
- (i) Name of pathogen
- (ii) Test for confirmation of disease
- (iii) Main symptoms of disease
- (iv) Ways of prevention
- (v) Diagram of replication of retrovirus.

OR

Describe Typhoid disease on the basis of following points –

- (i) Name of pathogen
- (ii) Test for confirmation of disease
- (iii) Ways of infection
- (iv) Main symptoms of disease
- (v) Diagram showing structure of an antibody molecule

- Ans 29.**
- (i) Human Immunodeficiency virus (HIV)
 - (ii) Enzyme linked Imnumosorbent Assay (ELISA)
 - (iii) Bouts of fever, Diarrhoea, weight loss, Pneumouia, cancer.
 - (iv) – Making blood safe from (HIV).
– Ensure the use of only disposable needles & syringes in public & private hospitals.
– free distribution of condom.
– controlling drug abuse,
– advocating safe sex
– Promoting regular checkup for hiv insusceptible population.



OR

- (i) Salmonella typhi
- (ii) Widal test
- (iii) contaminated food & water
- (iv) high fever (39 to 40°C), weakness, stomach pain, constipations, headache, loss of appetite.

Q 30. Explain Mendel's monohybridization experiment. Write the rules proposed on the basis of this experiment. Draw its diagram using punnet square.

OR

What is co-dominance. Explain it through determination of blood groups in human. Draw a table showing the genetic basis of blood groups in Human population.

Ans 30. Monohybrid cross : It involves the study of inheritance of one pair of contrasting characters. eg. Inheritance of tall and dwarf characters.

→ Monohybrid cross :

- (a) When pure tall and dwarf pea are crossed the generation i.e F_1 generation was obtained, it was found that the resultant generation would express only one of the trait and not the other. i.e. all the Plants obtained were tall.
 - The trait which is expressed is called dominant, whereas the one which is not expressed is called recessive.
- (b) Law of Dominance :
 - When two homozygous individuals with one or more sets of contrasting characters are crossed the characters that appear in F_1 hybrids are dominant and those which do not appear in F_1 are recessive character.
- (c) Law of Segregation :
 - This law states that when a pair of contrasting factors or genes are brought together in a heterozygous condition, the two remains together without being contaminated but when gametes are formed from them the two separate out from each other. This is also known as Mendel's first law of heredity.



♀ \rightarrow	T	T
t	Tt	Tt
t	Tt	Tt

In F_1 all are tall
 ($F_1 \times F_1$)



♀ \rightarrow	T	t
T	TT	Tt
t	Tt	tt

In F_2 we will get 3 : 1 ratio

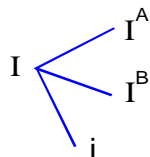
$TT \rightarrow$ Homozygous tall } Tall 3
 $Tt \rightarrow$ Heterozygous tall }

tt → Homozygous dwarf } Dwarf 1
 Homozygous Tall : Heterozygous tall : homozygous dwarf
 1 : 2 : 1

OR

Co – Dominance : The phenomenon is which the dominant and recessive allele express themselves simultaneously in equal proportions without showing any mixing of character.

- Example of Co-dominance is Blood grouping in human beings. ABO blood groups is controlled by gene [I]
- The plasma membrane of RBC has sugar polymer that protrude from its surface and a kind of sugar is controlled by the gene. The gene I has 3 alleles



- The Alleles I^A and I^B produce a slightly different form of sugar while allele i does not produce any sugar.
- Because humans are diploid organisms each person possess any into of the 3 I gene allele.
- I^A and I^B are completely dominant over small i , it means if I^A and i one present, I^A will express and when I^B and i are present I^B will be expressed.
- But when I^A and I^B are present together they both express their own type of sugar this is because of co-dominance.

Allele from Parent 1	Allele from Parent 2	Geno type of offspring	Blood types of offsprings.
I^A	I^A	$I^A I^A$	A
I^A	I^B	$I^A I^B$	AB
I^A	i	$I^A i$	A
I^B	I^A	$I^A I^B$	AB
I^B	I^B	$I^B I^B$	B
I^B	i	$I^B i$	B
i	i	ii	O