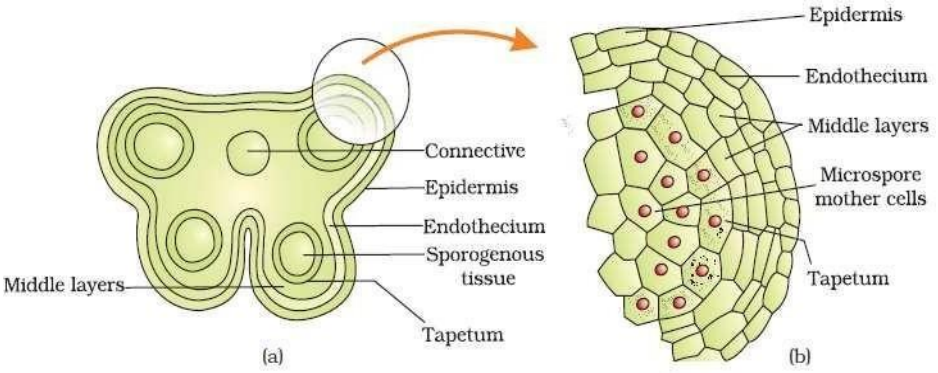
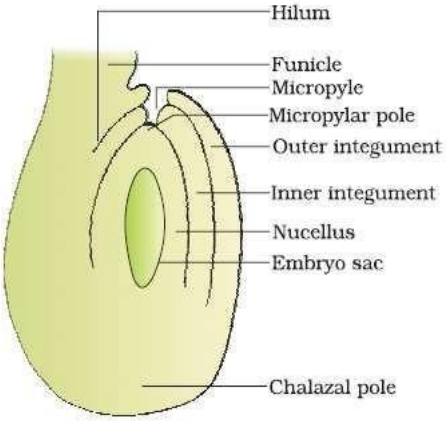
TOP MOST IMPORTANT QUESTIONS IN BIOLOGY FOR REDUCED SYLLABUS.....

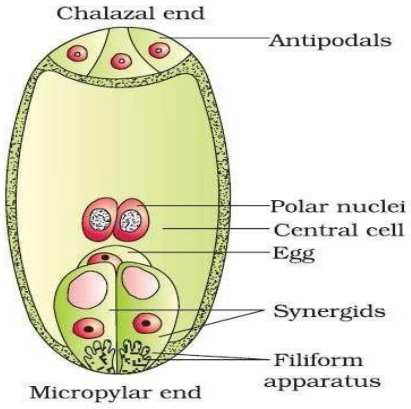
1. T.S of Anther OR Structure of microsporangium



2. The Megasporangium (Ovule) OR V.S of anatropus ovule



3. Female gametophyte or embryo sac or 7 celled 8 nucleate embryo sac



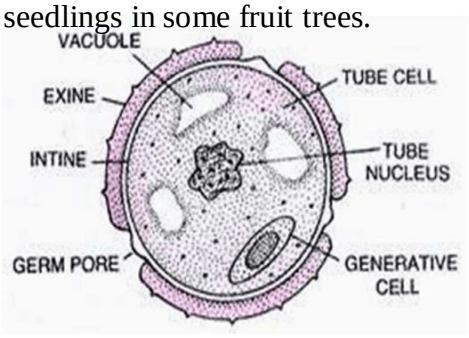
4. Define polyembryony? Write the significance of polyembryony.

Polyembryony: Ovule having more than one embryo is termed as polyembryony.

Significance of polyembryony:

- Polyembryony plays an important role in plant breeding and horticulture.
- Haploid embryos are used to raise homozygous diploids.
- Adventive embryos are used to provide genetically uniform seedlings in some fruit trees.

5. Briefly explain the structure of pollen grain.



- Pollen grains are spherical shaped structures measuring about 25-50 micrometers in diameter.
- It has two-layers- the hard outer layer called the exine and the inner layer called intine.
- The exine is made up of one of the most resistant organic material known as sporopollenin. It can withstand high

temperatures and strong acids and alkali.

- The inner wall of the pollen grain called the intine is a thin

and continuous layer made up of cellulose and pectin.

- Pollen grain exine has prominent apertures called germ pores where sporopollenin is absent.
- The cytoplasm of pollen grain is surrounded by a plasma membrane contains two cells, the vegetative cell and generative cell.

6. What are Cleistogamous flowers? Write their significance.

- The flowers which do not open at all are called Cleistogamous flowers.
- In such flowers, the anthers and stigma lie close to each other, When anthers dehisce in the flower buds, pollen grains come in contact with the stigma to effect pollination.
- Significance: Cleistogamous flowers are invariably autogamous as there is no chance of cross-pollen landing on the stigma.
- Cleistogamous flowers produce assured seed-set even in the absence of pollinators.

7. What is Pollination? Mention any four features of wind pollinated flowers.

POLLINATION: The process of transfer of pollen grains from anther to stigma is called Pollination.

- Wind pollination also requires that the pollen grains are light and non-sticky so that they can be transported through wind currents.
- They often possess well-exposed stamens and large often-feathery stigma to easily trap air-borne pollen grains.
- Wind pollinated flowers often have a single ovule in each ovary and numerous flowers packed into an inflorescence.
- Wind-pollination is quite common in grasses.

8. Describe the outbreeding devices that prevent autogamy.

Outbreeding devices is the method of promoting the plant to undergo cross pollination. Flowering plants have developed many devices to discourage self-pollination and to encourage cross-pollination.

Some of the mechanisms that plants have developed as outbreeding devices are described below;

- **Dicliny:** Dicliny or unisexuality is a condition in which the flowers are either staminate (male) or pistilate (female).
- **Self-sterility:** Pollen grains of a flower do not germinate on the stigma of the same flower due to presence of similar self-sterile gene e.g., Tobacco, potato.
- **Dichogamy:** The stigma and anther mature at different times. Dichogamy is further divided into Protandry- the androecium matures earlier than the gynoecium and Protogyny- the gynoecium matures earlier than androecium.
- **Herkogamy:** The natural physical barrier prevents the pollen of the same flower entering the ovary.

9. Write the events of development of female gametophyte in correct order OR Describe the process of megasporogenesis with a neat labelled diagram

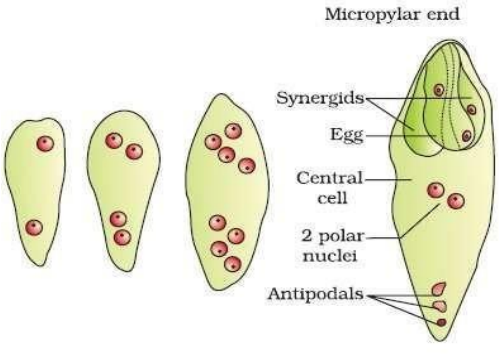


Fig: Nuclear divisions in the nucellus cell

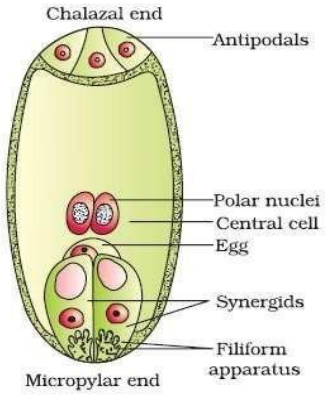


Fig: a typical embryosac

Ans: Megasporogenesis:

The process of formation of megaspores from the megaspore mother cell (MMC) is called megasporogenesis.

- The female gametophyte is formed within the nucellus of the ovule by undergoing sequential cell divisions. The angiospermic female gametophyte is a 7-celled and 8-nucleate structure.

- The formation of embryosac starts with a megaspore tetrad which is the result of mitotic divisions in the cells of nucellus at the micropylar region.
- One of the megaspores is functional while the other three degenerates. The functional megaspore develops into the female gametophyte (embryosac) this method of embryo sac formation from a single megaspore is termed monosporic development.
- The nucleus of the functional megaspore divides mitotically to form two nuclei which move to the opposite poles, forming the 2-nucleate embryo sac.
- Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stages of the embryo sac. After the 8-nucleate stage, cell walls are laid down leading to the organisation of the typical female gametophyte or embryo sac.
- Six of the eight nuclei are surrounded by cell walls and organised into cells; the remaining two nuclei, called polar nuclei are situated below the egg apparatus in the large central cell.
- The distribution of the cells within the embryo sac arranges like- three cells are grouped together at the micropylar end and constitute the egg apparatus consisting of two synergids and one egg cell.
- Three cells are at the chalazal end and are called the antipodals. The large central cell, as mentioned earlier, has two polar nuclei.
- The synergids have special cellular thickenings at the micropylar tip called filiform apparatus, which play an important role in guiding the pollen tubes into the synergid.

10. What is Emasculation?

It is a technique of removal of anther from the flower before they dehisce pollen grain to the stigma of same flower.

11. Differentiate between Geitonogamy and Xenogamy.

- **Geitonogamy:** Transfer of pollen grains from anther of a flower to the stigma of another flower born on the same plant.

It is functionally cross pollination and requires pollinating agent but genetically they are similar to autogamy since the pollen grains come from the same plant.

- **Xenogamy:** Pollination take place between two flowers born on two different plant of the same species introduces genetic variation.

12. What is apomixes?

The process of formation of seeds without fertilization is termed as apomixes.

13. Define parthenogenesis.

The process of formation of new organism without fertilization is called Parthenogenesis. eg: honeybees.

14. Define Embryogenesis.

The process of development of embryo from the zygote is called embryogenesis.

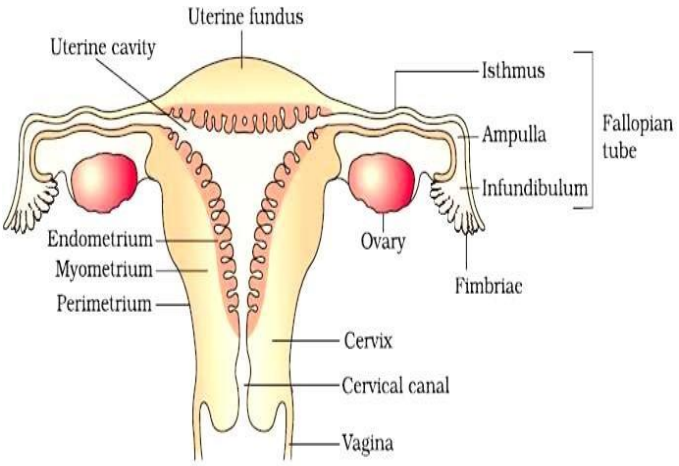
15. Distinguish between Homogametes and Heterogametes

HOMOGAMETES	HETEROGAMETES
When two gametes are so similar in appearance that it is not possible to categorise them into male and female gametes. They are called homogametes (isogametes)	When the gametes produced are of two morphologically distinct types. They are called heterogametes (anisogametes)

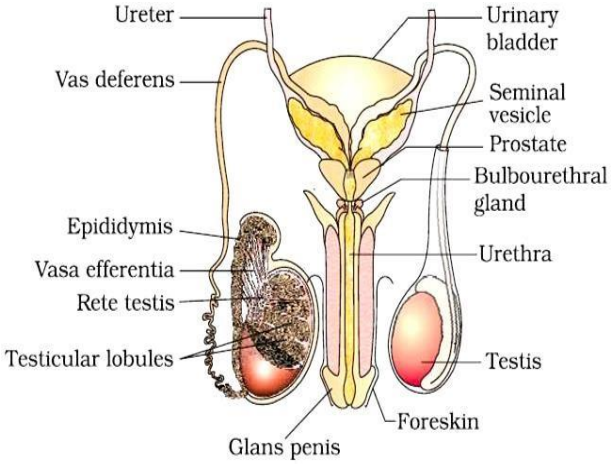
16. Differentiate between Menstrual cycle and Oestrous cycle

MENSTRUAL CYCLE	OESTROUS CYCLE
The cyclical changes during reproduction in primate mammals is called menstrual cycle e.g., monkeys, apes, and humans	The cyclical changes during reproduction in non- primate mammals is called oestrous cycle e.g., cows, sheep, rats, deers, dogs, tiger, etc.,

17. Female reproductive system



18. Male reproductive system



19. Name the cells that secrete androgens?

Interstitial cells or Leydig cells that synthesise and secrete testicular hormones called androgens.

20. What is menopause?

The Cessation or stoppage of menstrual cycle is called menopause.

21. What is menarche?

The first menstruation begins at puberty and is called menarche.

22. Name the hormone secreted by corpus luteum.

The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium.

23. What is ovulation?

Upon rupture of the Graafian follicle release the ovum and results in ovulation.

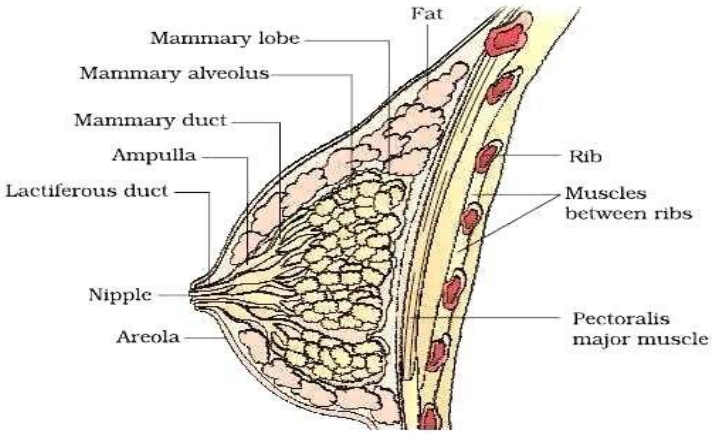
24. What is colostrum?

The milk produced during the initial few days of lactation is called colostrums.

25. Mention the functions of Sertoli cells of testis.

Sertoli cells provide nutrition to the germ cells several antibodies absolutely essential to develop resistance for the new-born babies.

26. Mammalian mammary gland



27. Define placenta? Write the function of placenta

Placenta: Temporary association between the fetal tissue (chorionic villi) and maternal tissue (uterine endometrium) is called placenta.

Function of placenta:

- The embryo connected to the placenta by umbilical cord, which transports substances to and from the embryo.
- Facilitate transport of oxygen and nutrient from mother to embryo.
- Removes CO2 and waste material from the embryo.
- Acts as endocrine gland and produces several hormones like:
  - Human chorionic gonadotrophins (hCG).
  - Human placental lactogen (hPL).
  - Estrogen.
  - Progesterone.
- Relaxin produced from the ovary in the later stage of pregnancy.

28. Describe the Intra Uterine Devices (IUDs)

- These are inserted by doctors or expert nurses in the uterus through vagina. This includes;
- Non-medicated IUDs (e.g. Lippes loop).
- Copper releasing IUDs (e.g. CuT, Cu7, Multiload 375).
- Hormone releasing IUDs (e.g. Progestasert, LNG-20): Make the uterus unsuitable for implantation and the cervix hostile to the sperms.

Principle of working IUDs:

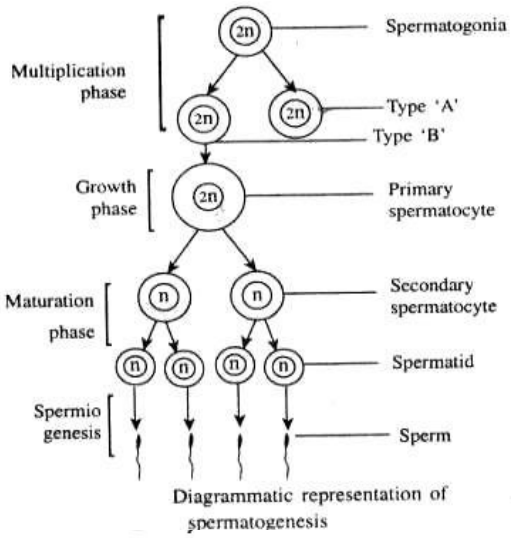
- IUDs increase phagocytosis of sperm within the uterus.
- Cu ion released suppresses sperm motility and fertilizing capacity of sperm.
- Hormone releasing IUDs make the uterus unsuitable for implantation and the cervix hostile to the sperm.

29. Artificial insemination (AI) technique:

Ans: The semen collected from the husband or a healthy donor is artificially introduced into the vagina or the uterus (IUI– intra-uterine insemination) of the female.

30. Explain the process of Spermatogenesis with schematic representation.

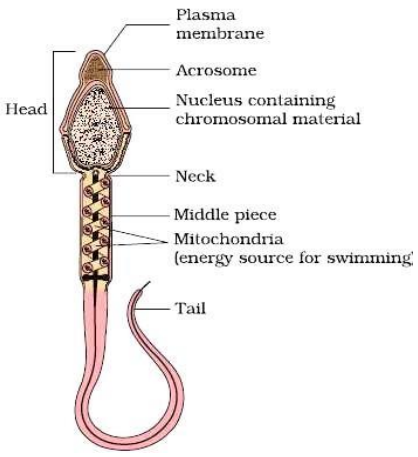
- Formation of sperm from the germ cell in the testes is spermatogenesis.
- The process begins at puberty.
- Each spermatogonium is diploid (2n) which contain 46 chromosomes.
- Innermost layer of spermatogonial becomes larger called primary spermatocyte.
- Primary spermatocyte undergoes meiosis-I to form two equal haploid (n) secondary spermatocytes (n).
- Each secondary spermatocyte undergoes meiosis-II to form two equal, haploid spermatids.
- Spermatids transformed into spermatozoa (sperms) by the process called spermiogenesis.



Diagrammatic representation of spermatogenesis

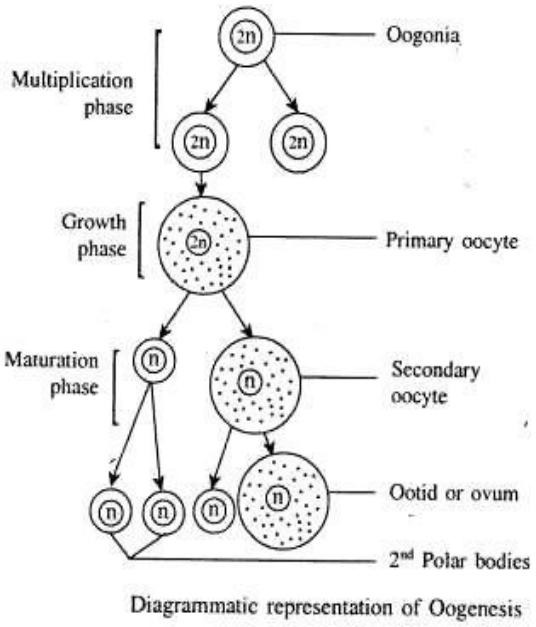
31. Explain the Structure of sperm with neat labeled diagram.

- A mature human sperm is a highly specialized sex cell measuring about 52 to 62 micron in length
- Ultrastructure of sperm consists of a head, neck, a middle piece and a tail.
- Whole body of sperm surrounded by plasma membrane.
- The sperm head contain an elongated haploid nucleus.
- Above the nucleus a cap like structure present called acrosome.
- The acrosome contains enzymes which help in fertilization of ovum.



- The middle piece contains mitochondria, which provide energy for movement of tail that facilitate sperm motility.

32. Explain the process of Oogenesis with schematic representation. or Define Oogenesis? Explain the process of oogenesis



Diagrammatic representation of Oogenesis

- It is the process of formation and maturation of egg within the ovary is called oogenesis.
- Oogenesis starts during embryonic stage, 25th week of the fetal age.
- Oogonia enters into meiosis-I and proceeds upto diakinesis of Prophase-I and get suspended, at this stage called primary Oocytes.
- Each primary oocyte surrounded by layers of granulose cells and then called primary follicle.
- At puberty only 60,000 to 80,000 primary oocytes are left in each ovary.
- The secondary follicle transformed into tertiary follicle, characterized by a fluid filled cavity called antrum.
- Large haploid cell is called secondary oocyte.
- A tiny cell called first polar body.
- The tertiary follicle having secondary oocyte further changes into Graafian follicle.
- At this stage Graafian follicle releases secondary oocyte from the ovary by the process called ovulation.

33. List any two principles to prevent sexually transmitted diseases.

- Avoid sex with unknown partners/multiple partners.
- Always use condoms during coitus
- Take advice of doctor for early detection and Treatment

34. What is infertility? Give reasons for infertility when the couples are unable to produce children in spite of unprotected sexual co-habitation.

The reasons for this may include physical, congenital diseases, drugs, immunological or even psychological.

35. What is Medical Termination of Pregnancy? Mention the safe period for medical termination of pregnancy.

Intentional or voluntary termination of pregnancy before full term is called Medical Termination of Pregnancy (MTP).

- In other words it is also called induced abortion MTPs are considered relatively safe during the first trimester, i.e., up to 12 weeks of pregnancy.

36. Differences between spermatogenesis and oogenesis:

Sl. No.	SPERMATOGENESIS	OOGENESIS
1	It is the process of formation of sperms	It is the process of formation of egg
2	It takesplace within the seminiferous tubules of testis	It takesplace within the grafian follicle of ovary
3	Stage of growth is short.	Stage of growth is long.
4	It yields four functional sperms.	It yields only one functional ovum.
5	Polar bodies are not formed.	Polar bodies are formed.

37. Differences between sperm and ovum:

Sl. No.	SPERM	OVUM
1	They are produced in the testis.	They are produced in the ovary.
2	They are very minute sized.	They are relatively large in size.
3	They are visually flagellated.	They are non-flagellated.
4	They are motile.	They are non-motile.

38. Mention the techniques for infertility control (ARTs):

The techniques adopted for infertility control are,

- Invitro fertilization (IVF)
- Embryo transfer(ET)
- GIFT(gamete intra fallopian transfer)
- ZIFT(Zygote intra fallopian transfer)

39. What is test cross? Mention its significance.

It is a cross between a dominant phenotype with the recessive parent instead. The progenies of such a cross can easily be analysed to predict the genotype of the test organism.

40. What are the conclusions drawn by M. Morgan from the crossing experiments in Drosophila with respect to linkage?

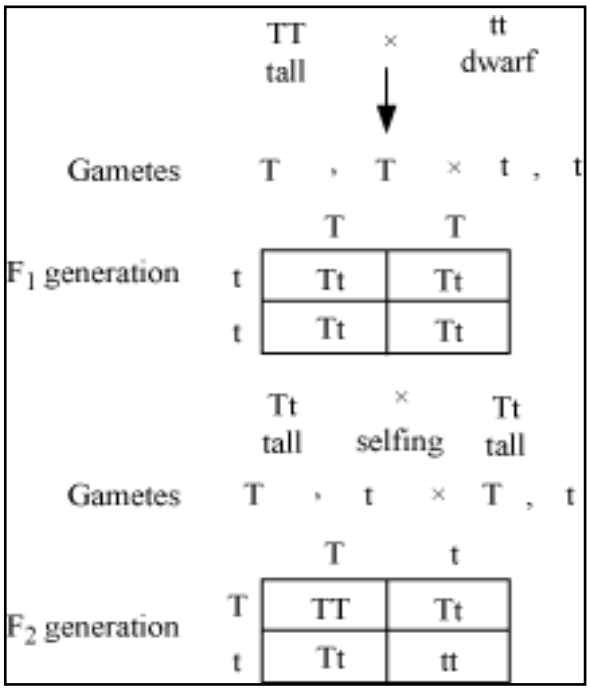
- Morgan describes that, the physical association of the two genes he coined the term linkage.
- The physical association of these genes on a chromosome was termed as recombination.
- Morgan and his group also found that even when genes were grouped on the same chromosome, some genes were very tightly linked and showed very low recombination.
- While other genes were loosely linked showing higher recombination.

41. Why did Morghan selected Drosophila as an experimental material?

- They can be grown on simple synthetic medium in the laboratory
- Their life cycle is completed in just two weeks
- A single mating could produce a large number of progenies
- They have clear differentiation of male and female flies
- They have many types of heredity variations which are easily visible under low power microscope.

42. Inheritance of one gene (Monohybrid cross) or law of segregation with suitable example?

- The cross between two homozygous individuals differing in one character is called monohybrid cross.
- Mendel selected garden pea plants for his experiment.
- He cross pollinated pure tall (TT) and pure dwarf (tt) pea plants as parents.
- The offspring produced (F1 hybrid) were all tall.
- In the next step the F1 plants were self- pollinated.
- In the second filial generation (F2) both tall and dwarf plants appeared in the ratio of 3:1 respectively.

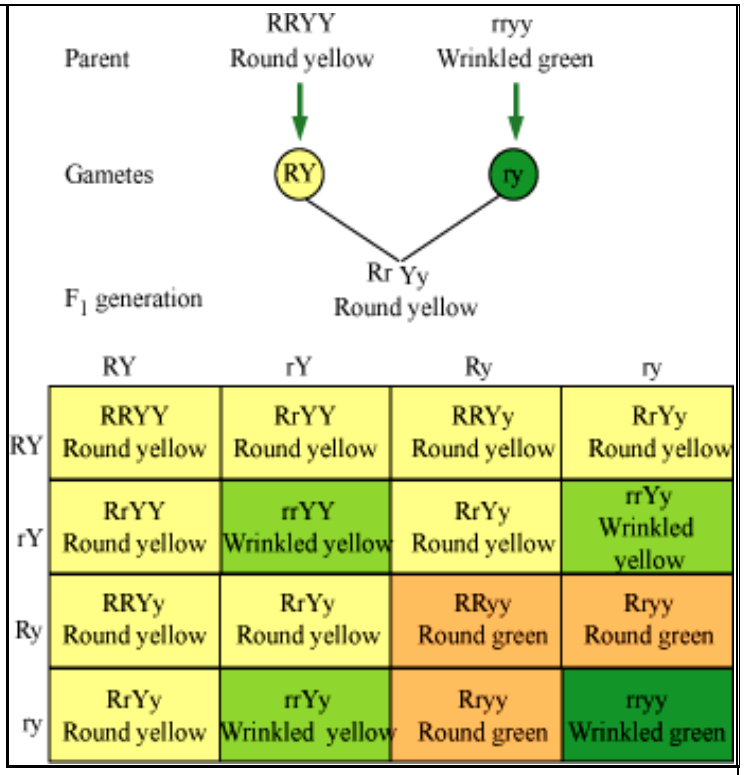


Observations:

- In the experiment all the F1 plant was tall.
- So Mendel called tall as dominant character and the dwarf as recessive.
- Punnet Square (Checker Board): It is thetable that displays all possible combinations of male and female gametes.

43. Mendel's Dihybrid Cross experiment.

- A cross between two homozygous individuals differing in two characters is called dihybrid cross.
- The experiment:
- Mendel in his dihybrid experiment, cross pollinated pure breeding round yellow (RRYY) and wrinkled green seeded (rryy) plants as parent.
- The offspring‟s produced in the first filial generation (F1 hybrid) were all round yellow seeded.
- In the next move, the F1 plants were self-pollinated.
- In the second filial generation (F2 hybrid) round Yellow, wrinkled Yellow, round green and wrinkled green seeded plants were produced in the ratio of 9:3:3:1 respectively. This is called dihybrid phenotype ratio.



	RY	rY	Ry	ry
RY	RRYY Round yellow	RrYY Round yellow	RRYy Round yellow	RrYy Round yellow
rY	RrYY Round yellow	rrYY Wrinkled yellow	RrYy Round yellow	rrYy Wrinkled yellow
Ry	RRYy Round yellow	RrYy Round yellow	RRyy Round green	Rryy Round green
ry	RrYy Round yellow	rrYy Wrinkled yellow	Rryy Round green	rryy Wrinkled green

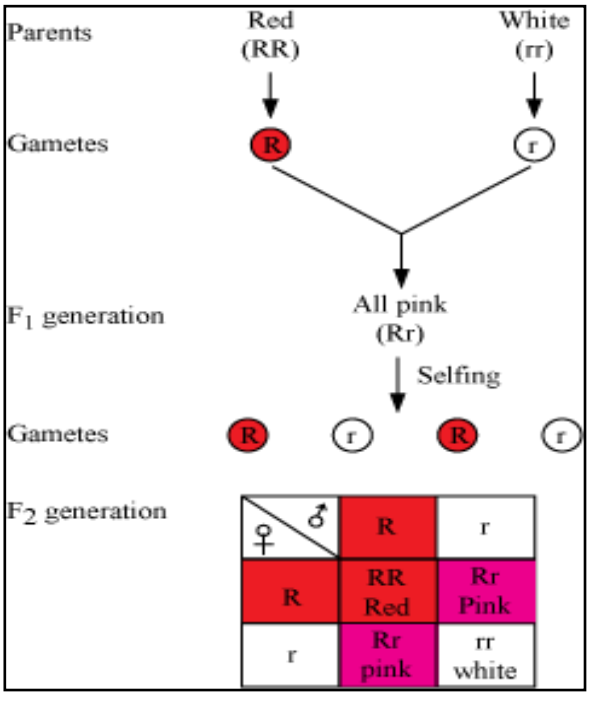
Observation:

- The formations of new combinations like wrinkled yellow and round green in addition to parental combinations in F2 generation clearly shows that seed colour and seed shape are independent characters.
- That is controlled by different genes.
- The genes (factors) controlling them separate independently during gamete formation.

44. Incomplete Dominance.

The expression of intermediate character in the hybrid obtained by crossing two pure varietiesis called incomplete dominance

- It is best explained in the inheritance of flower colour in Mirabilis Jalapa (Four O‟clock plant).
- In Mirabilis Jalapa when pure breeding red flower variety (RR) and pure white flower variety (rr) are cross pollinated, all the F1 hybrids show pink flowers.
- The F1 hybrids on self-pollination produced off springs with red flowers, pink flowers and white flowers in the ratio of 1:2:1



Observation:

- The reappearance of pure parental characters in F2 hybrids shows that there is no mixing of genes.
- Here, the gene of Red colour is not completely dominant over the white.
- Hence an intermediate character called pink is expressed.
- This cross also shows that there is no specific gene for pink flower.

45. Write any four symptoms of Down's syndrome.

- Short stature, large head, small nose with flat nasal bridge
- Open mouth with protruding tongue
- Eyes that slant upward with epicanthus fold
- Mentally retarded

46. Write the symptoms of Klenifelter's syndrome.

- Abnormal body propoprtions
- Tall stature
- Diminished pubic, axillary and facial hair
- Enlarged breast tissue (Gynaecomastia)
- Small firm testicles
- Sexual dysfunction

47. Mechanism of Sex determination:

Based on chromosomal differences, there are three types of chromosomal sex determination and they are as follows:

- XX - XO type (XO-type) – Insect (Grasshopper). Males- Heterogametic (XO).
- XX - XY type (XY-type) – Drosophila and human beings. Males- Heterogametic (XY).
- ZZ - ZW type (ZW-type) – Birds. Females- Heterogametic (ZW).

48. What are multiple alleles? Give an example.

When the particular character is governed by more than two alleles i.e., three alleles is called multiple alleles. Eg. **ABO blood grouping in humans.**

- Multiple alleles are found only when population studies are made.

49. Write a note on mendalian disorders.

Mendelian disorders are mainly determined by alteration or mutation in the single gene.
E.g. Haemophilia, colorblindness, Cystic fibrosis, Sickle cell anemia, Phenylketonuria, Thalasemia etc

A. Hemophilia:

- In this disease a single protein that is a part of the cascade of proteins involved in the clotting of blood is affected. Due to this in an affected individual a simple cut will result in non-stop bleeding
- Sex linked recessive disease.
- The diseases transmitted from unaffected carrier female to some of the male progeny.
- Affected transmits the disease only to the son not to the daughter.
- Daughter can receive the disease from both mother and father

B. Sickle cell anemia:

- The defect is caused due to substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule.
- Substitution of amino acid takes place due to the single base substitution at the sixth codon of the beta globin gene from GAG to GUG.
- This disease is controlled by single pair of allele, HbA, and HbS

C. Phenylketonuria:

- Autosomal recessive trait.
- Inborn error of metabolism.
- The affected individual lack one enzyme called phenyl alanine hydroxylase that converts the amino acid phenyl alanine to tyrosine.
- In the absence of the enzyme phenyl alanine accumulated and converted into phenylpyruvic acid and other derivatives

50. Write a note on chromosomal disorders.

A) Down's syndrome:

Caused due to presence of an additional copy of the chromosome number 21 (trisomy of 21).

- Short stature with small round head.
- Furrowed tongue
- Partially opened mouth
- Palm is broad with characteristic palm crease.
- Physical, psychomotor

B) Klinefelter's syndrome:

Caused due to the presence of an additional copy of X-chromosome resulting into a karyotype of 47, (44+XXY).

- Overall masculine development.
- Also develop feminine character.

C) Turner's syndrome:

Caused due to the absence of one of the X- chromosomes i.e. 45 (44 + X0).

- Such females are sterile as ovaries are rudimentary.
- Lack of other secondary sexual characters.

51. Mention any three applications of DNA fingerprinting technique.

- An individual DNA show polymorphism, which will be very useful tool in forensic lab.
- DNA fingerprinting is the basis of paternity testing, in case of solving disputes.
- Determining population and genetic diversities.
- Studying breeding patterns to save the animals facing the danger of extinction.
- It helps to show the connecting links between the different groups of animals (Eg. Man, to apes).

52. List the salient features of Human Genome Project (HGP).

Some of the salient observations drawn from human genome project are as follows

- The human genome contains 3164.7 million nucleotide bases.
- The average gene consists of 3000 bases, but sizes vary greatly, with the largest known human gene being dystrophin at 2.4 million bases.
- The total number of genes is estimated at 30,000–much lower than previous estimates of 80,000 to 1,40,000 genes. Almost all (99.9 per cent) nucleotide bases are exactly the same in all people.
- The functions are unknown for over 50 per cent of discovered genes and Less than 2 per cent of the genome codes for proteins.
- Chromosome 1 has most genes (2968), and the Y has the fewest (231).
- Scientists have identified about 1.4 million locations where single base DNA differences occur in humans called SNPs – single nucleotide polymorphism, pronounced as „snips.

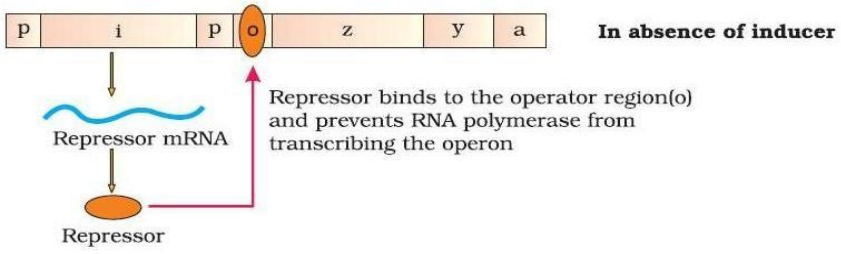
52. Describe the Lac-operon concept in E.coli bacterium.

The Lac Operon concept was proposed by Jacob & Monad for the regulation of genes from the lactose metabolism in E.coli.

- The conversion of lactose sugar into simple hexose sugars is catalysed by three enzymes β-galactosidase, permease & transacetylase regulated by the structural genes z, y, a respectively
- This concept can be explained under two headings i.e. in presence and in absence of inducer (Lactose).

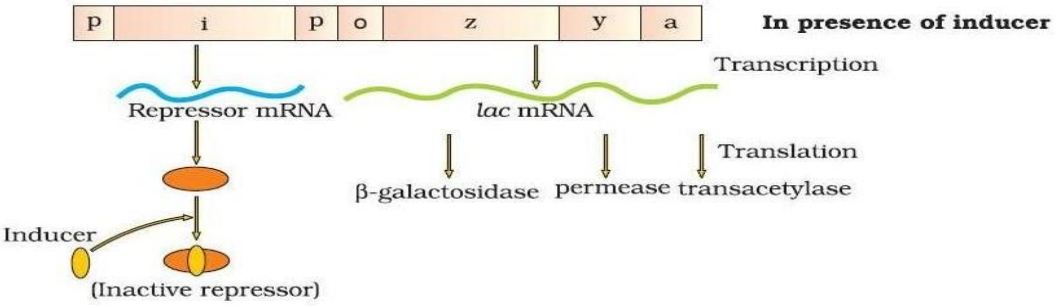
In absence of Inducer (Lactose): The regulatory gene (i) produces the repressor protein which binds to the operator gene in absence of lactose in the medium.

- This prevents transcription of the subsequent genes because of the presence of repressor protein which disables the mRNA polymerase from binding to the promoter. Hence, the transcription and translation is stopped and no enzymes are produced. The structural genes are now said to be "Switched off".

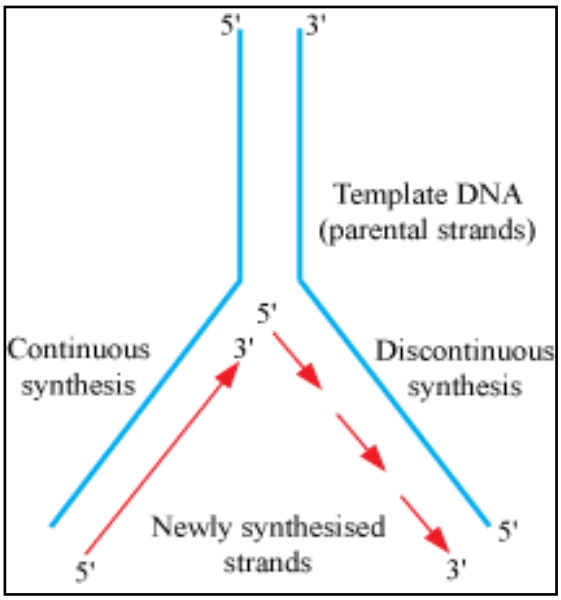


In presence of Inducer: In presence of lactose thee inducer interacts and inactivates repressor protein due to which the protein is unable to bind to the operator gene.

- The operator gene signals the structural genes to produce polycistronic mRNA which in turn produces three enzymes necessary for the lactose metabolism. Thus, the operon is now said to be in "Switched on" mode.



53. Describe the process of DNA replication with the help of a diagram.



- Replication occurs in S phase of cell cycle.
- Enzyme involved - DNA polymerase (DNA dependent DNA polymerase)
- Replication requires energy.
- Source of energy − Deoxyribonucleoside triphosphates (DNTPs)
- DNTPs have dual purpose − Act as substrates and provide energy also
- Replication initiates at specific regions in DNA called origin of replication.
- DNA polymerase polymerises a large number of nucleotides in a very short time.
- During the course of replication, two parent strands do not completely open, but a small opening forms in which replication occurs. This small opening forms a replication fork.
- DNA polymerase can polymerise only in one direction that is '.
- Therefore, replication occurs smoothly at 3^1 to 5^1 end of DNA. (Continuous replication, but occurs discontinuously at 5^1 to 3^1 end)
- The discontinuous fragments so formed are joined by DNA ligase.

54. Describe the Griffith's experiment to show transformation in bacteria.

- Ferdrick Griffith through his experiment on Streptococcus pneumoniae found the transformation in bacteria
- When Streptococcus pneumonia bacteria are grown on a culture plate, some produced smooth shiny colonies (S) – Virulent form of bacteria. While others produce rough colonies (R) – Avirulent form of bacteria, because the S strain have a mucous coat, while R strain does not.
- Mice was infected with the S strain (Virulent) die from pneumonia infection but mice infected with the R strain so not develop pneumonia.

S strain ⟶ Injected to the mice ⟶ Mice die
R strain ⟶ Injected to the mice ⟶ Mice survive

- Griffith was able to kill bacteria by heating them and he observed that the heat killed S strain bacteria injected into the mice did not kill them.
- When he injected a mixture of heat-killed S and R live bacteria, the mice died and he recovered living S strain of bacteria from the dead mice.

S strain (Heat killed) ⟶ Injected to mice ⟶ Mice survives
S strain (Heat killed)
\+ ⟶ injected to mice ⟶ Mice dies
(Live) R strain

- Thus, he concluded that the R strain bacteria had transformed by the heat killed S strain bacteria must be due to the transfer of the genetic material.

55. Define translation describe the process in detail.

"The process where the coded information present on the triplets of mRNA is decoded into specific protein molecule is called translation".

The process of translation is carried out in 4 important steps,

i. Activation of amino acids or activation of tRNA:

- Amino acids are activated in presence of magnesium ions and ATP and gets linked to a specific tRNA molecule to form amino acyl tRNA catalysed by enzyme amino acyl tRNA synthetase

ii. Initiation:

- The process of translation or protein synthesis begins with attachment of mRNA with small subunit of ribosome.
- The ribosome binds to the mRNA at the start codon (AUG).
- AUG is recognized by the initiator tRNA.

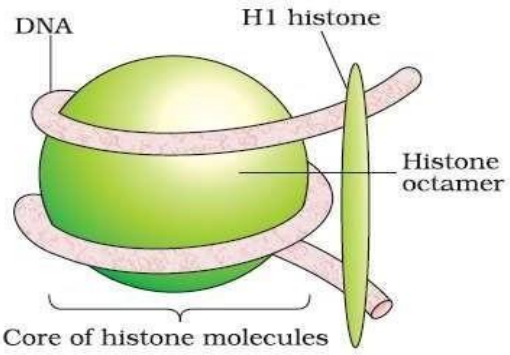
iii. Elongation:

- Larger subunit attached with the initiation complex.
- Larger subunit has two site „A" site and „P" site.
- Initiator tRNA accommodated in „P" site of large subunit, the subsequent amino-acyl-tRNA enters into the „A" site.
- Formation of peptide bond between two amino acids of „P" and „A" site, catalyzed by ribozyme, (23S rRNA in bacteria)
- The moves from codon to codon along the mRNA called translocation.

iv. Termination:

- Elongation continues until a stop codon arrives at „P" site.
- There is no tRNA for stop codon.
- A release factor binds to the stop codon.
- Further shifting of ribosome leads to separation of polypeptide.
- An mRNA also has some additional sequences that are not translated called untranslated regions (UTR).

56. Draw a neat labeled diagram of Nucleosome.



57. Define transcription? Describe the process of prokaryotic transcription.

TRANSCRIPTION:

„The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.

Process of transcription in prokaryotes:

- There is a single DNA dependent RNA polymerase that catalyses transcription or synthesis of all three types of RNAs in prokaryotes. It is 3 steps.

Initiation:

- RNA polymerase binds to the specific site of DNA called promoter.
- Promoter of the DNA is recognized by initiation factor or sigma (σ).

Elongation:

- RNA polymerase unzipped the DNA double helix and forms an open loop.
- It uses ribonucleoside triphosphates as substrate and polymerizes in a DNA template following the rule of complementarity.

Termination:

- RNA polymerase recognizes the terminator gene by a termination- factor called rho-factor.

58. Write the Salient features of genetic code.

- The codon is triplet. Three nitrogen base sequences constitute one codon.
- There are 64 codon, 61 codes for amino acids and 3 codons are stop codon.
- One codon codes for only one amino acid, hence it is unambiguous.
- Degeneracy: some amino acids are coded by more than one codon.
- Comma less: the codon is read in mRNA in a continuous fashion. There is no punctuation.
- Universal: From bacteria to human UUU codes for phenyl alanine.
- Initiation codon: AUG is the first codon of all mRNA. And also it codes for methionine (met), hence
- has dual function.
- Non-overlapping: The genetic code reads linearly.
- Non-sense codon: UAA, GUA, and UAG do not code for amino acid and has no anticodon on the tRNA.

59. Write a note on Salient features of Human Genome (HGP).

- The human genome contains 3164.7 million nucleotide bases.
- The average gene consists of 3000 bases.
- The largest known human gene being dystrophin at 2.4 million bases.
- The total number of gene is estimated at 30.000.
- 99.9 percent nucleotide base sequences are same in all peoples.
- The function of 50% genes discovered is unknown.
- Less than 2 percent of the genome codes for proteins.
- Repeated sequences make up very large portion of human genome.
- Chromosome I has most genes (2968) and the Y has the fewest (231).
- It is identified about 1.4 million locations where single-base DNA differences (SNPs – single nucleotide polymorphism) occurs in humans.

60. Name the causative organisms of the following diseases.

- Pneumonia- Streptococcus pneumoniae
- Common cold – Rhinovirus
- Typhoid – Salmonella typhi
- Ascariasis – Ascaris lumbricoides
- Filariasis – Wucheria bancrofti/Wucheria.malayi
- Malaria – Plasmodium vivax, Plasmodium falciparum.

61. What are Interferons.

Interferons are special class of proteins that are secreted by the virus-infected cells.

62. Name the diagnostic test used to detect AIDS.

ELISA- Enzyme linked immuno-sorbent assay.

63. Name the disease diagnosed by the Widal test.

Typhoid.

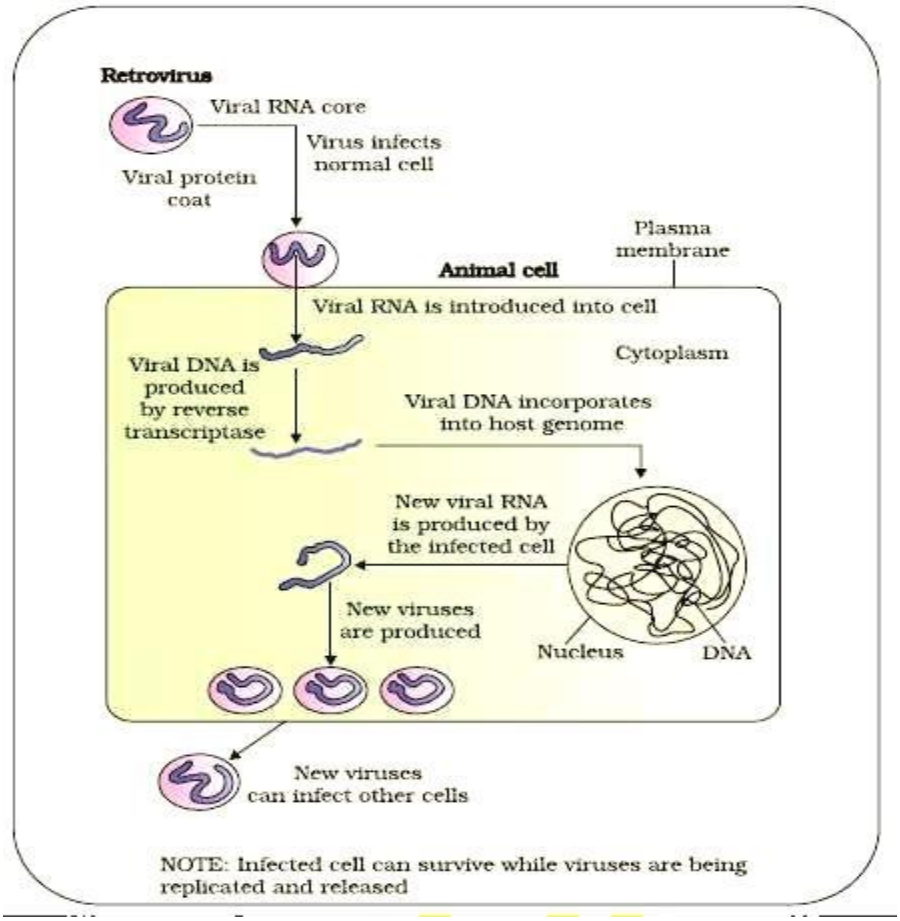
64. Write any two methods of transmission of HIV.

Transmission of HIV-infection generally occurs by;

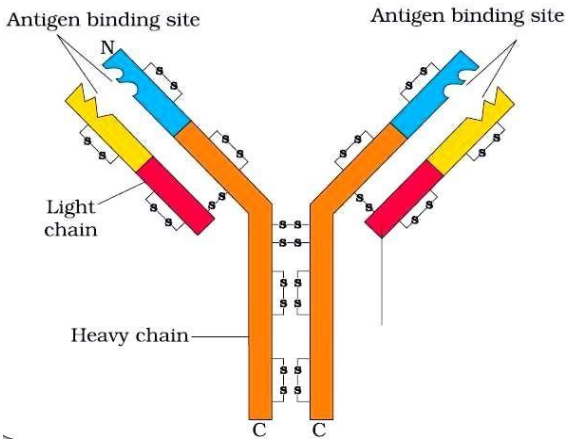
- Sexual contact with infected person.
- By transfusion of contaminated blood and blood products.
- By sharing infected needles as in the case of intravenous drug abusers and from infected mother to her child through placenta.

65. Explain the life cycle of HIV.

- Once the virus gets into the body of the person, the virus enters into macrophages where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase.
- This viral DNA gets incorporated into host cell‟s DNA and directs the infected cells to produce virus particles.
- The macrophages continue to produce virus and in this way acts like a HIV factory.
- Simultaneously, HIV enters into helper T- lymphocytes (TH), replicates and produce progeny viruses.
- The progeny viruses released in the blood attack other helper T-lymphocytes. This is repeated leading to a progressive decrease in the number of helper T-lymphocytes in the body of the infected person.



66. Draw a neat labelled diagram of an antibody molecule.



67. Mention any three characteristics of a cancer cell.

- Cancer cells appear to have lost the property of contact inhibition. As a result of which, cancer cells continue to divide giving rise to masses of cells called tumors.
- Cancer cells grow very rapidly, invading and damaging the surrounding normal tissues.

- Cancer cells reach distant sites through blood, and get lodged in the body, start a new tumor. This property called metastasis.

68. Differentiate between Innate immunity and Acquired immunity.

	Innate Immunity		Acquired Immunity
1)	It is present from birth	1)	It develops after birth by vaccination or contracting the disease
2)	It is non-specific immunity	2)	It is a specific immunity
3)	It isheritableandremainsthroughoutthe life	3)	It is non-heritable and lasts for a short period.

69. Differentiate between Active Immunity and Passive Immunity.

	Active Immunity		Passive Immunity
1)	It provides lifelong immunity.	1)	It provides temporary immunity.
2)	The antibodies produced are harmless.	2)	The antibodies which are injected are some time harmful.
3)	This is the naturally acquired immunity produced in the host body in response to an antigen.	3)	When readymade antibodies are provided to an individual to protect against foreign antigen.
4)	It is slow and takes time to response.	4)	It shows immediate response.

70. Differentiate between Benign and Malignant tumors.

Sl. No.	Benign tumors	Malignant tumors
1.	They are localized	They are not localized
2.	Growth is expansive	Growth is invasive
3.	Growth rate is slow	Very fast growth
4.	There is no metastasis	Metastasis occur

71. Drugs and alcohol abuse includes,

- Opioids: extracted from *Papaver somniferum*
- Cannabinoids: obtained from Cannabis sativa
- Cocaalkaloids/Cocaine: it is obtained from *Erythroxylon coca.*
- Hallucinogens: It is obtained from *Atropa belladonna* and Datura sp. LSD (Lysergic acid Diethylamide) is obtained from fungus.
- Tobacco:Itcontainsnicotine(*Nicotianatabacum*inwhichnicotinecanbeextraction)

72. Adolescence and Drug abuse

- Adolescence is the period during which the child becomes matured.
- It is between 12 – 18 years of age.

Causes of drug abuse

- Curiosity
- Adventure
- Excitement
- Experimentation
- Stress or pressure to excel in examination.

Effects of drug/alcohol abuse

- Reckless behavior
- Malicious mischief
- Violence
- Drop in academicperformance
- Depression, isolation, aggressiveness,etc.

Prevention and control

- Avoid peer pressure
- Counselling and education
- Take help from teachers, parents and peers
- Take professional and medical help

73. Explain the role of microbes in production of industrial products.

Fermented Beverages:

- Yeasts are used for production of beverages like wine, beer, whisky, brandy or rum.
- Saccharomyces cervisiae commonly called „brewer"s yeast used for fermenting malted cereals and Fruit juices to produce ethanol.
- Wine and beer are produced without distillation.
- Whisky, brandy and rum are produced by distillation of the fermented broth.

Antibiotics:

- Antibiotics are the chemical substances which are produced by some microbes and can kill or retard the growth of other microbes.
- The first antibiotic discovered is the penicillin, from a mould (fungus) Penicillium notatum.

Chemicals, Enzymes and other Bioactive Molecules:

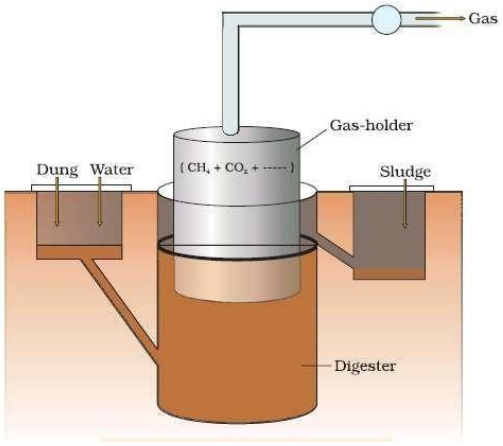
- Aspegillus niger (a fungus) produces citric acid.
- Acetobacter aceti (a bacterium) produce acetic acid.
- Clostridium butylicum (a bacterium) produce butyric acid.
- Lactobacillus (a bacterium) produces lactic acid.
- Saccharomyces cerevisiae (yeast) used for production of ethanol.
- Lipases are used in detergent produced by microbes.
- Pectinase, proteases and cellulase, make bottled fruit juices clearer.
- Streptokinase produced by Streptococcus used as a „clot buster", for removing clots from the blood vessels.
- Cyclosporin-A produced by a fungus called Trichoderma polysporum used as immunosuppressive agent in organ transplantation.
- Statins produced by Monascus purpureus used as blood cholesterol lowering agents. It acts as competitive inhibitor for the enzyme responsible for synthesis of cholesterol

74. Write a note on microbes as biofertilizers.

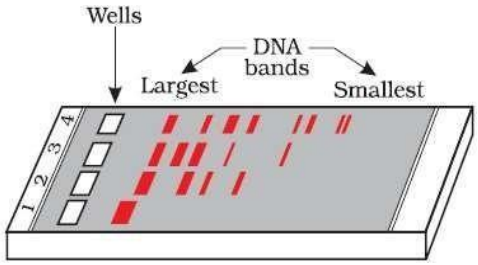
- Biofertilizers are organisms that enrich the nutrient quality of the soil.
- Main biofertilizers are the bacteria, fungi and cyanobacteria.
- Rhizobium form root nodules in legumes and fix atmospheric nitrogen.
- Azospiriliumand Azotobacter free living bacteria fix atmospheric nitrogen and thus increasing nitrogen content of the soil.
- Mycorrhiza: fungi symbiotically associated with root of plants.
- Many members of the genus Glomus form Mycorrhiza.
- Provide phosphorus to the plants from the soil.
- Make the plant resistant to root-borne pathogen.
- Increase tolerance to salinity and drought.
- Cyanobacteria like Anabaena, Nostoc, and Oscillatoria etc:
- Fix atmospheric nitrogen.

75. What is biogas? Explain the how biogas production occurs in biogas plant with the help of diagram

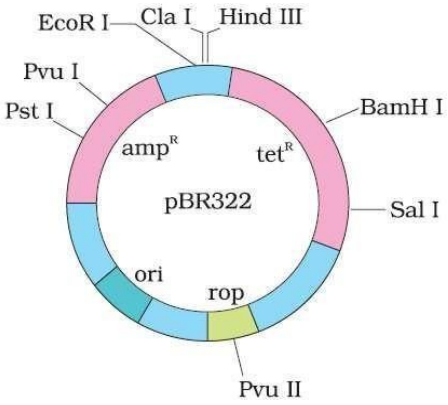
- Biogas is a mixture of gases (predominantly methane) produced by the microbial activity and is used as fuel.
- Certain bacteria grow anaerobically on cellulosic material, produce large amount of methane along with CO2 and H2S. These bacteria are collectively called methanogens. One common bacterium is Methano bacterium.
- These bacteria present in the rumen of cattle, plays essential role in nutrition of cattle by digesting cellulose. Hence the excreta (dung) used for the production of biogas.



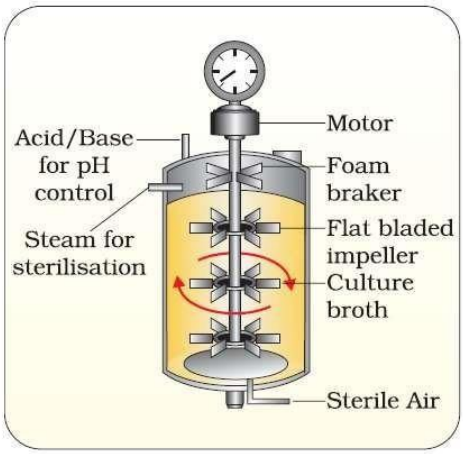
76. Draw a neat labelled diagram of Gel electrophoresis



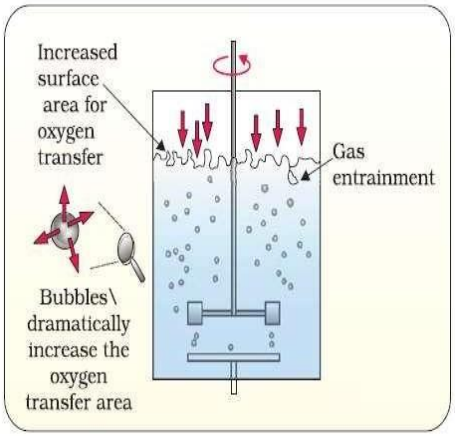
77. Structure of PBR322



78. Simple stirred tank Bioreactor



79. Sparged stirred tank Bioreactor



80. Write a note on microbes in sewage treatment.

The waste water generated in cities and town containing human excreta. This municipal water-water is called sewage.

Primary treatment:

Involves the physical removal of particles – large and small from sewage through filtration and sedimentation.

- Initially floating debris is removed by sequential filtration.
- The grit (soil and small pebbles) are removed by sedimentation.
- All solids that settle form the primary sludge, and the supernatant forms the effluents.

Secondary treatment or Biological treatment:

- The primary effluent is passed into large aeration tanks.
- This allows vigorous growth of useful aerobic microbes into flocs.
- The growth of microbes consumes the major part of the organic matter in the effluent. This significantly reduces the BOD (biochemical oxygen demand) of the effluent.
- Greater the BOD of the waste water more is its polluting potential.
- Once the BOD of sewage reduced significantly, the effluent is then passed into the settling tank where the bacterial "flocs" are allowed to sediment. This sediment is called activated sludge.
- The remaining sludge is pumped into anaerobic sludge digester.
- Ganga Action Plan and Yamuna Action Plan initiated by Ministry of Environment and Forest to save these major rivers of our country.

81. Differentiate between primary and secondary sewage treatment:

	Primary treatment	Secondary treatment
1	It is called physical process	It is called biological process
2	It involvesphysicalremovalofparticles.	It involves biological processes.
3	BOD does not takes place	BOD is takes place.
4	The effluents are taken for secondary treatment.	Theeffluentsaretakentoreleaseinto natural water body.

82. Define adaptation? Write a note on adaptation in high altitude sickness.

Adaptation is any attribute of the organism (morphological, physiological, and behavioral) that enables the organism to survive and reproduce in its habitat.

Adaptation in high altitude:

- A person move to high altitude (>3,500 meter), develop altitude sickness.
- Symptoms developed are nausea, fatigue and heart palpitations.
- This is due to low atmospheric pressure of high altitudes; the body does not get enough oxygen.

83. What is Eurythermal organism?

Organisms that tolerate wide range of temperature.

84. What is Stenothermal organism?

Organisms that tolerate only narrow range of temperature.

85. What is Euryhaline organism?

Organisms that can tolerate wide range of salinity.

86. What is Stenohaline organism?

Organisms that can only tolerate narrow range of salinity.

87. What is Homeostasis?

The ability of an organism to maintain the constancy of its internal environment despite varying external environmental conditions.

88. How does Homeostasis occur?

- Regulate: Maintain homeostasis by ensuring constant body temp (thermoregulation), and constant osmotic concentration (osmoregulation). Examples – mammals regulate temperature by shivering in cold and sweating in heat.
- Conform: Internal environment of conformers changes with external environment.
- Migrate: Move from stressful habitat temporarily to hospitable area and return when stressful period over. E.g.- Migration of birds to Keolado National Park, Rajasthan from Siberia.
- Suspend: Organisms develop mechanisms to deal with stressful situation Examples- Spores (bacteria and fungi).

89. What are the causes of bio-diversity losses? Or what are the four evil quartets of biodiversity losses?

- Habitat lass and fragmentation
- Over-exploitation
- Alien species invasions
- Co-extinctions.

90. Bio-diversity conservation:

- In-situ conservation or on site conservation:
  Conservation of animals and plants inside the natural habitat.
  Ex: National park, sanctuaries, etc
- Ex-situ conservation or Off-site conservation:
  Conservation of animals and plants outside the natural habitat.
  Ex: Zoo, Botanical Park, etc.

91. What are Biodiversity hot spots? Give examples.

Biodiversity hot spot is a region with a high levels of endemic species that is under threat from humans. Ex: Western Ghats and Himalayan region.

(34 biodiversity hotspots in the world, Indian subcontinent have two hotspots. Himalayan region and Western Ghats.)

92. What is Endemism? Give example.
Species which is only found in a given area not found in any other place.
Ex: Butea (plant) Nilgiri langur (Animal).

93. What are sacred groves? Give example.
These are the small forest patches have protected trees and wild life.
Ex: Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghats of Karnataka, etc.

94. What is sacred species?
Some Taboas and beliefs the protection of sacred species of plants and animals. Ex: Plants like Ficus religiasa (Ashwatha or Arali), Aegle Marmelas (Bilvapatra). Animals like Elephantidae (Elephant) and Pavo (Peacock).

LIST OF IMPORTANT DIAGRAMS

1. T.S of anther
2. V.S of Ovule (Anatropus ovule)
3. Embryosac
4. Male reproductive system
5. Female reproductive system
6. Human sperm cell
7. Graafian follicle
8. Mammary gland
9. Section of seminiferous tubule
10. Structure of a nucleosome
11. Transcription unit
12. Structure of a tRNA molecule
13. Hershey and Chase experiment
14. Structure of an antibody
15. Biogas plant
16. Schematic representation of rDNA technology
17. Agarose gel electrophoresis
18. Structure of Plasmid pBR 322
19. Structure of a typical bioreactor
20. Sparged stirred tank bioreactor