KENDRIYA VIDAYALAYA SANGTHAN

JAIPUR REGION

CLASS: XII

BIOLOGY

SESSION: 2020-21

LAST MINUTE REVISION STUDY MATERIAL

ADVISORS

- **SHRI B.L. MORODIA,** DEPUTY COMMISSIONER, KVS (RO), JAIPUR

COORDINATION TEAM AT KVS (RO), JAIPUR

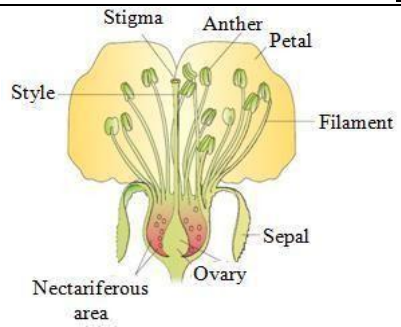
- **SHRI D.R. MEENA,** ASSISTANT COMMISSIONER, KVS (RO), JAIPUR
- **SHRI MUKESH KUMAR,** ASSISTANT COMMISSIONER, KVS (RO), JAIPUR

CONTENT TEAM

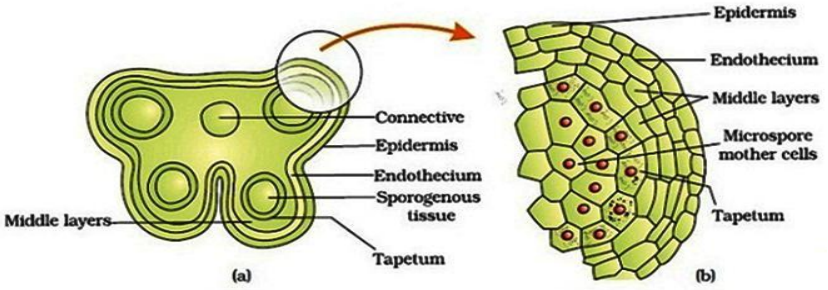
- **SHRI MANOJ KUMAR, PRINCIPAL,** KV JALIPA CANTT BARMER
- **SHRI MALLIKARJUN WALIKAR,** PGT BIO, KV BANSWARA
- **SHRI PUKHRAJ VAISHNAV,** PGT BIO, KV BEAWAR
- **MS SHIVANI PANDEY,** PGT BIO, KV NO. 1, JAIPUR
- **SHRI BHAGAT KUMAR MEGHWAL,** PGT BIO, KV BSF JODHPUR
- **SHRI PREM DEEPAK MISHRA,** PGT BIO KV CTPP, CHABRA

UNIT – 6 Reproduction

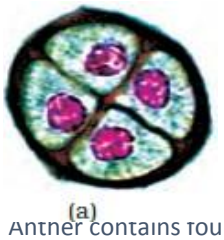
CHAPTER - 2 REPRODUCTION IN FLOWERING PLANT



Bisexual flower- stamen and pistil



Anther Walls -Epidermis, endothecium, middle layer and tapetum



four microspore join together and form microspore tetrad.

Anther contains four microsporangia where microspores are produced from microspore mother cell by meiosis called microsporogenesis.

PMC-> meiosis >> 4Microspore(tetrad)

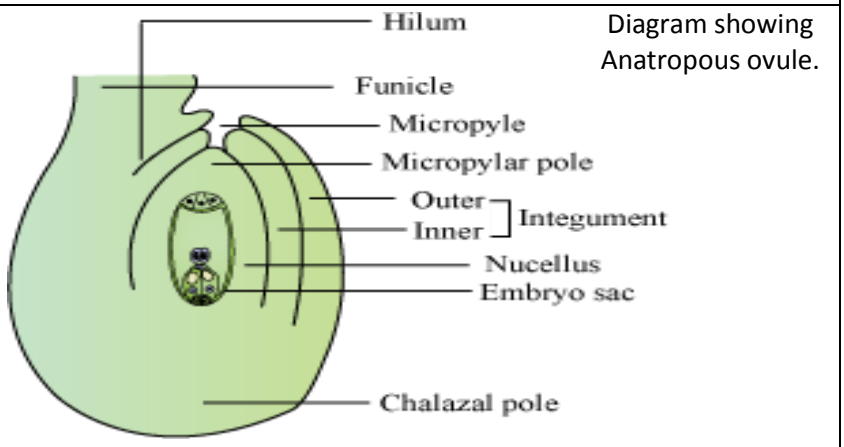
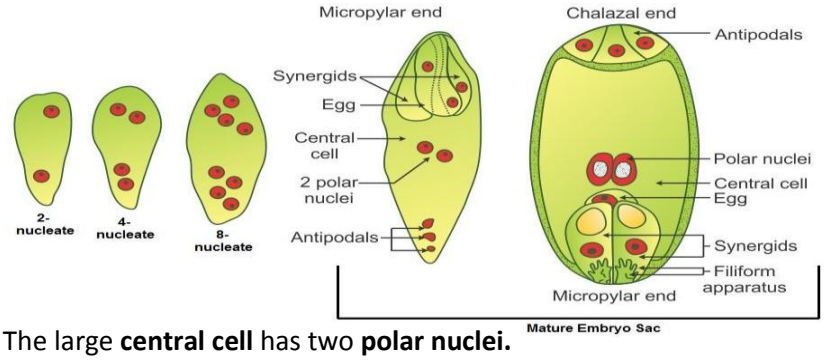


Diagram showing Anatropous ovule.

Megasporogenesis-The process offormation of **megaspores** from the**megaspore mother cell** is called**Megasporogenesis.**In the centre of the ovule there is amass of tissue called **nucellus**.Cells of nucellushave abundant reserve food materials.One cell of the nucellus towardsmicropylar end differentiated into**megaspore mother cell**(MMC).It is a large **diploid cell,** dense**cytoplasm** with **prominent nucleus.**The MMC undergoes **meiotic** division resulting four haploid **megaspores**.



The large **central cell** has two **polar nuclei.**

A typical angiosperm embryo sac at maturity is **8-nucleated** and **7-celled**

KEYWORDS-ENDOSPERM,PEC,PEN.

- Pollination:

Transfer of pollen grains from theanther to the stigma of a pistil istermed as pollination.

Both male and female gametes arenon-motile.

Kinds of pollination:Autogamy, **Geitonogamy and xenogamy.**

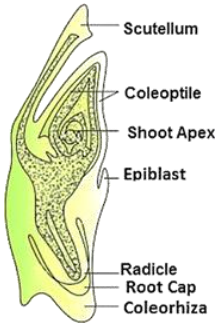
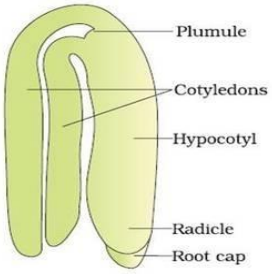


Diagram showing Embryo of grass &DICOT



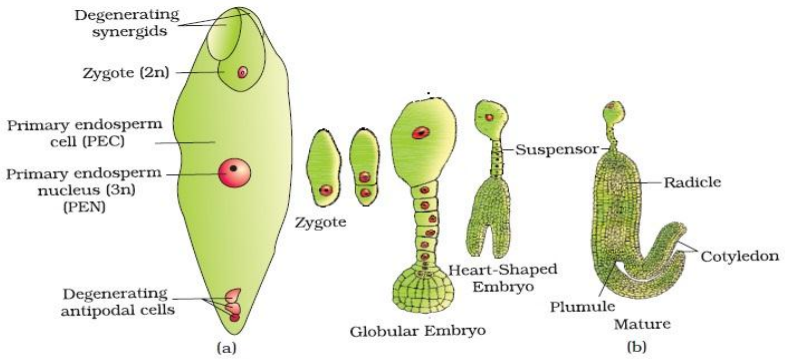
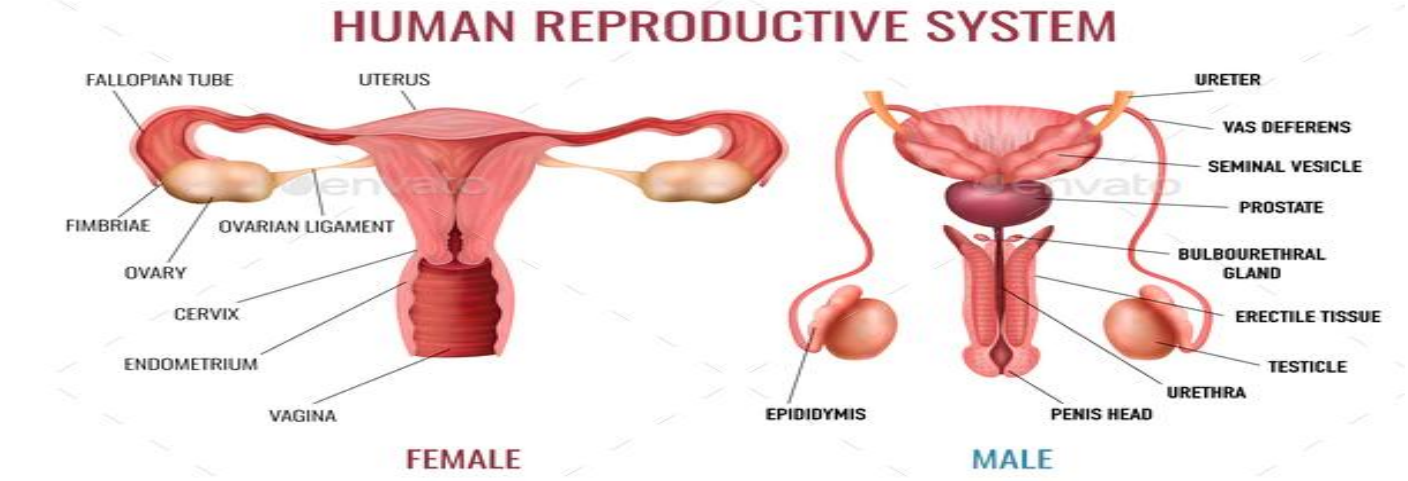
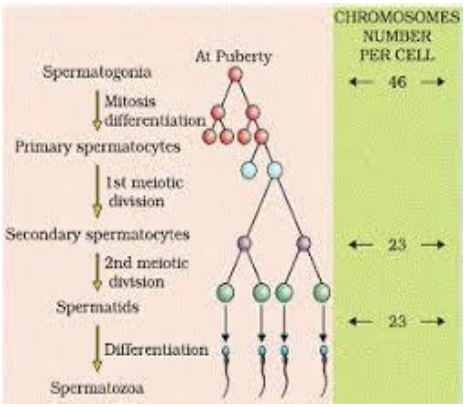


Figure 2.13 (a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN); (b) Stages in embryo development in a dicot [shown in reduced size as compared to (a)]

CHAPTER – 3: HUMAN REPRODUCTION

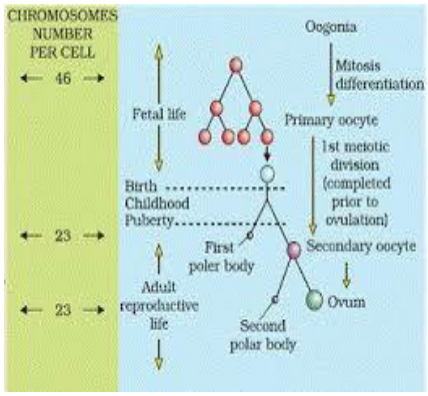


SPERMATOGENESIS



Result = 4 haploid sperms (Spermatozoa). This process of spermatogenesis starts from puberty in males.
(Refer fig 3.6 for sperm, a matured sperm have Head, Neck, Middle piece and tail each showing a peculiar function – Pg. 48)

OOGENESIS



1. Starts at embryonic stage in fetal ovary but meiosis -1 gets arrested at Prophase -1.
2. During puberty when follicle matures the first meiotic division completes and secondary oocyte forms.
3. During ovulation secondary oocyte releases.
4. During fertilization the secondary oocyte converts in to ovum (Adult reproductive stage)

Result = one Egg and 3 polar bodies generate which soon degenerate.

Hormonal control in Male reproductive system

Hypothalamus _____ GnRH ----------Pituitary gland it releases two hormones

LH	**FSH**
Acts on Leydig cells	**Acts on Sertoli cells**
Produces androgens	**Provide nutrition to sperms**
Starts spermatogenesis	**Also spermiation**

Menstrual cycle – The cycle is completes in 28 days.
Start is Menarche and end is Menopause. The cycle is divided in 3 phases (a) Pre ovulatory (1 to 5 days) (b) ovulatory (6 to 14 and on 14 ovulation occur) (c) Post ovulatory (14 to 28 days). Progesterone known as pregnancy hormone. If fertilization does not takes place then corpus luteum starts degenerating and visible indication bleeding starts.

(Refer fig. 3.9 at page no. 50 for details)

Fertilization and implantation

(Fertilization takes place in fallopian tube while implantation occurs in uterus.)
Only one sperm can enter in egg
As entry of sperm inside ovum changes membrane configuration**.**

Pregnancy and Embryonic development

After implantation placenta forms. and inner cell mass forms different organs in humans by the formation of germinal layer. The division at the time of embryo formation is cleavage, than morula,and blastocyst at this stage it moves in uterus and become embedded.
In 9 month's organogenesis completes. The first organ is human heart.

Parturition and Lactation-

Starts by foetal ejection reflex it releases oxytocin hormone, it increases contractions and helps in child birth and also lactation.
The first milk is known as colostrum it provide passive immunity to new born.

Some key words.

Stem cells , Chorionic villi, Placenta , Foetal ejection reflex.

CHAPTER – 4: REPRODUCTIVE HEALTH

WHO- WORLD HEALTH ORGANISATION have defined it as a total well-being in all Aspects of reproduction i.e., physical, emotional, behavioural & social.

Goal of Reproductive Health → FAMILY PLANNING'
→ Reproductive &Child Health Care Programmes' (RCH)

Creatingawareness, Educating people & aware aboutsexabuse&sex relatedcrimes

Problems in Reproductive Health-Sex myths & misconception ,lack of awareness & STDs

Amniocentesis-It is a fetal sex determination test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo.

- How is it misused? - They are misused for sex determination of unborn child and increase female foeticides.

MTP-voluntary termination of pregnancy before full term is calledmedical termination of pregnancy (MTP) or induced abortion. It allowed up to 24 weeks. It is legalized in case of rape.,in case of casual unprotected intercourse, in case pregnancy is harmful for foetusor for mother.

Sexually transmitted diseases (STD) or venereal diseases (VD) or reproductive tract infections (RTI).
The various types of sexually transmitted diseases include gonorrhoea, syphilis, genitalherps, cancroid and of course the most common HIV leading to AIDS **Prevention**-avoid sex with unknown partners or multiple partners, always use condoms during coitus,in case of doubt, go to a qualifieddoctor for early detection andget complete treatment ifdiagnosed with disease.

Ideal contraceptive -User friendly, easily available, least side – effects

Infertility-A large no of couples all over India are infertile due to physical, congenital, diseases, drugs, Immunological or even psychological.

ART (Assisted reproductive technique)

Method of Birth Control

(i)NaturalMethods : Periodic abstinence ,Coitus interruptus Lactational amenorrhea.
(ii) Barrier methods : Condom, Diaphragms, Cervical cap.
(iii) Intra uterine devices : Non . medicated e.g. Lippes loop
Copper releasing e.g., Cu-T, multiload 375
Hormone releasing e.g. LNG.20, progestasert
(iv) Oral contraceptives : Pills / Saheli
Small doses of either progestogens or Progestogen . estrogen combination
(v) Surgical (Sterilisation) :
(1)Tubectomy; (2) Vasectomy

In vitro fertilization-(IVF–fertilisation-outside the body in almost similar conditions as that in the body)
Embryo Transfer – Test tube Baby
1. (**ZIFT**–zygote intra fallopian transfer) The zygote or early embryos (with upto 8 blastomeres)
could then be transferred into the fallopian tube
2. (**IUT** – intra uterine transfer), embryos with more than 8 blastomeres, into the uterus

In-vivo fertilisation (fusion of gametes within the female)
1.(**GIFT** – gamete intra fallopian transfer) Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one, but can provide suitable environment for fertilization
2.Intra cytoplasmic sperm injection **(ICSI)** to form an embryo in the laboratory in which a sperm is directly injected into the ovum.
3.Artificial insemination **(AI) (IUI** – intra- uterine insemination In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus

UNIT – 7 : GENETICS AND EVOLUTION
CHP 5 - PRINCIPLES OF INHERITANCE AND VARIATION

USING MATHS TO EXPLAIN BIOLOGY WAS TOTALLY NEW PHENOMENON & UNACCEPTABLE AT THAT TIME.

COMMUNICATION WAS NOT EASY

REMAINED UNRECOGNISED TILL 1900

CONCEPT OF GENES / FACTORS CONTROLLING TRAITS WAS NOT ACCEPTED

GREGOR MENDEL

AUSTRIA / MONK / STUDIES IN VIENNA / PEA PLANT / PUBLISHED HIS WORK IN 1866 / FACTORS – CONTROL TRAITS / RULES OF HEREDITY / RE-DISCOVERED HIS WORK IN 20th CENTURY BY TSHERMAK, DeVries, & CORRENS

STUDIED 7 CHARACTERS:

REFER: FIG 5.1 (PG 70) – NCERT TEXTBOOK

LAW OF DOMINANCE

LAW OF SEGREGATION

LAW OF INDEPENDENT ASSORTMENT

MONOHYBRID CROSS FIG 5.3/5.4 (PG 72) NCERT TEXTBOOK

DIHYBRID CROSS FIG 5.7 (PG 79) NCERT TEXTBOOK

NON-MENDELIAN INHERITANCE

INCOMPLETE DOMINANCE FIG 5.6 (PG 76) NCERT TEXTBOOK.

EX. SNAPDRAGON OR ANTIRHINUM SP.

CO-DOMINANCE EX. BLOOD GROUPS – ABO TYPE IN MAN (= 2 ALLELES ARE EQUALLY DOMINANT)

MULTIPLE ALLELES (A GENE EXISTS IN MORE THAN 2 ALLELIC FORMS EX. ABO TYPE BLOOD GROUP IN MAN.

PLEIOTROPY (= ABILITY OF A GENE TO HAVE MULTIPLE PHENOTYPIC EFFECTS AS IT INFLUENCES MANY CHARACTERS)

CHROMOSOMAL THEORY OF INHERITANCE

2 IDENTICAL CHROMOSOMES FORM HOMOLOGOUS PAIRS, CHROMOSOMES SEGREGATE AT TIME OF GAMETE FORMATION, CHROMOSOMES ARE MUTABLE

USING FRUIT FLY – T. H. MORGAN

PROPOSED BY: WALTER SUTTON AND T. BOVERI (1902) AND MORGAN COINED THE TERM LINKAGE.

SEX DETERMINATION

FEMALE HETEROGAMEITY.
EX. BIRDS / GALLUS
ZZ / ZW TYPE

MALE HETEROGAMEITY

XX / XY

EX. HUMAN

XX / XO

EX. GRASSHOPPERS

PEDIGREE ANALYSIS

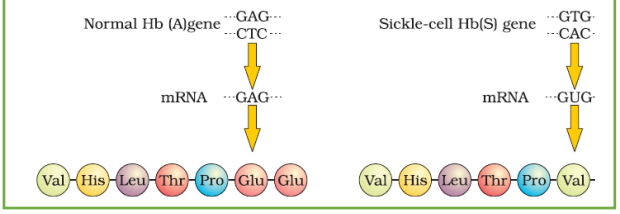
(= PLOTTING THE OCCURRENCE OF A TRAIT ACROSS GENERATIONS)

IMPORTANCE: TO TRACE ANCESTRY & INHERITANCE OF A SPECIFIC TRAIT. EX. ROYAL FAMILY DISORDER.

SYMBOLS USED: FIG 5.13 (PG 88) – NCERT TEXTBOOK

MUTATIONS = SUDDEN INHERITABLE CHANGE

- POINT MUTATION (= CHANGE IN SINGLE BASE PAIR OF DNA). EX. SICKLE CELL ANEMIA



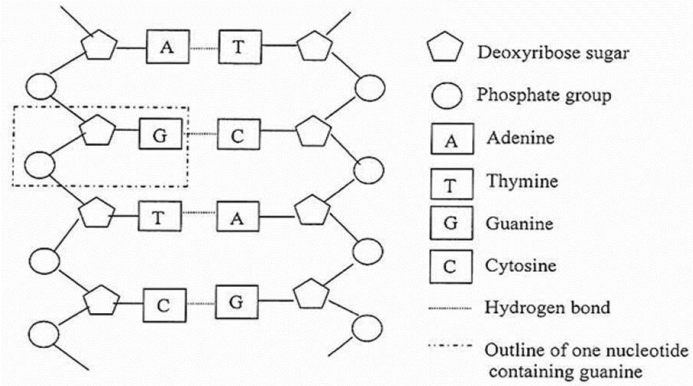
- FRAME SHIFT MUTATIONS (= LOSS / GAIN OF A DNA SEGMENT)

GENETIC DISORDERS

- MENDELIAN DISORDERS
  - AUTOSOMAL
    - DOMINANT EX. MUSCULAR DYSTROPHY
    - RECESSIVE EX. SICKLE CELL ANEMIA
  - ALLOSOMAL
    - **X-LINKED**
      - DOMINANT EX. INCONTINENTIA PIGMENTI
      - RECESSIVE EX. HEMOPHILIA
    - **Y-LINKED**
      - EX. HYPERTRICHOSIS
- CHROMOSOMAL DISORDERS
  - EUPLOIDY
  - ANEUPLOIDY
    - **ALLOSOMAL TRISOMY**
      - EX. KLINEFELTER'S SYNDROME **(XXY)**
    - **MONOSOMY**
      - EX. TURNER'S SYNDROME **(XO)**
    - **AUTOSOMAL TRISOMY**
      - EX. DOWN'S SYNDROME **(TRISOMY – 21)**

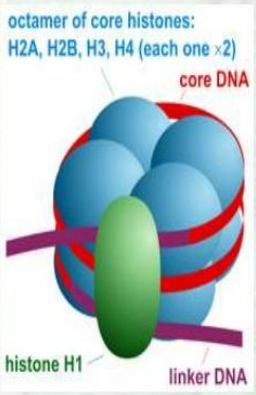
CH. 6 Molecular Basis of Inheritance

Simple diagram of DNA - labeled



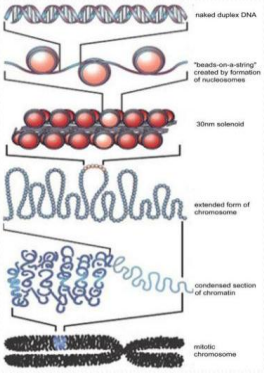
NUCLEOSOMES

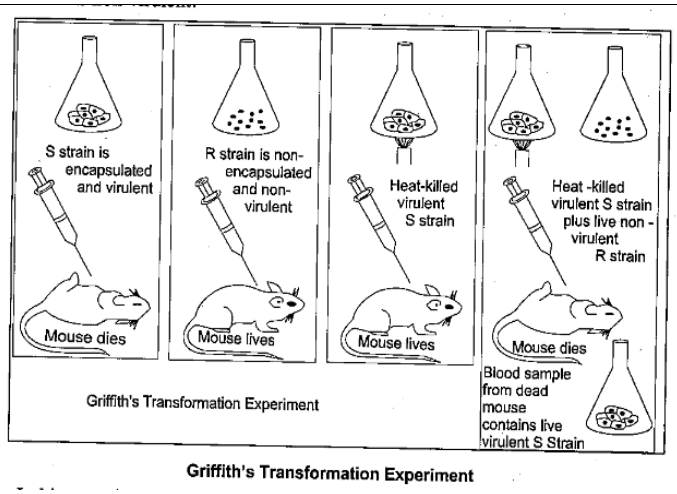
- Nucleosomes are the fundamental repeating subunits of the eukaryotic chromatin
- They are made of DNA and a four pairs of proteins called histones, and resemble "beads on a string of DNA" when observed with an electron microscope
- Nucleosomes contain nearly 200 bp of DNA
- Histones form the interior core and DNA lies on the surface of the particle



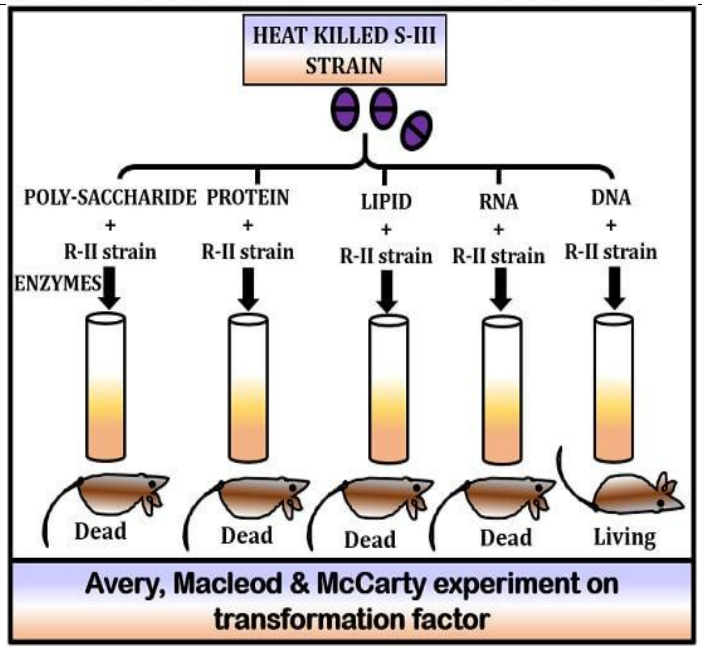
Chromatin Structure

- Higher Levels of DNA packing:
- There are several orders of chromatin coiling, each in order of increasing compactness.
- DNA– coils around histones to form a nucleosome. Look like "beads on a string" formation.
- The beaded string coils/folds to form **chromatin fiber** (30 nm).
- The chromatin fiber forms loops called **looped domains**. They are in the extended form of the chromosome.
- The looped domains condense tightly into small portions of the mitotic chromosome.

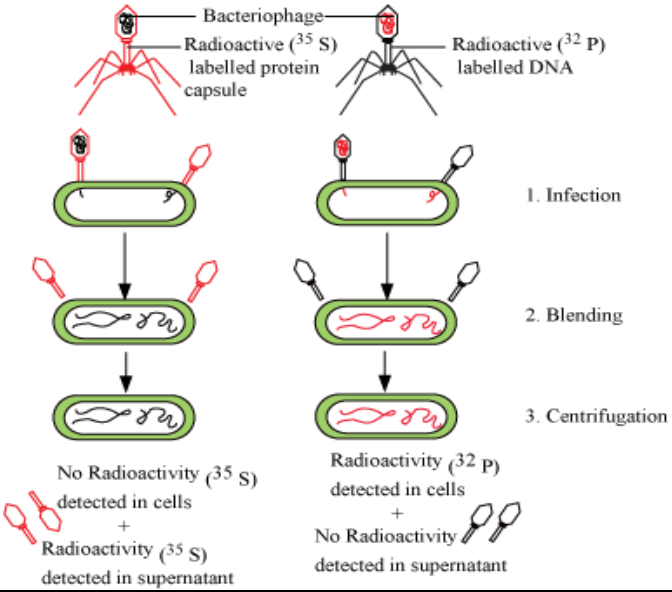




Griffith's Transformation Experiment

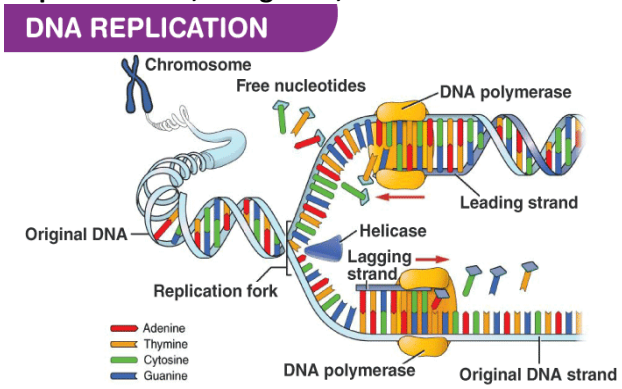


Hershey Chase Experiment: To prove that DNA is the genetic material

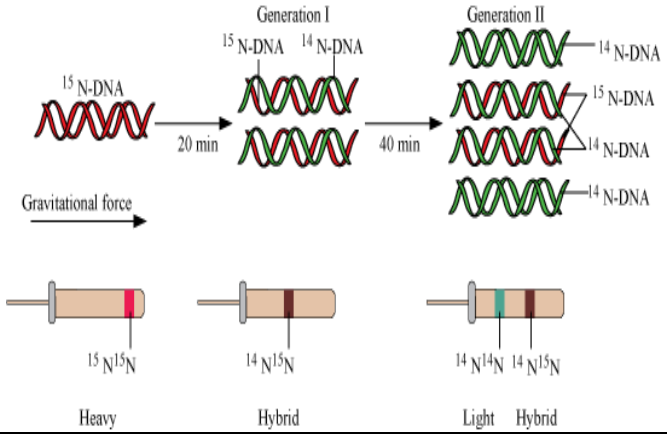


DNA Replication

Steps: Initiation, Elongation, termination



Messelson Stahl's Experiment : To demonstrate that DNA replicates semi conservatively



Transcription Unit

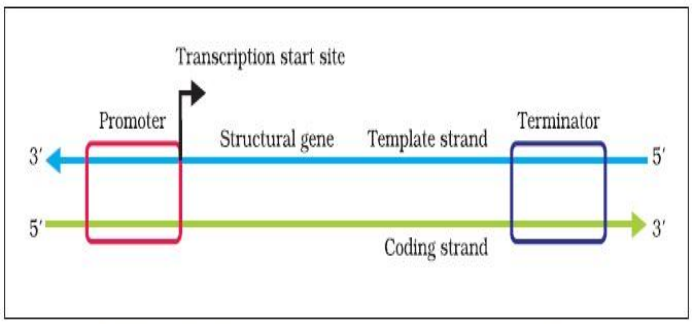
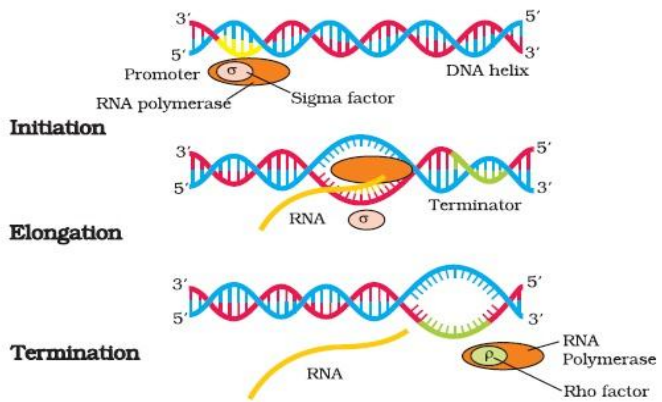


Figure 6.9 Schematic structure of a transcription unit

Transcription in Bacteria



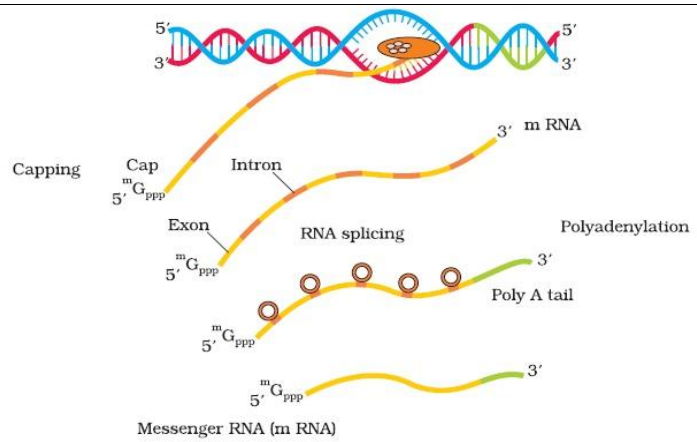


Figure 6.11 Process of Transcription in Eukaryotes

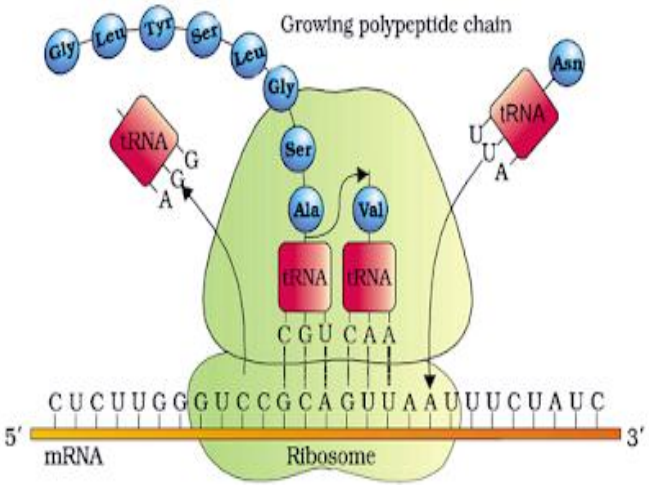
The Genetic Code

- The codon is triplet
- 61 codons code for amino acids, 3 are stop codons (UAA, UAG, UGA)
- AUG has dual function, it codes for methionine and is initiator codon also.
- Code is unambiguous, one codon codes for one amino acid.
- Code is degenerate, some amino acids are coded by more than one codon.
- The code is read without punctuations.
- The code is nearly universal.

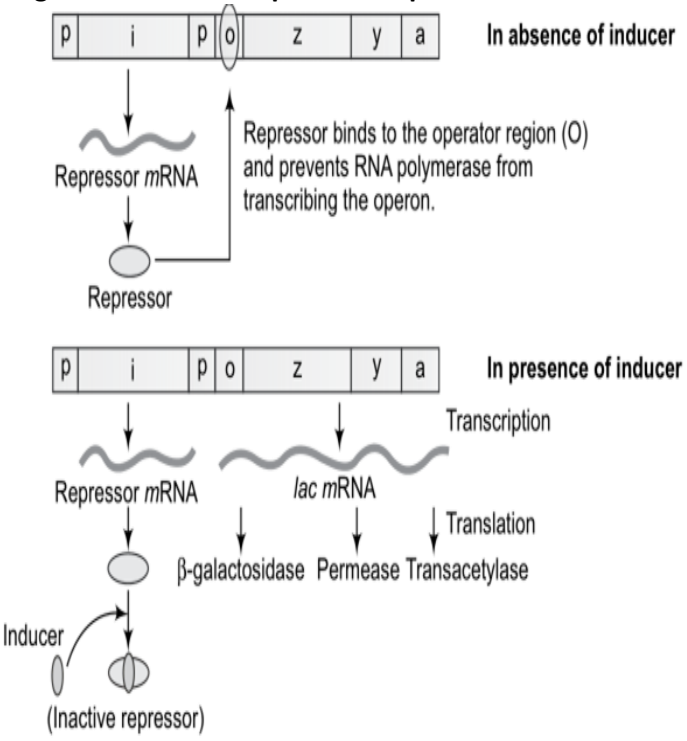
Human Genome Project

- Human genome is said to have 3x 10^9 bp.
- Methodologies- (1) identifying all the genes that are expressed as RNA (Expressed sequence Tags)
  (2) Sequence annotations- sequencing the whole set of genome that contained all the coding and non- coding sequence and later assigning different regions in the sequence with functions.
- Commonly used vectors were- BAC(bacterial artificial chromosomes) and YAC (Yeast artificial chromosome)

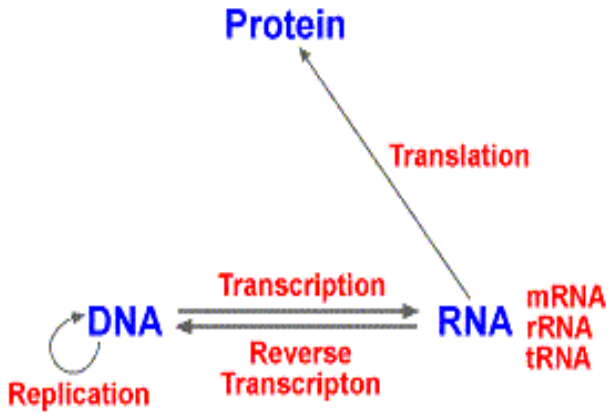
Translation:
Formation of protein using information from mRNA



Regulation of Gene Expression: Operon



Central Dogma



DNA Fingerprinting

- It is a quick way to compare the DNA sequences of any two individuals.
- It involves identifying difference in some specific regions in DNA sequence called as **repetitive DNA**.
- **Satellite DNA** sequences normally do not code for any proteins, but show high degree of **polymorphism**, which arise due to mutations and form basis of DNA fingerprinting.

UNIT – 8 : BIOLOGY AND HUMAN WELFARE
CH 8 Human Health and Disease

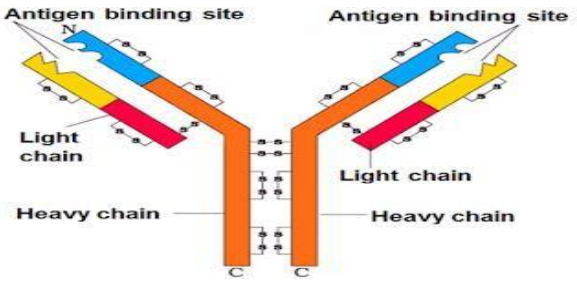
Health, for a long time, was considered as a state of body and mind where there was a balance of certain 'humors'.	Improper functioning of one or more organs or systems of the body is adversely affected, gives rise to various signs and symptoms i.e we have **disease.**
FACTORS THAT AFFECT HEALTH Balanced diet 1.Personal hygiene 2.Regular exercise 3.Good habits	**HOW TO ACHIEVE GOOD HEALTH ?** Knowledge about diseases, their cause and effect Vaccination/ immunisation Control of vectors Proper disposal of waste Consumption of clean food and water Maintenance of hygiene

DISEASES

which can easily transmit from one person to other by any means are called **infectious or communicable diseases.**
Virus -Common cold, polio, measles **Bacteria** -Typhoid, pneumonia, plague, diphtheria, tetanus
Protozoa – amoebiasis, Malaria **fig.8.1**
Fungi -ringworm
Helminthes -Ascariasis, filariasis, taeniasis

Diseases which can not be transmitted from one person to another are called non-infectious or **noncommunicable diseases.**

Each **antibody** has four polypeptide chains.
Two small chains called light chains.
Two longer chains called heavy chains.
Antibody represented as H2L2.
Different classes of antibody produced in out body are IgA, IgM, IgD, IgE and IgG.



KEYWORDS- PATHOGEN,VACCINATION,DRUG / ALCOHOLABUSE,

AMI vs. CMI: Immune response by the B-cells by production of antibody is called Antibody mediated immune responseor humoral immune response. Immune response by T-cells is by activation of cytotoxic killer cells which detects and destroys the foreign cells and also cancerous cells called cell mediated immune response. Rejection of organs transplants are due to T-lymphocytes. Tissue matching, blood group matching are essential for organ transplantation. Even after tissue typing immune-suppressants is required before and after transplantation.

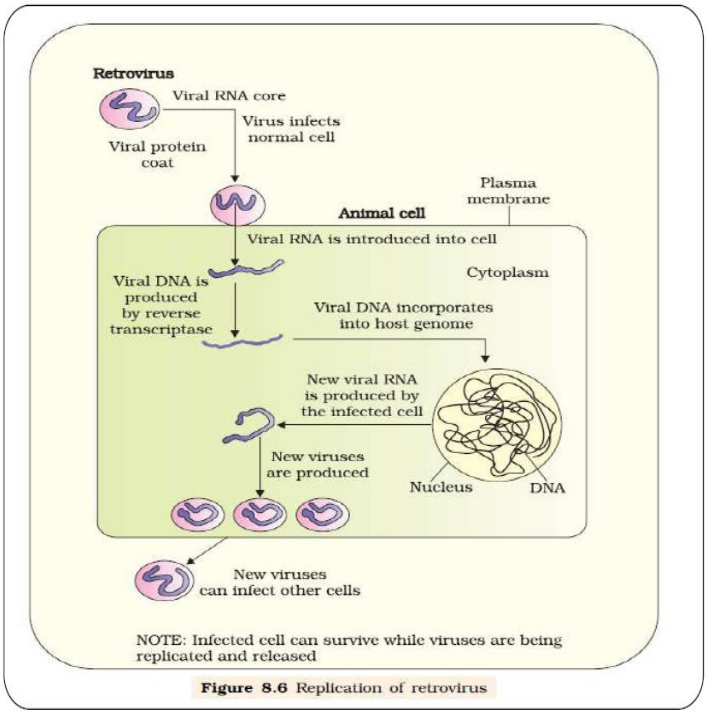


Figure 8.6 Replication of retrovirus

Figure-8.6 page no 155

Diagnosis: ELISA (enzyme linked Immuno-sorbent assay),PCR test for confirmation
Prevention of AIDS:
AIDS has no cure, prevention is the best option.
Safe blood for transfusion
Use of disposable needles
Free distribution of condoms.
Prevention of drug abuse
Advocating safe sex and promoting regular checkup
CANCER-Uncontrolled cell division leads to production of mass of cell called cancer.
Cancerous cell lost the property of contact inhibition.
Cancerous cell just continue to divide giving rise to masses of cell called tumors.
Benign tumors: Normally remain confined to their original location
Do not spread to other location. Cause little damage.
Malignant tumors: Cancerous cells escape from the site of origin and moves to distant place by blood, wherever they get lodged make the normal cell cancerous. This property is called metastasis.

IMMUNITY

The overall ability of the host to fight the disease causing organism by immune system is called **immunity**	**There are two types of immunity:** Innate Immunity. Acquired Immunity. Active and Passive

CHAPTER - 10
MICROBES IN HUMAN WELFARE

MICROBES IN HOUSEHOLD PRODUCTS

Lactobacillus / LAB	***Saccharomyces cerevisiae***	***Saccharomyces cerevisiae***	***Propionibacterium sharmanii***
CURD	**BREAD**	**TODDY** - Microbes ferment sap from plants	**SWISS CHEESE**

MICROBES IN INDUSTRIAL PRODUCTS

1 - FERMENTED BEVERAGES		2 - ANTIBIOTICS	3 - ENZYMES
WITH DISTILLATION	WITHOUT DISTILLATION		
WHISKY, BRANDY AND RUM	WINE AND BEER		LIPASES – digests lipids
Saccharomyces cerevisiae		***Penicillium notatum***	PECTINASES AND PROTEASES (to clarify bottle juices)
4 - BIOACTIVE MOLECULES			STREPTOKINASE
STATINS		CYCLOSPORINE - A	***Streptococcus***– used as clot buster
Monascus purpureus – blood cholesterol lowering agent		***Trichoderma polysporum –*** immunosuppressive drug	

5 – ORGANIC ACIDS			
Aspergillus niger	***Acetobacter aceti***	***Clostridium butylicum***	***Lactobacillus***
A fungus	A bacterium		
Citric acid	Acetic acid	Butyric acid	Lactic acid

MICROBES IN PRODUCTION OF BIOGAS – BACTERIA INVOLVED IS METHANOBACTERIUM

MICROBES IN SEWAGE TREATMENT

PRIMARY SEWAGE TREATMENT	**SECONDARY TREATMENT**
INVOLVES REMOVAL OF SOLID MATERIALS	INVOLVES THE ACTION OF MICROBES

MICROBES AS BIO-CONTROL AGENTS

Bacillus thuringiensis	***Trichoderma sp.***	***Baculoviruses***
Control butterfly caterpillar		Esp. genus *Nucleopolyhedrovirus*– controls insect and arthropods

MICROBES AS BIO-FERTILISERS

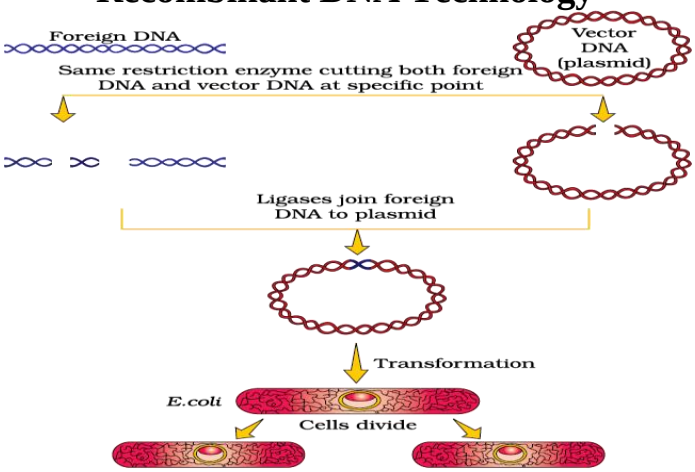
CYANOBACTERIA	**BACTERIA**	**FUNGI**
SYMBIOSIS: ANABAENA IN AZOLLA	SYMBIOTIC BACTIERA – RHIZOBIUM	MYCORRHIZA
FREE LIVING: NOSTOC, OSCILLATORIA, BLUE-GREEN ALGAE	FREE LIVING BACTERIA – AZOSPIRILLUM, AZOTOBACTER	Association of Glomus with plants

UNIT – 9 : BIOTECHNOLOGY AND ITS APPLICATION

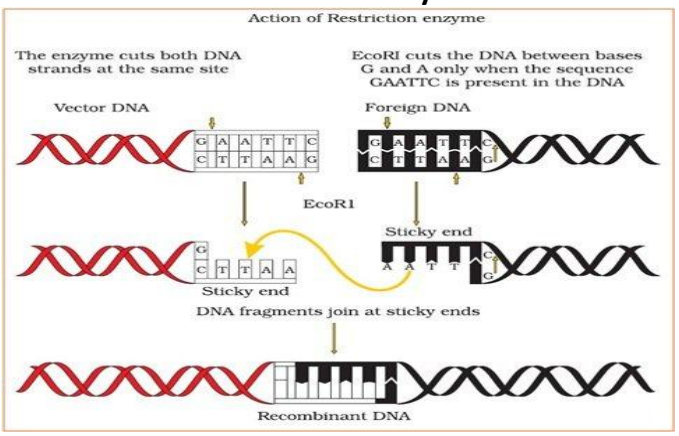
Chapter 11 Biotechnology: Principles and Process

Biotechnology deals with techniques of using live organisms or enzymes from organisms to produce products and processes useful to humans. **Principles:** (i) Genetic engineering (ii) Maintenance of sterile conditions during the process.	**The techniques of genetic engineering include –** • Creation of recombinant DNA • Use of gene cloning • Gene transfer **Cloning**- is making multiple identical copies of any template DNA
Tools of Recombinant DNA Technology 1. Restriction enzymes 2. Cloning vectors 3. Competent host for transformation with Recombinant DNA **Steps in genetically modifying an organism-** • Identification of DNA with desirable genes • Introduction of the identified DNA into the host • Maintenance of introduced DNA in the host • Transfer of the DNA to its progeny	**Processes of Recombinant DNA technology** • Isolation of the genetic material (DNA) • Cutting of DNA at specific locations • Amplification of Gene of interest using PCR • Insertion of Recombinant DNA into the host cell/organisms • Obtaining the foreign Gene product • Downstream processing – separation and purification

Recombinant DNA Technology



Steps in formation of recombinant DNA by action of restriction endonuclease enzyme- EcoRI



Separation and isolation of DNA fragments :

- Obtaining fragments of DNA after treatment with specific restriction endonuclease
- Separation of fragments by gel electrophoresis
- Staining the separated DNA fragments by ethidium bromide
- Visualising DNA fragments under uv light
- Cutting and extracting identified DNA fragments (elution)

Features of cloning vectors :

- Presence of origin of replication
- Provision of selectable markers
- Presence of cloning sites

Vectors for cloning genes in plants and animals –

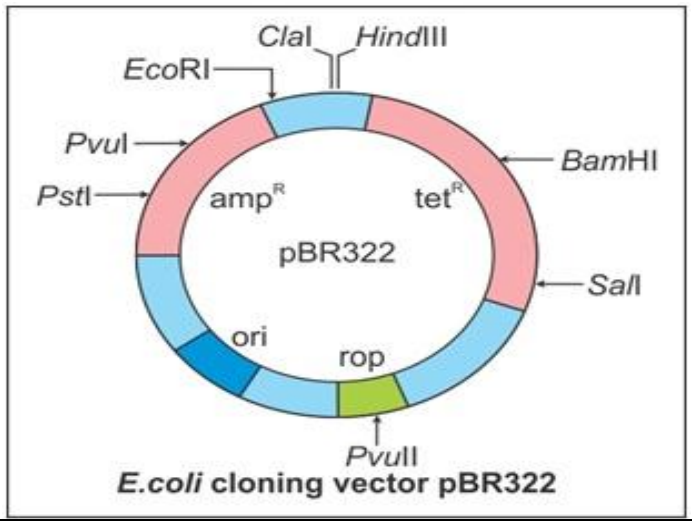
- Ti plasmid of Agrobacterium tumefactiens for plants
- Retroviruses for animals

E. coli cloning vector pBR322

pBR322

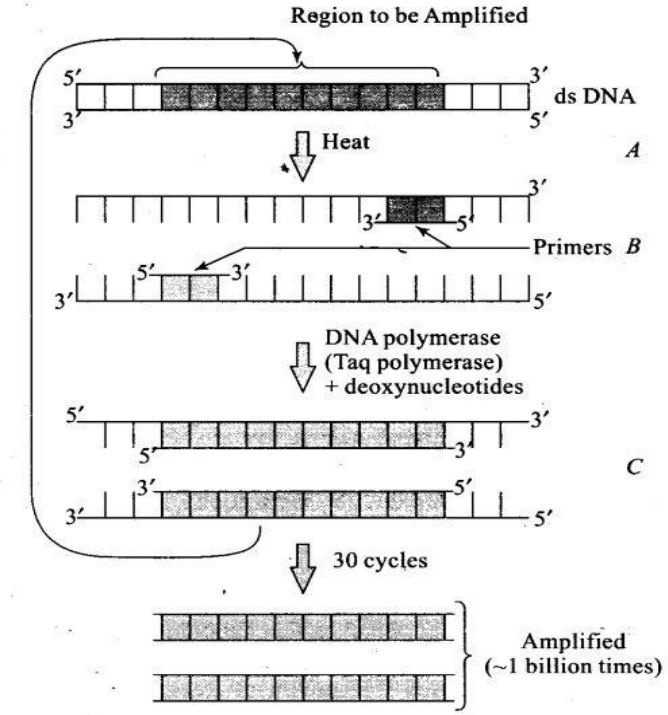
- It was one of the first vectors to be developed in 1977.
- The 'p' indicates that it is plasmid, 'BR' indicates Bolivar and Rodriguez
- '322' distinguishes it from the other plasmids produced in the same laboratory e.g. pBR325, pBR327, pBR328.
- It is 4363bp in size i.e. less than 10kb
- It carries two sets of antibiotic resistance genes i.e. either ampicillin or tetracycline can be used as a selectable marker.
- Each of the marker genes carries unique restriction sites and insertion of DNA into these sites inactivates the specific marker site. e.g. insertion of new DNA with Pst1, Puv1, Ppa1 or Sca1 inactivates the amp^s gene.
- It has a high copy number. They are about 15 molecules present in transformed cells but it can be increased to 1000 to 3000 by plasmid amplification in the presence of protein synthesis inhibitor i.e. chloramphenicol.
- The vector comprises DNA derived from three different naturally occurring plasmids: the amp^s gene is from R1 plasmid, tet^s from R6-5 plasmid and the ori gene from pMB1 plasmid.

pBR322



E.coli cloning vector pBR322

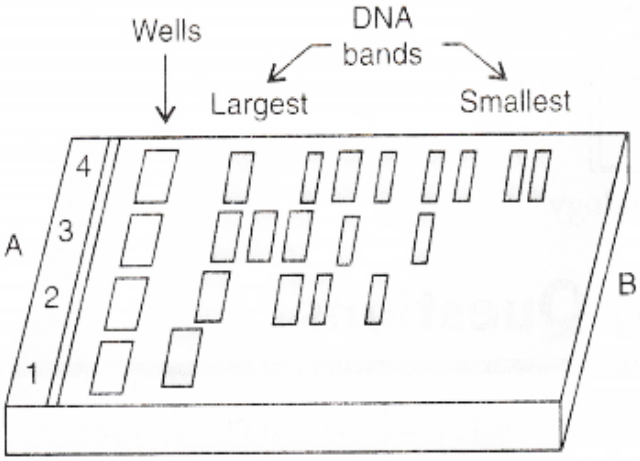
Amplification of Gene of Interest : PCR



Making the host competent for transformation with recombinant DNA

- Treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall.
- Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (heat shock), and then putting them back on ice which enables the bacteria to take up the recombinant DNA.
- Recombinant DNA can be directly injected into the nucleus of an animal cell by a method called **micro-injection**.
- In **biolistic or gene gun** method, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA
- Disarmed pathogen vectors can be allowed to infect the cell to transfer the recombinant DNA into the host.

Agarose gel electrophoresis : for separation and isolation of DNA fragments



Bioreactors : to produce recombinant protein in large quantities

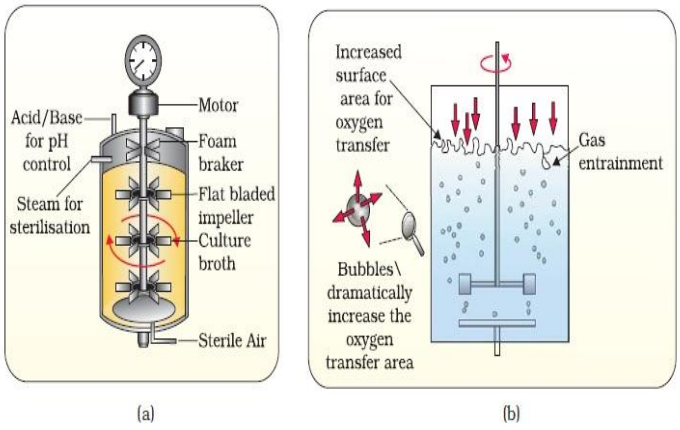
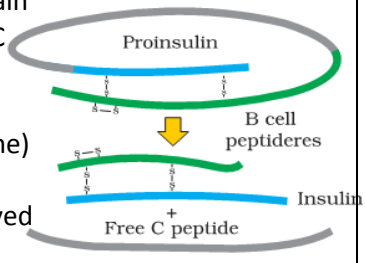


Figure 11.7 (a) Simple stirred-tank bioreactor; (b) Sparged stirred-tank bioreactor through which sterile air bubbles are sparged

Chapter-12 Biotechnology And Its Applications

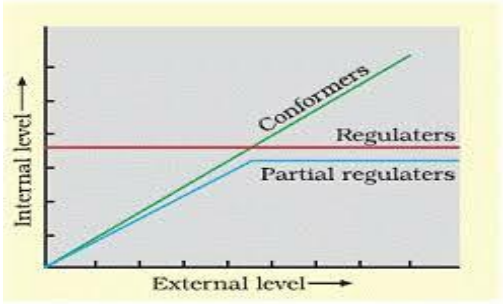
Biotechnology application in agriculture- 1.Agro-chemical based agriculture,2. Organic agriculture,3.genetically engineered crop based agriculture **Transgenic crops(GMO)-Genetically modified organisms-Advantages-** More tolerant to stresses (heat, cold, draught), Pest resistant's GM crops, Reduced post harvest losses, Enhance nutritional value-vitamin A **Disadvantages**-causes allergy & damage Ecosystem	**Bio-pesticide**. Examples are Bt cotton, Bt corn, rice, tomato, potato and soyabean etc. proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes) proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms, that of *cryIAb* controls corn borer.
Problem-A nematode Meloidogyne incognita infects tobacco plant & reduces its yield**Solution**-RNA interference The specific genes from parasite Agrobacterium ↓ Plants (Tobacco) ↓ sense&Antisense RNA areproduced ↓ Both are complimentary so forms DS-RNA ↓ RNA interferance Neutralizes the specific RNA of nematode & There sult was that the parasite could not survive in the transgenic host	**Bt- cotton** -- BT stands for *Bacillus thuringiensis* ↓ produce scrystal proteins called cry proteins by cry gene of bacteria ↓ endotoxicto larvae of insects like to baccobudworm ,beetles & mosquitoes. ↓ cryproteinsexistasinactiveprotoxin&getsconvertedintoactivetoxinwheningestedlaytheinsect,asthealkalinepHofgut & Causes pore
Natural Insulin- Insulin contain A & B Chain and overstrace C polypeptide chain(Termed ↓ as pro enzyme or Prohormone) C polypeptide removed ↓ Mature Insulin Insulin extracted from pancreas of slaughtered cattle and pigs (Animal sources) causes **allergy** 	**Recombinant Insulin**-Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin ↓ introduced them in plasmids of *E. coli* to produce insulin chains. ↓ Chains A and B were produced separately ↓ Forming disulfide bonds between A & B to form human insulin.
Gene Therapy- Thefirstclinicalgenetherapywasgivenin1990(adenosine deaminase (ADA) deficiency.) ↓ A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes ↓	**Molecular diagnosis**-Polymerase Chain Reaction (PCR) and Enzyme Linked Immuno-sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis. **ELISA is based on the principle of antigen-antibody interaction**. **Use of Transgenic animals**-(i)Alpha-1-antitrypsin – a protein that is used to treat emphysema. ii) Alpha – lactalbumin –

Which are subsequently returned to the patient. It called bone marrow transplantation and alternate method is enzyme replacement therapy . **Problem**-both are not permanent cure. **Solution**- If ADA is introduced into cells at early embryonic stages, it could be a permanent cure. **Biopatent: A biopatent is** a right granted by a government to an inventor to prevent others from commercial use of his invention eg. **Basmati rice(US Patent**	protein – rich milk that is more nutritionally balanced product for human babies? **GEAC** (Genetic Engineering Approval Committee), which will makedecisions regarding the validity of GM research and the safety ofintroducing GM-organisms for public services. **Biopriracy**-use of bio-resources without properauthorization from the countries and concerned people Biopatent-

Unit X Ecology& Environment

Chapter – 13: ORGANISM AND POPULATION

4 Levels of biological organisation-Organisms, population, community and biomes. The key elements responsible for change in habitat (Temperature, water, light and soil). Niche is the functional role of organisms in ecosystem.

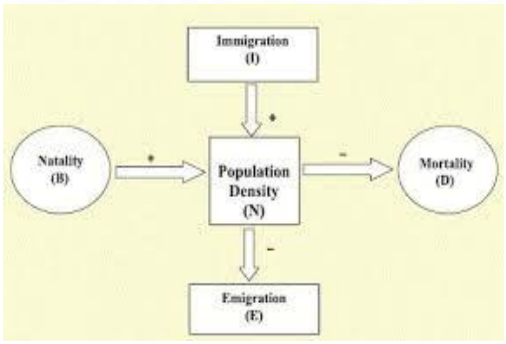


Major abiotic factors-

1. Temperature - (a. Stenothermal b. Eurythermals) 2. Water - (Stenohaline and Euryhaline)

3. Light - Photoperiod – a. Long day b. Short day and c. Day neutral plant

4. Soil-Soil micro climate, air, water and light also decide the type of vegetation and animal population.



Responses to abiotic factors

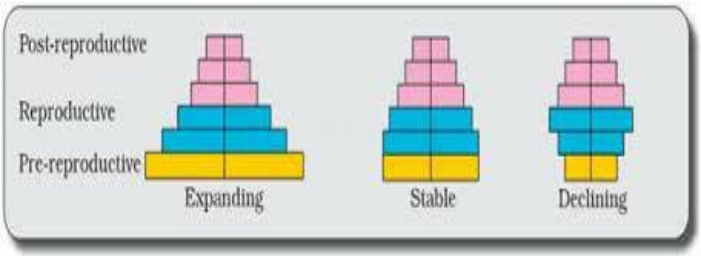
Homeostasis (The process to maintain internal environment constancy)

Regulators – eg. Human, Conformers – eg- Fish, Birds

During stressful conditions organism shows these strategies-

1. Migrate - Birds migrate from one place to another
2. Suspend – It includes dormancy, diapause, hibernation and aestivation.

   Fungi and lower class plants make thick walled spores while angiosperms forms seeds.



ADAPTATIONS- Animal and plants shows 3 types of adaptations

a. Morphological b. Physiological and c. Behavioural

Some examples Kangaroo rat and Camel, Cactus plant, Mammals in colder climate have shorter ear and limb (Allen's rule) Presence of blubber in whale etc.

Human overcome altitude sickness by increasing RBC, decreasing oxygen binding capacity of haemoglobin.

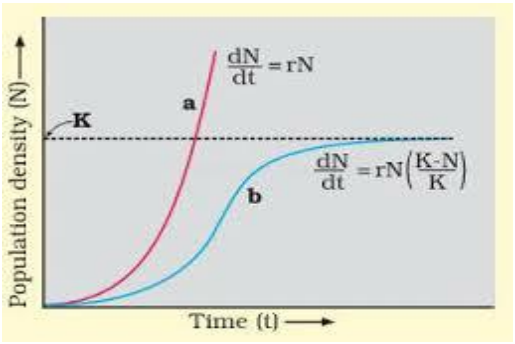
Basking in sun by Desert lizard.

POPULATION ATTRIBUTES

Birth rate, Death rate, Age group, Density are included in this. 3 types of population on the basis of age group

1. Expanding 2. Stable 3. Decline

Density- Need not to be measured always in number some time in form of relative density and some time on the basis of their biomass.



POPULATION GROWTH

Population growth can be explained by two curves.

1. Exponential growth -

   dN/dt = (b – d) × N Let (b–d) = r, then dN/dt = rN. The r in this equation is called the 'intrinsic rate of natural increase'.

   Exponential growth equation as $N_t = N_0^{ert}$, where N_t = Population density after time t, N_0 = Population density at time zero, r = intrinsic rate of natural increase, e = the base of natural logarithms (2.71828).

The exponential curve is J shaped curve. The S Shape curve is logistic growth curve.

Table 13.1 : Population Interactions

Species A	Species B	Name of Interaction
+	+	Mutualism
–	–	Competition
+	–	Predation
+	–	Parasitism
+	0	Commensalism
–	0	Amensalism

2. LOGISTIC CURVE – and is described by the following equation: dN / dt = r N (K-N/K) Where N = Population density at time (t), r = Intrinsic rate of natural increase, K = Carrying capacity. Also known as Verhulst-Pearl Logistic Growth.

Population interaction - Some important facts –

Biological control Methods, competitive release'. Gause's 'Competitive Exclusion Principle, Brood parasitism, mutualism and co-evolution and pseudo copulation etc.

Some examples related with interactions-

1. Predation- Prickly pear cactus and Moth, Starfish Piaster, camouflaged, Phytophagous, Monarch butterfly.
2. Competition-Flamingos with Fish, Tortoise and goats, Barnacles (balanus),
3. Parasitism: Liver fluke, Malaria parasite, Lice and Ticks, Cuscuta, Cuckoo and crow
4. Commensalism: Epiphyte, Cattle egret and grazing cattle, Sea anemone and Clown fish
5. Mutualism: Lichens, Mycorrhizae, Fig tree with Wasp, Orchid with bees and bumblebees.

CHAPTER -15 BIODIVERSITY AND ITS CONSERVATION

Biodiversity can be defined as the totality of genes, species, and ecosystems of a given region. Termed by**EDWARD WILSON**

Levels of biodiversity

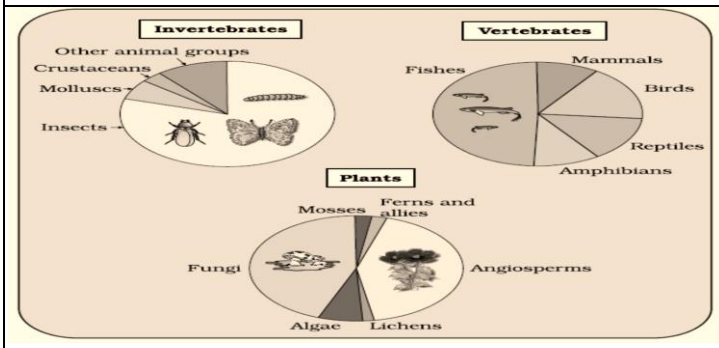
- Genetic diversity- diversity of genes
- Species diversity- diversity of species
- Ecological Diversity- variation of habitats ,community types

GLOBAL BIODIVERSITY

According to IUCN (2004), the total number of plant and animal species described is about 1.5 million.

Robert May (made more conservative & scientifically sound estimate) puts global species diversity at about seven million.

These estimates do not give any figure for prokaryotes.



Global Diversity-

* More than 70 % of all the species recorded are animals out of which 70 % are insects.

* plants account for about 22 %.

The conventional taxonomic methods **are not suitable prokaryotes because** These species cannot be cultured under laboratory conditions.

Biochemical and molecular biology techniques would put their diversity into millions

Loss of biodiversity :-

The IUCN Red List (2004) documents the extinction of 784 species in the last 500 years that include 359 vertebrates and 87 plants.

Extinct animal- Steller's Sea Cow (Russia), Dodo (Mauritius), Quaga (Africa), Thylacene (Australia)

PATTERNS OF BIODIVERSITY

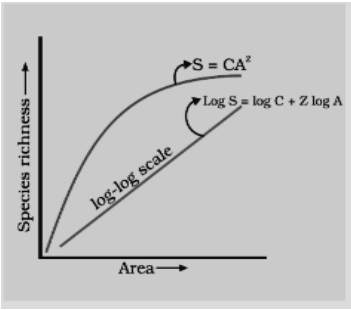
1). LATITUDINAL GRADIENTS- Species diversity decreases as we move away from the equator towards poles. The tropics (23.5^0 N to 23.5^0 S)

The Amazon Rain Forest in South America has the greatest biodiversity on earth

More diversity in Tropical- undisturbed environment, less seasonal , relatively more constant, and predictable.

2) SPECIES - AREA REALATIONSHIP

Alexander Von Humboldt has observed that with in a region , species richness increased with the increasing explored area, but only up to a limit.



$\log S = \log C + Z \log A$

where

S= Species richness A= Area

Z = slope of the line (regression coefficient)

C = Y-intercept

Causes for loss of biodiversity :-

Four major causes **(The Evil Quartet)**

1. Habitat loss & fragmentation.
2. Over exploitation.
3. Co-extinctions.
4. Alien species invasion.

CHARACTERISTIC FEATURE OF A STABLE COMMUNITY :-

i) A stable community should not show too much variation in productivity from year to year.

ii) It must be resistant to occasional disturbances (natural or man made) and

iii) It must also be resistant to invasions by alien species.

David Tilman's Experiment :-

a) Tilmanfound that plots with more species showed less year to year variation in total biomass.

b) He also found that increased diversity contributed to higher productivity.

Why should we conserve Biodiversity ?

1. Narrowly Utilitarian reason- economic benefits like food , fibre firewood, industrial products(resins,gums,dyes,tanins etc)
2. Broadly Utilitarian reasons :-Role in ecosystem, purifying of air
3. Ethical Reasons :- Every species has an intrinsic value to conserve.

Biodiversity conservation

In-situ conservation (On site)	**Ex-situ conservation (Of site)**
National Parks, Biosphere Reserves, Wild life Sanctuaries Sacred forests & Lakes	Botanical Gardens Zoos, Arboreta Seed/Pollen banks Gene Bank

Keyword & Comparison

UNIT – 6 Reproductions

Chapter 2

Comparison

1. unisexual and bisexual flowers
2. pollination and fertilisation
3. syngamy and triple fusion
4. microsporogenesis and megasporogenesis
5. Endosperm and perisperm
6. Apomixis and polyembryony

Chapter 3

Keywords: Stem cells , Chorionic villi, Placenta , Foetal ejection reflex.

Comparison:

1. Spermatogenesis and oogenesis
2. Fertilisation and implantation

Chapter 4

Keyword: ART, IVF, ET, ZIFT, IUT, GIFT, ICSI, AI, IUI

Comparison:

1. Maternal mortality rate and infant mortality rate.
2. Vasectomy and tubectomy

UNIT – 7 : GENETICS AND EVOLUTION

Chapter 5

Keywords:

Multiple alleles (Pg.78), Pleiotropic (Pg.85) ,Punnett square (Pg.73), Polygenic inheritance (Pg.85), Male and Female heterogamety (Pg.86-87), Aneuploidy and Polyploidy (Pg.91), Alfred Sturtevant (Pg.82)

Comparisons:

Monohybrid and Dihybrid cross, Homozygous and Heterozygous, Phenotype and Genotype, Test cross and Back cross (Pg. 72), Incomplete dominance and Co-dominance (Pg.76-77), Linkage and Recombination, Chromosome and Gene. (Pg.82-83)

Chapter 6

Keywords:

Erwin Chargaff, Wilkins and Franklin (Pg.97), Central dogma (Pg.98), NHC (Pg.98), Semi-conservative (Pg.104), Density gradient centrifugation (Pg.105), Replication fork, Ori (Pg.106), Exon , Intron, Cistron, Split gene(Pg.109), UTR, RF (Pg.115), Operon (Pg.116), EST and SA (Pg.119), SNPs (Pg.120), Polymorphism, VNTR, Probe and Southern blot (Pg.122), Ribozyme(Pg.115)

Comparisons:

Euchomatin and Heterochromatin (Pg. 98), DNAs and DNase(Pg101), DNA and RNA (Pg.103), Continuous and Discontinuous replication (Pg.106), Coding and Non- Coding strand (Pg.108), Monocistronic and Polycistronic (Pg. 109), Prokaryotic and Eukaryotic Transcription (Pg. 110-111), Frame shift and Point Mutation(Pg.113-114), Repetitive DNA and Satellite DNA (Pg.120).

UNIT – 8 : BIOLOGY AND HUMAN WELFARE

Chapter 8

Points to remember

Carcinogens: Cancer causing agents. e.g., gamma rays. UV rays, dyes and lead.
Immunity: Resistance to infection or antigen.
Immuno Suppressant: The chemical which supress the immunity response to antigen partially or completely.
Interferon: The glycoproteins produced by our body cells in response to a viral infection.
Incubation Period: The time period between infection and the appearance of symptoms.
Metastasis: The property in which the cancer cells spread to different sites through blood and develop secondary tumors.
Oncogenes: Viral genome which causes cancer.
Retrovirus: A virus having RNA as genetic material and forms DNA by reverse transcription and then replicate e.g., Human Immunodeficiency Virus (HIV).
Sporozoites: The infective stage of protozoa *Plasmodium* which is injected into human blood through saliva of female *Anopheles* mosquito.
Syndrome: Collection of disease symptoms responsible for a disorder or a disease.
Vaccination: Inoculation of a vaccine to stimulate production of antibodies and provide immunity for one or more disease.

Abbreviations

PMNL: Polymorpho-Nuclear Leukocytes
CMI : Cell Mediated Immunity
ELISA : Enzyme Linked Immunosorbent Assay
HLA : Human Leukocyte Antigen,
MALT : Mucosal Associated Lymphoid Tissue
SCID : Severe Combined Immuno Deficiency
NACO : National AIDS Control Organisation
MRI : Magnetic Resonance Imaging

Comparisons

1. Communicable and non-communicable disease
2. Humoral & Cell mediated Immunity
3. Active & Passive Immunity
4. Opioid & Cannabinoid
5. Innate & acquired Immunity.
6. Benign & Malignant tumor

Chapter 10

Points to remember

Activated Sludge Process: Aerobic sewage treatment process using aerobic micro-organisms present in

sewage sludge to break down organic matter in sewage .

Biofertilisers : Microorganisms which produce fertilisers and enrich the soil e.g., Bacteria, cyanobacteria and fungi.

Bioactive Molecules : Molecules produced for commercial use from microbes and used for various purposes e.g., Trichoderma polysporum (fungus) is used to obtain immunosuppressive agent cyclosporin A.

Biochemical Oxygen Demand (BOD) : Total amount of oxygen consumed by bacteria for oxidation of organic matter present in one litre of water.

Baculovirus : Pathogens that attack insects and other arthropods. They are used to kill harmful pests and arthropods e.g., Nucleopolyhedrovirus.

Biocontrol Agents : Use of biological methods for controlling plant diseases and pests

Effluent : The product of primary treatment of sewage which is passed into large aeration tanks for secondary treatment.

Fermentation : The process by which microorganisms turn organic materials such as glucose into products like alcohol.

Fermentors : A very large vessel used in industry where microbes are grown on an industrial scale.

Flocs : During secondary treatment of effluent, excessive growth of aerobic bacteria and fungi form a mass of mesh like structure called flocs.

Immunosuppressive Agent : Chemical substances which suppress the immunity against organ transplant.

Lactic Acid Bacteria (LAB) : Bacteria growing in milk and convert it into curd e.g., Lactobacillus.

Abbreviations

DO: Dissolved Oxygen **GAP :** Ganga Action Plan **KVIC :** Khadi and Village Industries Commission

TMV: Tobacco Mosaic Virus **YAP :** Yamuna Action Plan **IPM :** Integrated Pest Management.

Comparisons

1. Swiss cheese & Roquefort cheese 2. Cyclosporin & Statin 3. Aeration tank & Activated sludge digestor
4. Conventional pestiside & Bio control agent 5. Chemical fertilizer & Bio fertiliz 6.Conventional farming & Organic farming

UNIT – 9 : BIOTECHNOLOGY AND ITS APPLICATION

Chapter 11

Keywords:

1. Recombinant Dna = Creating An Hybrid Dna With Desired Genes.
2. Gene Cloning = Creating A Copy Of The Geneome
3. Ori = Oringin Of Replication
4. Plasmid = Autonomously Replicating Ciruclar Extra-Chromosomal Dna
5. Molecular Scisors = Restriction Enzymes Are Used To Tailor The Dna And Use It.
6. Gel Electrophoresis = Technique For Separation Of Dna Fragements
7. Ethidium Bromide = Used To Stain Dna
8. Transformation = Procedure By Which A Piece Of Dna Is Introduced Into The Host.
9. Insertional Inactivation = Pg. 200
10. Downstream Processing = Pg. 204
11. Rna Interference = Pg. 208
12. Biopiracy = Pg. 214

Abbreviations:

1. Efb = The European Federation Of Biotechnology
2. Pbr322 = Plasmid Bolivar And Rodriguez
3. Ti = Tumor Inducing
4. Pcr = Polymerase Chain Reaction
5. Bt = Bacillus Thuringiensis
6. Gmo = Genetically Modified Oranisms
7. Ada = Adenosine Deaminase
8. Elisa = Enzyme Linked Immunosorbent Assay
9. Pku = Phenylketonuria
10. Geac = Genetic Engineering Approval Committee

Points To Remember

1. Construction Of First Rdna – Stanley Cohen And Herbert Boyer (1972)
2. Isolation Of Enzymes Restricting The Growth Of Bacteriophage In E. Coli – 1963
3. Pbr322 = Created In 1977
4. Rnai = Post Transcriptional Gene Silencing (Ptgs)
5. 1983 = Preparation Of Synthetic Insulin By A Company Called Elli Lilly
6. In 1997, The First Transgenic Cow, Rosie Produced Human Protein Enriched Milk

UNIT - 10 Ecology& Environment

Chapter 13

Key words and comparisons:

1. Eurythermal and stenothermal
2. Euryhaline and stenohaline
3. Homeostasis
4. Thermoregulation and Osmoregulation
5. Regulators and conformers
6. Migration and Suspension
7. Hibernation and aestivation
8. Diapause (zooplanktons)
9. Altitude sickness
10. Adaptations- Morphological, physiological, Behavioral
11. Birth rates and death rates/ per capita births and per capita deaths
12. Sex ratio 13. Natality and mortality 14. Immigration and Emigration 15. Exponential and logistic growths
16. Commensalism and Amensalism 17. Predation and Parasitism 18. Competition and Mutualism

Chapter-15

Keywords and comparisons:

1. Biodiversity- Genetic, Species, Ecological
2. Patterns of Biodiversity: Latitudinal gradients, Species Area relationship
3. Z value 4. IUCN 5.Alien species 6. Rivet pooper hypothesis 7. Key species/ key stone species
8. Loss of biodiversity- Fragmentation, over exploitation, Alien species invasions, co-existence
9. In situ and ex situ conservation 10.Biodiversity hot spots 11. Endemism 12.Sacred groves

Question-Bank

Chapter 2 Sexual Reproduction in Flowering Plants

1. Draw the embryo of grass and dicot plant and label it? P35
2. Name the layers present in a typical angiosperm anther. P22
3. What is double fertilization and triple fusion? P32
4. Define microsporogenesis and megasporogenesis. P22-25
5. Draw and explain 7-cell 8-nucleate stage of embryo sac. P26

Capter 3 Human Reproduction

1. Give the reason why not all copulations leads to fertilisation and pregnancy? Pg. 51
2. Why, scientifically it is correct to say that the sex of the baby is determined by the father and not by the mother? Pg.52
3. Write The role of male accessory glands in human reproductive system. Pg.44
4. Write the name of hormones which present only during Pregnancy in human female, which among these is checked for confirmation of pregnancy. Pg. 53
5. How many wall layers are present in female uterus, write their role in pregnancy? Pg.46
6. Schematically represent the pathway of sperm from testis to ejaculatory duct. Pg.43

Chapter 4 Reproductive Health

1.Why a ban has been imposed on amniocentesis? P58
2.Differentiate between GIFT and ZIFT. P64
3.Explain the natural methods of preventing pregnancy. P60
4.Write any four characteristics of ideal contraceptives. P59
5.What is MTP? When it will be legalised? P62

CH . 5 PRINCIPLES OF INHERITANCE AND VARIATION

1. A. During a medical investigation, an infant was found to possess an extra chromosome 21. Describe the symptoms the child is likely to develop later in the life. Page no. 90
   B. A colorblind child is born to a normal couple. Workout the cross to show how it is possible and mention the sex of the affected child. Page no. 90
2. A. How does a chromosomal disorder differ from a mendelian disorder? Page no. 88
   B. Name any two chromosomal aberration-associated disorders. Page no. 89
   C. List the characteristics of the disorders mentioned above that help in their diagnosis. Page no. 89
3. State and explain the “Law of Independent Assortment” in a typical Mendelian dihybrid cross. Pg no. 78
4. I) In snapdragon, a cross between true-breeding red flowered (RR) plants and true-breeding white flowered (rr) plants showed a progeny of plants with all pink flowers. A) the appearance of pink flowers is not known as blending. Why? B) What is this phenomenon known as? Page no.76
   II) Write the scientific name of fruit fly. Why did Morgan prefer to work with fruit flies for his experiments? State any three reasons. Page no. 83
5. A) What is a test-cross? How can it decipher the heterozygosity of a plant? Page no. 75
   B) Although Mendel published his work on inheritance of characters in 1865 but it remained unrecognized till 1900. Give three reasons for the delay in accepting his work. Page no. 70

Chapter 6 Molecular Basis of Inheritance

1. (a) Explain the process of splicing of hnRNA in a eukaryotic cell. 111
   (b) How do mRNA, tRNA and ribosomes help in the process of translation? 114
2. (a) Give a labelled schematic representation of lac operon in it’s switched off position. 117
   (b) DNA polymorphism is the basis of the DNA finger printing technique. Explain. 121
3. (a) State the conditions when genetic code is said to be: degenerate, unambiguous and specific, universal 112
   (b) What is mutation? Explain with the help of an example how does a point mutation affect the genetic code. Name another type of mutation 113
4. (a) How did Hershey and Chase’s established that DNA is transferred from virus to bacteria? 102
   (b) How did Messelson and Stahl prove that DNA replication is a semiconservative process? 105
5. (a) Draw a labelled diagram of replication fork showing the polarity. Why does DNA replication occur within such forks? 107
   (b) Write the conclusion drawn by Griffith at the end of his experiment with the bacterium 100

Chapter 8 Human Health and Disease

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2. Draw the structure of an antibody molecule? P151
3. How can we identify drug abused and write any preventive measure of drug/alcohol abuse? P158
4. What is HIV factory? P155
5. Write the life cycle of plasmodium in human and mosquito. P148

Chapter 10 MICROBES IN HUMAN WELFARE

1. A) Bottled fruit juices are clearer as compared to those made at home. Explain. (Pg 183)
   B) Name the two groups of organisms which constitute 'flocs'. Write their influences on the level of BOD during biological treatment of sewage. (Pg 184)
   C) Why do we add an inoculum of curd to milk for curdling it? (Pg 181)
2. A) Name the function of Cyclosporin-A. How does this bioactive molecule function in our body? (Pg 183)
   B) Name the source of statin and state its action on the human body. (Pg 183)
   C) Write the scientific name of the microbe used for fermenting malted cereals and fruit juices. (Pg 182)
3. A) Explain the different steps involved during primary treatment phase of sewage. (Pg 184)
   B) Make a list of three household products along with the names of the microorganisms producing them.
4. A) Describe how biogas is obtained from the activated sludge? (Pg 184)
   B) State the medicinal value and the bioactive molecules produced by Streptococcus, Monascus and Trichoderma
   (Pg 182)
5. Given below is a list of 6 microorganisms. State their usefulness to humans.
   a. *Nucleopolyhedrovirus* (Pg 187)
   b. *Monascus purpureus* (Pg 183)
   c. *Penicillium notatum* (Pg 182)
   d. *Saccharomyces cerevisiae* (Pg 182)
   e. *Trichoderma polysporum* (Pg 183)
   f. *Propionibacterium shermanii* (Pg 181)

Chapter 11 Biotechnology: Principles and processes

1. a. How are recombinant vectors created? Why is only one type of restriction endonuclease required for creating one recombinant vector? 197
   b. Explain with the help of a suitable example the naming of a restriction enzyme. 195
2. a) State the functions of the following in the cloning vector pBR322 : 199
   (i) ori (ii) rop (iii) Hind III
   b) How are the following used in biotechnology? 194-95
   Plasmid DNA (ii) Recognition sequence (iii) gel electrophoresis 198
3. a) Write the palindromic nucleotide sequence for the following DNA segment 196
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Chapter-12 Biotechnology And Its Applications

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2. Expand ELISA. Why it is used as a disease diagnostic tool?. P212
3. Explain the steps involved in the production of genetically engineered insulin. P211
4. (a) Name the nematode that infests and damages tobacco roots.
   (b) How are transgenic tobacco plants produced to solve this problem? P209
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   (b) Name the vector used for transferring ADA-DNA into the recipient cells in humans.
   Name the recipient cells. P211

CH 13 ORGANISM AND POPULATION

1. Plant shows some astonishing properties of defence against herbivore. Pg. -234
2. Species promote co-existence rather than exclusion. Give justification with example. Pg-121
3. Why plant-animal interactions often involve co-evolution of the mutualists. Pg 237
4. Small animals rarely found in Polar Regions? Give reason Pg.224
5. If there are 200 carrot grass (Parthenium hysterophorus) plants but only a single huge banyan tree with a large canopy, stating that the population density of banyan is low relative to that of carrot grass amounts. In such case how will you calculate density? Pg. 228

Chapter-15 Biodiversity and its conservation

1. Alien species are highly invasive and are a threat to indigenous species.
   Substantiate this statement with any three examples taking one example each of. P265
2. What is the difference between in-situ & ex-situ conservation? P267
3. "Amazonian rain forest in south America has the greatest bio-diversity on earth". Justify the statement. P261
4. What are sacred grooves? What is their role in conservation? P267
5. What is evil quartet ? Explain in detail. P264