PLUS 2

NOTES

Chapter Wise



PLUS TWO ZOOLOGY

1.HUMAN REPRODUCTION

2. REPRODUCTIVE HEALTH

3. PRINCIPLES OF INHERITANCE AND VARIATION

4. MOLECULAR BASIS OF INHERITANCE

5.EVOLUTION

6. HUMAN HEALTH AND DISEASES

7. MICROBES IN HUMAN WELFARE

8. BIODIVERSITY AND CONSERVATION

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HUMAN REPRODUCTION

Reproduction is the ability of an organism to produce its young one

Reproductive events	
1. Gametogenesis 2. Insemination 3. Fertilization	4. Implantation 5. Gestation 6. Parturition

Male reproductive system

Flow chart showing the path of sperm

Seminiferous tubule →Rete testes → Vasa efferentia→Epididymis→ Vas deferens→Urinogenital duct

Glands associated with Male reproductive organ-

Seminal vesicle, Prostate gland,Bulbo urethral gland.

Seminiferous tubules contain two types of cell

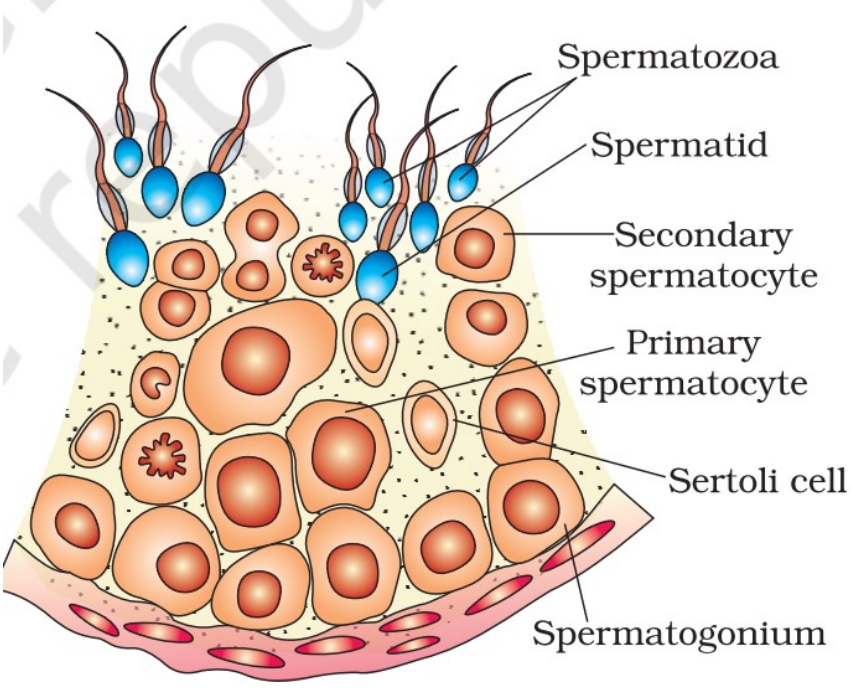
Sertoli cell- Nourish the sperm

Leydig cells- Produce male hormone androgen (Testoterone)

Spermatogonium- Produce sperm

- In human, testes are placed outside the body to maintain lower temperature

Structure of Seminiferous tubule



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Spermatogenesis	Spremiogenesis	Spermiation
Production of sperm	Formation of spermatid to sperm	Releasing of sperm from seminiferous tubule

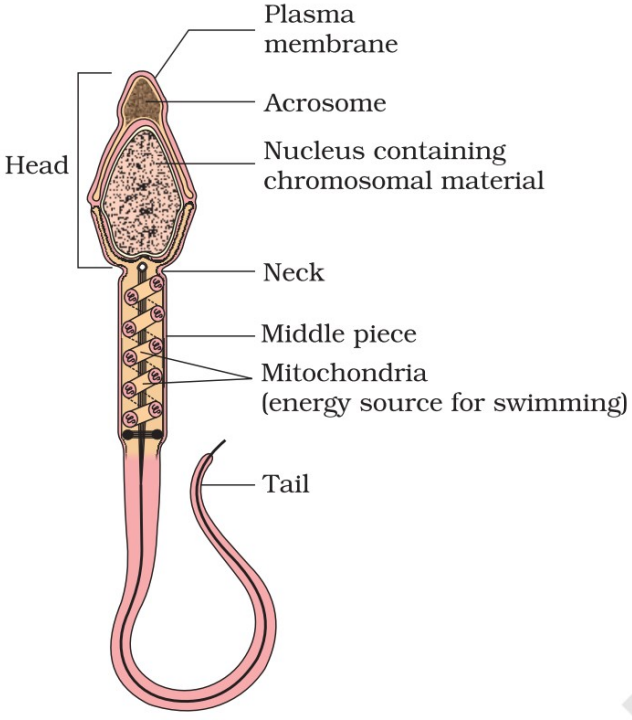
Female reproductive System

Ovary→ Fallopian tube(Infundibulum Ampulla Isthmus)→Uterus→Vagina

- Layers of Uterus- Perimetrium(outer), Myometrium(middle) , Endometrium(inner)
- Fertilisation taken place inside the Fallopian tube
- Hymen is not considered as a reliable symbol of virginity because it may be broken by exercise

Milk conduction in mammary gland-Mammary tubule→Mammary duct→ Mammary ampulla→Lactiferous duct**(TDAL)**

Structure of Sperm



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- Function of Acrosome-To penetrate the ovum
- Mitochondria –provide energy
- Tail –movement of sperm

- **Layers of ovum**

  Plasma membrane- Vitelline membrane –Zona pellucida-Corona radiata

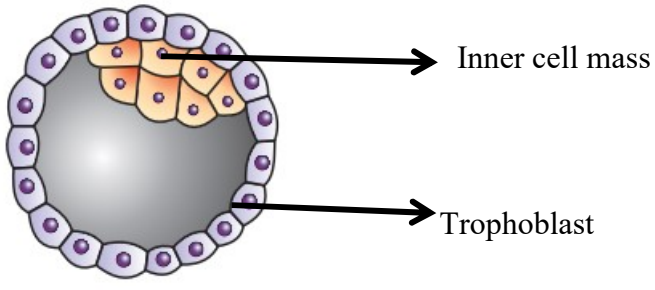
Mensrual cycle

Phase	**Days**	**Events**
Menstrual phase	1-5	Bleeding
Follicular phase	6-13	Endometirum regenerate Primary follicle to Graafian follicle
Ovulatory phase	14	Releasing of ovum
Luteal phase	15 -28	Corpus luteum formation

- Function of Corpus luteum-Production of Progesterone

Menarche-First menstruation Menopause-Stopping of menstruation

Structure of Blastocyst



Trophoblast-Become **Placenta** Inner cell mass- Become**Embryo**

- **Implantation**- Attaching of blastula to endometrium

Egg→Zygote→Morula→Blastula

Placenta- connection between mother and foetus

It transports oxygen & nutrients to foetus, removal of waste from foetus

Placenta secretes hCG, hPL, Estrogen, Progesterone

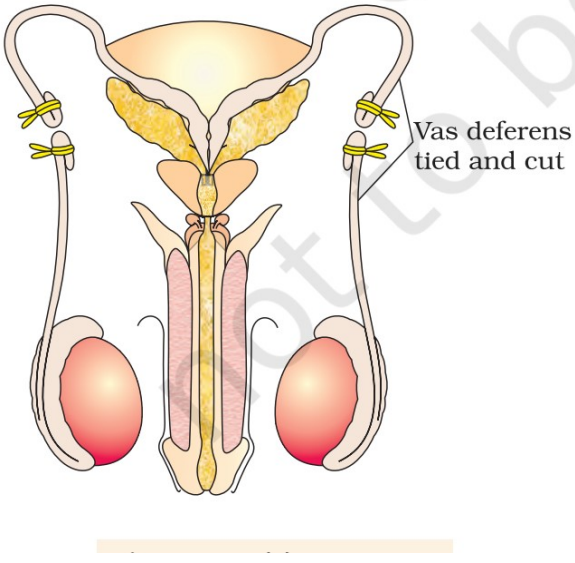
Colostrum- First milk produced in mammary gland –contains **Ig A,** Provides immunity to bab

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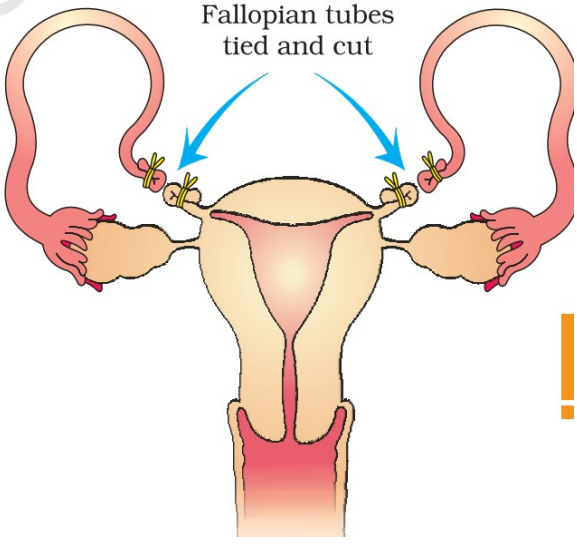
REPRODUCIVE HEALTH

Contraceptive methods

Natural Method	1. Periodic abstinence 2. Coitus interruptus 3. Lactational amenorrhoea	
Barriers	Prevent the meeting of Sperm and ovum	Condom Cervical cap Diaphragm Vault
IUD	1.Non medicated 2. Cu releasing 3. Hormone releasing	Lippes loop CuT, Cu7, Multiload 375 LNG 20,Progestasert
Oral contraceptive	Pill	Saheli (once a week pill) Produced in CDRI
Surgical method	Male sterilization Female sterilization	Vasectomy Tubectomy



Vasectomy



Tubectomy

- MTP- Medical Termination of Pregnancy- Induced abortion
- Amniocentesis – Technique to identify genetic disorder in developing foetus. It is banned in our country to avoid killing of female foetus(Female foeticide)

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STI-Sexually Transmitted Infection

Disease	Pathogen	Symptom
Gonorrhoea	Bacteria	Fluid discharge, Itching, Slight pain in the genital region
Syphilis	Bacteria	
Chlamydiasis	Bacteria	
Trichomoniasis	Protozoa	**Preventive measures** 1. Avoid sex with unknown/multiple partners 2. Use condom during intercourse 3. Seeking medical help
AIDS	Virus	
Hepatitis B	Virus	
Genital Herpes	Virus	

INFERTILITY

ART-Assisted ReproduciveTehnologies

1. Test tube baby programme-IVF(Invitro Fertilization) followed by ET(Embryo Transfer-ZIFT, IUT)
2. GIFT - Gamete Intra Fallopian Transfer
3. ICSI - Intra Cytoplasmic Sperm Injection
4. AI - Artificial Insemination
5. IUI - Intra Uterine Insemination

RCH - Reproductive and Child Health care Programme
MMR - Maternal Mortality Rate
IMR - Infant Mortality Rate
IUD - Intra Uterine Device
CDRI - Central Drug Research Institute
AIDS - Acquired Immuno Deficiency Syndrome
ZIFT - Zygote Intra Fallopian Transfer
IUT - Intra Uterine Transfer

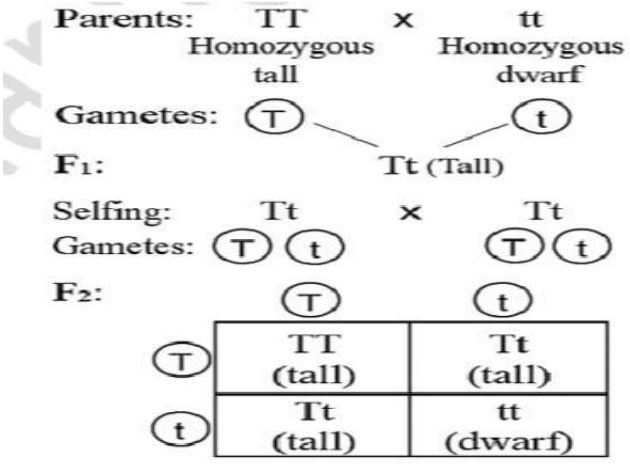
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PRINCIPLES OF INHERITANCE AND VARIATION

Mendelian laws

1. Law of Dominance
2. Law of Segregation
3. Law of Independent Assortment

Monohybrid Cross



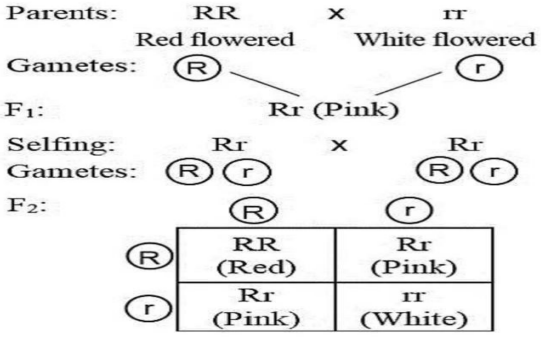
- Monohybrid Phenotypic Ratio-3:1
- Genotypic Ratio-1:2:1

Test cross and Back cross

Test cross - Crossing of F1 progenywith the recessive parent (test cross ratio1:1)

Back cross - Crossing of F1 progeny with any one of the parent

Incomplete dominance



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- F1 progeny shows a character in between two parents(Dominant gene is incompletely dominant over recessive gene)
- Genotypic & phenotypic ratio of incomplete dominance is 1:2:1

Multiple allelism and Codominance

Alleles from parent 1	Alleles from parent 2	Genotype of offspring	Blood types (phenotype)
I^A	I^A	$I^A I^A$	A
I^A	I^B	$I^A I^B$	AB
I^A	i	$I^A i$	A
I^B	I^A	$I^A I^B$	AB
I^B	I^B	$I^B I^B$	B
I^B	i	$I^B i$	B
i	i	ii	O

Multiple allelism -Involvement of more than two alleles for a single trait Eg. Human blood group

Co-dominance -Two dominant alleles are equally dominant and express at the same time AB Blood group

- Dihybrid phenotypic ratio-9:3:3:1

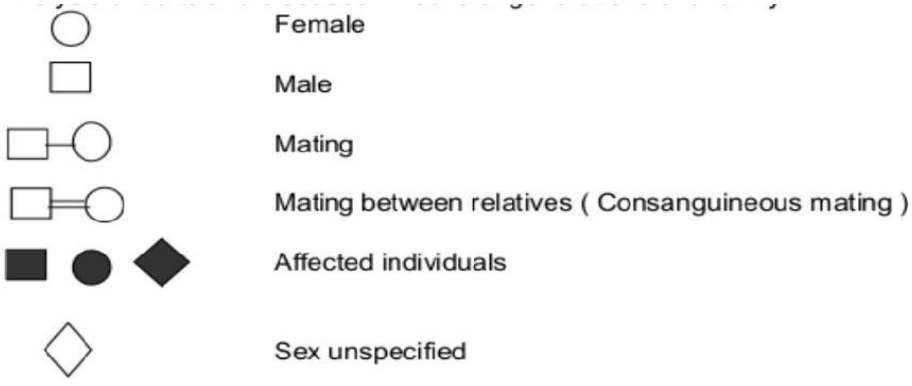
Sex determination

XX-XY Type - Drosophila and Human-Male heterogamy

XX-XO Type -Insect(Grasshopper)- Male heterogamy

ZW-ZZ Type -Birds-Female heterogamy

PEDIGREE ANALYSIS



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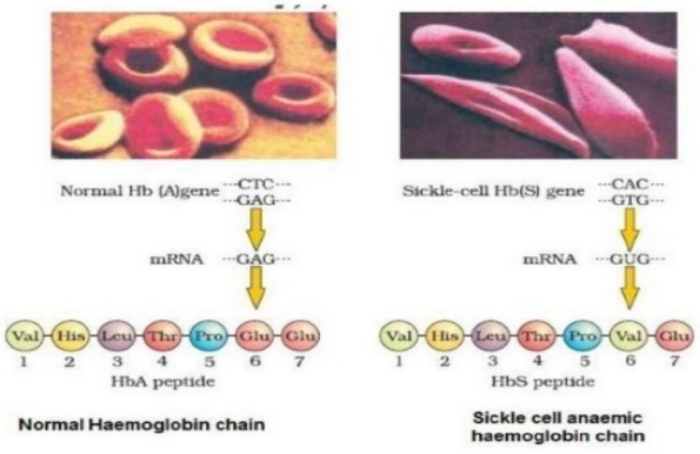
GENETIC DISORDERS

A. Mendelian Disorders

1. Haemophilia (bleeder's disease or Royal disease)- Clotting of blood is delayed

   Sex linked recessive trait

   Sickle cell anaemia -Autosomal recessive trait. Substitution of Glutamic acid by Valine at the 6th position of beta globin chain.



2 Phenyl ketonuria -Inborn error in metabolism

Chromasomal Disorders

1.Down's Syndrome - 45A+XX/XY =47(21 Trisomy) – short stature, Mentally retarded

2. Klinefelter's Syndrome-44A+XXY=47 -Sterile male, gynaecomastia

3. Turner's Syndrome -44A+X0 =45 -Sterile female ,Rudimentary ovary

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MOLECULAR BASIS OF INHERITANCE

a. Nucleoside:

Nucleoside=Nitrogen base + Pentose sugar

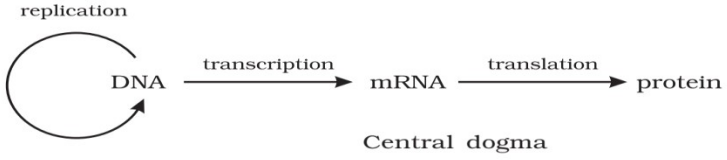
b. Nucleotide:

Nucleotide=Nitrogen base + Pentose sugar + Phosphate group

- Bond present between nucleotides = Phosphodiester bond.

CENTRAL DOGMA

- **Francis Crick** proposed central dogma.



Central dogma

The Double Helical Model of DNA

- Proposed by **Watson** and **Crick**.
- Contains **2 polynucleotide chains**.
- Nitrogen bases–**ATGC**.
- Sugar–**Deoxyribose**.
- **Hydrogen bond** – Connect Nitrogen bases.Between A and T – 2 hydrogen bond. Between G and C –3 hydrogen bond.
- **Phosphodiester bond**–Connect Sugar and phosphate.

Heterochromatin	Euchromatin
Densely packed	Loosely packed
It stains dark	It stains light
It is transcriptionally inactive	It is transcriptionally active

DIFFERENCES BETWEEN DNA AND RNA

DNA	RNA
Double stranded	Single stranded
Deoxyribose sugar	Ribose sugar
Nitrogen bases are ATGC	Nitrogen bases AUGC

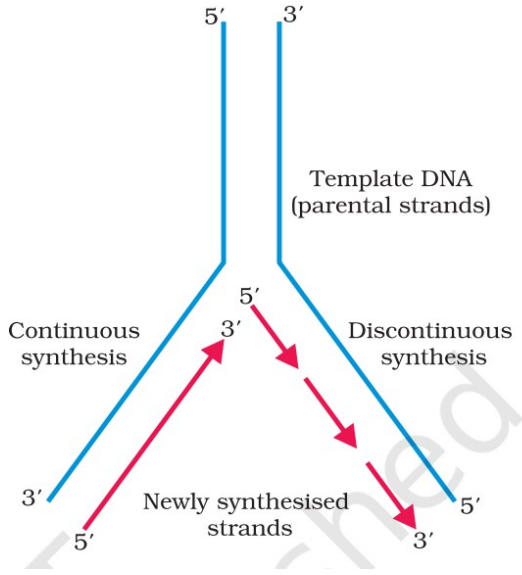
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Purines and pyrimidines are present in equal amount	Purines and pyrimidines are not present in equal amount

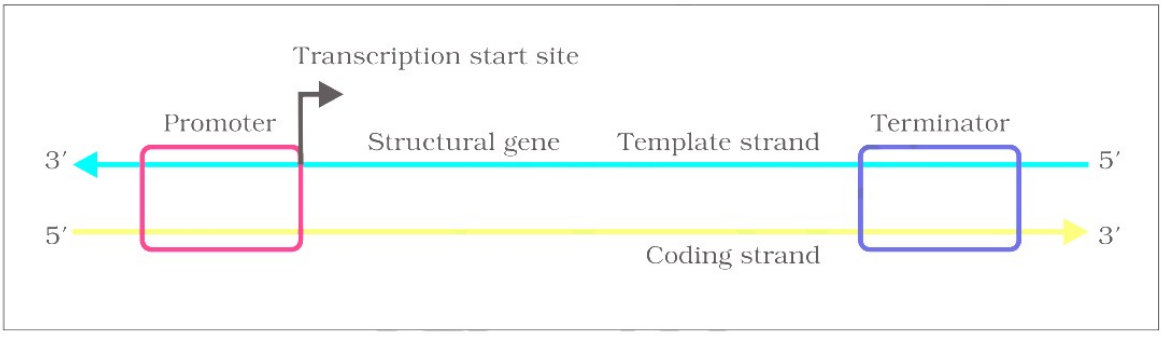
DNA REPLICATION

Semi conservative mode of replication proposed by Watson and Crick

Structure of Replication fork



Transcription Unit



Properties of Genetic code

1. Genetic code is triplet
2. Genetic code is commaless
3. Genetic code is unambiguous
4. Genetic code is degenerate
5. Genetic code is universal

AUG–Start Codon, it codes for methionine

Stop codons–UAA,UAG,UGA.

Template Strand–3'TACGTACGTACGTACG5'

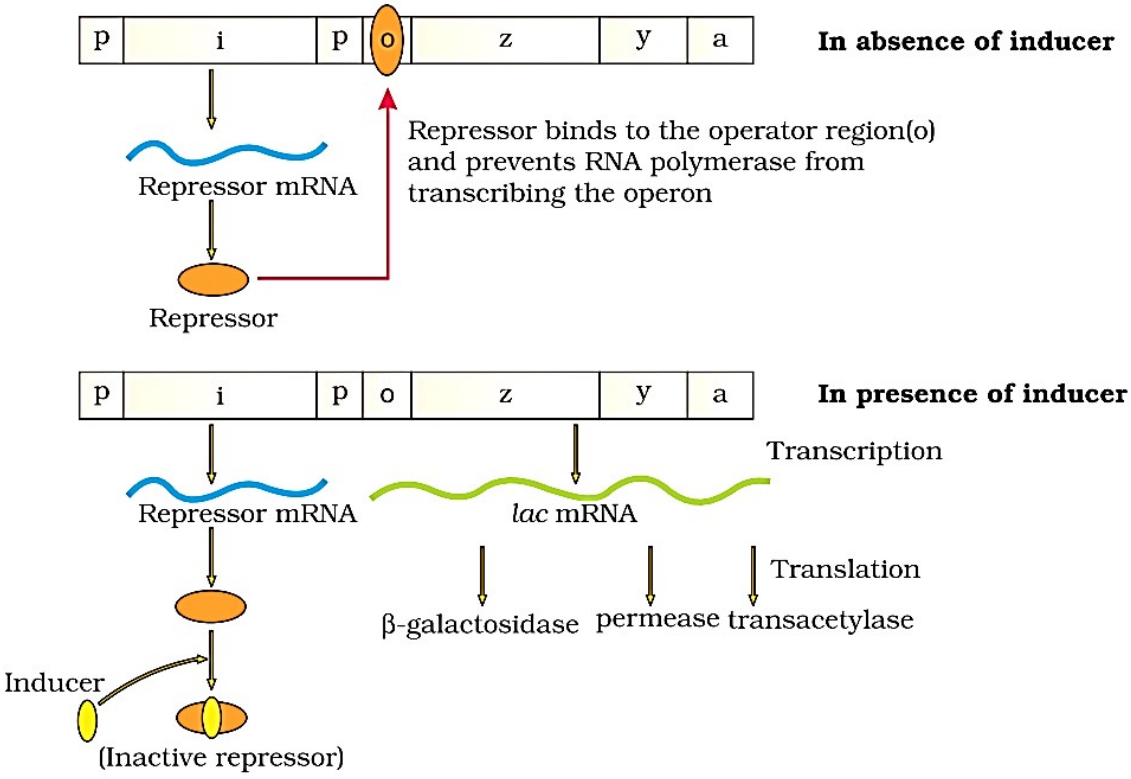
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Coding strand–5'ATGCATGCATGCATGC3'

mRNA strand–5' AUGCAUGCAUGCAUGC3'

- **Cistron:**It is a **segment of DNA**, coding for a polypeptide.

LAC Operon



VNTR (Variable Number of Tandem Repeats)

DNA Finger printing

The technique was developed by **Alec Jeffry**

1. Isolation of DNA
2. Digestion of DNA by Restriction endonuclease
3. Separation of DNA fragments by Gel Electrophorosis
4. Transfering of DNA fragments into nitrocellulose paper(Blotting)
5. Hybridisation using labelled VNTR probe
6. Detection of hybridised DNA fragments by Auto radiography

Application of DNA Finger printing

- ✓ Used in forensic science to solve the problems of paternity,rape,murder etc.
- ✓ Used to diagnose genetic disorders.

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EVOLUTION

- Origin of universe – About 20 billion years ago
- Origin of earth – About 4.5 billion years ago
- Origin of Life –500 million years ago

  Theory of Chemical Evolution- Proposed by Oparin and Haldane

  -It states that life was originated from non living organic molecules by chemical reaction

  The Hypothesis was experimentally proved by Urey and Miller
- They created electric discharge using electrodes in a closed flask containing **methane(CH4), ammonia(NH3), hydrogen(H2) and water vapour(H2O).**

HOMOLOGOUS ORGAN	ANALOGOUS ORGAN
Same structure but different function	Different structure but same function
Divergent Evolution	Convergent Evolution
Eg- • Fore limb of Whale ,bat,mammals • Thorns and tendrils	Eg- • Eye of octopus and man • Wings of insect and birds

Adaptive radiation

The process of evolution of different species in a given geographical area starting from a point and radiating to other geographical areas or habitat .

Examples

1. Darwin Finches
2. Australian Marsupials

Hardy Weinberg equilibrium

- Sum total of frequencies of all the alleles=1
- $p^2 + 2pq + q^2 = 1$

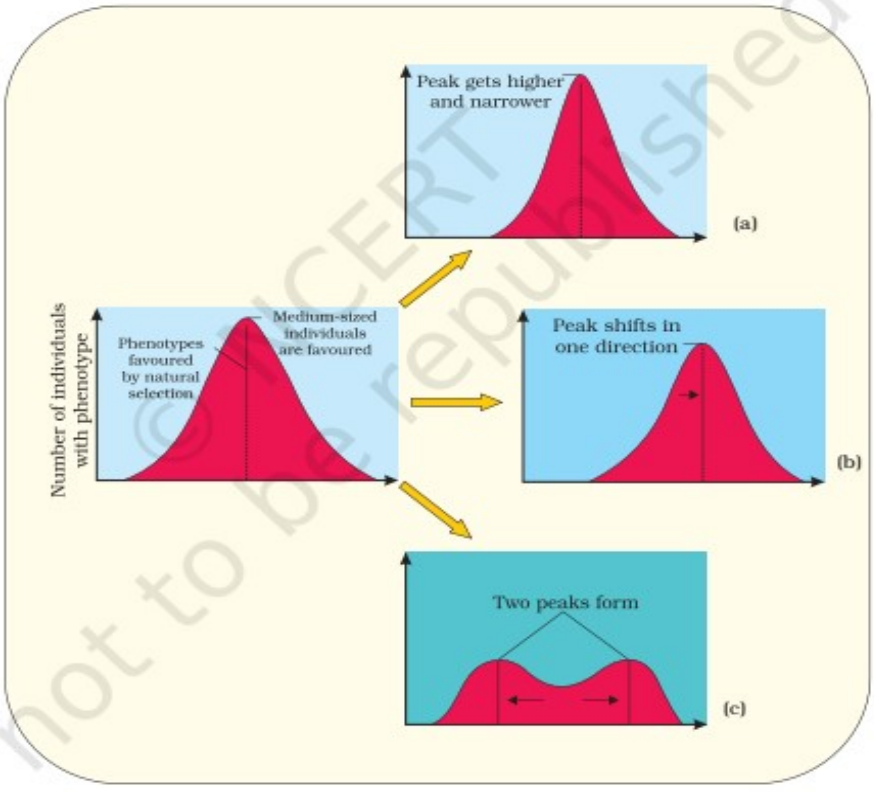
Factors Affecting Hardy Weinbergequilibrium

- Gene Migration
- Genetic Drift
- Mutation

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- Genetic recombination
- Natural selection

Effects of natural selection



a). Stabilizing selection

b). Directional selection

c) Disruptive selection

- **<u>Evolutionary stages of Man</u>**

Dryopithecus	More ape like	15mya
Ramapithecus	Man like	15 mya
Australopithecines	Hunted with stone weapons, ate fruit	2 mya
Homo habilis	Did not eat meat,650-800cc brain capacity	1.4 mya
Homo Erectus	Ate meat ,900cc brain capacity	1.5 mya

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Neanderthal man	Used hides to protect their body,buried their dead,1400cc	1,00,000-40,000years
Homo sapiens	Modern man	

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HUMAN HEALTH AND DISEASES.

Disease	Pathogen	Transmission	Symptoms
Typhoid	*Salmonella typhi* **Group: Bacterium** **Widal test:** To confirm the disease.	Food & water → small intestine.	High fever, weakness, stomach pain, constipation, headache & loss of appetite. Intestinal perforation.
Pneumonia	*Streptococcus pneumoniae* & *Haemophilus influenzae* **Group: Bacterium**	Inhaling droplets from patients, Sharing contaminated objects.	Respiratory problems, fever, chills, cough, headache. In severe cases, lips and finger nails turn gray to bluish colour.
Common cold	*Rhinovirus* **Group: Virus**	Inhaling droplets from cough or sneezes. Contaminated objects.	Nasal congestion & discharge, sore throat, cough, hoarseness, headache, tiredness.
Malaria	*Plasmodium sp.* **Group: Protozoa**	Female *Anopheles* mosquito.	Haemozoin toxin causes chill and high fever recurring every 3-4 days.
Amoebiasis (Amoebic dysentery)	*Entamoeba histolytica* **Group: Protozoa**	Houseflies transmit parasites from faeces to food & water.	Constipation, abdominal pain & cramps, stools with mucus and blood clots.
Ascariasis	*Ascaris* **Group: Helminth**	Soil, water, vegetables, fruits etc. contaminated with faeces.	Internal bleeding, muscular pain, fever, anaemia, blockage of intestinal passage.
Filariasis (Elephantiasis)	*Wuchereria* (Filarial worms) **Group: Helminth**	Female *Culex* mosquito.	Chronic inflammation and deformity of limbs & genital organs.
Ringworm	*Microsporum, Trichophyton* & *Epidermophyton* **Group: Fungus**	From soil or towels, cloths, comb etc.	Dry, scaly lesions on skin, nails, scalp etc. Itching.

Immunity

2 types of immunity. Innate and acquired.

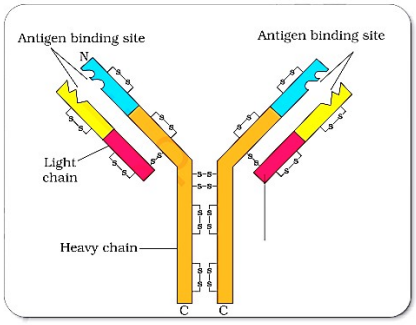
Innate immunity - 4 types of barriers

1. Physical barrier - skin , mucus
2. Physiological - HCl, saliva,Tear
3. Cellular - WBC - Neutrophils, monocytes, lymphocytes and macrophages.
4. Cytokine – Interferon

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Acquired immunity - Antibody mediated

Structure of antibody - H2L2 model



Active Immunity	Passive immunity
1. Antibody produced in response. to antigen 2. It is slow 3. Stays longer period **Eg . vaccination**	1. Ready made antibody **2.** It is faster **3.** Shorter period **Eg. Colostrum , Tetanus antitoxin**

- Graft rejection by cell mediated immunity
- Vaccine - Inactive pathogen
- Antigen - antibody generating substances
- Auto immunity

  Eg . Rheumatoid arthritis

MALT	Mucosal Associated Lymphoid Tissue
AIDS	Acquired Immuno Deficiency Syndrome
HIV	Human Immuno DeficiencyVirus
ELISA	Enzyme Linked Immuno Sorbent Assay
NACO	National AIDS Control Organization

AIDS

- Pathogen - HIV(Human Immuno deficiency Virus)

Transmission

- By sexual contact with infected person
- By transfusion of contaminated blood
- Sharing of infected needle
- From infected mother to foetus through placenta

  Test →ELISA

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Cancer

Two types of tumour

1. Benign- Do not spread
2. Malignant-Spread from one place to other(Metastasis)

DRUGS		
Types of Drug	**Origin(Plant)**	**Effect**
Opioid Morphin, Heroin	*Papaver somniferum*	Sedative, Pain killer Depressant
Cannabinoid	*Cannabis sativa*	Affect CNS
Coca alkaloid	*Erythroxylum coca*	Affect CNS
L S D	Fungus	Hallucinogenic

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MICROBES IN HUMAN WELFARE

House hold products		
Lacto bacillus	Lactic Acid Bacteria(LAB)	Converts milk to curd Increasing Vitamin B12
Saccharomyces cerevisiae	Baker's Yeast	Used making bread
Propionibacterium sharmanii	Bacteria	Used making Cheese

Industrial Product

Industrial product

a) Beverage

Yeast - Saccharomyces cerevisiae

b) Antibiotic

Penicillin-*Penicillium notatum*

c) Organic acids		
Acid	**Microbe**	**Category**
Citric acid	*ASpergillus niger*	Fungus
Acetic acid	*Acetobacter aceti*	Bacteriun
Butyric acid	*Clostridium butylicum*	Bacteriun
Lactic acid	Lactobacillus	Bacteriun
Ethanol	*Saccharomyces cerevisiae*	Fungus

Enzymes

- Pectinase& Protease-Clear fruit juice
- Lipase-Removing oily stain from cloths
- Streptokinase-Clot buster(Remove blood clot from blood vessel)

Bio active molecules		
Cyclosporin A	Trichoderma polysporum	Immuno suppressive agent
Statin	Monascus purpureus	Lowering blood cholesterol

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Microbes in biogas

- Methanobacterium- Bio gas is a mixture of methane and CO2

Microbes as bio control agents

- *Bacillus thuringiensis*-Bacteria (Bt) is used to control caterpillar
- Trichoderma(Fungus)-To control plant diseases
- Baculo viruses- Destroy insects and other arthropods
- IPM- Integrated Pest Management

Microbes as bio fertilisers

- Bacteria-Rhizobium(Symbiotic Bacterium)
- Azospirillum, Azotobactor-(Free living bacteria)
- Cyanobacteria-Nostoc,Anabaena, Oscillatoria
- Fungus– Mycorrhiza

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BIODIVERSITY & CONSERVATION.

Biodiversity - Edward wilson

Levels of biodiversity

1. Genetic level
2. .species level
3. Ecological level

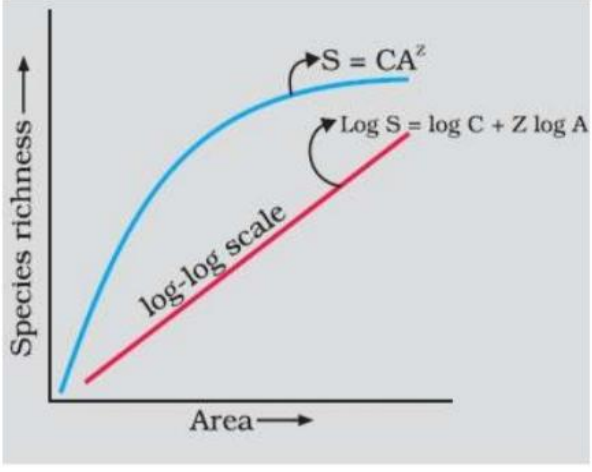
Tropics contain more species than temperate and polar regions. Because

- Undisturbed area.
- Less seasonal
- More solar radiation and more productivity.

Amazon rain forest in south America - Lungs of planet. - greater biodiversity on earth

Species - Area relationship by alexander Von Humboldt.

Species richness increases with increasing area but up to a certain limit.



Species Area Relationship

log S = log C + Z log A, where
S = Species Richness
Z = Slope of the line (Regression Co-efficient)
A = Area
C = y- intercept

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Causes of biodiversity loss -*The Evil quartet*

1. Habitat loss and fragmentation
2. Over exploitation
3. Invasion of alien species
4. Co - extinction

Conservation of biodiversity

In-situ conservation (on site)- Within the natural habitat

Eg . 1). Hot spot

2). Biosphere reserve

3).National park

4). Wild life sanctuary

5). sacred forest

2.Ex - situ conservation (Off site)- Organisms are protected outside the natural habitat under human care'

Eg. Zoo, Aquarium, Botanical garden ,pollen bank ,Gene bank, cryopreservation

- IUCN- International Union for Conservation of Nature and Natural resources
- The Earth summit - Rio de Janerio in 1992
- The World summit - Johannesburg, South Africa in 2002..

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