

Ch. REPRODUCTION IN ORGANISM

Life Span:

• Period b/w birth to natural death.

Exception - Single cell organism

Organism	Life Span
Elephant	60-90 yrs
Rose	5-7 yrs
Dog	14-18 yrs
Butterfly	1-2 weeks
Crow	15 yrs
Banana tree	25 yrs
Cow	20-25 yrs
Parrot	140 yrs
Crocodile	60 yrs
Horse	60 yrs
Fruit fly	2 week
Rice plant	3-4 month
Tortoise	100-150 yrs
Banyan tree	200-300 yrs

Asexual Reproduction:

Uniparental, NO variation

Fission

Binary
when parent body divide into similar cells

Simple

Amoeba

Transverse

Paramecium

Longitudinal

Euglena

Oblique

Gracilaria

Multiple

Cyst

Amoeba

Paramecium

Euglena

Gracilaria

Budding

Exogenous

Externally

bud comes

f detached

from parent

body as new

individual

Endogenous

Replacement

of lost parts

Eg Lizard

Regeneration

Eg planaria

morpholaxia

Small part of

body part can

give rise to

new individual

Eg starfish,

Planaria

Epimorphosis

Replacement

of lost parts

Eg Lizard

Fragment

Parent body

is broken

into fragment

& each fragment

give rise to

new individual

Eg Spirogyra

Sexual Reproduction:

- Two parents
- Favours variation i.e. Evolution

Pre-fertilization:

- Gametogenesis
- Female → Oogenesis → ova
- Male → Spermatogenesis → sperm

Anisogamy

(Heterogamy)

Isogamy

(Homogamy)

Oogamy

(Heterogamy)

Animal Terminology:

- 1) Protandrous → ♂ Reproductive organ matures early.
- 2) Protogynous → ♀ Reproductive organ matures earlier
- 3) Hermaphrodite → Single body have both ♂ & ♀

Plant Terminology:

- 1) Dioecious (unisexual) → both ♂ & ♀ on same diff plant
- 2) Monoecious (bisexual) → both ♂ & ♀ on same plant

Fertilization / Syngamy:

External

Fertilization

occurs outside

the body

less safe

more no. of

gamete

Eg frog, Bony

fish, Earthworm

Internal

Internal Fertilisation

more safe

less no. of gamete

Eg Cockroach,

Sponge

Post fertilization:

zygote → morula → blastula

Gastrula

Cell division & cell differentiation

@Gangigaski

Mode of development:

Oviparous:

Animals lay Eggs

Yolk

Eg Birds, Insects,

bony fishes

Viriparous:

Animal give birth to

young ones.

Placenta

Eg Humans

Oviviviparous:

fertilization → Egg

remain in body &

hatching occurs

inside the body &

finally give birth to

young ones.

Yolk

Eg Scorpion,

Salamander

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Oestrus Cycle

- Scanty bleeding
- mammalian non-primates
- Season influenced
- Period of heat
E↑↑
- ♀ Sexually active
eg. dog, cat

Menstrual Cycle

- mammalian primates
- Bleeding occurs
eg. monkey, human apes

Kingdom Fungi &
Some members of
monera

Penicillium

water hyacinth
water lily

Chlamydomonas
Zoospore

Conidia

offset

Some Imp Data:

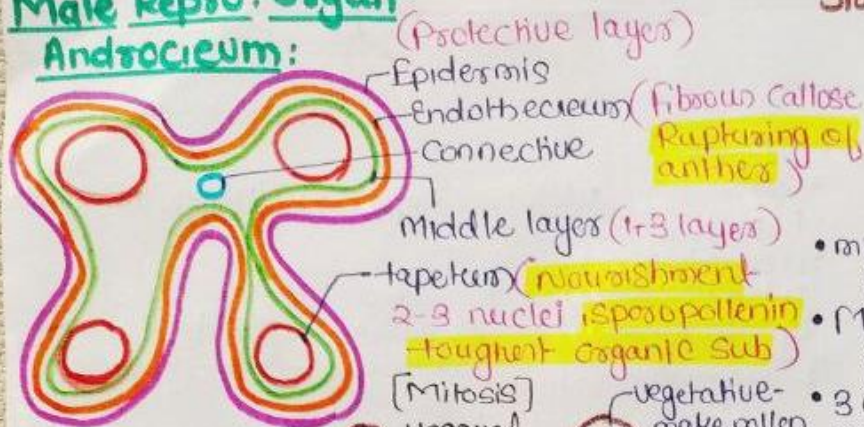
- Bamboo flowers once in their life (50-100 yrs)
- Strobilanthes kunthiana (Neelakuraji)
flowers only once in 12 yrs.

@Gargigaikee

Organism	2n	n
Human beings	46	23
House fly	12	6
Rat	42	21
Dog	78	39
Cat	38	19
Fruit fly	8	4
Ophioglossum	1260	630
Apple	34	17
Rice	24	12
Maize	20	10
Potato	48	24
Butterfly	380	190
Onion	16	8

Ch. SEXUAL REPRODUCTION IN PLANTS

Male Repro. Organ Androecium:



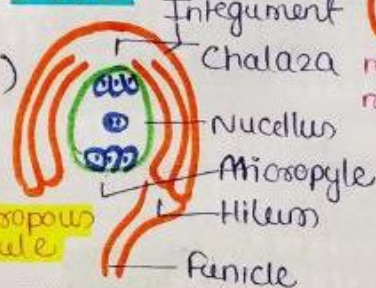
Pollen Viability:

- Rice, wheat pollen grain lose viability in 30min
- Rosaceae, Leguminosae, Solanaceae $\Rightarrow$ 3-4 month
- Store pollen (Cryopreservation) liq N₂ (-196°C)

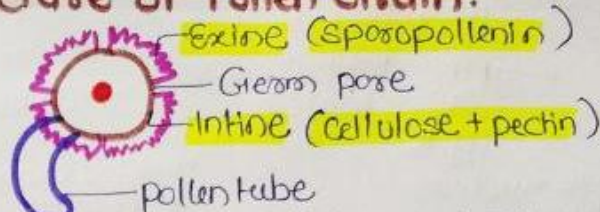
Female Repro Organ Gynoecium:

- 1 seed - mango
- many seed - Papaya, Guava
- Apocarpous - Carpel free
- Syncarpous - Carpel fused

Ovule:



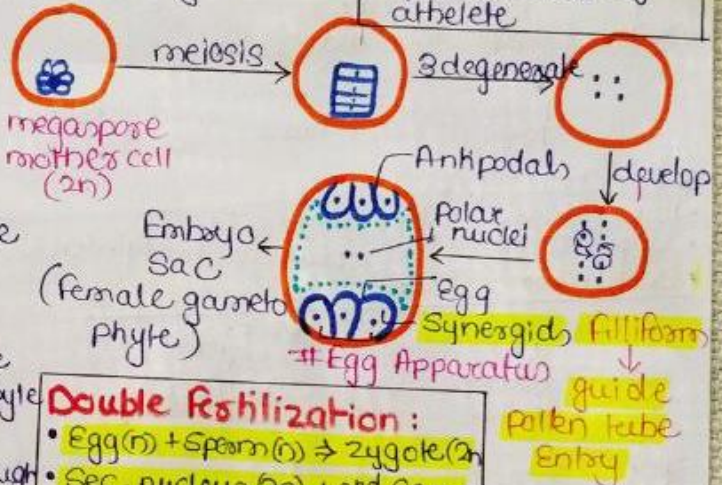
Structure of Pollen Grain:



- microspore - male gametophyte (n)
- Megaspore - female gametophyte (n)
- 3 cell = fully developed
- 2 cell = partially developed gametophyte.
- Pollen grains come out of Angiosperm = 60% = 2 cell stage
- Angiosperm = 40% = 3 cell stage

Economic value:

- Rich in nutrient
- Food Supplement
- ↑ performance of athlete



Double Fertilization:

- Egg (n) + Sperm (n) $\Rightarrow$ Zygote (2n)
- Sec. nucleus (2n) + 2nd Sperm $\Rightarrow$ PEN

Pollen Pishil Interaction:

- Basal acid will accelerate germination.
- # Artificial Hybridization:
 - Bisexual flower - Emasculation (removal of anther in bud stage)

- ① Bagging - Covering to prevent contamination
- ② Dusting - dusting desired pollen grain
- ③ Re bagging - recovering dusted pollen

Out breeding devices:

- Cross pollination - variation (better survival)

- ① Unisexuality: dioecious, σ , ϕ on diff. Eg. Papaya, date palm.
- ② Dichogamy: anther, stigma mature at diff time
- ③ Protogyny: anther mature first
protogyny = stigma mature first
- ④ Heterogamy: physical barrier b/w anther & stigma
- ⑤ self sterility:

Pollination:

$\rightarrow$ Transfer of anther to stigma

Autogamy

- Self pollination
- chasmogamous - open
- cleistogamous - closed
- Eg. Viola, Commelina, Oxalis

Cleistogamy

- Same plant diff flower genetically same
- Eg. Cucurbita

Xenogamy

- Cross pollination diff male & female plant
- no auto & Cleistogamy
- Eg. Date palm, Papaya

Agents:

ABIOTIC

- wind (Anemophily)
 - Smooth, dry pollen
 - Small flower without nectar, fragrance
 - Eg. grass
- water (Hydrophily)
 - Small flower, long ribbon like pollen
 - no nectar, fragrance
 - Eg. Vallisneria, Zostera

- ① Epiphytrophily: Above water surface
- ② Hypohydrophily: Below surface

Anthrophilous Adensomep

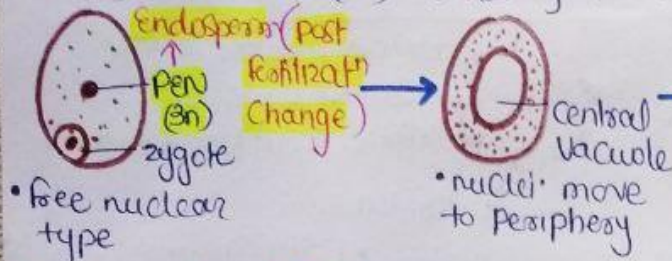
BIOTIC

- Insect (Entomophily)
 - brightly colors, nectar, fragrance
 - Sticky stigma
 - Eg. Rose, Jasmine
- Bird (Ornithophily)
 - large flowers, showy
 - large nectar
 - pollen sticky
 - Eg. Bombax, balsa bottle brush
- Bat (Chiropterophily)
 - flowers at night
 - rotten smell

Development of Endosperm:

@Garg.garke

$PEN(3n) \Rightarrow 2^{\circ} \text{ nucleus}(2n) + 2^{\circ} \text{ male gamete}(n)$

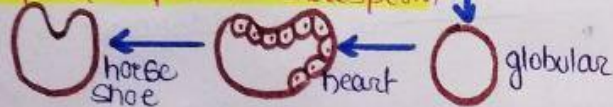


Development of Embryo:

Embryogenesis $\Rightarrow$ micropyles end



Suspensors push the embryo deeper & deeper into Endosperm



Function of Suspensors:

- lower 4 cells make Hypocotile
- upper 4 cells make plumule & cotyledon.

Non Albuminous seed

Ex albuminous
Non-Endospermous
Dicot
eg pea, Beans, ground nut

Albuminous seed

Endospermous
monocots
eg Castor (dicot)
wheat, maize
barley

Parthenocarpy:

- Formation of fruit without fertilization. (Seedless)
- Growth hormones Auxin, Gibberlin

Apomixis:

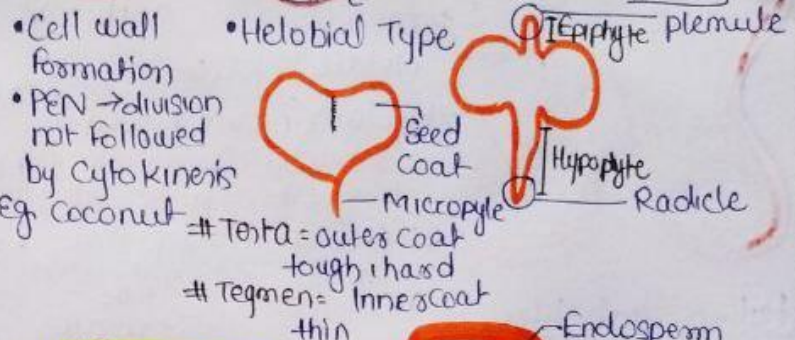
- Formation of seed without fertilization.
- Organisms are genetically similar, i.e. clones

Polyembryony:

many viable embryos present in seed.
eg Citrus, mango

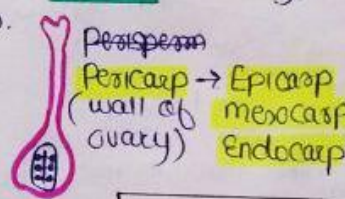
Nucellus:

persistent perisperm.
Embryonal axis
cotyledon
dicot



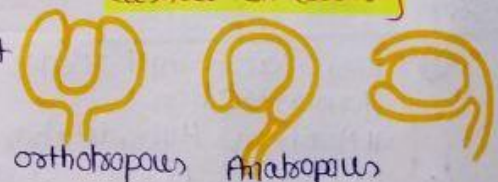
Dormancy
Seeds inactive
- moisture, H₂O, oxygen at micropyle

Fruit: (ovary)



True fruit develop from ovary
mango, Guava, tomato

False fruit develop from other part
Apple (thalamus), Pear, cashew, Strawberry



Fruit:

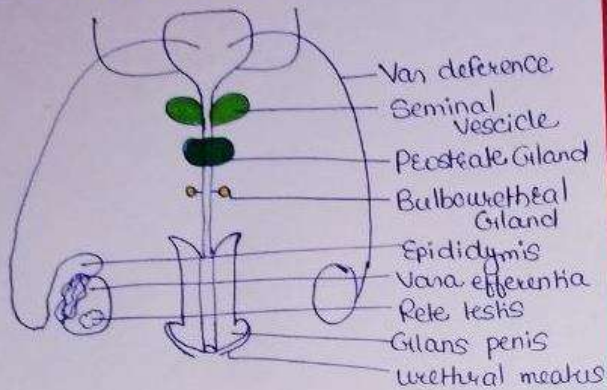
Fleshy
mango, Guava, tomato
Dry:
Pea, mustard
Ground nut

HAND WRITTEN SHORT NOTES

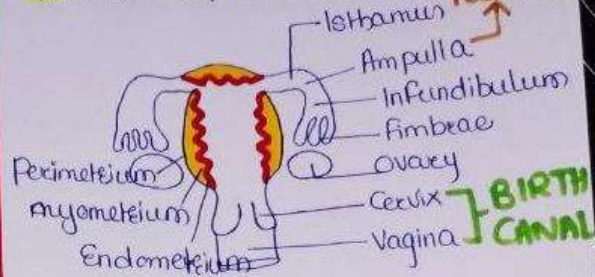
HUMAN REPRODUCTION

Ch. HUMAN REPRODUCTION

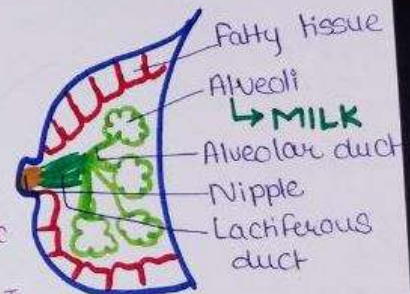
Male Reproductive System:



Female Reproductive System:



MAMMARY GLANDS



Mother's 1st milk has Colostrum

Ab. Protein

FERTILIZATION

Insemination → Capacitation (Removal of cholesterol, Influx Ca^{2+})

Acrosomal ← Chemo attraction

maturation promoting → 2n zygote

Factor → cleavage

4th 3rd 2nd 1st

1st month Heart, Heart beat listen

End of 2nd month limbs & digits

End of 3rd month major organs formed

5th month movement & body hair

3rd trimester Eye lash, Eye lids Full Growth

GAMETOGENESIS

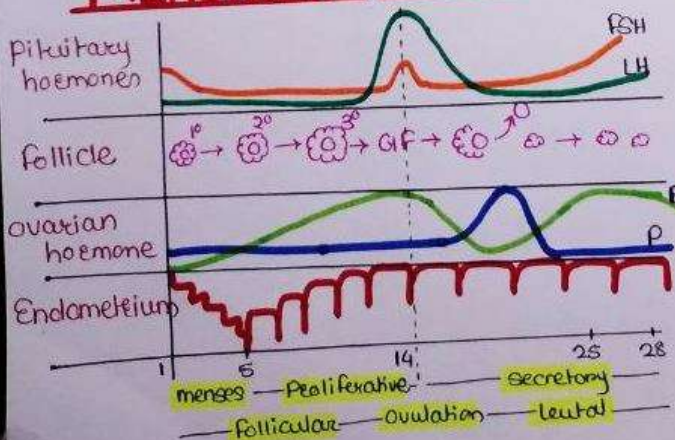
MALE

- Spermatogenesis - formation of Sperms
- Spermatogenesis - at puberty Spermatogonia
- 1° Spermatocyte - diploid undergo meiosis I
- 2° Spermatocyte
- Spermatid undergo Spermiogenesis
- Spermatozoa / Sperm

FEMALE

- Oogenesis - formation of ovum
- Oogonia - during Embryonic development
- 1° oocyte upto prophase I
- 1° follicle, 2° follicle
- 2° oocyte - ovulation occur
- After Entry of Sperm - Completion of meiosis II
- ovum

MENSTRUAL CYCLE:



@Garagi

Join telegram:garimagoel007_g2

Ch. REPRODUCTIVE HEALTH

1951

Indian Govt. → Family planning

Reproductive and child health care

- ① take care of mothers after pregnancy
- ② neo-natal care
- ③ Safe coitus
- ④ Avoid Sexual Infections
- ⑤ Population Control

1947 → Census → 350 millions

2001 → Census → 1.1 billion

2011 → Census → 1.2 billion

Amniocentesis:

Extraction of amniotic fluid (foetus skin cells)

know about genetic disorders.

Illegally "sex determination"

14th-16th week of preg.

Contraceptive Method

Inhibit pregnancy.

Features:

- ① Cheap
- ② Easily Reversible
- ③ Effective
- ④ User friendly
- ⑤ Reversible
- ⑥ less side effects
- ⑦ do not interfere b/w coitus

1. Natural Method:

avoid meeting of sperm & ova naturally.

- no side effect, successful

Periodic Abstinence:

- chances of fertilization are high during fertile period (10-17th day)
- Couples should avoid this

Lactational Amenorrhoea:

- during lactating / breast feeding period gonadotropins ↓↓
- Valid upto 6 months!

Coitus Interruptus:

- withdrawal of penis just before ejaculation

3. Chemical Method:

Chemicals which kill sperms.

4. IUDs (Intra uterine device):

Inserted inside uterus.

most accepted method in India

5. Contraceptive pills:

- Combination of E₂ + progesterone
- has to be taken b/w 1-5th day of cycle.

Eg. Mala-D, Mala-N

Mini pills:

- progesterone only
- have to be taken daily

SAHEI:

Central drug Research Institute, Lucknow

- non-steroidal
- initial 3 months - twice week
- after that once a week
- side effects low.
- Blocks E₂ Receptors

2. Barrier method: NIRODH

@Gargigakee

Type	Condom	Femidom	Vaults	Caps	Diaphragm
Organ	Penis	Vagina	Cervix	Cervix	Cervix
made up of	latex sheath	plastic / thin rubber	~	~	~
Privacy	✓	✓	✓	✓	✓
Disposable	✓	✓	✓	✓	✓
Reusable	✓	X	✓	✓	✓
STD Protection	✓	✓	X	X	X

Non-medicated: loop impregnated in Borsly uterus hostile for implantation
Kill Sperm

Eg. Lippe's loop

Hormone Releasing: release progesterone → ovulation X
↑ cervical mucus
Eg. LNG20 (Levonorgestrel)
Progestasert

Copper Releasing: suppresses motility of sperm
Eg. CuT, Cu7, multiload 375

6. Depo-provera:

- Injectables
- ♀ injected with E₂+P
- work for 3-2 months

7. Implants:

- Silicon rods with E₂+P are implanted.
- work for 5-7 yrs

8. Emergency Contraceptive:

- Morning after pills
- Fertilization already happened now we have to stop implant.
- Eg. i-pills, Unwanted 72, Ru-486
- Coitus → 72hrs → No pregnancy

9. Sterilization:

Permanent method to stop pregnancy.

Vasectomy:

- vas deferens cut & tied
- Semen without sperm
- spermatogenesis ✓

Tubectomy:

- fallopian tube cut & tied
- sperm fertil ova

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Medical Termination of Pregnancy:

- Voluntary Expulsion of premature foetus

Abortion: #12 weeks safe

In 1971 → MTP legal

Female foeticide → Illegal

- Foetus suffering from genetic disorders
- Foetus is harmful to mother
- Failure of contraceptive
- Child is result of Rape

Assisted Reproductive Technology:

In Vitro Fertilization:

Embryo upto 8 cell stage

transferred to Fallopian tube

Zygote Intra Fallopian transfer

more than 8 cell stage

Transferred to uterus

Intra uterine transfer

Bacterial

Chlamydia	Chlamydia trachomatis
Syphilis	Treponema pallidum
Gonorrhea	Neisseria gonorrhea
Chancroid	Haemophilus ducreyi

Viral

Herpes	Human Simplex Virus
Genital wart	Human papilloma virus
AIDS	Human Immunodeficiency virus
Hepatitis	Hepatitis Virus

Protozoan

Trichomoniasis
→ Trichomonas vaginalis

Fungal

Candidiasis
→ Candida albicans

Gamete Intra Fallopian Transfer:

- ♀ can't produce ova, but provide uterus
- donor → ova
- Internal fertilisation
- child not identical to parent

Intra-cytoplasmic Sperm Injection:

- Sperm injected into ova
- External fertilisation → child original to parents
- when Sperm naturally fails to fertilise ova.

Artificial Insemination:

Intra uterine Insemination

- when ♂ fails to hold erection
- oligospermia = low sperm count

@Gargigaikee

G SQUARE

Ch. PRINCIPLES OF INHERITANCE

MENDEL (1856-1863) 7 yrs

Monohybrid Cross:

Dihybrid Cross:

Why **Pisum sativum**

- Small Breeding Cycle
- Natural Self Pollination
- Visible Contrast Character
- Pure line large progeny

Parent $TT \times tt$
Gamete $T \times t$
F₁ Tt

Parent $RRYY \times rryy$
Gamete $RY \times ry$
F₁ $RyYy$

Trait	Dominant	Recessive
Seed shape	Round	Wrinkled
Seed Colour	Yellow	Green
Flower Colour	Purple	White
Flower position	Axial	terminal
Plant height	tall	dwarf
Pod shape	Inflated	constricted
Pod Colour	Green	Yellow

G₁R = 4:0 PR = 4:0

	T	t
T	TT	Tt
t	Tt	tt

G₁R = 1:2:1 PR = 3:1

no of Gametes = 2ⁿ heterozy.
no of offspring = 4ⁿ

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

G₁R = 1:2:2:4:1:2:1:2:1

PR = 9:3:3:1

Parent. Recomb = 10:6

I. Law of Dominance:

"One of the allele which Expresses itself Completely even in heterozygous Condⁿ is called dominating allele."

Exception to Mendelism:

I. Incomplete Dominance:

dominant allele Express partially
eg. Antirrhinum (Snapdragon)
Mirabilis Jalapa

Parent $RR \times rr$

F₁ Rr pink

	R	r
R	RR	Rr
r	Rr	rr

G₁R = 1:2:1

PR = 1:2:1

II. Law of Segregation

"Every allele has 50% chance to go into gamete"
Law of Purity of Gamete

II. Test Cross:

To identify parent Genotype by crossing with homozygous Recessive
 $TT/TE \times tt$

Back cross = Cross of F₂ hybrid with any Parent

III. Law of Independent Assortment

"Inheritance of one gene is independent of other gene"
Exception: Linkage

III. Co-Dominance:

both allele Express
eg. ABC blood Group

Gene	Antigen on RBC	Ab in Plasma
I ^A I ^A	A	B
I ^A i	A	B
I ^B I ^B	B	A
I ^B i	B	A
I ^A I ^B	AB	-
ii	O	AB

Multiple Allelism = One character expressed by 2 or more allele
eg. blood group, Coat colour in Rabbit.

IV. Pleiotropism:

One gene Control many character

V. Polygenic Inheritance:

many gene Controlling one character.
eg. Skin colour.

* Chromosomal theory of Inheritance

Drosophila Melanogaster (fruit fly)

- 2 week lifestyle

MORGAN

less chances of Recombi. more chances of Recombi.

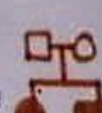
Gene Mapping:

Alfred Sturtevant

Recom. = $\frac{\text{no of Recomb}}{\text{Total Progeny}} \times 100$

Pedigree Analysis

- normal ♂
- affected Individual
- normal ♀
- ◻ mating
- ◻ mating b/w Relative
- ◻ Sex Unspecified.



affected child

Sex Determinatⁿ

Human / Drosophila

♀ xx ♂ xy

Birds ♀ zw ♂ zz

Insects ♀ xx ♂ xo

X: Autosome Ratio

>1 Super ♀

1 Normal ♀

1-0.5 Intersex

0.5 Normal ♂

<0.5 Super ♂

Skipping = Recessive
no skip = Dominant

Disorders:

I. Haemophilia: x linked Recessive
→ Delayed blood clotting
Factor VIII (haemo A)
Factor IX (haemo B)

II. Colour Blindness: x linked Recessive

III. Down's Syndrome: trisomy at 21st Chromo.

IV. Patau Syndrome: Trisomy at 13 Chromo.

V. Edward Syndrome: trisomy at 18 Chromo.

VI. Klinefelter: XXY
Gynaecomastia → overall masculine development.

VII. Turner: 45+X0

MENDELIAN DISEASES:

I. Cri du chat: (cat like cry)
loss of P arm at 5th Chromo.

II. Cystic Fibrosis: damage lung & digestive system.

→ Affect mucus producing cells

III. Phenylketonuria
Autosomal Recessive

→ lack enzyme which convert phenylalanine into tyrosine due to which phenylpyruvic acid accumulate into brain.
→ mental Retardation

IV. Thalassemia:

α Thalassemia

↓
mutation Gene
HbA₁ HbA₂
↓
Chromo. 16
↓
 α globin chain

β Thalassemia

↓
mutation Gene
Hbb
↓
Chromo 11
↓
 β globin chain

@Gargigaikee

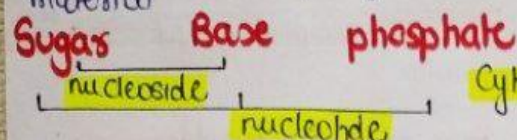
V. Sickle cell Anaemia:

Autosomal Recessive
RBC → Sickle Shaped
Substitution of Glutamic acid by Valic
GAG → GUG.

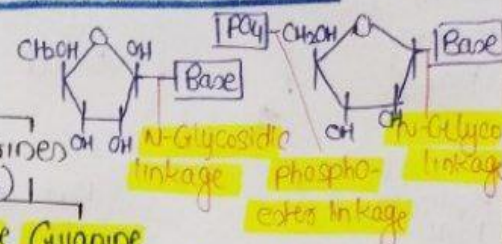
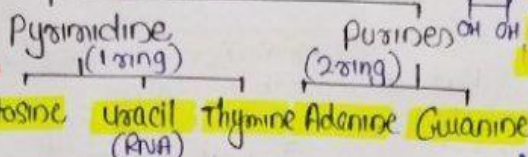
Ch. MOLECULAR BASIS OF INHERITANCE

Deoxyribonucleic acid (DNA): Nitrogenous Bases:

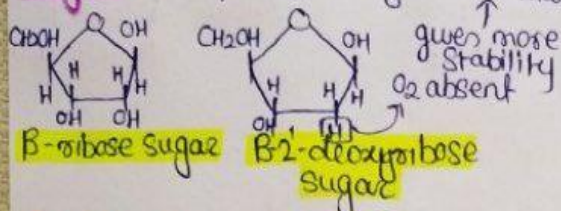
- acidic, -ve charge, genetic material



Nitrogenous Bases:

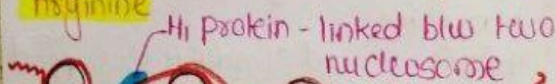


Sugar: 5C pentose sugar $\therefore$ genetic material



Packaging of DNA:

- DNA 2.2m long
- wrapped with basic AA. lysine & Arginine



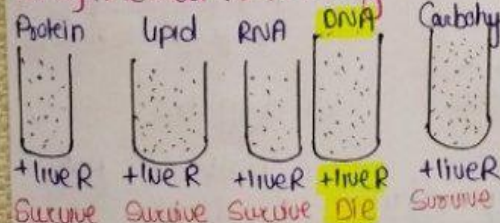
= # Beads on String = Chromatin

non-histone chromosomal protein = stability of packaging

Euchromatin	Heterochromatin
- loosely packed - active transcription - lightly stained	- tightly packed - inactive / can not transcribe - dark stain

11. Biochemical Analysis:

Avery, McLeod, Mc Carthy



III. Hershy - chase Expt

⇒ Blender's Expt:

- Bacteriophage $\rightarrow$ Transduktion
- Radioactive Isotopen
- DNA $\rightarrow$ P^{32} ; Capsid $\rightarrow$ S^{35}

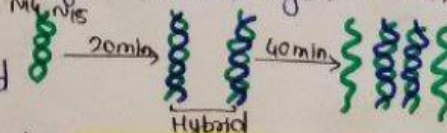


- DNA with P^{32} was transferred from virus into bacteria
- proves DNA is genetic material

Meselson-Stahl Expt:

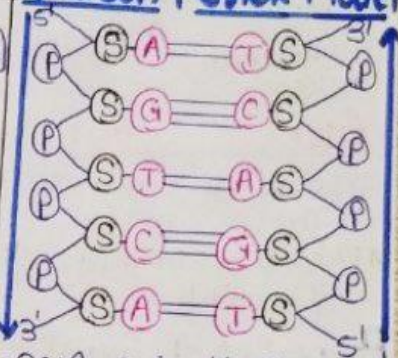
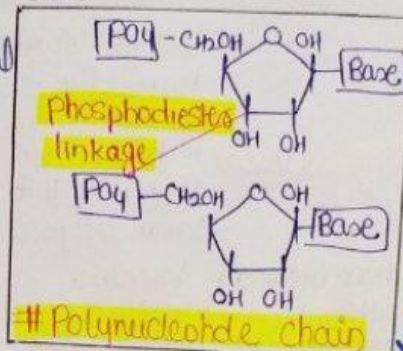
• Replication is Semiconservative

- E. Coli. Cultured on Nig (heavy isotope)
- after 20 min Hybrid DNA



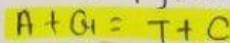
To obtain density standard C_6Cl_2

Watson & Crick Model



Chargaff Rule:

Purines = pyrimidines



- DNA is double stranded
- Both strands antiparallel & joined through H bond
- dist. b/w two bp 0.34nm
- B DNA
- Pitch of DNA 3.4nm.

@Gargigauke

Search for genetic material:

1. Griffith: Transforming Principle

Bacteria $\Rightarrow$ St. pneumonia

- Rough - Non-Virulent
- Smooth - Virulent

S live	R live	heat killed S	heat killed S + R strain
mouse	mouse	mouse	mouse
Pneumonia	X	X	Pneumonia
death	live	live	death

Character of genetic material:

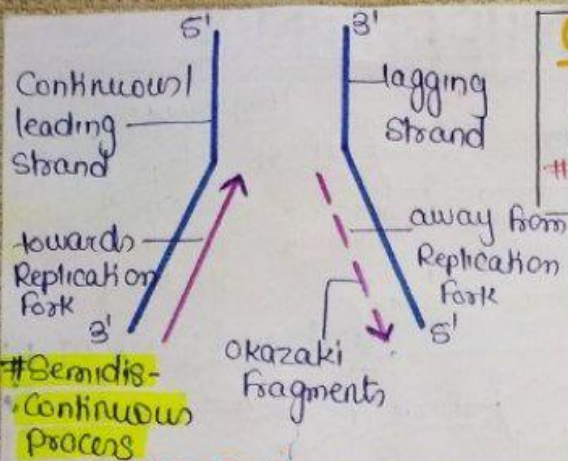
- Chemically more stable
- Can self replicate
- Should be prone to errors
- Should express itself in mendelian characters.

RNA world Hypothesis
Suggest that RNA would have
arised first

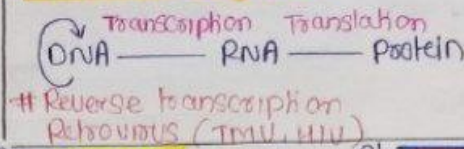
RNA = Genetic material + Ribozymes

Replication in Prokaryote

- Topoisomerase (Gyrase) open Super coils.
- Helicase Enzyme break H bond.
- to avoid Complementary bonding of both strand
Single stranded binding protein stabilize DNA
- addⁿ of deoxynucleotide triphosphate in 5'-3'OH
- Primase = DNA dependent RNA Polymerase Synthesis oligonucleotide seq.

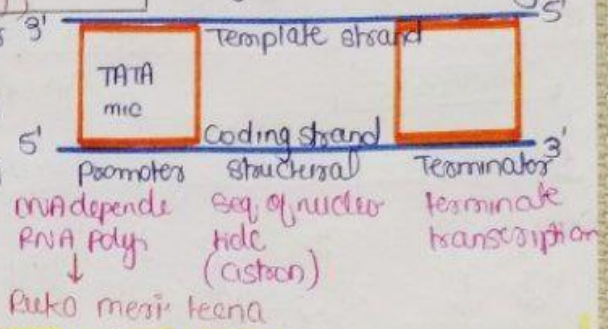


Central Dogma:



Transcription:

- monocistronic = Eukaryote
- polycistronic = Prokaryote



Genetic Code: George Gamow

3 nucleotide $\rightarrow$ 1 codon
20 AA $4^3 = 64$

Nirenberg & Matthaei: Poly U mRNA

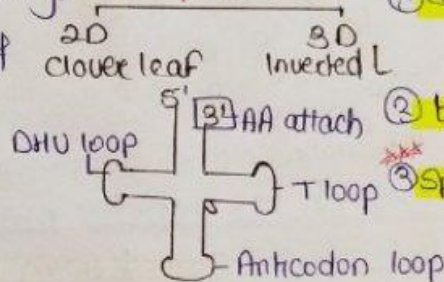
Har Gobind Khorana: alternative tail of C/U $\rightarrow$ our genetic code is triplet

Properties of Genetic Code:

- Commaless, Unambiguous
- non-overlapping, Redundant
- Universal Except Virus & mitochondrial DNA
- Start Codon AUG, methionine
- Stop codon UAA, UAG, UGA

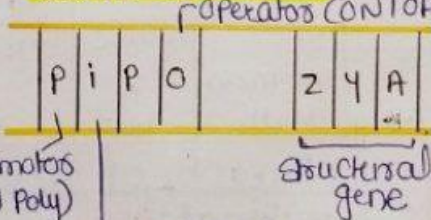
t-RNA:

> Transfer RNA Adapter / Soluble



Lac Operon:

Jacob and Monod



Inhibitor / Regulator

Lac Z = β galactosidase

Lac Y = permease $\uparrow$ permeability of galactoside

Lac A = transacetylase

transfers acetyl group on β galactosidase

@Ganggaikar

Translation:

Activation of Amino acid:

ATP + Enzyme + tRNA $\rightarrow$ Charged tRNA

- 1) Initiation: Smaller subunit attaches with mRNA, larger unit = 8 sites [APE]
- 2) Elongation: aminoacyl site shifts to A $\rightarrow$ P $\rightarrow$ E
- 3) Termination: stop codon terminate process.

Human Genome Project:

- haploid content of nucleus 3×10^9 bp
- 1990-2003 (13 yrs)
- 9 billion dollars

Goals of HGP:

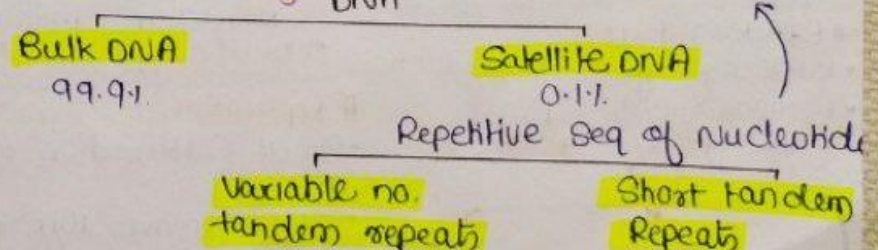
- 1) Identify 20,000-25,000 genes
- 2) Store this info. into databases
- 3) address ethical, legal, social issues, genetic disorders.

Methodology:

- (Expressed seq. tag) Approach directly starts with parts of DNA which express in mRNA
- (Seq. annotation) Sequencing entire genome

DNA Fingerprinting:

Alec Jefferys



- 1) AT:GC Ratio
- 2) length
- 3) no. of repetition

HAND WRITTEN SHORT NOTES EVOLUTION

Ch. EVOLUTION

⇒ Process of Gradual change & irreversible.

Origin of Universe:

Bigbang theory ⇒ 20 bya
Cosmic matter blasted
(Unimaginable in physical terms)

H & HE Comes out
Condensed under gravitational force

Universe still Expanding

Origin of Galaxy:

Akash Ganga / Milky way

Nebular Hypothesis:

In middle we have nebula which is a source of heat & surrounded by cloudy mist which contain all planets revolving around nebula.

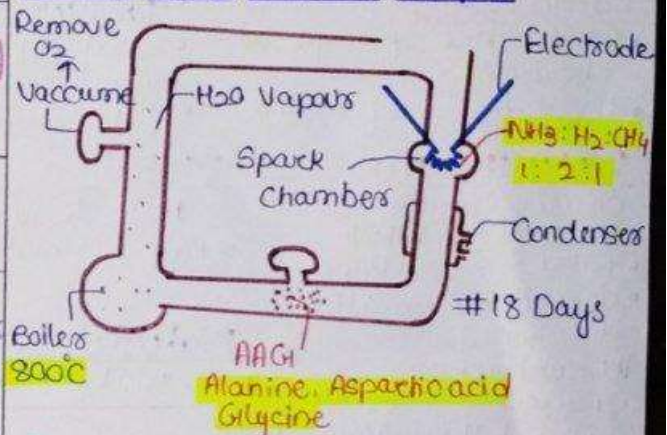
Origin of Earth:

4.5 bya origin

Primitive Earth:

- high temp. no O₂
- Volcanic Eruption
- thundering & lightning
- UV can easily penetrate
- Reducing atm.
- No ozone layer.

Urey and Miller Expt:



Biogeny: formation of life

Basis of being a cell:

- ① mem. which can separate inner & outer Environment.
- ② Inner material → proven to errors
- ③ Self Replicating

• oparin gave concept of Coacervates

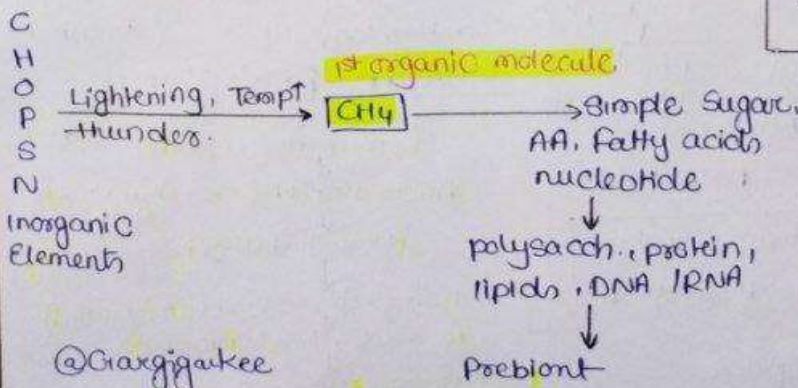
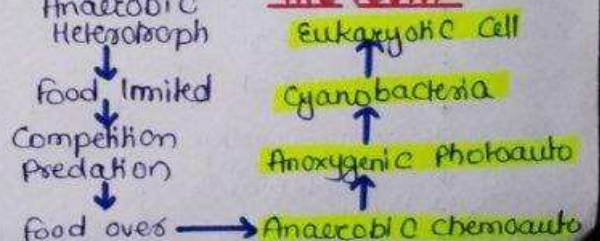
- polysach. + protein to form aggregates
- Failed to show binary fission. rejected as life precursor

• Sydney Fox 1st made microspheres using AA.

- lipids + protein formed bilayers lipid showed binary fission chosen as precursor of life

Theory	Given by	Characters
Special Creation	Father Saurez	• God Create Earth in 6 days. <u>mabimapsima</u> • Everything was as such - no variation
Theory of Catastrophism	Cuvier	• mass Extinction then God again create life.
Theory of abiogenesis/ Spontaneous Generation	Aristotle	• life is formed from dead & decaying matter
Theory of Biogenesis	Louis pasteur	• disapprove theory of Abiogenesis. • life Comes from pre-exist life. # Swan neck Flask Expt • fail to explain origin of life
Theory of Panspermia/ Cosmozoic	Arrhenius	• life Comes from other planet (Spore, spore)
Chemosynthetic chemogony/ chemical evolution	Opardin & Haldane	• life originated from <u>inorganic molecules</u> • Rxn in ocean <u>Prebiotic Soup</u>

Cognogeny: diversification of life form



@Gargigauke

Join telegram: garimagoel007_g2

HAND WRITTEN SHORT NOTES EVOLUTION

Evidences of Evolution:

Connecting link:

- plant + Animal = Euglena
- Annelida + Arthropoda = Peripatus
- Annelida + Mollusca = Neopilina
- Chordate + Non Chordate = Hemichordate

Vestigial Structures:

- Wisdom teeth
- Appendix
- Coccygeal bone
- Abdominal muscle

Lamarckism:

- Inheritance of acquired characters
- Use & disuse of organs

Darwinism:

- Charles Darwin
- Survival of fittest
- Fittest = max Repro
- Variations small & directional

Drawbacks:

- ① Failed to explain origin & variations transmission.
- ② Failed to explain presence of harmful features.

Dinosaurs:

- Extinct due to Continental drift

Stegosaurus

T-Rex

Archaeopteryx

Pterodactyl

Evolution of Animal:

- First cell (2bya)
- multicellular
- 500mya Invertebrates
- 350mya Jawless fish
- 1938, Coelocanth (Connective link b/w fish & Amphibian)
- 200mya Reptiles
- 65mya Dinosaur Extinct
- Bird mammal

Missing link:

organism showing common characters of two diff taxa but organism extinct

Eg. Archaeopteryx, Urographica

Palaentological:

hard remains of organism preserved in sedimentary rocks
Best method to know age of fossils.

Malthus theory:

- Every population ↑ exponentially if unlimited resource
- Stable due to nature

Mutation theory:

Hugo de vries.
x Ray → mutagens → Genotheca Lamarckian (Evening primrose)

Natural Selection

Industrial Melanism:

- | Before | After: |
|----------------------|-------------------|
| • more white lichens | • no lichens |
| • more white moth | • more dark moth |
| • less dark moth | • less white moth |

② Genetic drift

Sudden change in small population

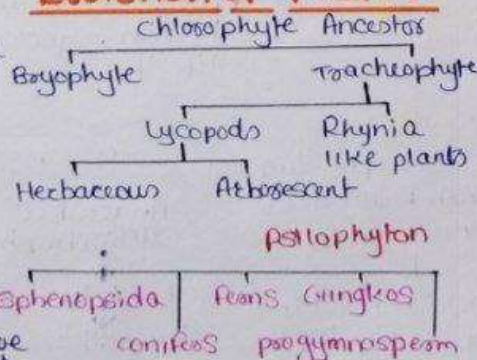
③ Isolation

Geographical & Reproductive

Hardy-weinberg Principle:

$$p^2 + 2pq + q^2 = 1$$

Evolution of Plants:



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Atavism:

Reappearance of ancestral characters

- long Canines
- body hair ↑
- more of Ear pinna
- having tail bone

Anatomical & Morphology

Divergent Evolution:

- Common ancestors
- Same structure but diff function

Homology

Eg limbs of cheetah, whale
thorns of Bougainvillea & tendrils of Cucurbita

Convergent Evolution:

- no Common ancestors
- diff structure but same function

Analogy

Eg sweet potato & potato
Flippers of whale & Penguin
Eyes of octopus & human

Adaptive Radiation:

- organism of Common ancestry move to diff area
- Eg. marsupials, Darwin finches

Biogeographical Evidence:

- Alfred wallace
- distribution of species over the earth

Embryological Evidences:

Biogenetic law: Ernst Haeckel
ontogeny recapitulate phylogeny
(Embryological) (Evolutionary)

Human Evolution:

- 15mya primate, dryopithecus (ape)
- Ramapithecus (man)
- Australopithecus (hunt with stone)
- Homo habilis (human like 65000-80000)
- 1.5mya homo erectus (40000)
- Neanderthal (140000)
- 7500-18000yr Homo Sapiens

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Human health & Disease

Types of diseases:

- Bacterial
- Virus
- Fungal
- protozoan
- Helminthic

Communicable diseases
Eg: Flu, covid etc.

Non-communicable diseases
Eg: cancer

Diseases	Causative Agent	MOI	Symptoms
Cholera	Vibrio cholera	Water borne	Rice water stools
Anthrax	Bacillus anthracis	Air borne	Breathing problem
Tetanus	Clostridium tetani	Rusted iron	Toxoids interfere with NT
Syphilis	Treponema pallidum	STI	Chancres, organ degeneration
Pneumonia	Haemophilus influenzae, Streptococcus pneumoniae	Air borne	Fluid filled alveoli, Hypoxia
Tuberculosis	Mycobacterium	Air borne	Extreme joint pain, mucus is formed more
Typhoid	Salmonella typhi	Water borne	High fever, intestinal perforation
Gonorrhoea	Neisseria gonorrhoea	STI	Liq. discharge from R. organs
Diphtheria	Corynebacterium diphtheriae	Air borne	Hoarseness in voice, difficulty in breathing
Leprosy	Mycobacterium leprae	Touch	White fluid filled patches
Bubonic plague	Yersinia pestis	Xenopsylla	Black spots on body
Pertussis	Bordetella pertussis	Air borne	Cough
Scarlet fever	Streptococcus pyogenes	Air borne	Constant high fever
Botulism	Clostridium botulinum	Water borne	Attacks nervous system
Hepatitis	Hepatitis Virus A, B, C, D, E	STI, faecal-oral, Blood	Anorexia, body ache, liver cancer & cirrhosis
AIDS	HIV	Blood, STI, syringe, mother to foetus	
Rabies	Rhabdovirus	Rabid dog	Hydrophobic, more salivation etc.
Polio myelitis	Poliovirus	Water borne	Poliovirus enters through alimentary canal
Influenza	Myxovirus	Air borne	Moderate fever, headache, running nose etc.
Chicken pox	Varicella zoster	Air borne + Touch	Scabs appear on chest & abdomen
Mumps	Paramyxovirus	Water borne	Infection of parotid glands
Measles	Rubeola	Touch	Scabs appear on head, face, neck
Small pox	Varicella	Touch	Scabs on full body
Chikungunya	Chikungunya virus	Aedes aegypti	Extreme joint pain
Dengue	Flavivirus	Aedes aegypti	Rashes on body, platelets count down
Rhinitis	Rhino virus	Airborne	Headache, running nose etc.
Malaria	Plasmodium	♀ Anopheles	Nausea, fever, shaking, chills etc.
African sleeping sickness	Trypanosoma gambiense & T. brucei	tse tse fly (♀)	Swollen lymph nodes, extreme fatigue
Chagas	T. cruzi	Tse-tse fly (♀)	Loss of appetite, rash, body ache etc.
Dysentery/Amoebiasis	Entamoeba histolytica	Cassia, musca domestica	Diarrhea, weight loss etc.
Keshan disease (kala azar)	Keshan disease	Phlebotomous (sand fly)	Swelling of spleen
Toxoplasmosis	Toxoplasma gondii	uncooked meat	Jaundice, swollen lymph nodes, enlarged liver & spleen
Babesiosis	Piroplasma (babesia)	Bite of infected tick	Fever, chills, anaemia etc.
Giardiasis	Giardia lamblia	Water-borne	Diarrhea, stomach ache
Ascariasis	Ascaris lumbricoides	Food contamination	Internal bleeding etc.
Elephantiasis	Wuchereria bancrofti	♀ Culex	Blockage in lymphatic vessels
Taeniasis	Taenia solium	uncooked pork	Weakness, constipation
Ringworm	Trichophyton, Epidermophyton, Microsporum	used things & infected persons	dry skin, scaly skin, itching, redness
Tinea pedis			→ Athlete foot → itching in toe fingers
Tinea cruris			→ causes itching in groin areas
Tinea barbae			→ itching in beard

Amoebiasis/Dysentery:-

CA: Entamoeba histolytica
↓
endoparasite of large intestine

MOT: housefly

Lifecycle: 8 stages

Minuta	magma
Non-pathogenic	Pathogenic
in lumen of LI	Eat submucosa of LI causes blood, ulcers, bleeding

Treatment: Metronidazole is given

Malaria

Vector: ♀ Anopheles mosquito

CA: Plasmodium vivax

- ♀ falciparum → most dangerous
- ♀ ovular → could be fatal
- ♀ malariae

Biological control: Gambusia



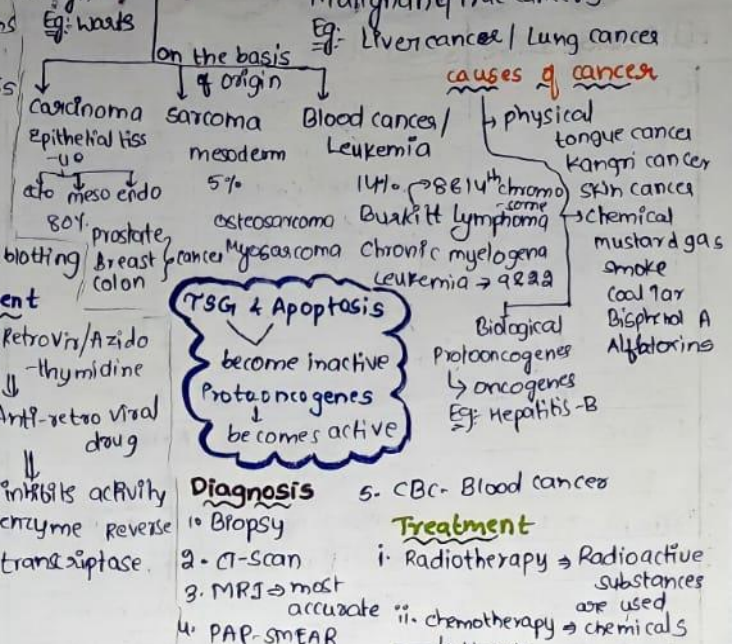
Imp points:-

- 1° Host - Human
 - 2° Host - mosquito
 - Infectious stage - sporozoites
 - Pathogenic stage - Merozoite
 - Fertilization - exit of mosquito (♀ Anopheles)
- RBC bursts & ♀ gametocytes release but do not fertilize due to high temperature
- Haemozoin released

CANCER: uncontrolled proliferation of cell

-ney Syndrome

Malignant/True cancers
Eg:- Liver cancer / Lung cancer



⇒ ability of body to resist infection

Antibody mediated immunity

Humoral immunity

Structure of Ab

Stomme - TAxoJ
- mical drug

Catharantus roseus (Vinca based)
Taxos barcata

Gymnsterm

Vinblastine & Vinorelbine

III. Immunotherapy - α-interferon are used to eliminate virus & cancer.

Specific

Variable region of Hight chain
Variable region of Heavy chain

Constant region of heavy chain
Constant region of light chain

Antigen Binding site - paratope

Hybridoma technology

(Ag) + mouse → mouse infected by Ag
↓
mouse - B-cell

MHC / HLA gene

unique to individual

Antigen present of WBC

Recepter ← If this is introduced in other body

Monoclonal

Immunisation

- passive immunity
 - Emil von Behring
 - ↳ Father of Immunisation

↳ short-lived
↳ host response

Extraction
↓
Anti-bodies

Monoclonal Ab
↓
Injection

Receptor ← this is introduced in other's body
will attack this Ag ⇒ Rejection of organ

Before transplant (Blood grouping, MHC typing)
↓
After transplant
↓
Immunosuppressant is given ⇒ corticoid, Cyclosporin-A

Allergy: exaggerated response of immune system towards an allergen.

opium, Morphine, Heroin ⇒ Latex of poppy plant
↓
Papaver somnifera

Cocaine, coke, crack, cocaine
↳ Ecstasy, xylom coca
Papaver somnifera

Cannabinoids - Bhang, charas, ganja ⇒ Indulgence of cannabis
Marijuana, Hashish, L.S.D sativa

Quarantined EG: MMR
Condition to leave BCG
pathogenicity Typhoid

Quarantined
Killed or Chemically killed
EG: Polio virus

Lysergic acid diethylamide
• obtained from Ergot fungus
• Hallucinogen

Nicotine ⇒ alkaloid
Smoking Nicotine
Chewing - Gutka

Alcohol Abuse affects
• Liver • Kidney
• Nervous System
• Heart • stomach • Eyes

Steroids effects
♀ ⇒ Hirsutism, heavy voice, infertility, irregular menstrual cycle
♂ ⇒ Gynaecomastia, infertility, aggressiveness, oligospermia

Ch. STRATEGIES OF ENHANCEMENT IN FOOD PRODUCTION

Animal Husbandry:

- practising & raising livestock.

70% of world's livestock in India & China
but production only 25%

Dairy Farm:

- selection of good breed
 - disease resistant
 - high milk yielding capacity.
 - Feeding in scientific manner
 - Cleanliness & Hygiene
 - Regular Inspection
 - Regular visit by veterinary doctor
- Eg. Jersey

Multiple Ovulation Embryo

Transfer technology:

- Superior Cow is administered on FSH like hormone
- Ovulation Super 6-8 eggs.
- Superior Cow x Superior bull
- Fertilised eggs at 8-32 cell
- Stage removed non-surgically and transferred into surrogate mother.

Cattle, sheep, Rabbits, buffalo

High milk yield

High quality meat yield

Aquaculture

- Culturing of Aquatic animals & plants

Fresh water

→ Catla

→ Rohu

→ Common carp

Pisciculture

- Culturing, processing of fish and other aquatic animals.

Marine

→ Hilsa

→ Sardines

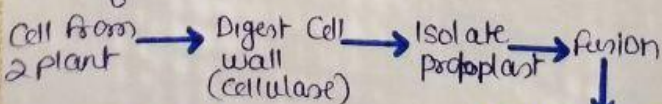
→ Mackrel (high-23)

→ Pomfret

Crop	Variety	Insect pest
Brassica (rapeseed mustard)	Pusa Gauran	Aphids
Flat bean	Pusa Sem 2 Pusa Sem 3	Jassids, aphids, fruit borers
Okra (Bhindi)	Pusa Sawani Pusa A-4	Shoot & fruit borers

Somatic Hybridisation:

- hybrid plants → fusion of protoplast of two diff plants



Eg. Pomato

@Gargigaikee

Somatic Hybrid

Poultry Farming:

- Chickens, ducks, turkey & Geese

- selection of diseased free and suitable breed.
 - proper & safe Condⁿ
 - Hygiene & health care
- Eg. Leghorn, Chicker

Ranikhet disease: (new cattle disease)

poultry bird (virus)

Affecting respiratory system of birds.

(4) Interspecific Hybr^d: diff species mating.
mules → Donkey x Horse

(4) Artificial Insemination:

- semen collected from Superior male
- Frozen for later use
- Success rate is very low

Bee Keeping - Apiculture

Bee - Apis indica

- Honey - food, medicine
- Bee wax - polishes, cosmetics

Plant Breeding:

- Increase crop yield
- Improved quality
- Increased tolerance to environmental stress.
- disease Resistance

33% of India GDP

62% of population

Employs in Agri.

1963, Sonalika, Kalyan

Sona → wheat

Taiwan (Taichung-
native-I), Jaya

Ratna → Rice

millet → Hybrid maize

Jowar, Bajara

disease Resistance:

- Fungal disease - Rust, Smut, Red rot of sugarcane & late blight of potato
- Bacterial disease - Black rot of crucifers (mustard family)
- Viral disease - Tobacco mosaic, turnip mosaic
- mung bean - resistant to yellow mosaic virus & powdery mildew.

Animal Breeding

Breed: Group of animal related by descent

Superior male bull give rise to superior progeny

Superior female Cow / buffalo produce more milk per lactation

Inbreeding:

- mating of Superior male & female for 4-6 generation.
- Increases homozygosity - pure line
- # Inbreeding depression
 - Expose harmful characters
 - Productivity ↓, Infertility

Outbreeding:

Breeding of unrelated animals

(1) Out cross:

- Same breed but no common ancestor for 4-6 generations.
- # Best method to overcome inbreeding depression.

(2) Cross Breeding:

diff breed → mating:

Hissardale → developed in Punjab (Sheep)

Bikaneri ewes x Marino Rams

(1) Collection of Variability (Germplasm)

(2) Evaluation & Selection

(3) Cross hybridisation

(4) Selection testing of Superior Recombinant

Father of green Revolution

Norman E Borlaug

In India - M.S. Swaminathan

Saccharum X Saccharum

Barberi (North India) officinarum (South India)

Poor sugar High sugar

thin stem thick stem

Neco variety High sugar, thick stem

grow well in north

Single Cell Protein:

Spirulina (rich in protein, fat, vit)
Chlorella

- SCP $\Rightarrow$ unicellulars (Fungi/Algae)
- *Methylophilus methylotrophicus* increases protein level.
- Grows on waste water of potato processing (starch)
- Reduce Environ. Pollution.

Tissue Culture:

@Gargigauke

- Totipotency = ability to generate whole new plant.
- Genetically identical.
Eg. Tomato, Banana, Apple.

Crop	Variety	Resistance to disease
Wheat	Himgiri	leaf and stripe rust hill bunt.
Brassica	Pusa Swarnim (Karan Rai)	white rust
Cauliflower	Pusa Shubhra Pusa Snowball K-1	Black rot, Curl blight black rot
Cowpea	Pusa Komal	Bacterial blight
Chilli	Pusa Sadabahar	Chilli mosaic virus, Tobacco mosaic virus & leaf curl.

Ch. MICROBES IN HUMAN WELFARE

Microbes in household:

- *Lactobacillus* (lactic acid bacteria) milk → Curd
- Inoculum: transfer of microbe
 - digest milk partially
 - B₁₂ vitamin
 - check pathogen in stomach.

Alcohol:

- Big fermentor
- Brewer's yeast - *Saccharomyces cerevisiae*
- Ferment malted cereals, fruit juice → Ethanol
 - without distillⁿ wine, Beer
 - with distillation whisky, Rum, Brandy

Antibiotics:

- *penicillium* → *penicillium notatum*
- Alexander Fleming discovered.
- Ernest chain & Howard Jeffery Full potential Ab

Fermentation:

- *Saccharomyces cerevisiae*
- Anaerobic process
- make dough
- puffed appearance due to CO₂
- Baker's yeast Idli, dosa.

Toddy:

- Sap from plum - fermentation
- other fermented food - fish, Soya bean, Bamboo shoot.
- # Swiss cheese - *Bacteria propionibacterium shermanii*
- # Roquefort cheese - Fungus *penicillium Roqueforti*

Microbe in industry:

<i>Aspergillus niger</i> (Fungus)	citric acid
<i>Acetobacter aceti</i> (bacteria)	Acetic acid
<i>Clostridium butylicum</i> (bacteria)	butyric acid
<i>Lactobacillus</i> (bacteria)	lactic acid

Enzymes:

- Lipase - detergent remove oil stains
- Pectinase & Protease degrade pectin - protein
- Streptokinase Clot buster. remove blood clot from vessels
- Cyclosporine A *trichoderma polysporum* (Fungus)
- Immunosuppressive agent in organ transplant
- Statins - blood cholesterol lowering agent
- # Ganga Action plan
- # Yamuna Action plan

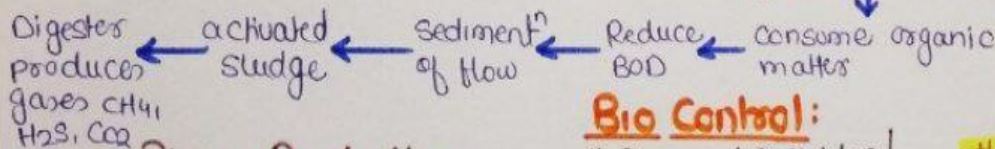
Microbes in Sewage Treatment:

Sewage = domestic + office waste.

- # Primary treatment: physical removal of particles (sand, soil)

Secondary Treatment:

- Supernatant → Aerobic tank → Growth of aerobic microbe in flocs mesh like bacterial growth
- Primary Effluent



Biogas Production:

- Biogas - mixture of gases (CH₄)
- *Methanobacterium*
- cattle dung - methanogens biogas production



- # Indian Agriculture Research Institute
- # Khadi and Village Industries Commission

Microbe as Fertilizer:

- # Bacteria: *Rhizobium* (Symbiotic) - N₂ fixⁿ. Root nodules of legumes.
- *Azospirillum* & *Azotobacter* (free living) - N₂ fixⁿ

Fungus:

- Mycorrhiza - Symbiotic association of fungus + roots of higher plant.
- Resistance to root pathogen E.g. *Glomus*

Cyanobacteria:

- *Anabaena*, *Nostoc*, *Oscillatoria*
- Azolla (Symbiotic)

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Bio Control:

- # Chemical Pesticides / Insecticides:
 - pollution
 - Biomagnification
 - lady bird - Aphids
 - Aseagon flies - Mosquitoes
 - moth - Prickly pear cactus

Spores:

- dry spore mix with water
- Spray on plant
- *Bacillus thuringiensis*

Bacillus thuringiensis

- Crystal Coy gene
- Insect alkaline gut
- Protoxin into toxin
- Insect die due to Starvation

Tachodesma Sp. (Fungus)

- Control plant pathogen of roots.
- *Baculoviruses*
- attack Insect & other arthropod.
- Integrated pest management

HAND WRITTEN SHORT NOTES

BIOTECHNOLOGY PRINCIPLE AND PROCESSES

Ch. BIO-TECH - PRINCIPLES AND PROCESS

European Federation of Biotechnology:
Biotech = integration of natural science & organisms, cell past.
Paul Berg: Father of Biotech

Tools of r-DNA Technology:

1. Restriction Enzyme:

- naturally found in bacterial DNA to protect it from virus.
- Add DNA methyl transferase
- Arber & Linn (1968) Isolate 2 Enzymes:
 - ① RE
 - ② methylase
- Smith (1968) Isolate 1st RE = Hind II
- # Nuclease

Exonuclease → **Endonuclease**

2. Core techniques:

- Genetic Engg: Recombination DNA technology
- Maintenance of sterile Contamination free Environ

Steps:

- Development of rDNA
- cloning of desired gene
- Transfer of cloned gene to suitable host

History: Cohen & Boyer (1972)
Salmonella typhimurium

- isolated antibiotic resistant gene by cutting plasmid.
- linked to plasmid of another Salmonella.
- plasmid (rDNA) act as vector transferred to E. coli
- multiple copies of Ab gene.

Restriction Endonuclease:

- Cuts the DNA at special Seq.
- Restriction site / Recognition Seq → Palindrome Seq.

5' GAATTC 3' → 3' CTTAAG 5' (Sticky End)
5' GAATTC 3' → 5' GAATTC 3' (Blunt End)

Restriction Enz.	Source	Recognition Site	End Product
Bam HI	Bacillus amyloliquefaciens H	-GATAC- -CTAGG-	Sticky
Eco RI	Escherichia coli RYB	-GAATC- -CTAAG-	Sticky
Hind II	Haemophilus influenzae Rd	-GTCGAC- -GACGTC-	Blunt
Ecoo RI	E. coli RYB	-GATATC- -GTATAG-	Blunt

Order of discovery: Eco RI → Hind II → Ecoo RI

3. Gel Electrophoresis:

Separation of fragments of DNA.

Diagram: A gel with 5 lanes showing bands of varying positions.

- ve DNA moves towards anode
- Agarose Gel (polymers from sea weeds - Red Algae)
- # Smaller fragments moves faster.
- # Ethidium bromide (dye) UV rays → DNA visible

4. Amplification of Gene of interest by using PCR:

Kary Mullis (1983)

Requirements:

- DNA containing desired segment
- four dNTPs (Mg²⁺)
- Excess of two primers
- molecules (Oligonucleotide)
- heat stable DNA polymerase Taq poly (Thermus Aquaticus)

Denaturation: (90-98°C) → Strands separated

Annealing: (40-60°C) → Primers bind

Extension/Amplification: (70-75°C) → Taq poly + dNTPs

30 cycle → billion copies

5. Infection of DNA into Vector:

6. Infection of Gene into Suitable Host:

Cloning vector:

- plasmid: autonomously replicating extra chromosomal genetic material. carry small fragments.
- cosmid Vectors: Plasmid + Bacteriophage
- # Bacterial artificial chromosome (BAC)
- # Yeast artificial chromosome (YAC)

Vectors:

- Origin of Replication (Ori) → Replication in the host cell & making copy no.
- Selectable Markers → to identify the transformed cells with the help of antibiotic resistant gene [Ampicillin, tetracycline, Kanamycin]

@Gargigaikee

HAND WRITTEN SHORT NOTES

BIOTECHNOLOGY PRINCIPLE AND PROCESSES

P = Plasmid
BR = Bolivar & Rodriguez
322 = discovery

Insulin ✓
tet Inactive
tet + amp X
nothing X

Agrobacterium tumefaciens (Ti-plasmid)

Competent Host:

formation of ϕ DNA into recombinant host.

microinjection:

- Animal cell
- ϕ DNA is directly transferred into nucleus of animal cell.

Biolistic:

- plant cell
- gold/tungsten bullet coated with ϕ DNA are bombarded over plant cell with high velocity.

Downstream Processing:

- Process of Separation & Purification of product after the biosynthetic stage.
- Suitable Preservation
- Clinical trials, Quality Control testing.

obtaining foreign gene product:

Continuous Culture System:
 - Physiologically more active cells $\rightarrow$ max Biomass $\rightarrow$ more desired product

Bioreactors: Upstream processing

Big vessels
 $\downarrow$
 Raw material
 $\downarrow$
 Specific product (Protein, Enzyme)

- pH, Oxygen
- Temp, Substrate
- Salts / Vitamins

Vectors for plants

- Found in soil
- Graft formation in dicot.

Vectors for Animals:

Disarmed Retrovirus

- Isolation of DNA
- Isolation of GATC
- Gel electrophoresis
- Amplification $\rightarrow$ PCR
- Infection of vector $\rightarrow$ ϕ DNA
- Infection of ϕ DNA in host
- foreign gene product

pH control
 foam breakers
 steam for sterilization
 sterile air
 #stirred tank: helps in mixing & oxygen availability.

Bubbles $\uparrow$ surface area for easy transfer of oxygen
 #sprayed: Air bubbled through reactor.

HAND WRITTEN SHORT NOTES

BIOTECHNOLOGY AND ITS APPLICATION

Ch. BIOTECHNOLOGY AND ITS APPLICATION

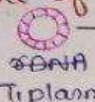
Application in plants:

Agriculture: Organic Farming
manure, yield $\downarrow$
- Fertilizers: yield $\uparrow$
1947 - population: 55 million
2001 - population: 1 Billion
• Demand for food $\uparrow$

#Green Revolution

M.S. Swaminathan (1970) PYQ
White Revolution $\rightarrow$ milk
Red Revolution $\rightarrow$ Medicines
Blue Revolution $\rightarrow$ fish
Silver Revolution $\rightarrow$ Egg

2. Anti-Coagulant:

Houdin (Saliva of leeches)
Houdin +  $\rightarrow$  $\rightarrow$ Transformed (Biological)
Synthesising Gene + Ti plasmid $\rightarrow$ τ -DNA
HIRUDIN $\leftarrow$ Downstream processing $\leftarrow$ Brassica napus (castor oil)

RNAi / RNA interference / Gene Silencing:

Coag Mellow + Andrew Fire $\rightarrow$ G. elegans (nematode)
Prokaryotes $\rightarrow$ Natural defence $\rightarrow$ RE
Eukaryotes $\rightarrow$ Natural defence $\rightarrow$ Against dsRNA
RISC $\Rightarrow$ RNA induced silencing complex
Tobacco plant $\rightarrow$ dicot $\rightarrow$ Fibrous root.
Infected by melodogyne Incognita

#Mechanism:

- Introduced dsRNA in the cell such that it produce dsRNA
 $\rightarrow$ Sense & Antisense strand.
- dsRNA is introduced dicer protein.
- dicer protein attach to dsRNA forming RISC Factor
- RNA will be no more functional & hence M. Incognita Cannot grow.

4. Flavr Savr Tomatoes:

• Increasing the shelf life
Polygalacturonase $\rightarrow$ Enzyme
 $\downarrow$
Inactive Enzyme $\rightarrow$ digest pectin
 $\downarrow$
tomato shelf life decrease $\rightarrow$ tomato become soft.

Biotechnology:

GMO's = Genetically modified organisms
Ideal = ① High yield
Plant ② Disease Resistant
③ Tolerant for climatic change
④ High nutritional value
⑤ less dependent on water
⑥ low cost seeds

#Drawbacks:

- seeds were expensive
- Biomagnification
- Disruption of food chain
- Permanent loss of soil fertility.

1. Golden Rice!

Biofortification



#Ingo partskun & peter Boyers

3. Insecticide Resistant plant:

PYQ
Bacteria $\Rightarrow$ *Bacillus thuringiensis*
 $\downarrow$
Cry gene (Cry protein)
 $\downarrow$
Inactive in bacteria pro-toxin
 $\downarrow$
Alkaline gut of insect
 $\downarrow$
active toxin
 $\downarrow$
Creates pores in midgut of insect (starvation)

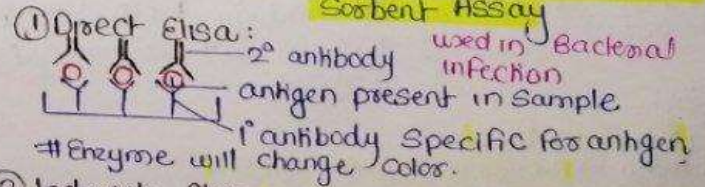
1st plant in India = BT Cotton

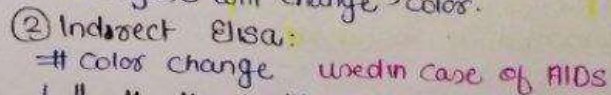
Cry I Ab $\Rightarrow$ Corn borer

Cry I Ac & Cry II Ab $\Rightarrow$ Cotton bollworm

Molecular Diagnosis Technique

I. ELISA: Enzyme linked Immuno-Sorbent Assay

① Direct Elisa: 

② Indirect Elisa: 

③ Probe:

ssDNA / ssRNA + Radioactive labelled = probe

@Garggaurke

Join telegram: garimagoel007_g2

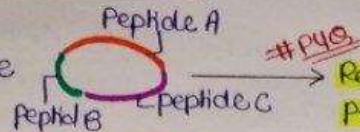
HAND WRITTEN SHORT NOTES

BIOTECHNOLOGY AND ITS APPLICATION

Application of Biotech in Animals: # Produced by Elitily (1983)

1. Humulin:

Chromosome → Insulin gene
PBR322



Removal of Peptide C

Active Insulin
disulphide bond

Qu. why Insulin:

Diabetes Mellitus → Blood Sugar ↑

① Oral Insulin: Insulin proteinaceous in nature
broken down in stomach

② Source of Insulin: slaughter pig & cattle
Pancreas → Insulin
Cause Allergy in humans!

③ Biotech: Synthetic Insulin (Humulin)

5. Gene Therapy:

1990, 4 yr old girl

SCID (Severe Combined Immunodeficiency)

ADA (Adenosine deaminase) enzyme deficiency

lymphocyte proliferation reduced
Immune system weakens.

Ethical Issues:

GEAC - Genetic Engg Approval Committee

- Animals → not treated as factories
- Unique feature of organism should not be transferred.

Biopatent

biological product
Copyright given to owners.

Eg.

① Basmati Rice:

- India → 2,00,000 varieties of rice
- 27 documented as basmati
- US Company stole
- WTO gave patent to India.

② Neem:

- Indian culture → antifungal & antibacterial

③ Turmeric:

- medicinal value (Antiseptic)

@Garigiskee

2. Sheep - Tracy:

- α-1 Antitrypsin drug
- Treatment of Emphysema

3. Rosie - Cow:

Protein enriched milk

- α-lactalbumin
- 2-4 gm/l of milk

4. Transgenic Mice:

- 95% • Clinical trials of drugs
- Vaccine safety
- Study disorders, chemicals.

Solutions:

Enzyme Replacement Therapy:

Injection of ADA given after ~~each~~ every 3 months

In vitro introduction of ADA gene in WBC

ADA gene → WBC → introduced in girl

∴ but WBC has limited lifespan

Bone marrow transplant:

donor problem + expensive permanent

Change defective gene at embryonic stage:

Ch. ORGANISM AND POPULATION

atom → molecular → organelle → cell → tissue → system → organ → organism

• **Organism**: each individual of a species

• **Population**: group of same interbreeding species

• **Community**: diff. population in an area

• **Biome**: unit of flora & fauna in specific area

• **Ecology**: interaction among organism & abiotic factors

• **Habitat**: specific place niche where organism lives.

• **Niche**: physical space occupied by a species.

Homeostasis: ability of main-
-taining const body temp.
- human 37°C

Major Biomes in India:
→ Tropical rain forest
→ Deciduous forest
→ Desert
→ Sea Coast

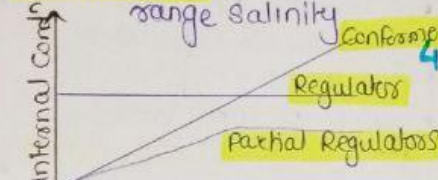
2. Water:

• **Quality & Quantity**
pH, salts

• **Halophytes**: Salty Condition
Pneumatophores, vivipary
Eg. Rhizophora

Euryhaline: tolerate wide range salinity

Stenohaline: narrow range salinity



Major Abiotic Factors:

1. **Temperature**: most ecologically relevant factor.

• Enzyme kinetics depend on temp.

Eurythermal: tolerate wide range of temp.

Stenothermal: narrow range of temp.

3. Light:

Sun - Ultimate Source of light

• photorespiration

• photosynthesis

• stratification

• Deep sea - no sunlight - chemo auto.

4. Soil:

• Soil → Grain Size, Aggregation
pH, mineral compo.
vegetation, animals
topography.

Benthic Animals:

animals at deep waters & dependent on sediment

↓
soil related factors

edaphic factors

↓
Sediment determine type of benthic animal

3. Migrate:

• leaving the stressful atmosphere temporarily

Eg. Keolade National Park (Bharatpur, Raj)
Siberian migratory birds

2. Conformers:

• Body temp & osmotic conc. changes with the surrounding.

4. Suspend:

• **Hibernation** - Bears (winter sleep)

• **Aestivation** - Snails (summer sleep) Fishes

• **Diapause** - Zooplankton Insects

Allen's Rule:

colder area animals
short limbs & legs, ears.
- to reduce surface area
- Reduce heat loss

ADAPTATIONS:

1. Regulator:

- Can maintain their body temp.

Eg. humans

• Thermoregulation
Energetically expensive

→ Small Animals (humming bird, mouse)

Poikilotherms:

cold blooded

- Can not regulate body temp.

Homeotherms:

warm blooded

- Can regulate body temp.

• **Blubbers** - a layer of fat in aq. animals acts as insulator

• **High altitude** - altitude sickness, due to atm pressure. body gets accl. gradually, RBC ↑, Breathing Rate ↑

• **Archaeobacteria** - Extreme Cond. hot spring, hydrothermal vent. Stoic cell wall made up of pseudo peptidoglycan.

1. Kangaroo Rat (North American desert)
Internal fat oxidation, Conc. Ureine use metabolic water
2. thick cuticle, sunken stomata
3. Succulent plants - CAM
Eg. Aloe vera
4. Opuntia → cactus desert plant leaves into spines

Behavioural Adaptation:

① Desert Lizard:

Bask in Sun → absorbed heat. moves into shade when body get warm.

② Burrowing Animals:

Escape above ground heat

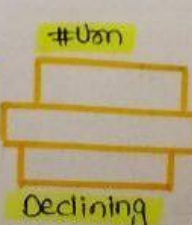
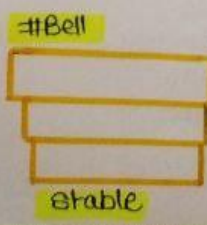
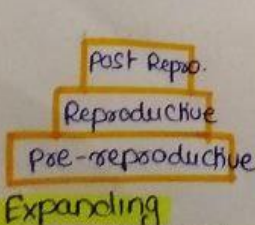
Birth Rate

Natality

Death Rate

Mortality

Age Pyramid:



Morphological

- Opuntia
- thick cuticle
- Blubbers
- Allen's law

Physiological

- Altitude sickness

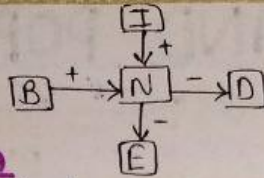
Biochemical

- Kangaroo Rat
- Fish in cold waters
- Antifreeze Protein

@Gargigaikee

Population density (N)

no. of individuals per unit area/volume.



Immigration Emigration

(I) no. of individual come into habitat (E) no. of individual exit habitat.

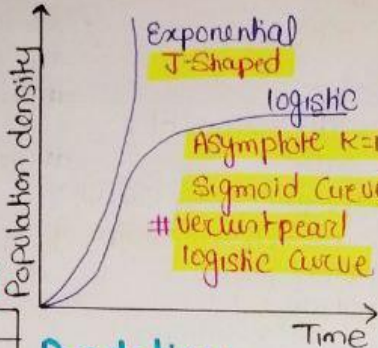
$$N_{t+1} = N_t + (B+I) - (D+E)$$

Malthusian Theory:

- Food production will not be able to keep up with the growth of human population.

Population Interaction:

	A	B
Mutualism	+	+
Competition	-	-
Predation	+	-
Parasitism	+	-
Commensalism	+	0
Amensalism	-	0



Predation:

- Ecologically herbivore & carnivore are predators.
- 25% Insect → Eat plants
- Control prey predators.

Poikily Pears Cactus (Opuntia)

Introduced in Australia

Invasive species

Control-natural Cactus feeding predators

Glause Competition

Exclusion principle:

"Two closely related species competing for same resource can not co-exist. one will eliminate."

Resource Partitioning

Mac Arthure

Managing timing for foraging & resting

Competition:

- Flamiguen & Fishes (South America)

Feeding efficiency of one species interfere with others.

- Albington tortoise

↓
Galapagos Island

↓
Introduce Goat (Superior)

↓
Albington tortoise extinct

- # Cornelli's Expt.

Rocky Sea Scotland when introduced with Balanus (Superior) chatharnalus excluded the area

Parasitism:

EctoParasite	EndoParasite
- Feed on External Surface - lice on humans - ticks on dogs - Cuscuta - Copepod (Sea lice) on marine fishes	- live inside the host. - human liver fluke - Tape worm - Malaria parasite - Life Cycle more complex. - liver fluke 3 host - Fish, Snail, human - Plasmodium 2 host - Human, mosquito

Adaptations:

- loss of sense organ
- Suckers
- loss of digestive system
- high Repro

* Brood Parasitism:

Cuckoo & Crow

→ Cuckoo lays his eggs in Crow's.

eggs resembles to Crow's eggs. Crow take care of Cuckoo egg.

Amensalism:

- Calotropis producing cardiac glycosides
- Production of Ab penicillium from Bacteria (-)

Growth models

Exponential

- Resources Unlimited

$$\frac{dN}{dt} = (b-d) \times N$$

(b) intrinsic rate of natural ↑

$$\frac{dN}{dt} = rN$$

$$N_t = N_0 e^{rt}$$

List-Group">

- N_t = popⁿ after time t.

List-Group">

- N_0 = popⁿ at time zero.

List-Group">

- e = base of natural log

Logistic

List-Group">

- Limited
- Survival of fittest

$$\frac{dN}{dt} = rN \left[\frac{K-N}{K} \right]$$

List-Group">

- K = Carrying Capacity
- resources enough to support max individual.

Norway Rate = $r = 0.015$
Flower beetle = 0.12
human Popⁿ = 0.0265

List-Group">

- maintain species diversity
- Intertidal Communities
- Removed **Pinkies (Starfish)** (Top predators)

↓
After one yr. 10 inverte Extinct

List-Group">

- Defence of prey: Camouflage - frog, insects poison.
- # Monarch butterfly = feed on poisonous plant

List-Group">

- Thorns = Acania
- Spines = Cactus
- Calatrops = Cardiac glycosides
- Chemicals = nicotine, opium, Caffeine

Commensalism:

List-Group">

- orchid growing on mango
- Barnacles on the back of whale
- Cattle Egrets & Grazing Cattle
- Sea Anemone and Clown Fish

Mutualism:

List-Group">

- Lichens = Fungus + Algae
- Absorb Food
- water, minerals, photosyn (mycobiont) (phycobiont)
- Mycorrhiza = Fungus + Higher plants
- pine seed can not germinate without fungus.

@Gargigaikee

HAND WRITTEN SHORT NOTES

ECOSYSTEM

Ch. ECOSYSTEM

Functional unit of nature

Terrestrial

- Grassland, forest, desert

Aquatic

- pond, lake, wetland

Man-made

- Crop field, Aquarium, Zoo

Ecosystem:

- ① **productivity**: Sun - ultimate source of energy

Stratification:

- vertical distribution of diff. species occupying diff. levels



- **Primary productivity**: rate of biomass produced by plants
- **Gross primary productivity**: production of organic matter during photosynthesis
- **Net PP = GPP - R**

Annual net productivity = 170 billion tons

Ocean productivity = 55 billion tons

plants photosynthesis
(primary product)

biomass produced per unit area per unit time by plants.

@Gargigalkee

② Decomposition:

- Breakdown of complex organic matter
- oxygen dependent

Fragmentation

Breakdown of debris

leaching

water soluble inorg. nutrients go down deeper in soil. Unavailable

catabolism

degradation of debris by bacteria & fungi

Humification

accumulation of humus

Mineralisation

Release of inorganic nutrients due to degradation of humus by microbes

factors affecting decomposition:

- ① lignin & chitin - slow
- ② nitrogen, water soluble sub (sugar) - fast
- ③ moisture, high temp, oxygen = fast

Food chain:

- ① Grazing food chain
- ② Debris food chain

Standing Crop: mass of living material at a particular time

10% law - Lindemann

③ Energy Flow:

- photosynthetically active radiation (PAR)
- > 50% of solar radiation
- plants capture 2-10% of PAR

Autotroph:

- plants (synthesize own food)

Consumers:

- 1° Consumers: feed on producers (herbivore)
- 2° Consumers: feed on herbivore
- 3° Consumers: Top carnivore

Decomposers:

- feed on dead & decaying matter (Saprophytes)

Ecological Succession:

pioneer species

Lichen

(Enzyme which can break rock)

Biophyte

Gymnosperm

Angiosperm

1° Succession:

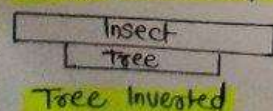
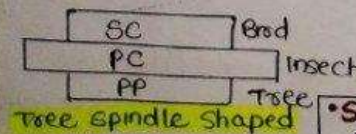
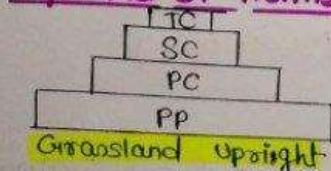
- area where no organism ever existed
- slow
- soil formation

2° Succession:

- Area where organism existed.
- fast coz already soil / sedimentary rocks are present

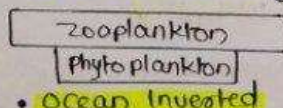
Ecological Pyramids:

Pyramid of numbers:



Pyramid of Biomass:

- Grassland upright



Pyramid of Energy:

- always upright

- **Sere**: Entire seq. of communities that succ. change in an area
- **Seral Stage**: individual transitional stage

Lithosere

- Initiating on barren rocks

Halosere

- Initiating in saline water

Psammosere

- Initiating on sand

HAND WRITTEN SHORT NOTES

ECOSYSTEM

HYDRACH

(wet land)

Phytoplankton

Free floating angiosperm

Rooted hydrophytes

Sedges, grass

Trees

Meric Condition

XERARCH

(Dry area)

Lichen

Bryophyte

Psilodophytes

Stable climate community

Meric Condition

Nutrient Cycling:

Standing state: amount of nutrient like C, N₂, P, Ca, present in the soil at any given time.

- The movement of nutrients through various component of an ecosystem = **Biogeochemical Cycle**

Gaseous

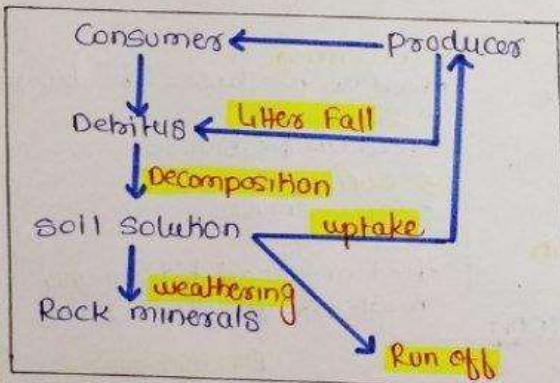
- Reservoir is atmosphere
- Eg N₂, C

Sedimentary

- Reservoir is Earth's crust
- Eg S, P

Carbon Cycle:

- Atm about 1%
- organism 49% of dry wt
- Oceans 71% dissolved O₂
- Burning of wood, fire, Combustion of organic matter
- Respiration



Phosphorous Cycle:

- phosphorus constituent of Biological mem., nucleic acids, Cellular Energy transfer system.
- Animals use P to make shells, bones & teeth

Reservoir of phosphorus rock:

Rocks are weathered

minute amount of so phosphorus dissolve in soil solution

Absorbed by plants

Herbivores & other Animals obtain this from plants

@Gargigauke

Ecosystems Services of a healthy forest:

- purify air & water
- nutrient Cycle
- Generate fertile soil
- Provide wildlife habitat
- maintain biodiversity

Robert Constanza & his colleagues

put price tags on nature's life support services

twice global gross national productivity

US - \$ 18 billion

Soil formation 50%

other services like recreation & nutrient cycling less than 10%

Eliminate regulation & habitat for wild life - 6%

US \$ 33 trillion → years on fundamental ecosystem services

Join telegram:garimagoel007_g2

HAND WRITTEN SHORT NOTES

BIODIVERSITY AND CONSERVATION

Ch. BIODIVERSITY AND CONSERVATION

Biodiversity:

diversity at all levels of biological organisms ranging from cellular to macro biomes.

International Union for Conservation of Nature & Natural Resources (IUCN)

- 2004 - 1.5 million Species
- Robert May's global estimate - 7 billion
- Animals - > 70%
- Plants (Fungi) - 22%
- Fungi > Fish + reptiles + amphibian

Levels of Biodiversity:

Genetic

- one species & diff varieties

Eg. Pigeons

Ubiquitous

Rice - 50,000 varieties

Mango - 1000 varieties

Species

- diversity at species level

Eg. Western Ghats

greater amphibian

than Eastern

ghat

Ecological

- diversity at ecological level

Eg. Desert, wetlands, Coral reefs

rainforests, alpine meadow

Biodiversity of India:

- land 2.4%
- Species diversity 8.1%
- one of the 12 megadiversity countries.
- Acc to Robert May's estimate plants = 1 lakh
- Animals = 31 lakh

Conference of Parties (COP)

- Responsible for monitoring & implementation of "United Nations Framework Convention of climate change". (UNFCCC)

COP I - 1995 - Berlin Germany

COP II - 1997 - Kyoto Japan

COP III - Oct 2003 - New Delhi

COP 12 - Doha Qatar

Pattern of Biodiversity:

Poles

Equator

Poles

- Colombia - 1400 birds
- India - > 1200 birds
- New York - 105 birds
- Green land - 55 species

Amazon:

- 1,25,000 species invertebrates
- 40,000 plants
- 3000 fish
- 1300 birds
- 427 mammals + Amphibian
- 378 Reptiles.

Reasons for higher Biodiversity:

- ① more Evolutionary time
- ② Relative Constant Environment
- ③ more Solar Energy.

David Tilman:

- more diversity → higher productivity
- more stability
- Stable Community → Resistant / Resilient

Rivet Popper hypothesis:

Paul Ehrlich

Key Species → Species that drives major ecosystem functions.

Causes of Biodiversity loss:

1. Habitat loss and Fragmentation:

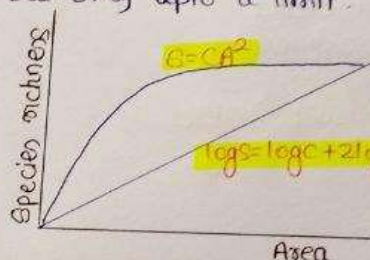
- Tropical rain forest → 14% loss = 61%
- Amazon - lungs of planet.
- 201.02

2. Over Exploitation:

- Steller's Sea Cow
- Passenger pigeon

Species Area Relationship:

- Species richness ↑ with increasing explored area but only upto a limit.



- S = Species richness
- A = Area
- C = y intercept
- 2 = slope of line
- 2 = 0.1 - 0.2
- large area (Continent)
- Very steep slope
- 2 = 0.6 - 1.2
- tropical area = 2 = 1.15

loss of biodiversity:

- IUCN Red List (600 yrs) 2004.
- 784 species Extinct.

Vertebrates

938

Eg. dodo (Mauritius)

Quagga (Africa)

es of Hgs)

Thylacine (Australia)

27 species (last 20 yr)

15,000 species - threat of extinction.

Six Extinction → Increased Speed of 1000 times

Invertebrates

359

Steller's Cow (Russia)

Bali, Java, Caspian (Europe)

12% Birds

23% mammals

32% amphibian

31% Gymnosperms.

plants

87

3. Alien Species Invasion:

• Nile Perch (fish) → lake

Victoria → cichlid fish

Extinct

• African cat fish (Clarias

Gracypinus) → indigenous

cat fish threatened

• water hyacinth (Eichhornia)

Parthenium (Carrat grass)

Lantana Camara

→ Invasive for India

4. Co-extinction:

• Host ↔ pathogen

• plants ↔ pollinators

Reasons for Conservation

① utilisation Argument

(Food, Fuel, Timber, dye)

② Ethical

③ Biodiversity (ecosystem

services)

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HAND WRITTEN SHORT NOTES

BIODIVERSITY AND CONSERVATION

Conservation:

In Situ:

- In natural Habitat
- protected area
National park,
wildlife Sanctuary
Biosphere reserve



Endemism:

- Species confined to a particular region & not found anywhere else → Endemic Species.

Earth Summit (Rio de Janeiro) 1992

- > Conservation of biodiversity
- > Sustainable use of biodiversity
- > Sharing of resources

The World Summit on Sustainable development 2002, Johannesburg
South Africa

- > 190 countries.

Ex-Situ:

- outside natural habitat
zoological park,
Botanical gardens,
Seed banks,
Cryopreservation

India,
14 Biosphere
90 National Park
448 wildlife Sanctuaries

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Sacred Groves: देवभूमि

- Rhoo and Jaintia Hills (Meghalaya)
- Aralvalli Hills (Rajasthan)
- Western ghats region of Karnataka
- Maharashtra
- Sarguja, Chanda & Bastion region of M.P.

Hotspot:

- max. species richness, most threatened.
- 34 hotspot world,
- 8 India western ghats & shiv lanka
Indoburma
Himalaya

HAND WRITTEN SHORT NOTES

ENVIRONMENTAL ISSUES

Ch. ENVIRONMENTAL ISSUES

Pollution:

Any undesirable change in physical, chemical & biological characteristics of air, land, water & soil.

Environmental Protection Act, 1986

Case Study:

CNG - Compressed natural Gas

Pros

- 1) cheaper
- 2) Burns completely
- 3) Can not be siphoned by thieves
- 4) can not be adulterated.

Cons:

- 1) Lying down pipelines.

Air Pollution:

• Particulate and gaseous are pollutants from smokestacks & smelters.

Central pollution Control board

→ > 2.5 um harmful

Noise pollution:

Air prevention & Control of pollution act, 1981

• Above 150 dB noise pollution

Harmful effects:

- Damage to Ears
- heartbeat, Breathing ↑
- Stress

Harmful Effects of pollutants

- Respiratory problems
- Inflammation, damage, Premature death lungs.
- yield production of crop ↓

Control of air pollutant:

Scrubbers

- Remove of SO₂

Electrostatic precipitators

- remove 99% of particulate matter.

Catalytic Converters

- Reduces Emission of poisons as gases from automobiles.

Control:

- Sound absorbent
- planting trees
- Permissible sound levels
- home free zone

Laws in India to Control

Vehicle Pollution:

1. Auto Fuel Policy: to cut down vehicular pollution in Indian cities

2. Euro III Norm: Control Sulphur Content at 350 ppm in diesel & 150 ppm in petrol.

• aromatic hydrocarbon 42% of fuel.

• for 4 wheelers 13 wheelers 2 wheelers

Bharat stage IV norms

Eutrophication:

- Natural aging of lake Nutrient Enrichment.
- Sewage waste adds nutrients like nitrate & phosphates
- Algal bloom → BOD ↑

Ecosan:

Ecological Sanitation toilet

Shri Lanka & Kerala

- toilets where waste is not flushed.

Water Prevention & Control Act, 1974

Hospital waste:

- Chemicals
- Pathogens
- Micro-organisms

Water Pollution:

• Impurities 0.1%

• Suspended Solids, Sand.

• Colloidal material (faecal matter, bacteria)

• nutrients (nitrate, ammonia, phosphate)

Biological Oxygen Demand:

amount of biodegradable organic matter in sewage water.

Sewage in water → more nutrients → Excess growth of Algae

BOD ↑ ← aquatic animal die ← dissolved O₂ reduced

Case study:

In Ascatia, California

Sedimentation, Filtration, Chlorine treatment

Still heavy metals present in water

created marsh lands

nutrify, absorb & assimilate pollutants

Pure water

Ascatia worked with Humboldt State University Friends of Ascatia marsh (FoAM)

Waters hyacinth (Eichhornia Crassipes)

Waste of Bengal

waste from industries:

Dichloro-diphenyl-trichloroethane (DDT)

heavy metals - mercury, Cadmium, Copper, lead.

Biomagnification:

- accumulation of toxicants
- Biomagnification of DDT in aquatic food chain.
- disturb Calcium metabolism, thinning of egg shell - death decline population

Solid waste:

① Dump: Breeding ground for pest

② Burn: all solid waste can not be completely burn

③ Sanitary landfills: limited area seepage of chemicals.

Biodegradable

- undergo natural Break down

non-biodegradable

- plastic, Polybags

Recycle

- plastic e-waste

E-waste:

- Recycling is only eco-friendly soln.
- developing countries receive e-waste from developed countries

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HAND WRITTEN SHORT NOTES

ENVIRONMENTAL ISSUES

Case Study:

Banglore:

Ahmed Khan

- developed polyblend
- mixed with Bitumenn layed roads.

AGRO chemicals:

- organic chemicals fertilizers, Pesticides herbicides.
- Effects:
 - ① Toxic
 - ② Biomagnification
 - ③ Eutrofication.

Ramesh Chandra Dagar

• Farmer in Sonapat, Haryana

• **Integrated Organic Farming**

• Crop waste - natural fertilizers generate natural gas.

Haryana Kisan welfare Club

- 5000 Farmers

Radioactive waste:

Accidental Leakage

- Accidental leakage
- Chernobyl three mile Island

Safe disposal

- 500m deep Earth Surface

Montreal Protocol:

International treaty of Canada, 1987
Effective - 1989

- to Control Emission of Ozone depletion

Kyoto Protocol: 1997

- to reduce emission of greenhouse gas

Deforestation, Grazing, Urbanization.

water logging & Soil Salinity:

without proper water drainage
water logging
water drains salt to soil surface
damages Agriculture

Deforestation:

- Conversion of forest area into non-forest area.
- topic = 40% lost, temperate 1% lost.

National Forest Policy (1988)

- forest covers 23% plains, 67% hills forest now 19.4%.

Thom cultivation:

Slash & burn agriculture

- Burning the plant remain

Consequences of deforestation:

- Atmospheric CO₂ ↑
- loss of biodiversity due to habitat destruction.
- Soil erosion & desertification

Bishnoi Movement (1931)

Amrita devi bishnoi wildlife protection award

chipko movement of Garhwal Himalaya:

1974, local woman participated to protect trees from the axe of Contractors by hugging them.

Green house Effect:

• natural phenomenon that causes heating of Earth surface (temp 15°C)

Green house: CO₂ 60%
CH₄ 20%
CFCs 14%
N₂O 6%

overheating of Earth surface:

Global warming
Earth temp has ↑ 0.5°C

El nino: Abnormal weather patterns caused due to warming of pacific oceans near the equator.
⇒ Polar Caps (ice) are melting.



Impacts of Ozone depletion:

- UV Radiation of wavelengths shorter than UV-B, Completely absorbed in Earth atmosphere.
- Cause mutation of DNA, aging of skin, skin damage, skin cancer.
- damage to Cornea, Snow blindness.

Environment act	1986
National forest policy	1988
Air pollution act	1981
Air + Noise Pollution	1987
water prevention & Control pollution act.	1974
CNG Bus (Delhi)	2002
Montreal Protocol	Signed 1987 Effective 1989

Joint forest Management, 1980

local communities were involved
Benefits of forest product fruits, gum, medicines.

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