# Class XII

FUNDABOX

# ALL NCERT DIAGRAMS

# BIOLOGY
## LEARNING FESTIVAL

| | |
|---|---|
| All Important Diagrams \| Class 12 \| CBSE Boards | 12/03/23 |
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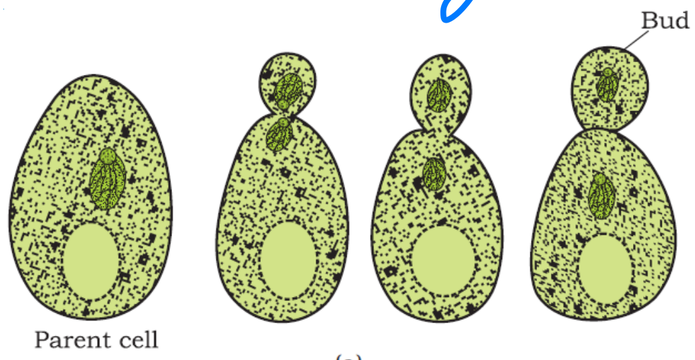
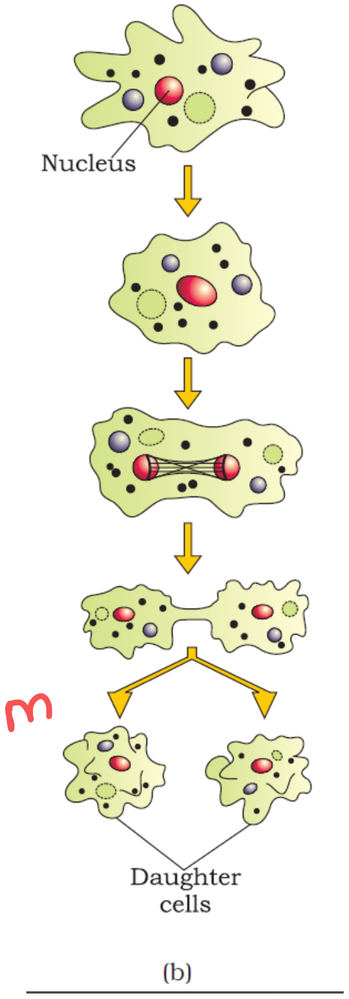
# CHAPTER-1
# Reproduction in Organisms

Budding




Asexual - Budding




Binary fission

⇒ Unicellular = growth & reproduction mutually inclusive

**Figure 1.2** Cell division in unicellular organism: (a) Budding in yeast; (b) Binary fission in *Amoeba*

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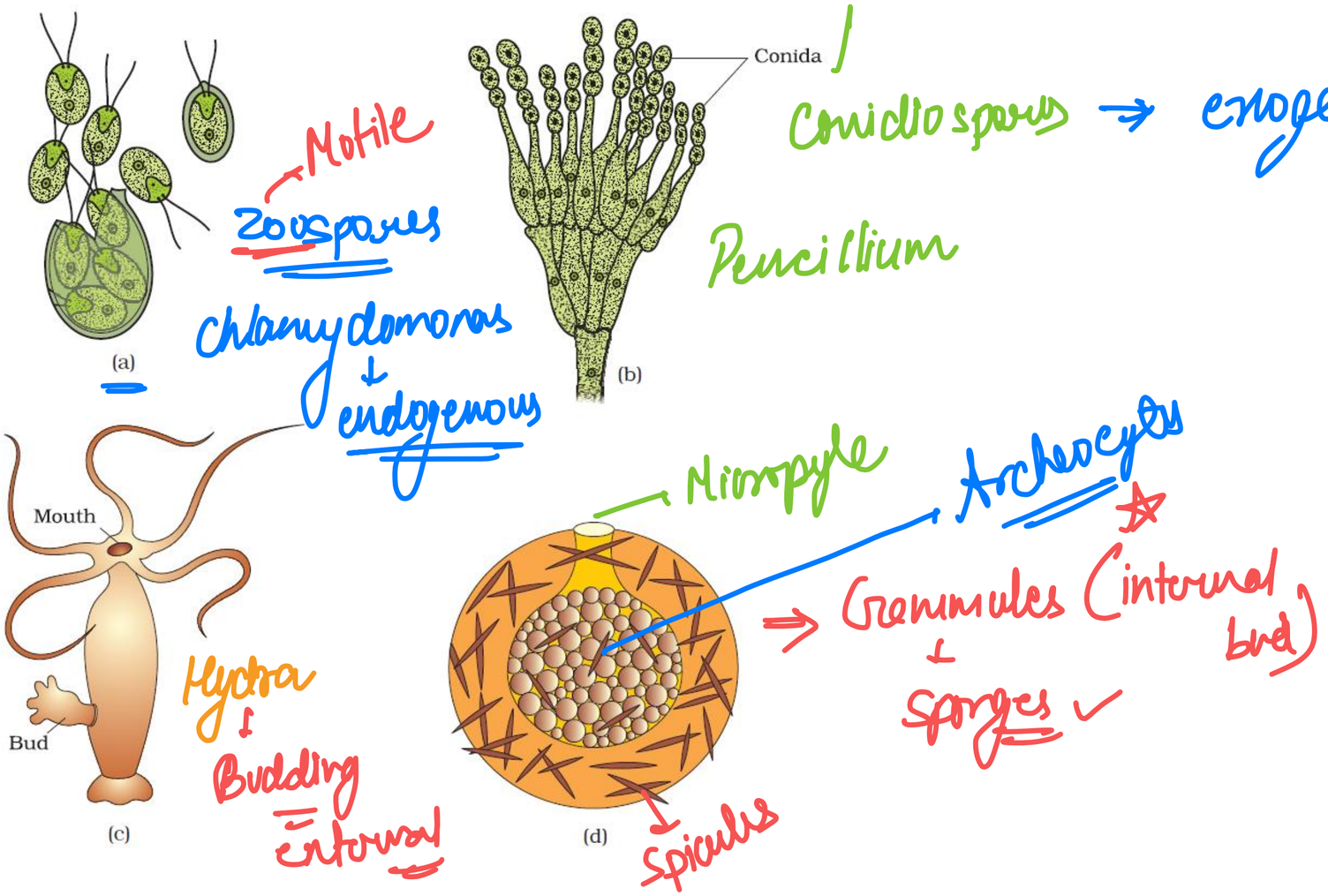


Motile
Zoospores
Chlamydomonas
endogenous
Conidiospores → exogenous
Penicillium
Micropyle
Archeocytes
Gemmules (internal bud)
sponges
Hydra
Budding
external
Spicules

**Figure 1.3** Asexual reproductive structures: (a) Zoospores of *Chlamydomonas*; (b) Conidia of *Penicillium*; (c) Buds in *Hydra*; (d) Gemmules in sponge

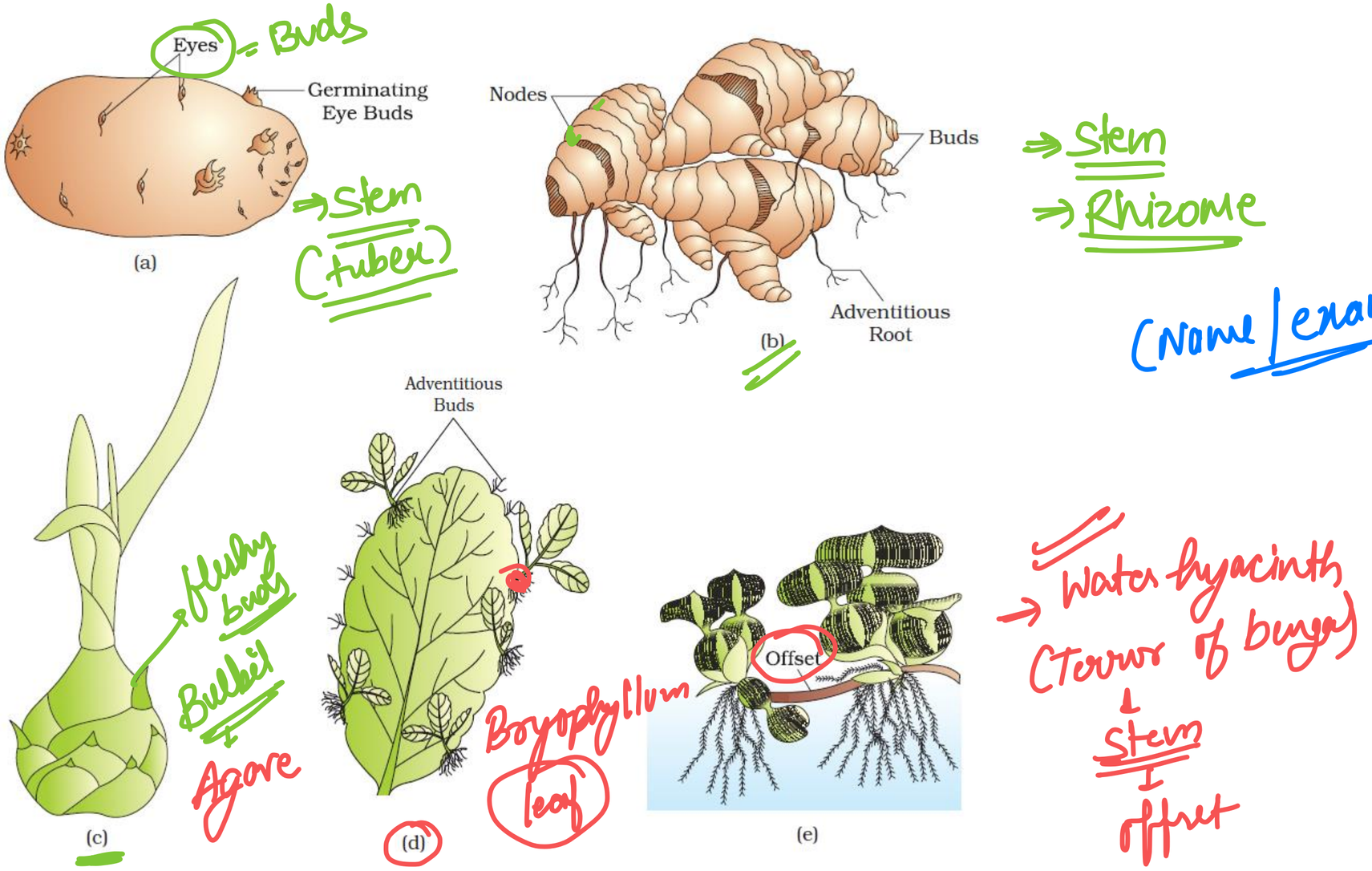


**Figure 1.4** Vegetative propagules in angiosperms: (a) Eyes of potato; (b) Rhizome of ginger; (c) Bulbil of *Agave*; (d) Leaf buds of *Bryophyllum*; (e) Offset of water hyacinth

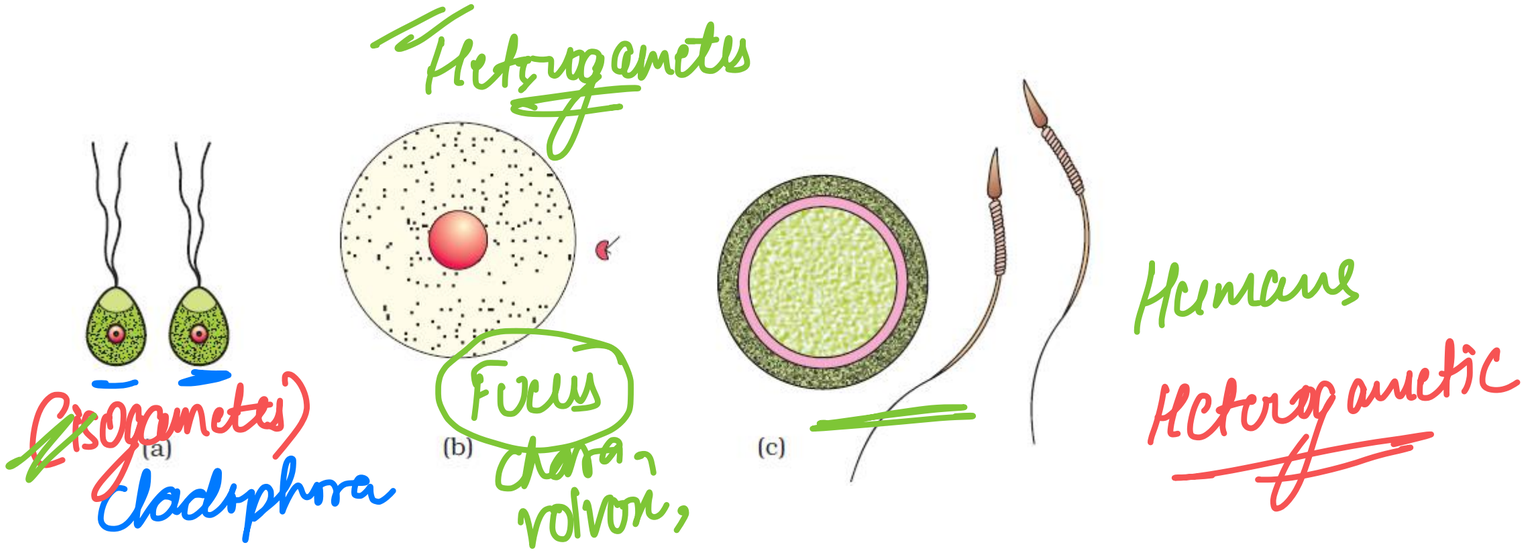


**Figure 1.5** Types of gametes: (a) Isogametes of *Cladophora* (an alga); (b) Heterogametes of *Fucus* (an alga); (c) Heterogametes of *Homo sapiens* (Human beings)

Homogametic

Heterogametic

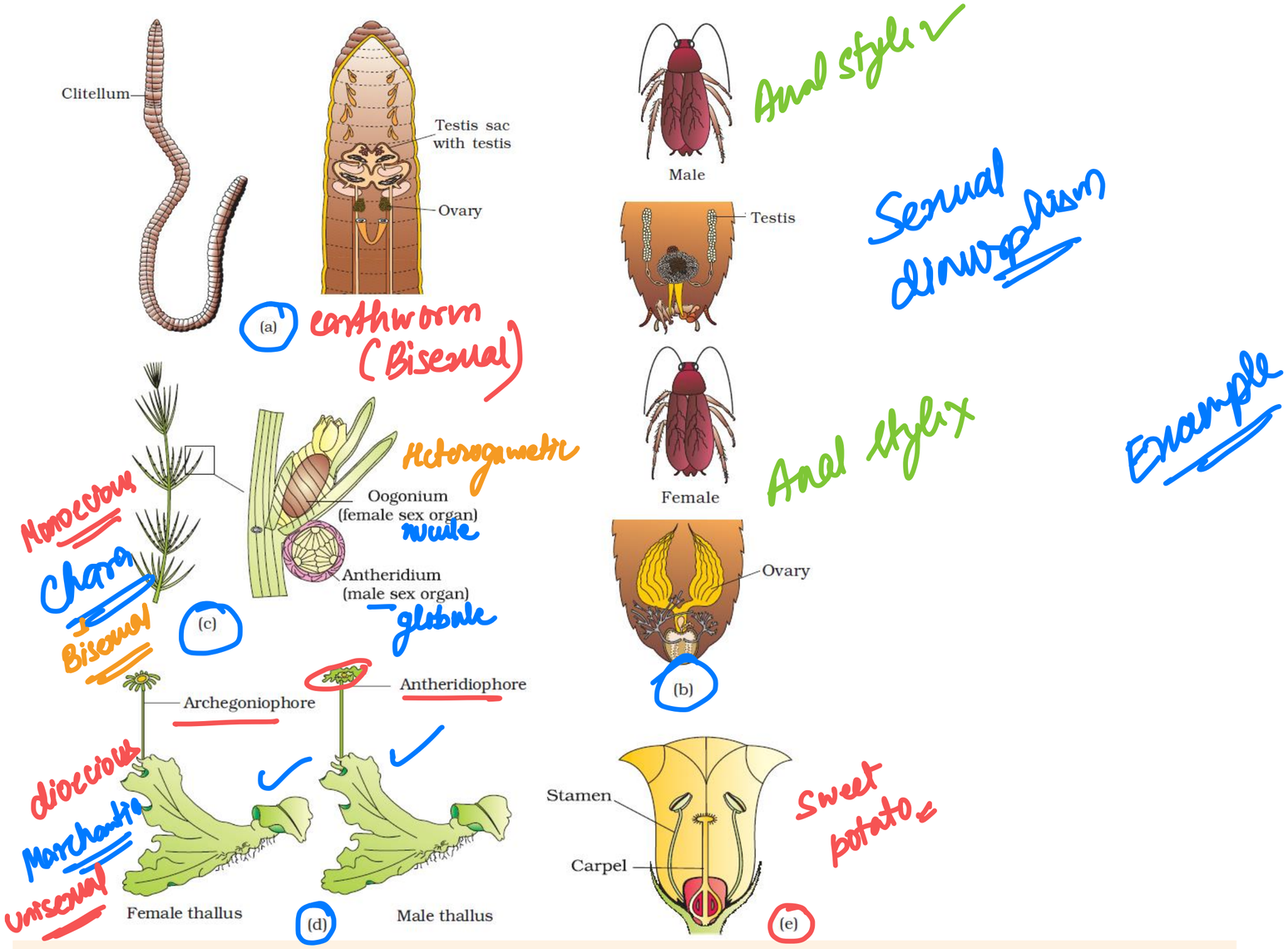


**Figure 1.6** Diversity of sexuality in organisms (a) Bisexual animal (Earthworm); (b) Unisexual animal (Cockroach); (c) Monoecious plant *(Chara)*; (d) Dioecious plant *(Marchantia)*; (e) Bisexual flower (sweet potato)

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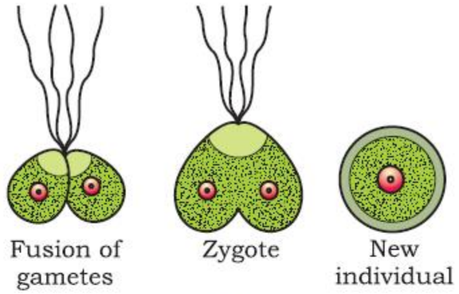



(a)

(b)

**Figure 1.7** (a) Homogametic contact in alga; (b) Germinating pollen grains on the stigma of a flower

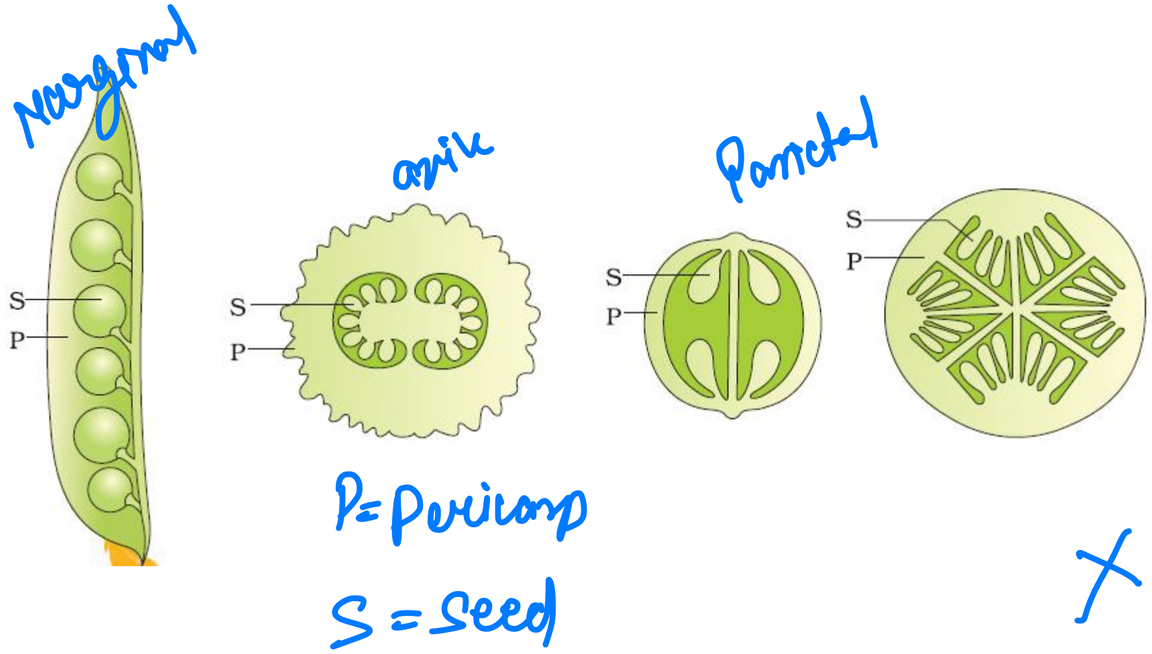
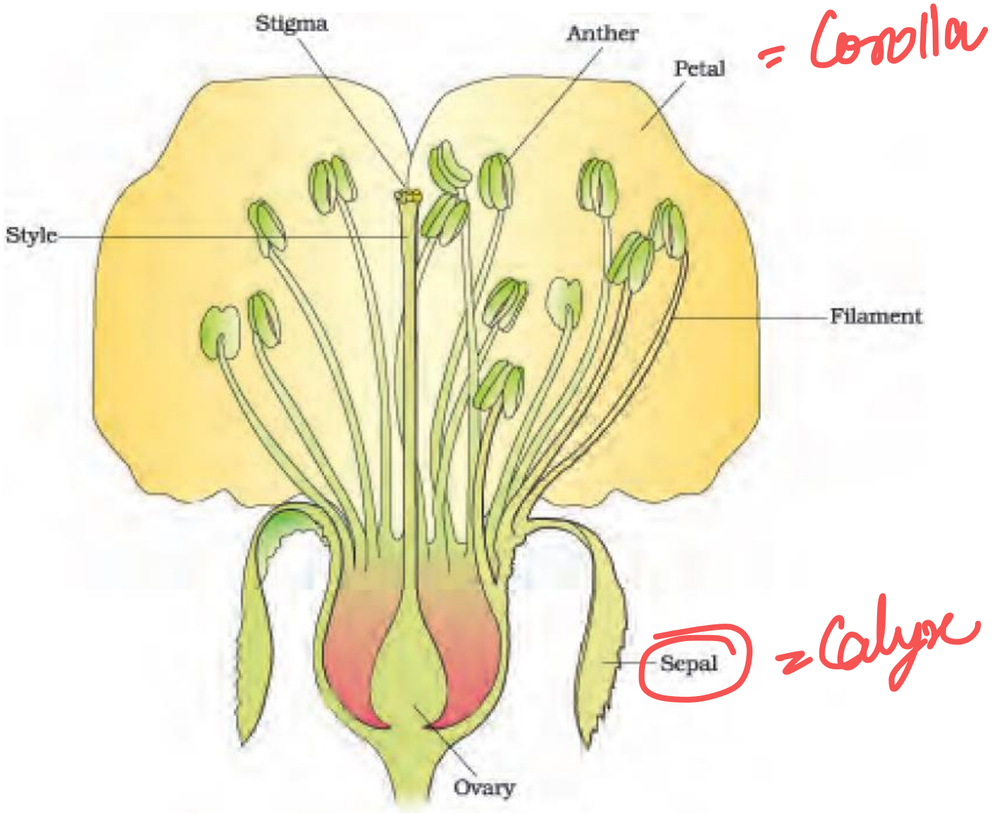



**Figure 1.8** A few kinds of fruit showing seeds (S) and protective pericarp (P)

# CHAPTER-2

# SEXUAL REPRODUCTION IN FLOWERING PLANTS




= Corolla

= Calyx

- Stamen

Androecium (Male)

Gynoecium (Female)

C

Carpel

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**Figure 2.1** A diagrammatic representation of L.S. of a flower

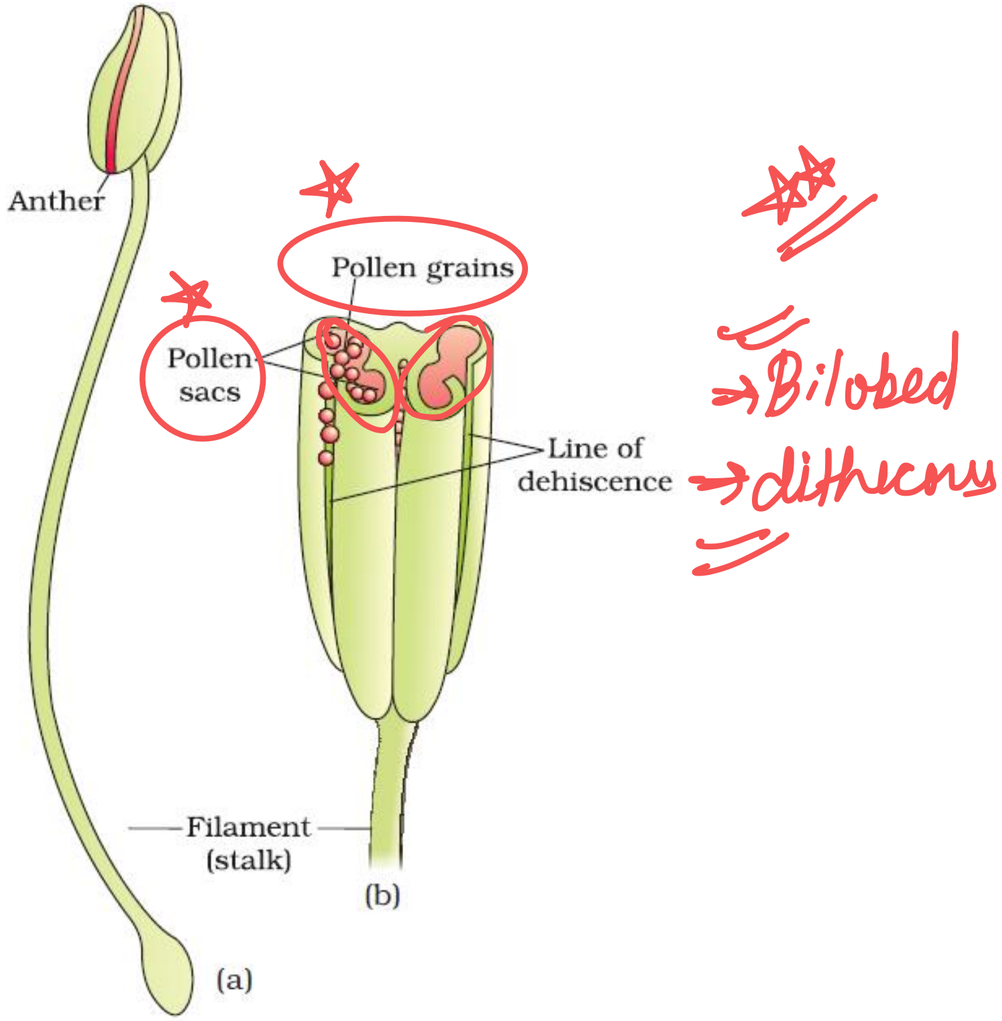



**Figure 2.2** (a) A typical stamen; (b) three–dimensional cut section of an anther

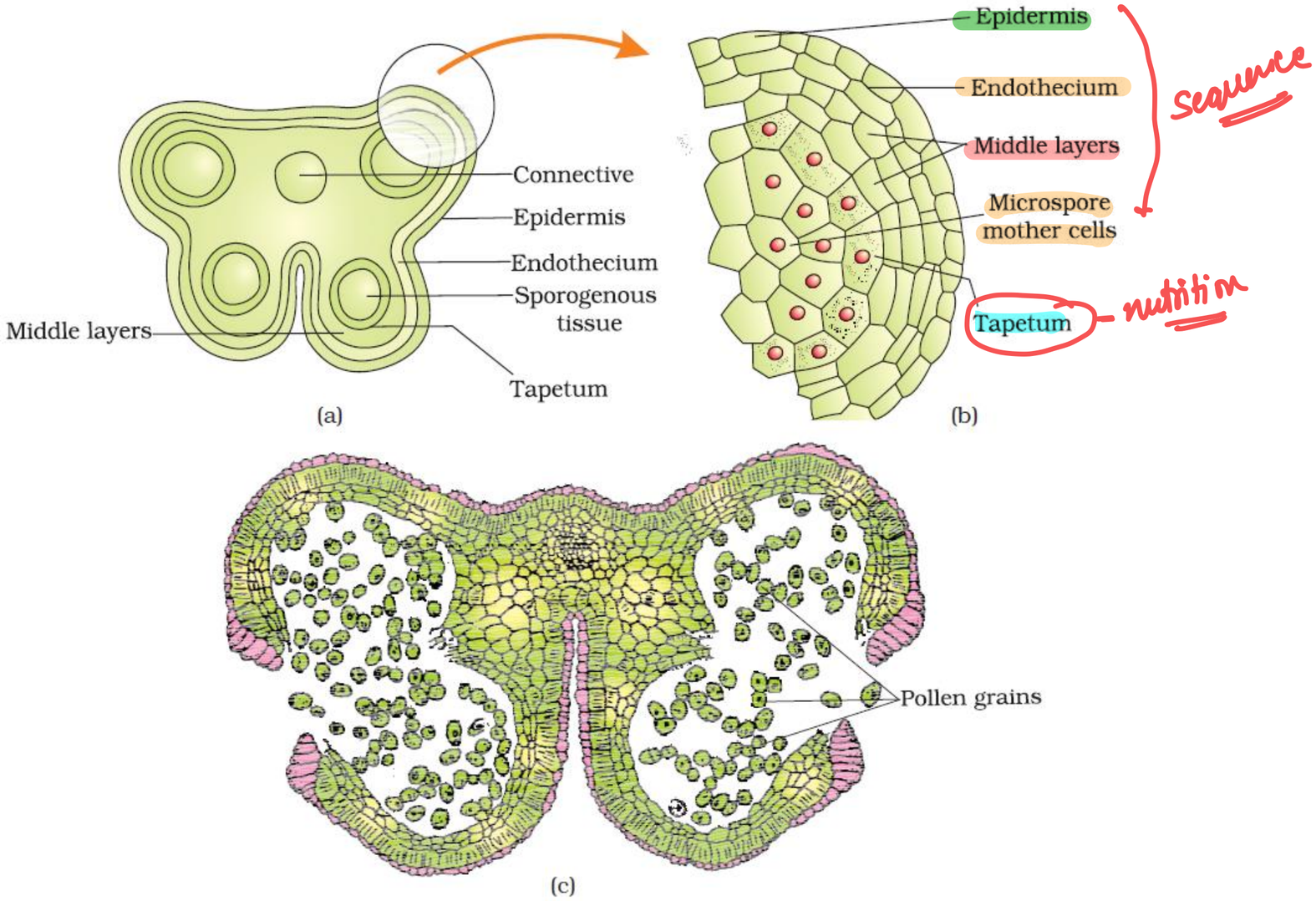



**Figure 2.3** (a) Transverse section of a young anther; (b) Enlarged view of one microsporangium showing wall layers; (c) A mature dehisced anther

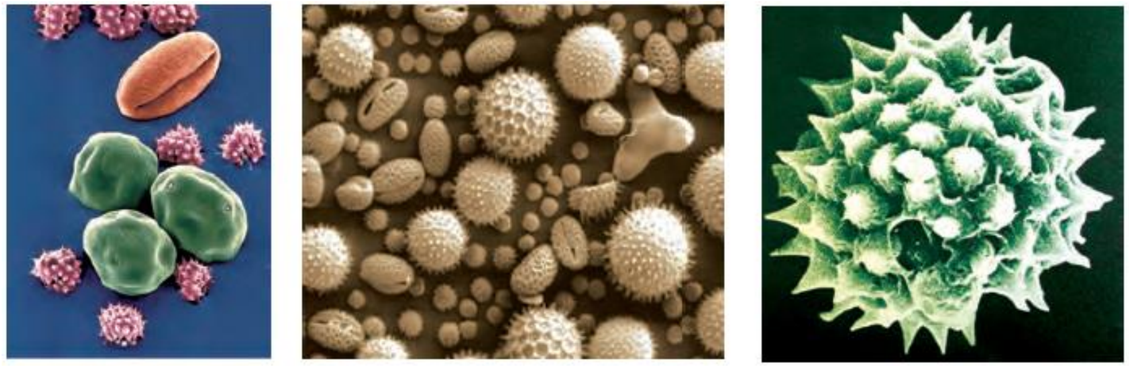
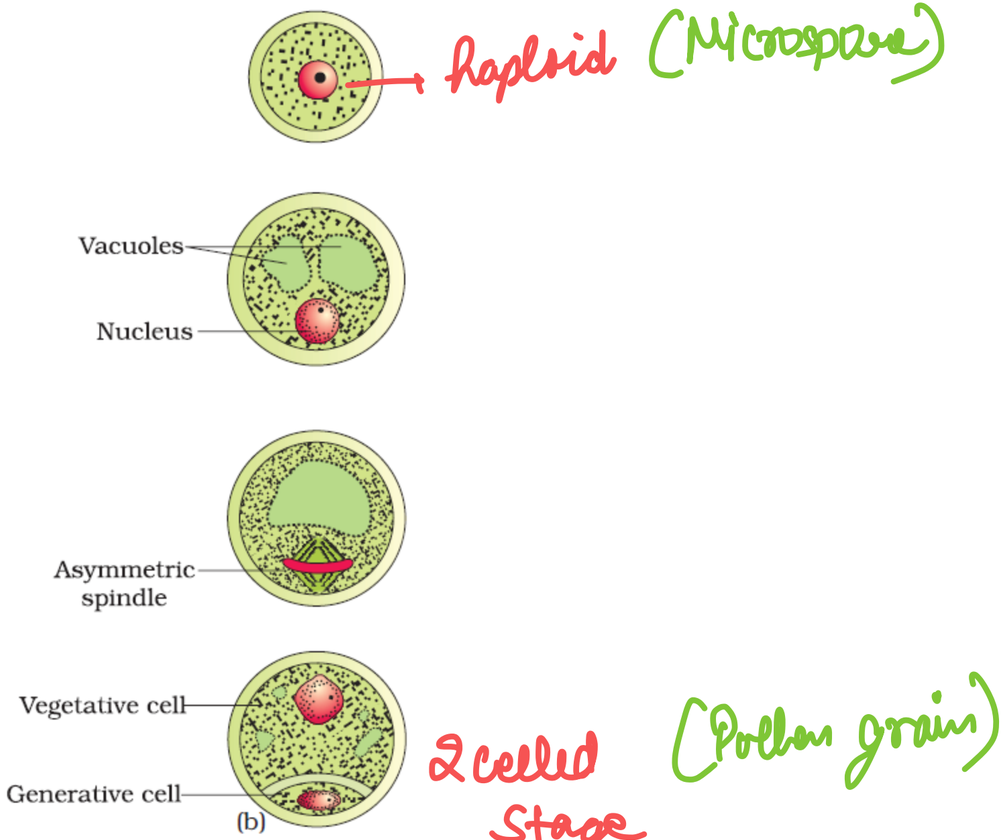


**Figure 2.4** Scanning electron micrographs of a few pollen grains

(a)




Haploid (Microspore)

2 celled stage (Pollen grain)

**Figure 2.5** (a) Enlarged view of a pollen grain tetrad; (b) stages of a microspore maturing into a pollen grain

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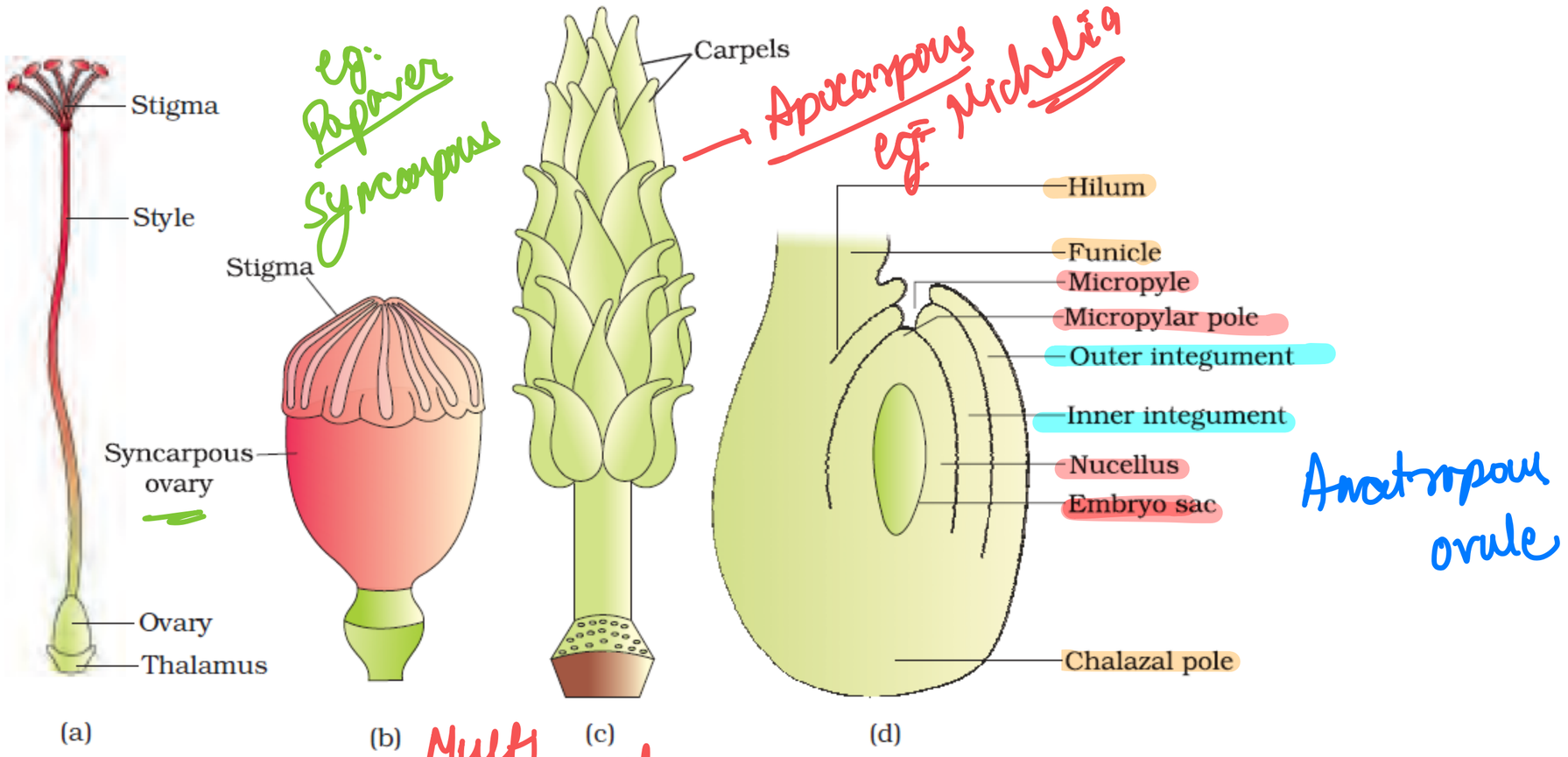



**Figure 2.7** (a) A dissected flower of *Hibiscus* showing pistil (other floral parts have been removed); (b) Multicarpellary, syncarpous pistil of *Papaver*; (c) A multicarpellary, apocarpous gynoecium of *Michelia*; (d) A diagrammatic view of a typical anatropous ovule

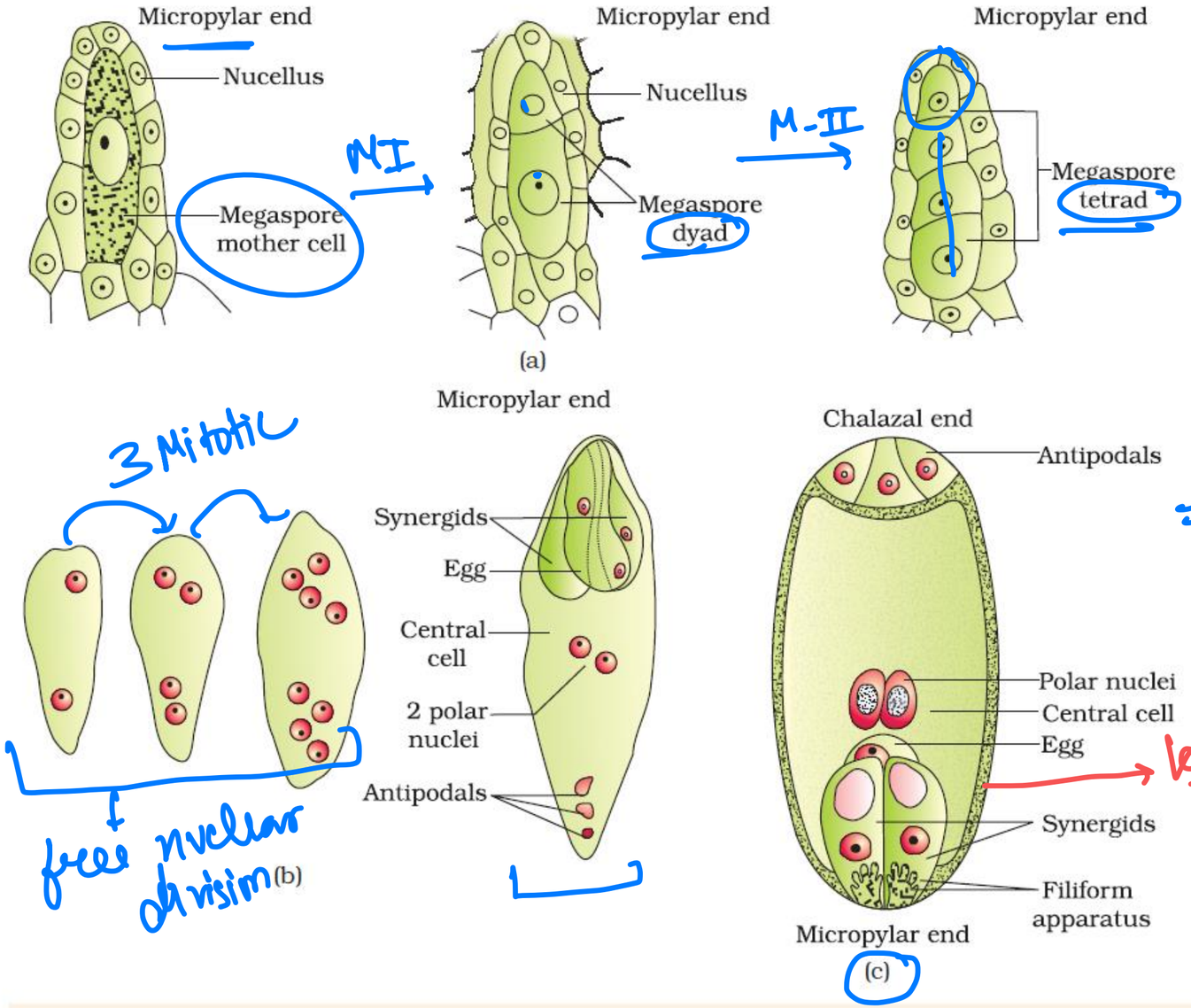
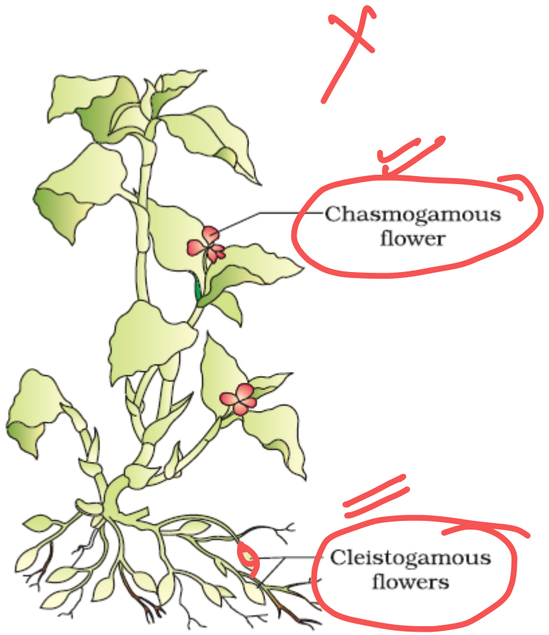



**Figure 2.8** (a) Parts of the ovule showing a large megaspore mother cell, a dyad and a tetrad of megaspores; (b) 2, 4, and 8-nucleate stages of embryo sac and a mature embryo sac; (c) A diagrammatic representation of the mature embryo sac.

(a)

(b)




(c)

**Figure 2.9** (a) Self-pollinated flowers; (b) Cross pollinated flowers; (c) Cleistogamous flowers

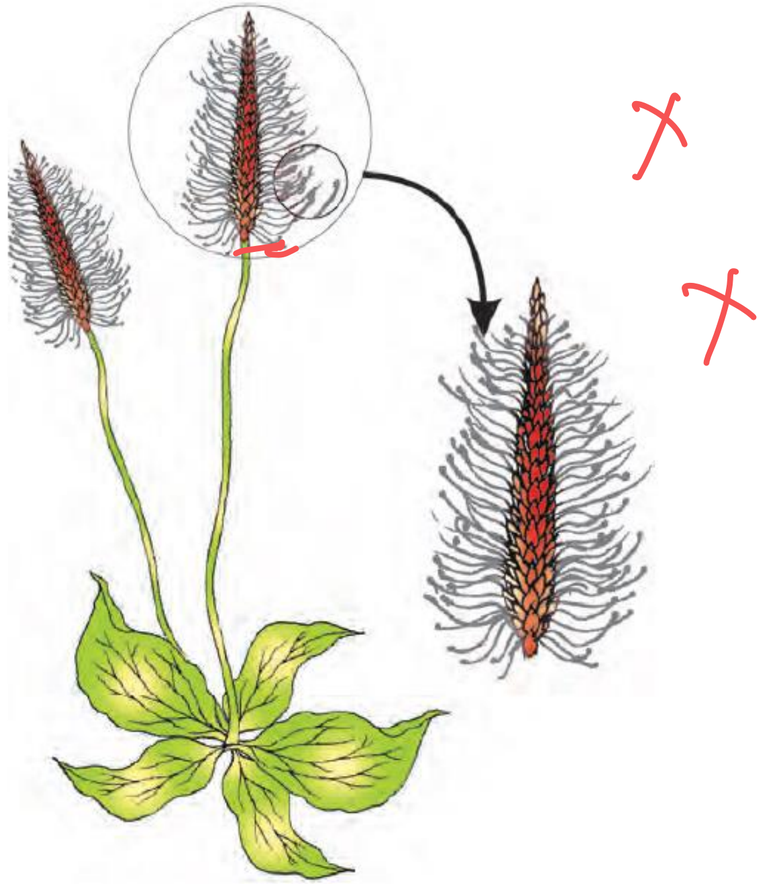
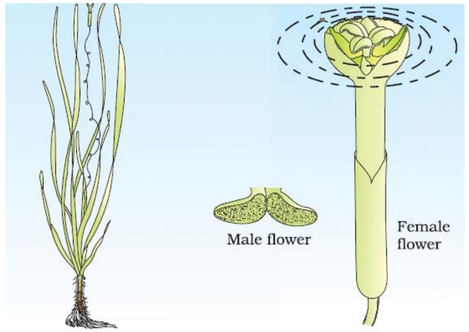
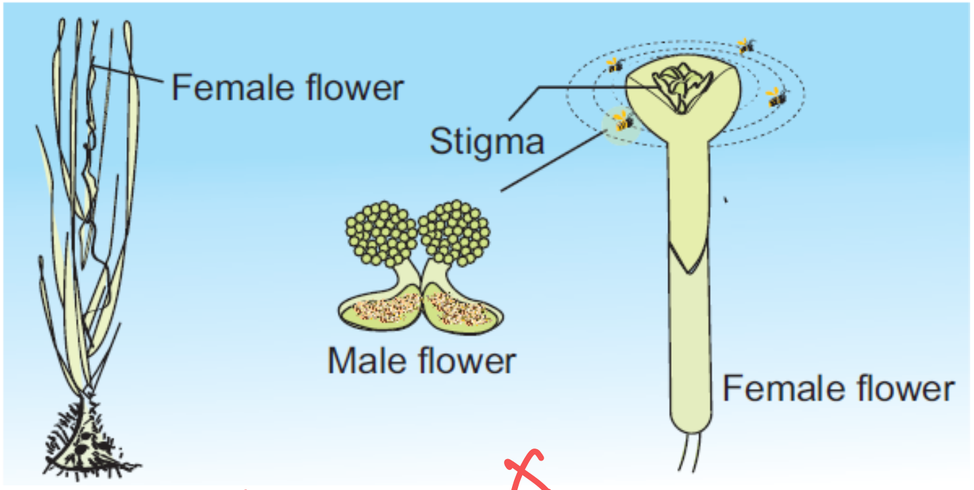


**Figure 2.10** A wind-pollinated plant showing compact inflorescence and well-exposed stamens




(a)




(b)

**Figure 2.11** (a) Pollination by water in *Vallisneria*; (b) Insect pollination

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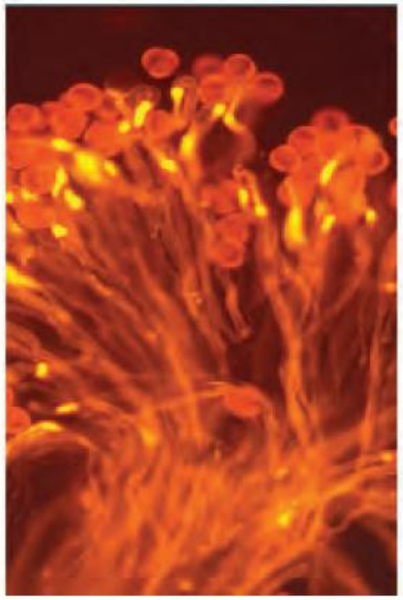
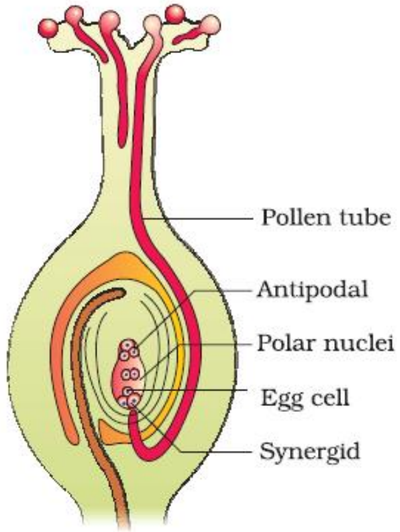


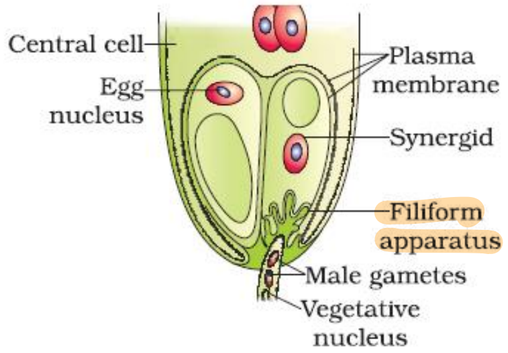
(a)

(b)

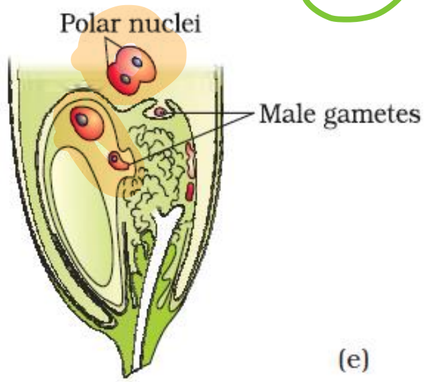



Longitudinal section of a flower showing growth of pollen tube

(c)




(d)




(e)

**Figure 2.12** (a) Pollen grains germinating on the stigma; (b) Pollen tubes growing through the style; (c) L.S. of pistil showing path of pollen tube growth; (d) enlarged view of an egg apparatus showing entry of pollen tube into a synergid; (e) Discharge of male gametes into a synergid and the movements of the sperms, one into the egg and the other into the central cell

egg - Micropyle

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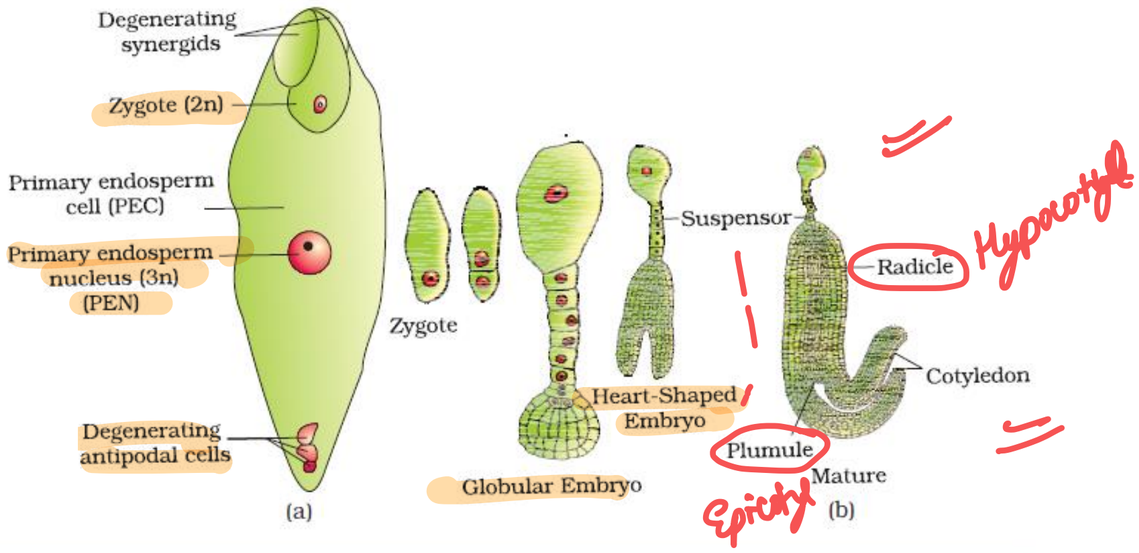
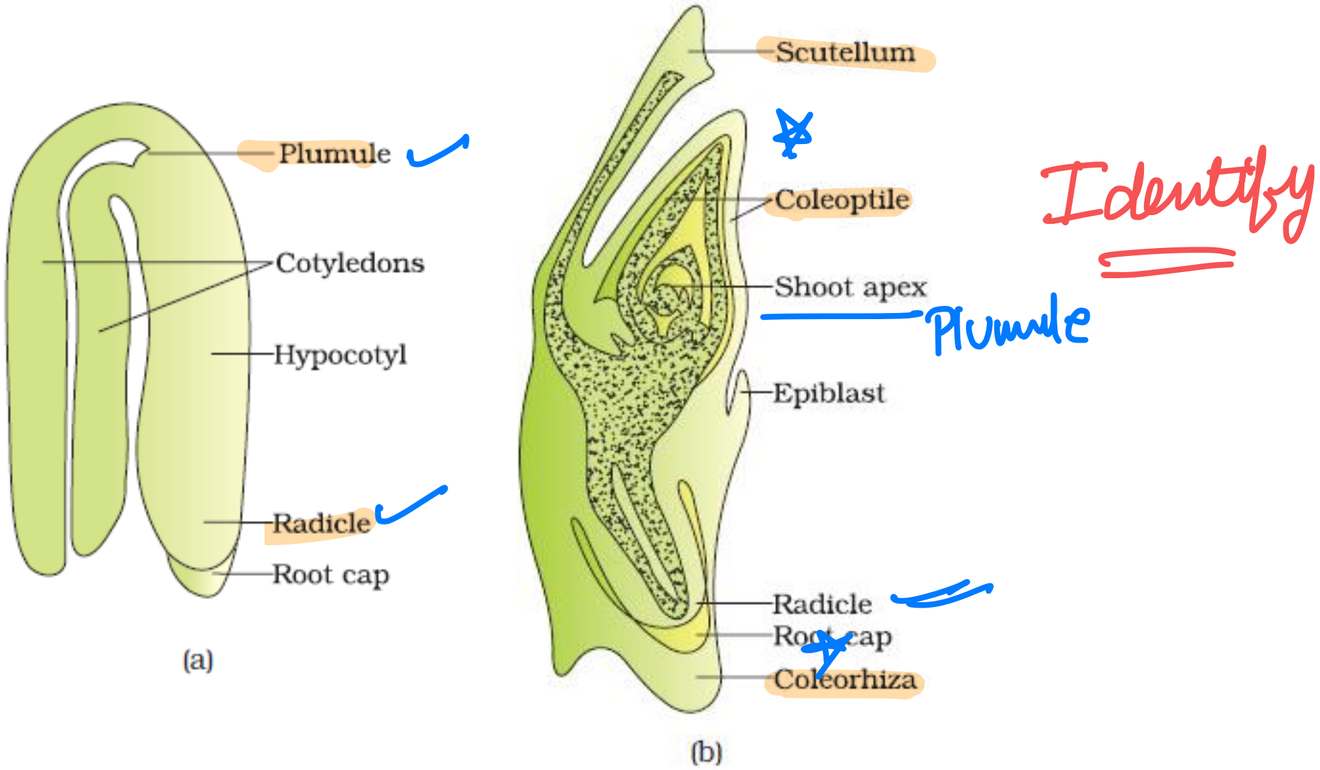



**Figure 2.13** (a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN); (b) Stages in embryo development in a dicot [shown in reduced size as compared to (a)]

Plumule = shoot tip

Radicle - root tip




Identify

Plumule

**Figure 2.14** (a) A typical dicot embryo; (b) L.S. of an embryo of grass

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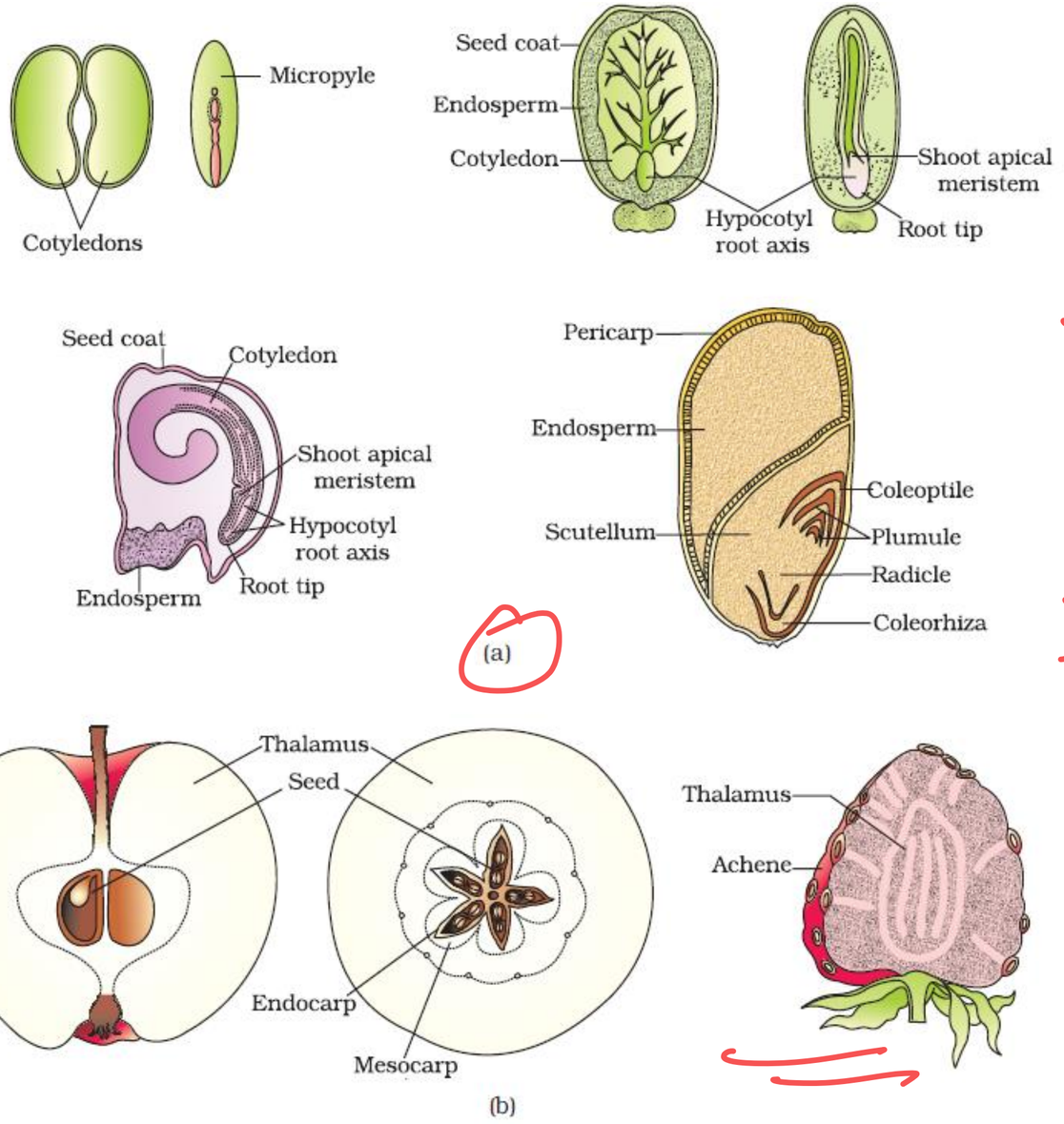


**Figure 2.15** (a) Structure of some seeds. (b) False fruits of apple and strawberry

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# CHAPTER-3
# HUMAN REPRODUCTION

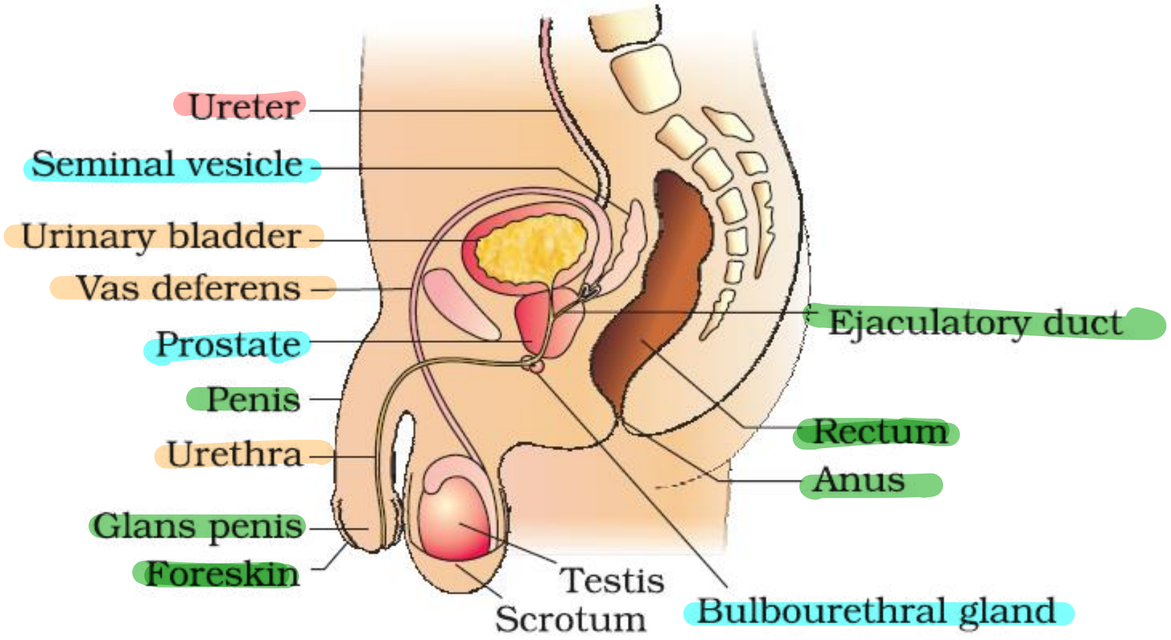


**Figure 3.1(a)** Diagrammatic sectional view of male pelvis showing reproductive system

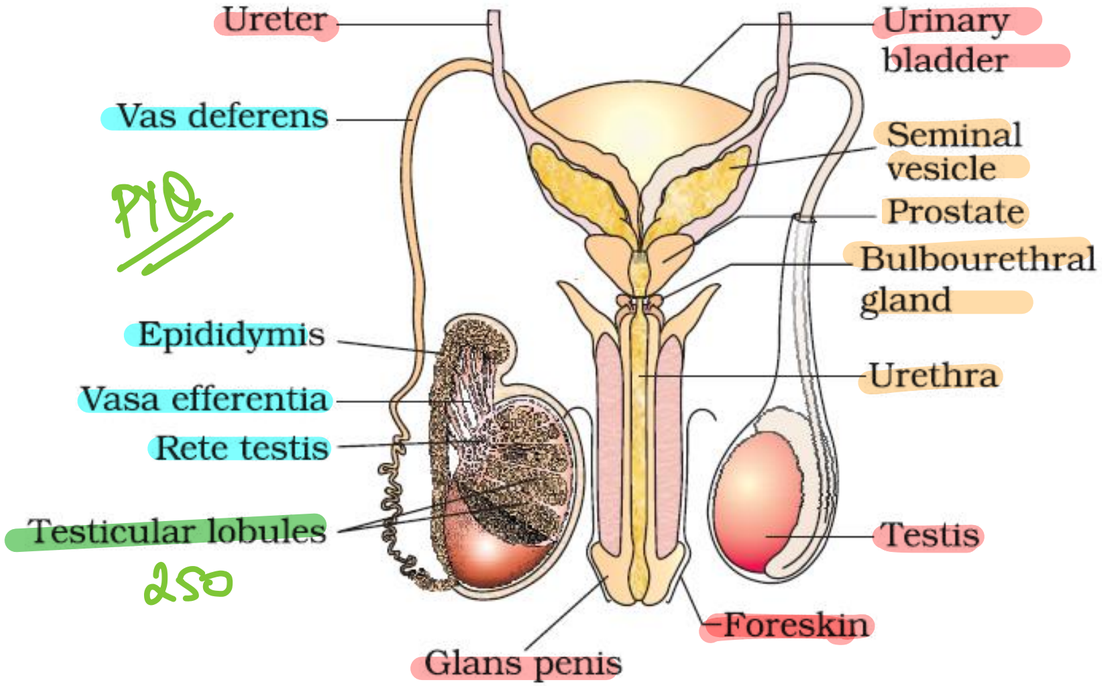


**Figure 3.1(b)** Diagrammatic view of male reproductive system (part of testis is open to show inner details)

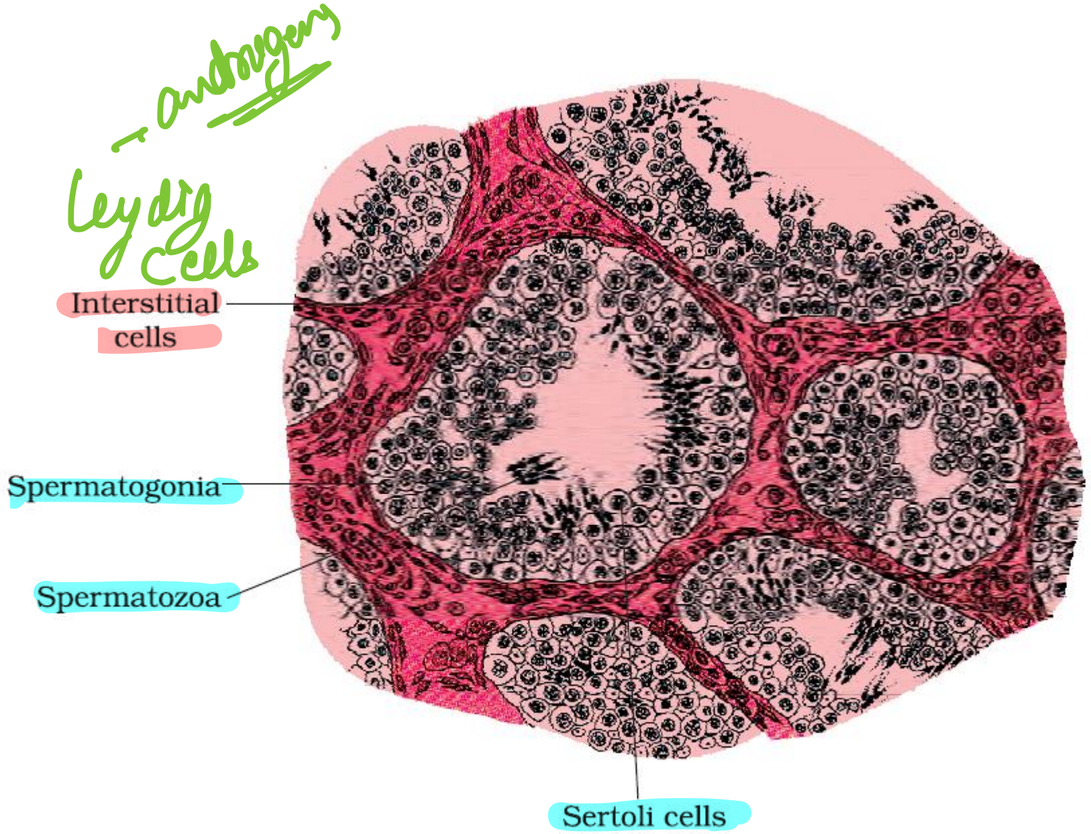


**Figure 3.2** Diagrammatic sectional view of seminiferous tubule

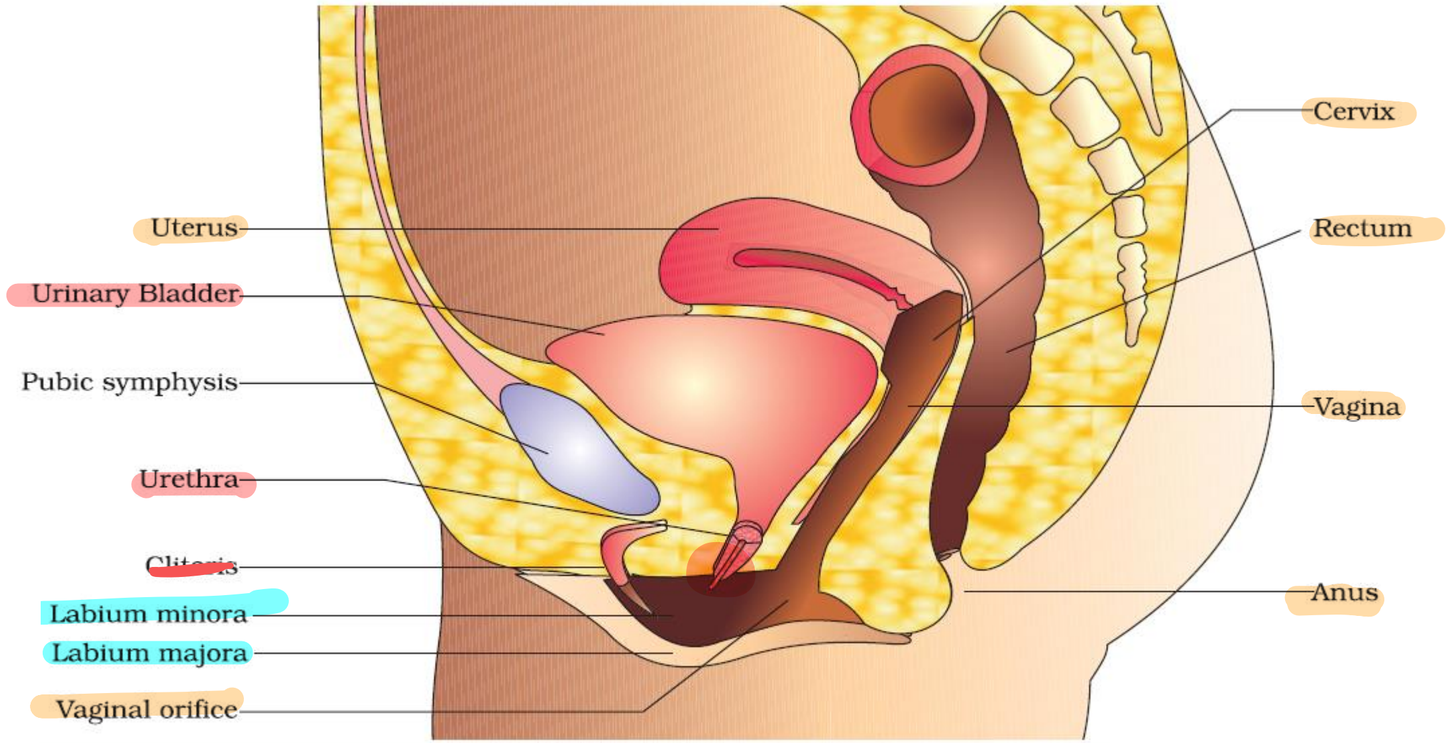


**Figure 3.3 (a)** Diagrammatic sectional view of female pelvis showing reproductive system

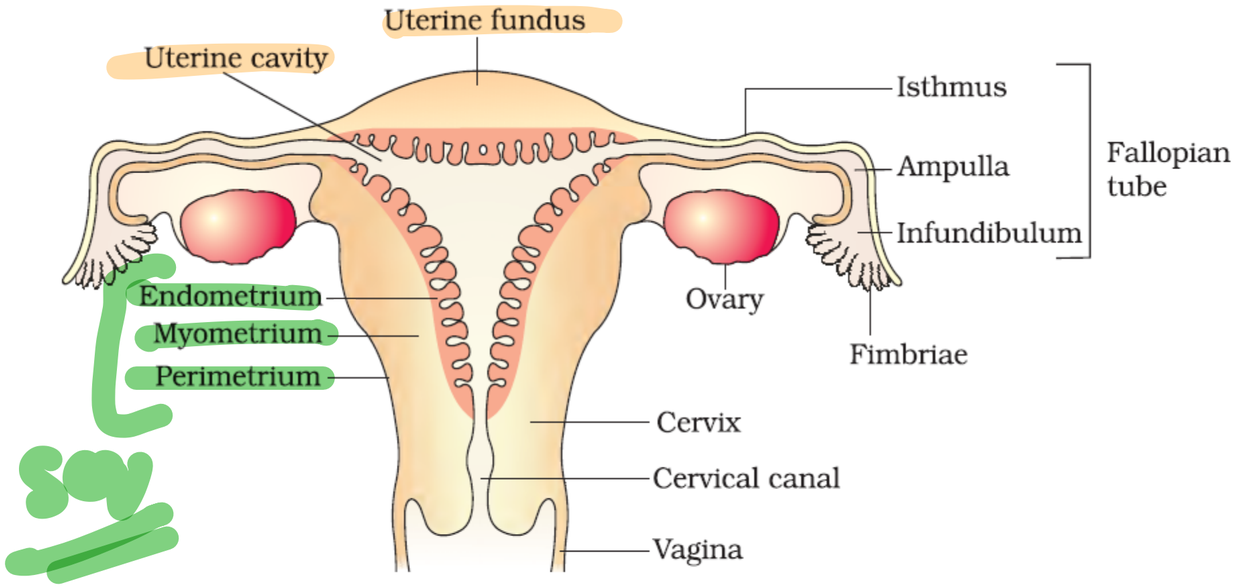


**Figure 3.3 (b)** Diagrammatic sectional view of the female reproductive system

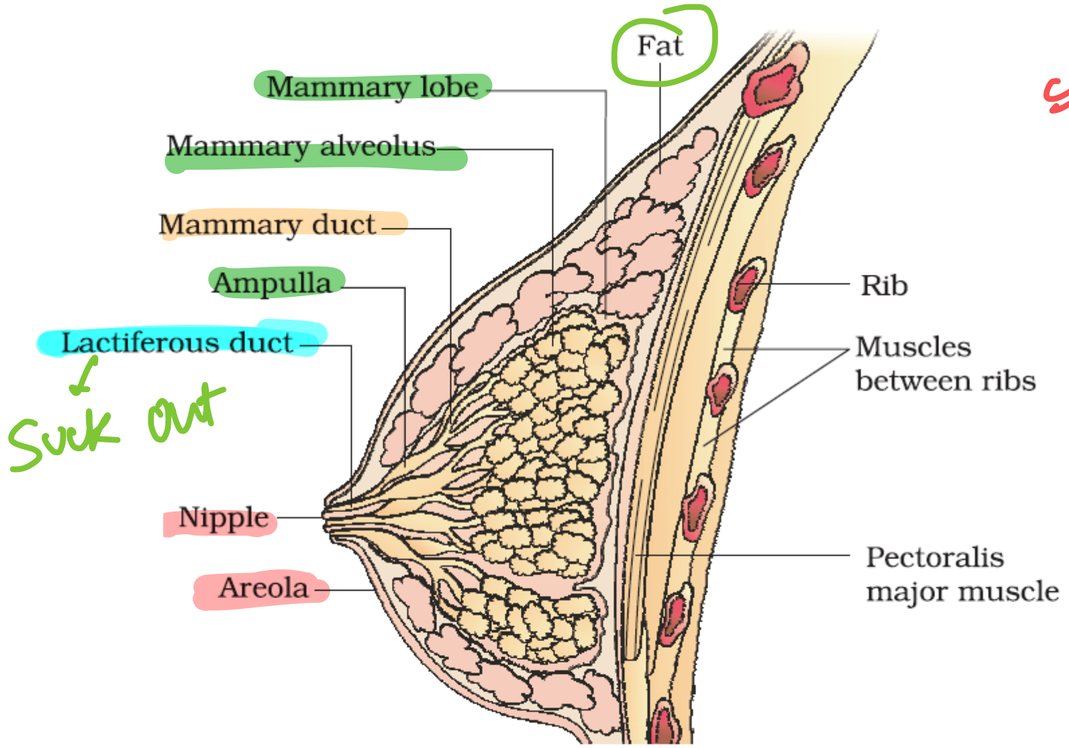


**Figure 3.4** A diagrammatic sectional view of Mammary gland

Alveoli (lobes)
↓
Mammary tubules
↓
Mammary duct
↓
Ampulla
↓
Lactiferous duct
↓
nipple

Suck out

Pathway

15-20 lobes
↳ alveoli (Milk secretion)

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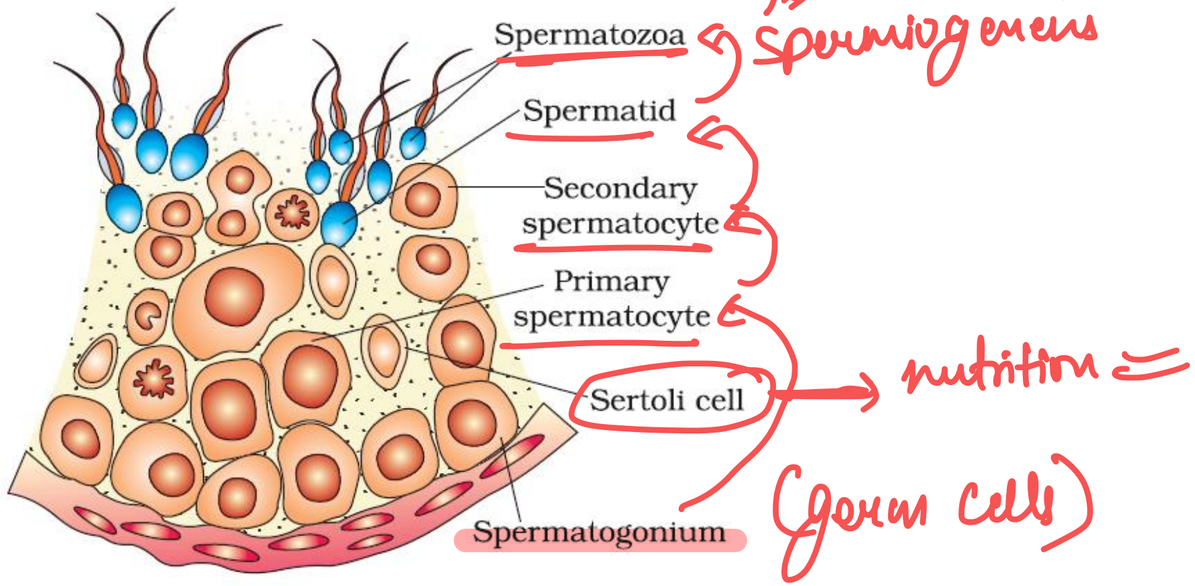


**Figure 3.5** Diagrammatic sectional view of a seminiferous tubule (enlarged)

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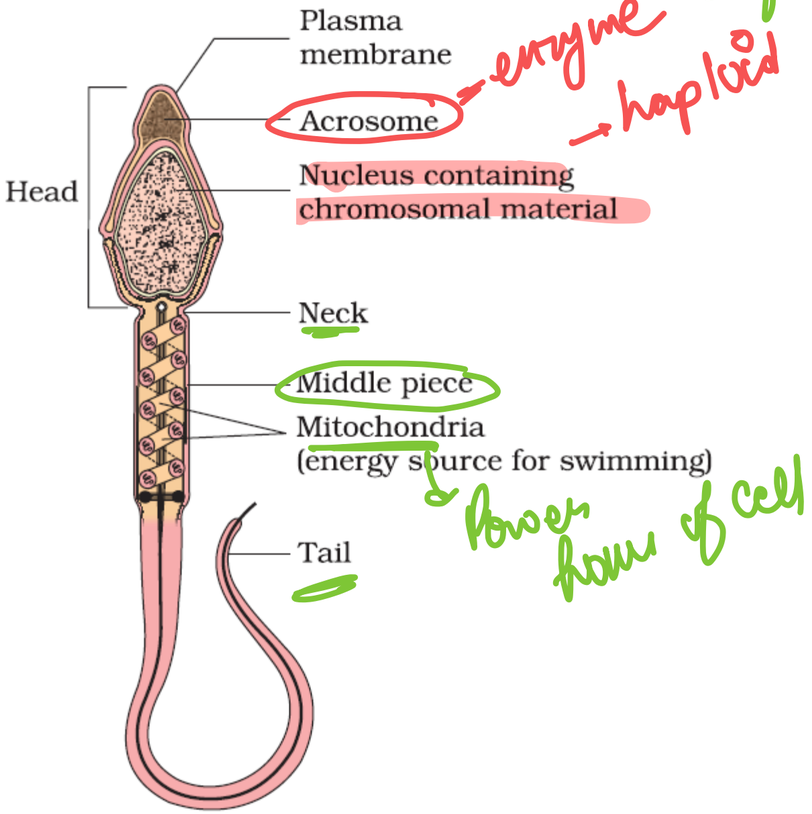



**Figure 3.6** Structure of a sperm

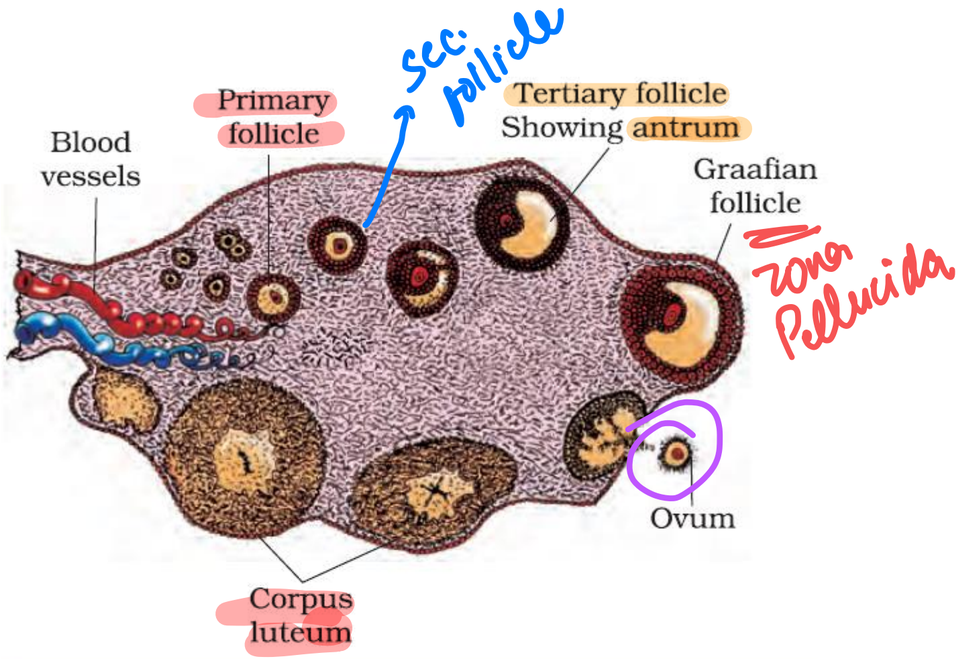
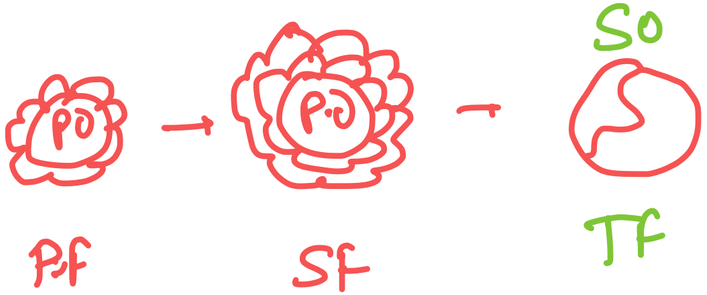
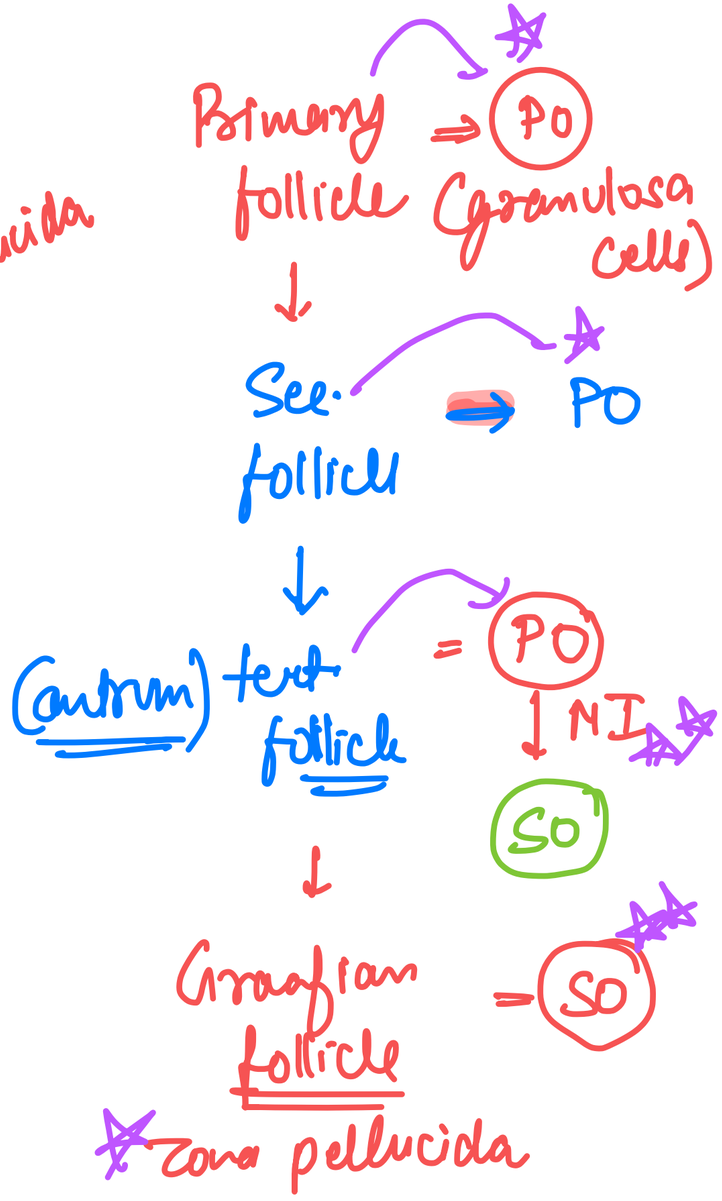



**Figure 3.7** Diagrammatic Section view of ovary



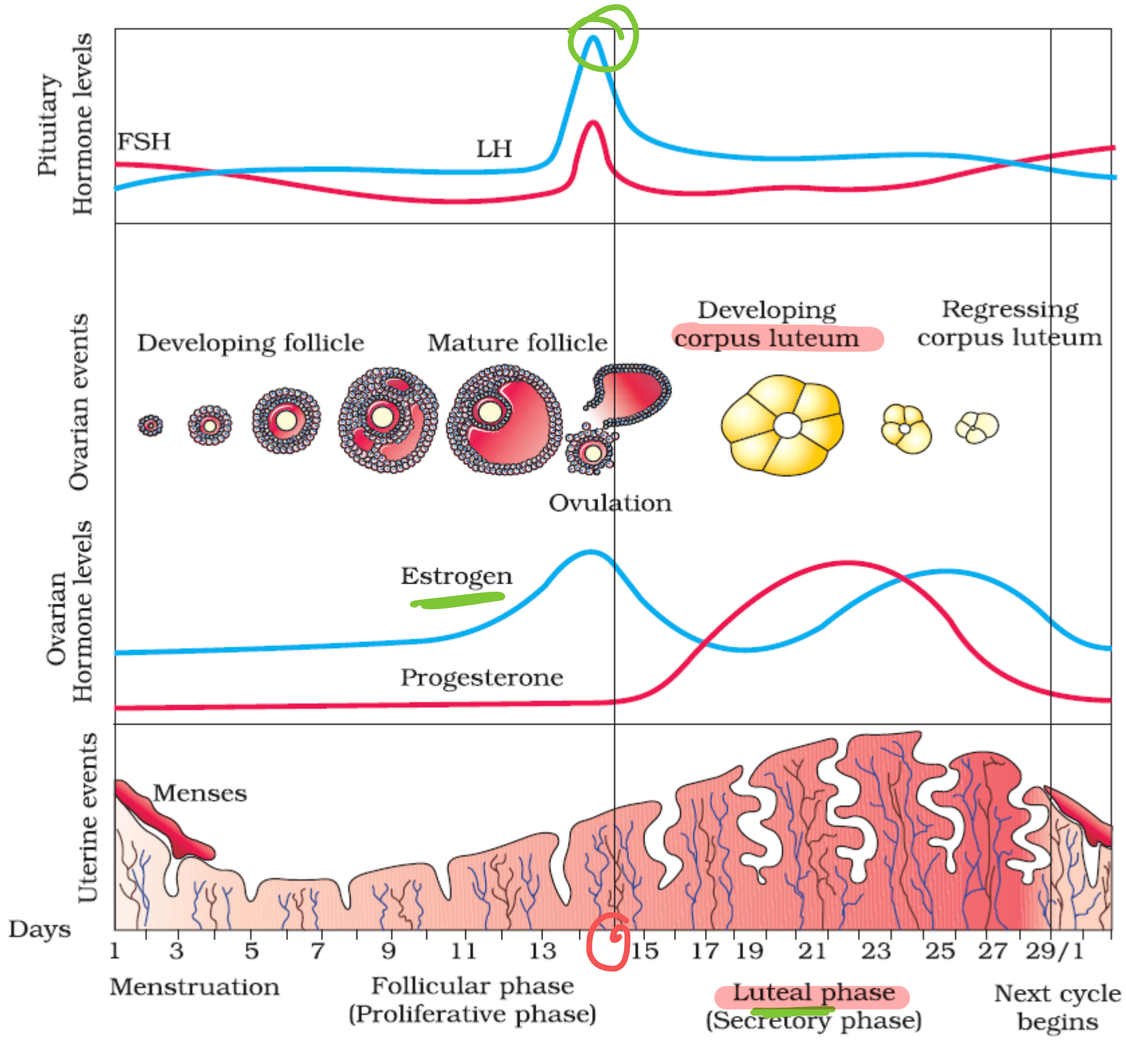




**Figure 3.9** Diagrammatic presentation of various events during a menstrual cycle

Ovulation = LH
FSH

LH > FSH

Oestrogen > Progesterone

Luteal phase = Progesterone peak

Menses start = Progesteron ↓
Oestrogen ↑

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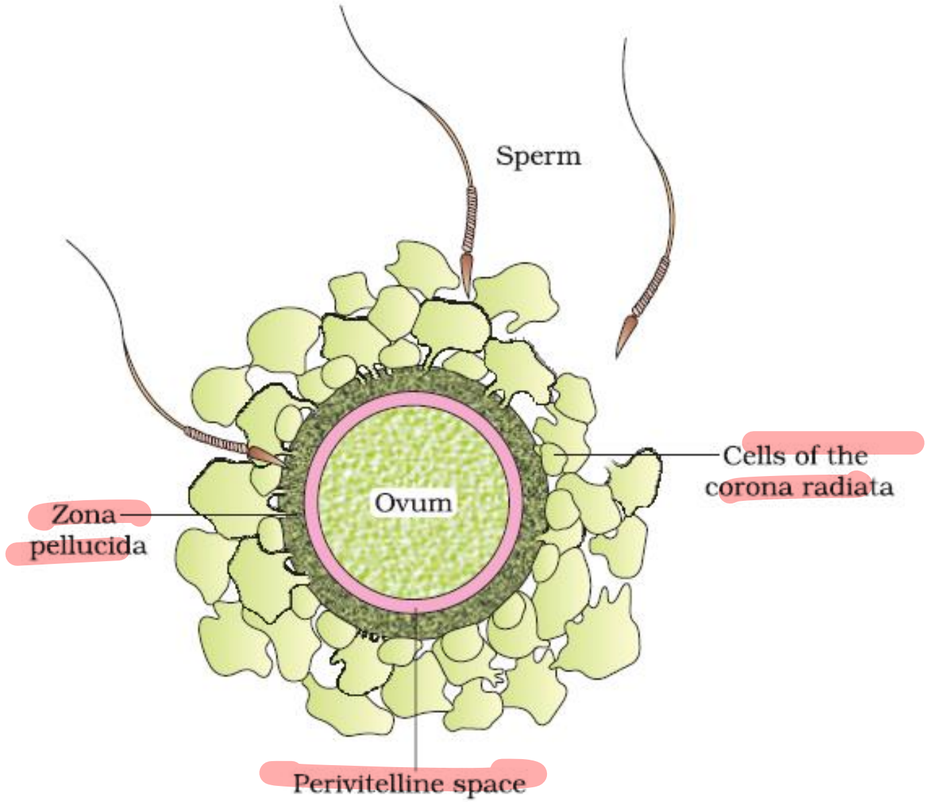


**Figure 3.10** Ovum surrounded by few sperms

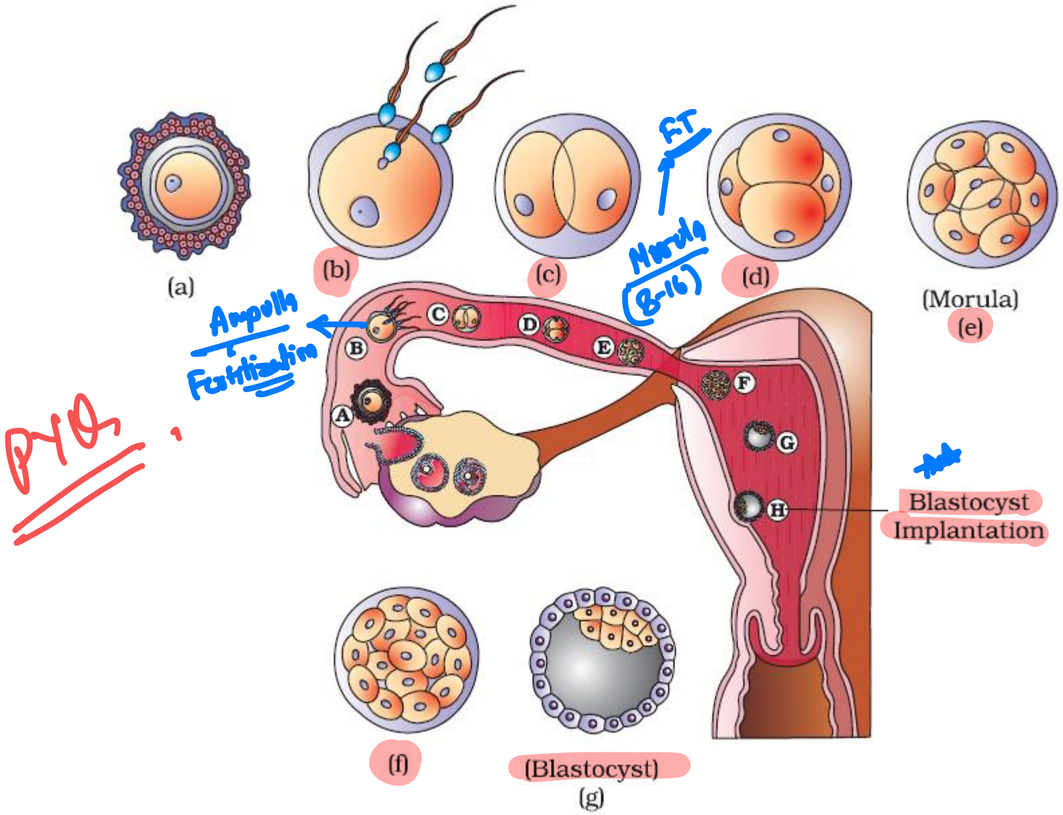


**Figure 3.11** Transport of ovum, fertilisation and passage of growing embryo through fallopian tube

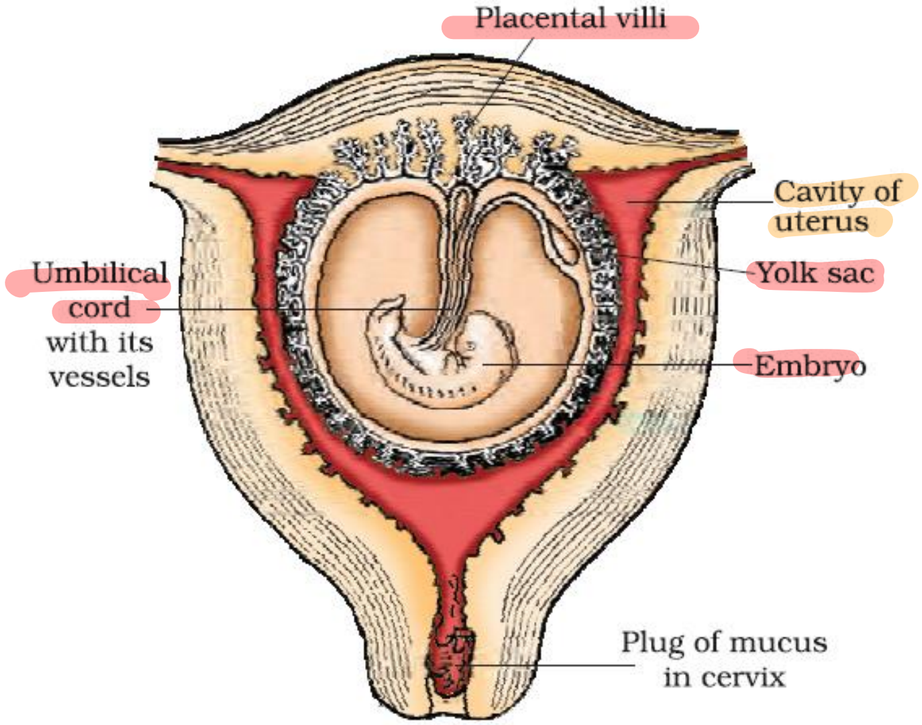


**Figure 3.12** The human foetus within the uterus

# CHAPTER-4
# REPRODUCTIVE HEALTH

**Figure 4.1(a)** Condom for male

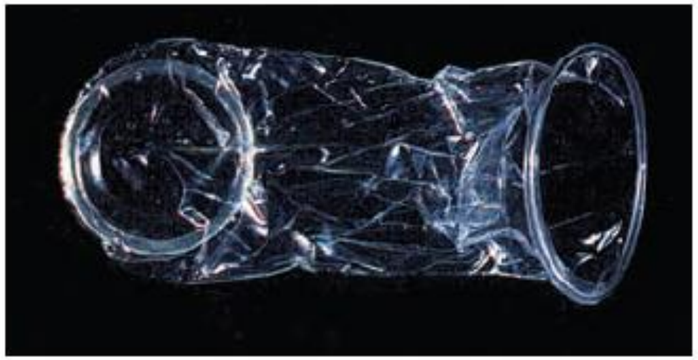

**Figure 4.1(b)** Condom for female

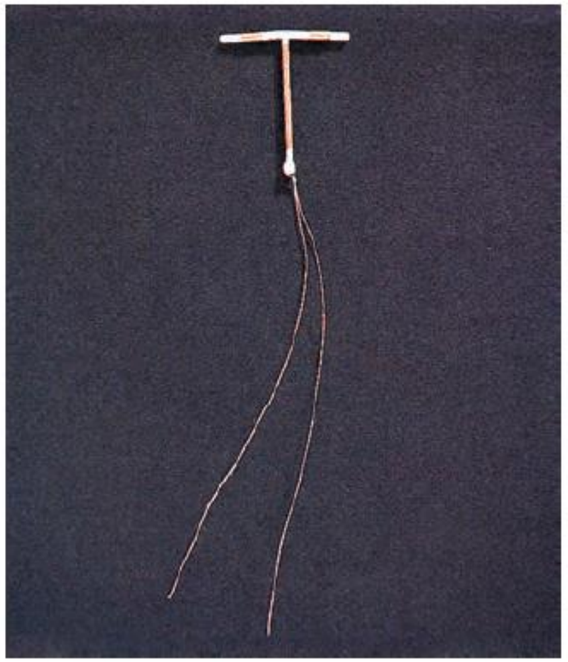

**Figure 4.2.** Copper T (CuT)

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IUD (Cu- release)
+
Sperms motility reduce

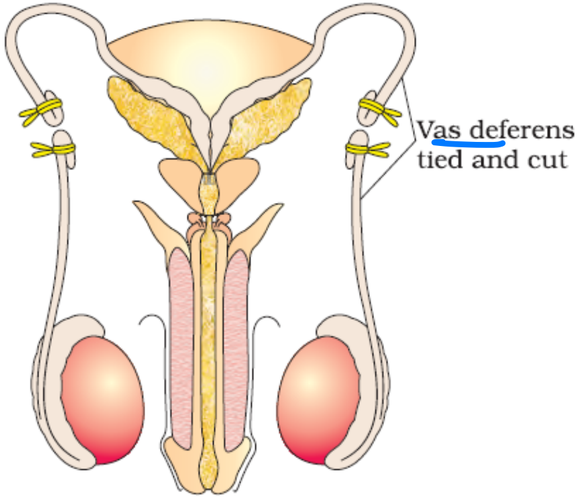


**Figure 4.4 (a)** Vasectomy

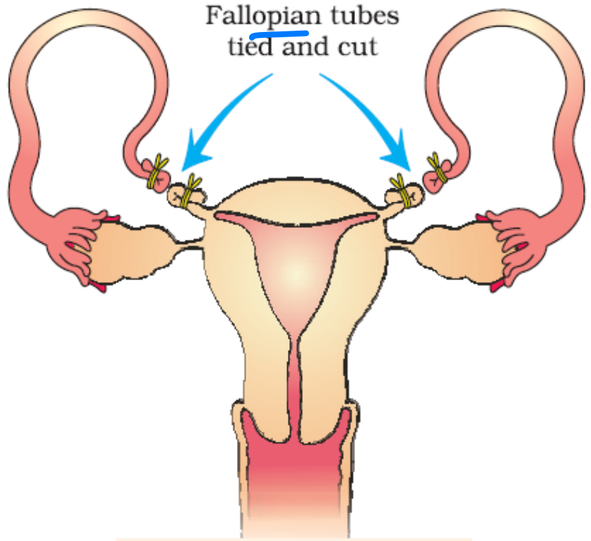


**Figure 4.4 (b)** Tubectomy

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Permanent / Surgical method

P/A

Sterilization method

# CHAPTER-5

# PRINCIPLES OF INHERITANCE AND VARIATION

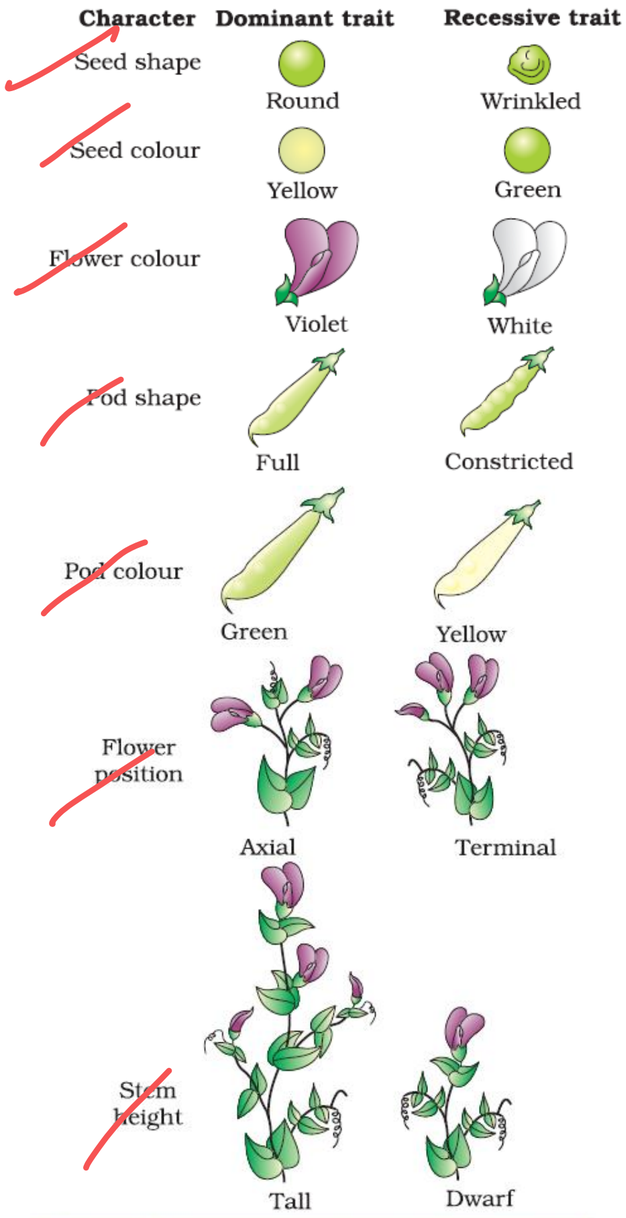


**Figure 5.1** Seven pairs of contrasting traits in pea plant studied by Mendel

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Imp

7 characters

14 traits (dom./recessive)

→ odd one out

* ↙ ↓ ↘

dom recessive

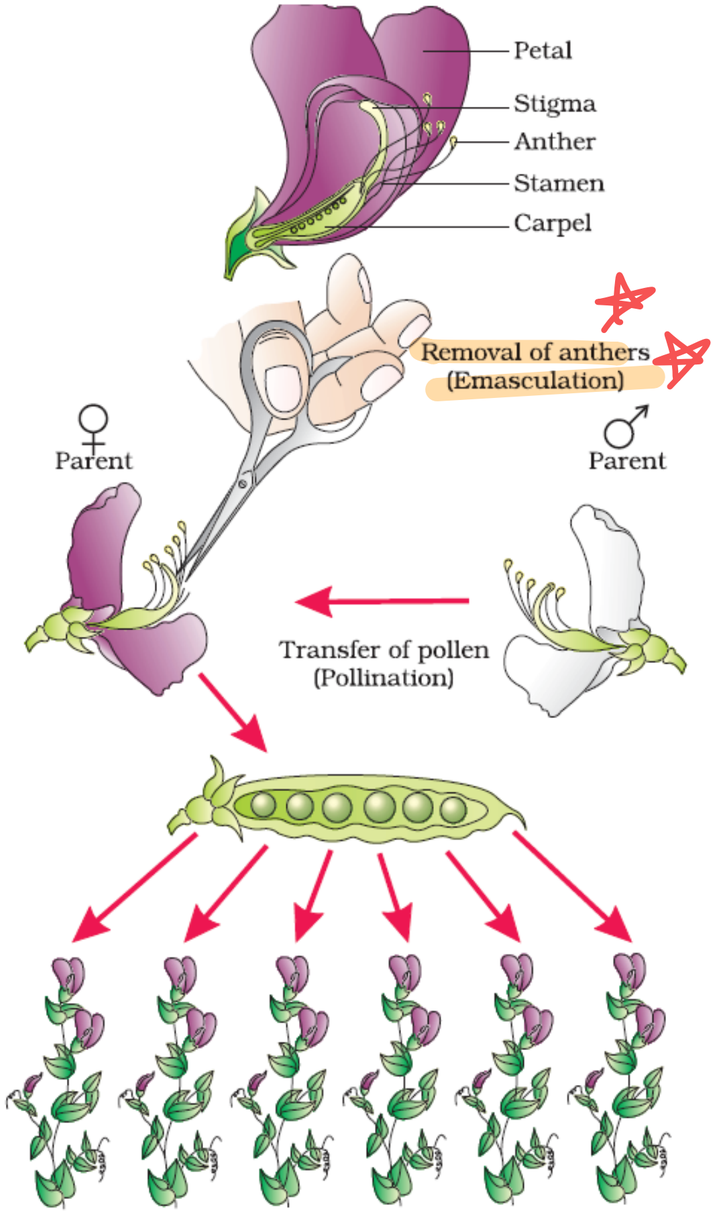


**Figure 5.2** Steps in making a cross in pea

Artificial hybridisation

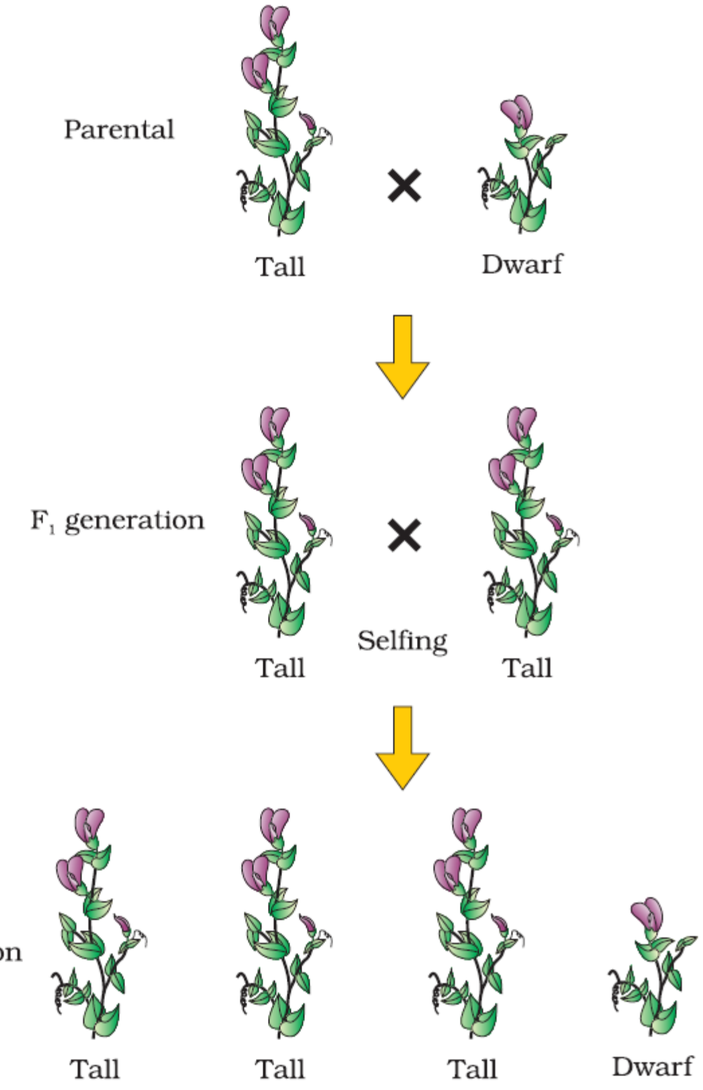


**Figure 5.3** Diagrammatic representation of monohybrid cross

ratio

Tall dwarf

phenotypic = 3 : 1

genotypic = 1 : 2 : 1

TT Tt tt

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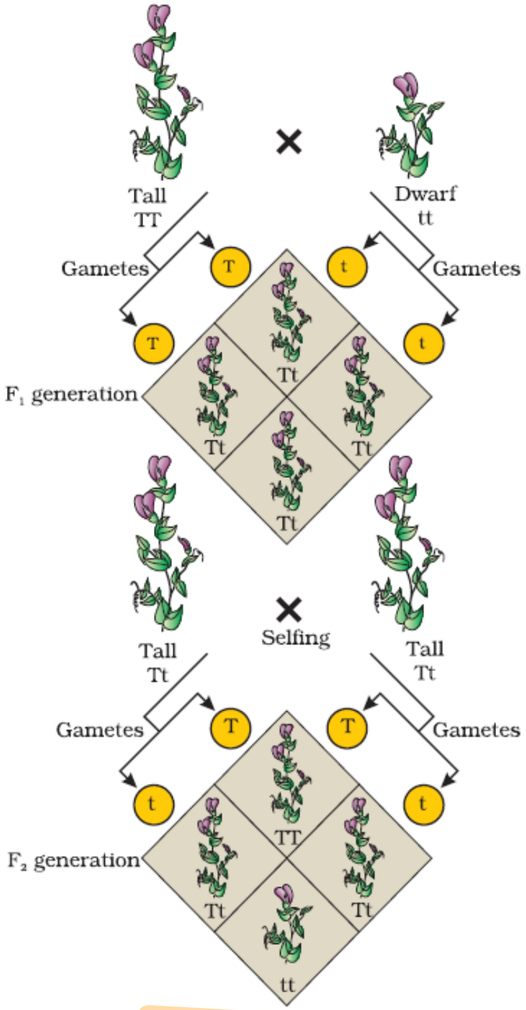


Phenotypic ratio : tall : dwarf
3 : 1
Genotypic ratio : TT : Tt : tt
1 : 2 : 1

**Figure 5.4** A Punnett square used to understand a typical monohybrid cross conducted by Mendel between true-breeding tall plants and true-breeding dwarf plants

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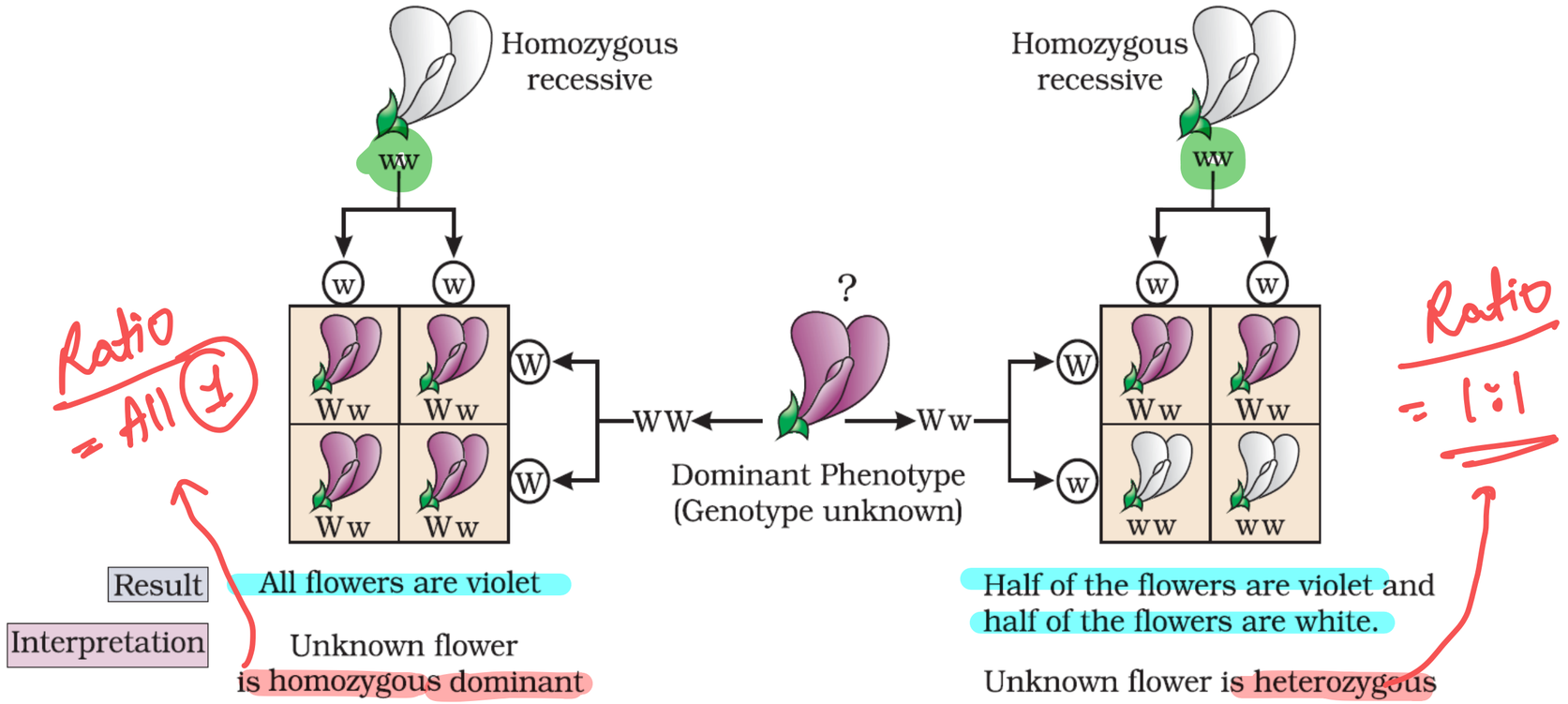
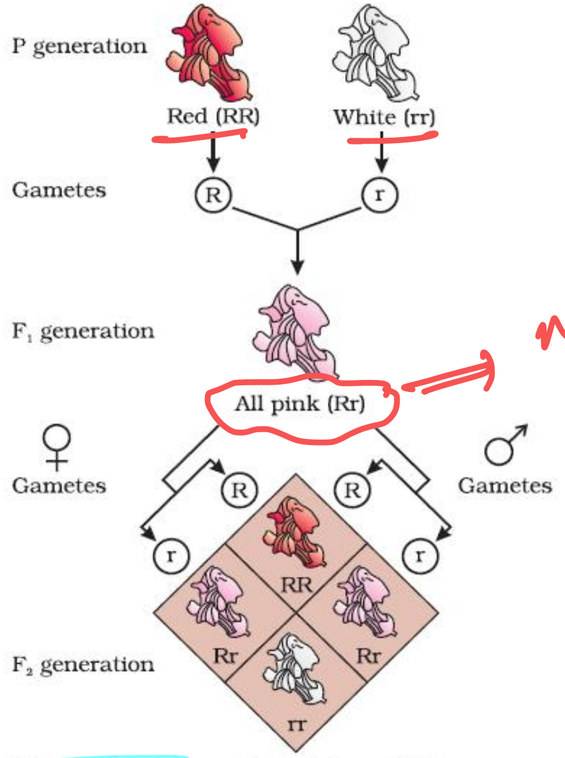



**Figure 5.5** Diagrammatic representation of a test cross




Phenotypic ratio : red : pink : white
1 : 2 : 1

Genotypic ratio : RR : Rr : rr
1 : 2 : 1

**Figure 5.6** Results of monohybrid cross in the plant Snapdragon, where one allele is incompletely dominant over the other allele

neither parent

Incomplete dominance

eg: Snapdragon

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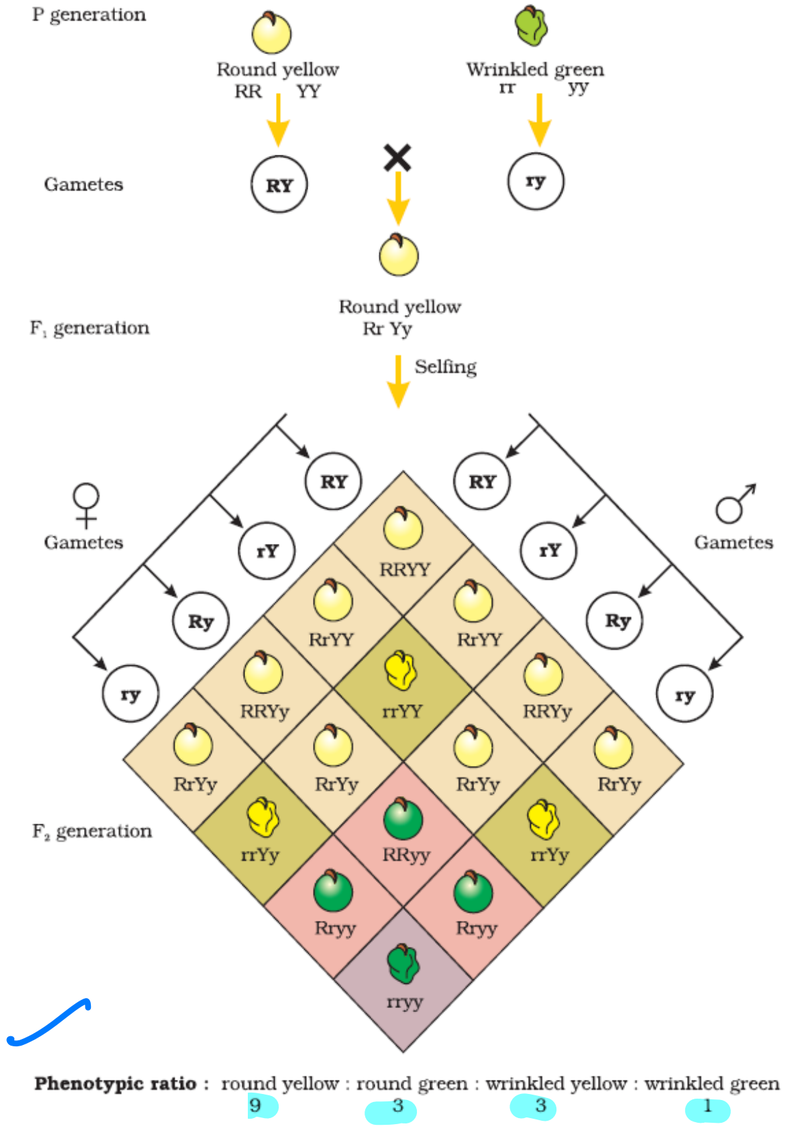


**Phenotypic ratio :** round yellow : round green : wrinkled yellow : wrinkled green
9 3 3 1

**Figure 5.7** Results of a dihybrid cross where the two parents differed in two pairs of contrasting traits: seed colour and seed shape

Genotypic ratio:

1:2:1:2:4:2:1:2:1

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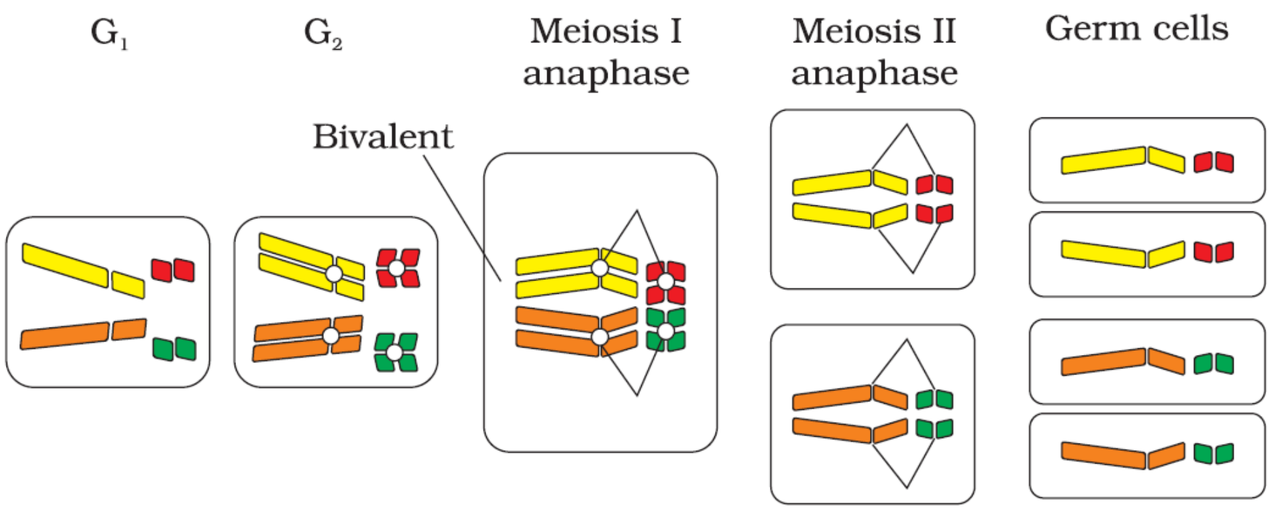




**Figure 5.8** Meiosis and germ cell formation in a cell with four chromosomes. Can you see how chromosomes segregate when germ cells are formed?

① Law of independent assortment

② Chromosomes segregation

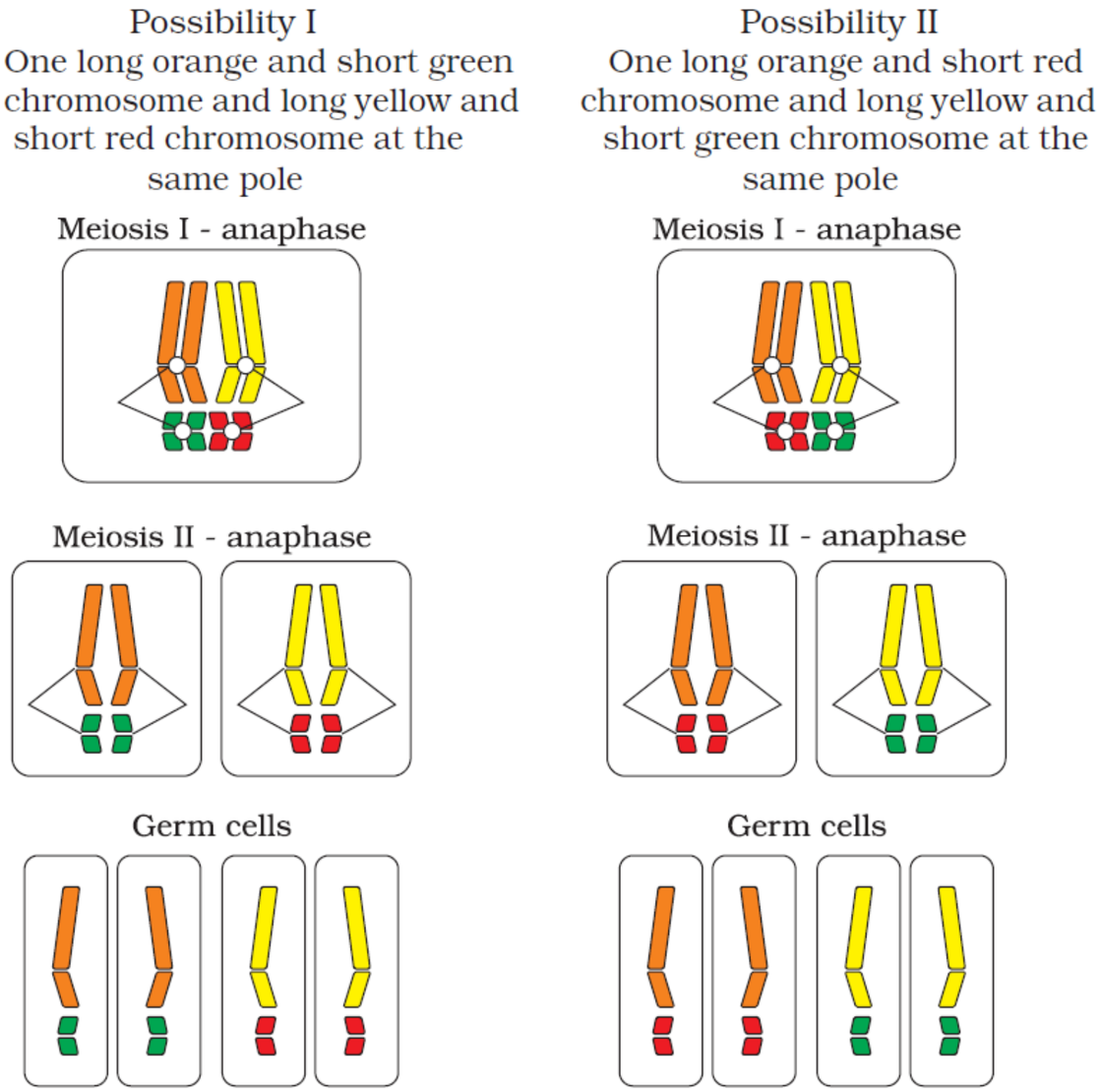
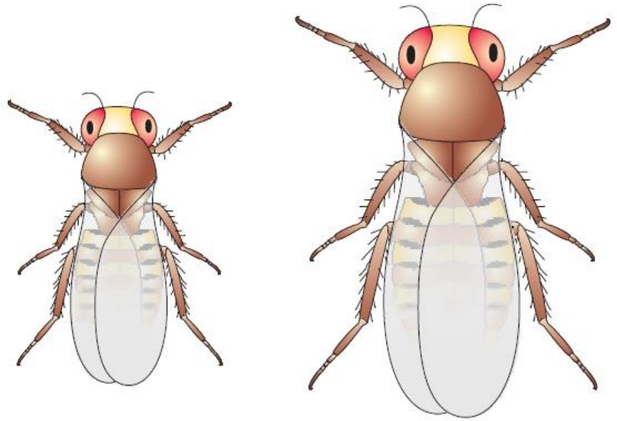



**Figure 5.9** Independent assortment of chromosomes



(a) (b)

**Figure 5.10** *Drosophila melanogaster* (a) Male (b) Female

Sexual dimorphism =

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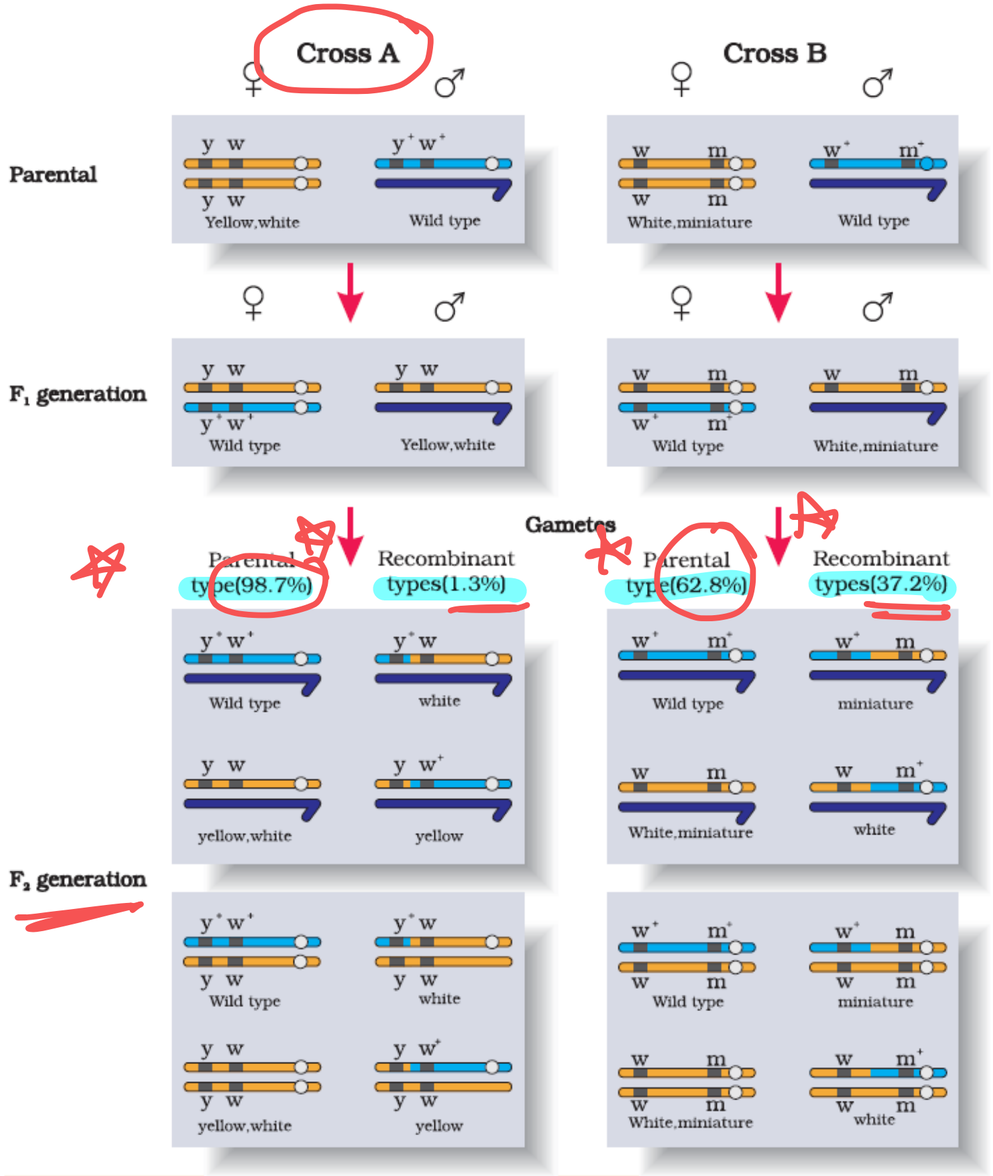


**Figure 5.11** Linkage: Results of two dihybrid crosses conducted by Morgan. Cross A shows crossing between gene y and w; Cross B shows crossing between genes w and m. Here dominant wild type alleles are represented with (+) sign in superscript
Note: The strength of linkage between y and w is higher than w and m.

% Recombination ∝ distance ↑

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Morgan

Cross A

① Body Colour
② Eye Colour
] Recomb ↓

Cross B

① Eye colour
② Wing size
] ∝ Recombinat ↑

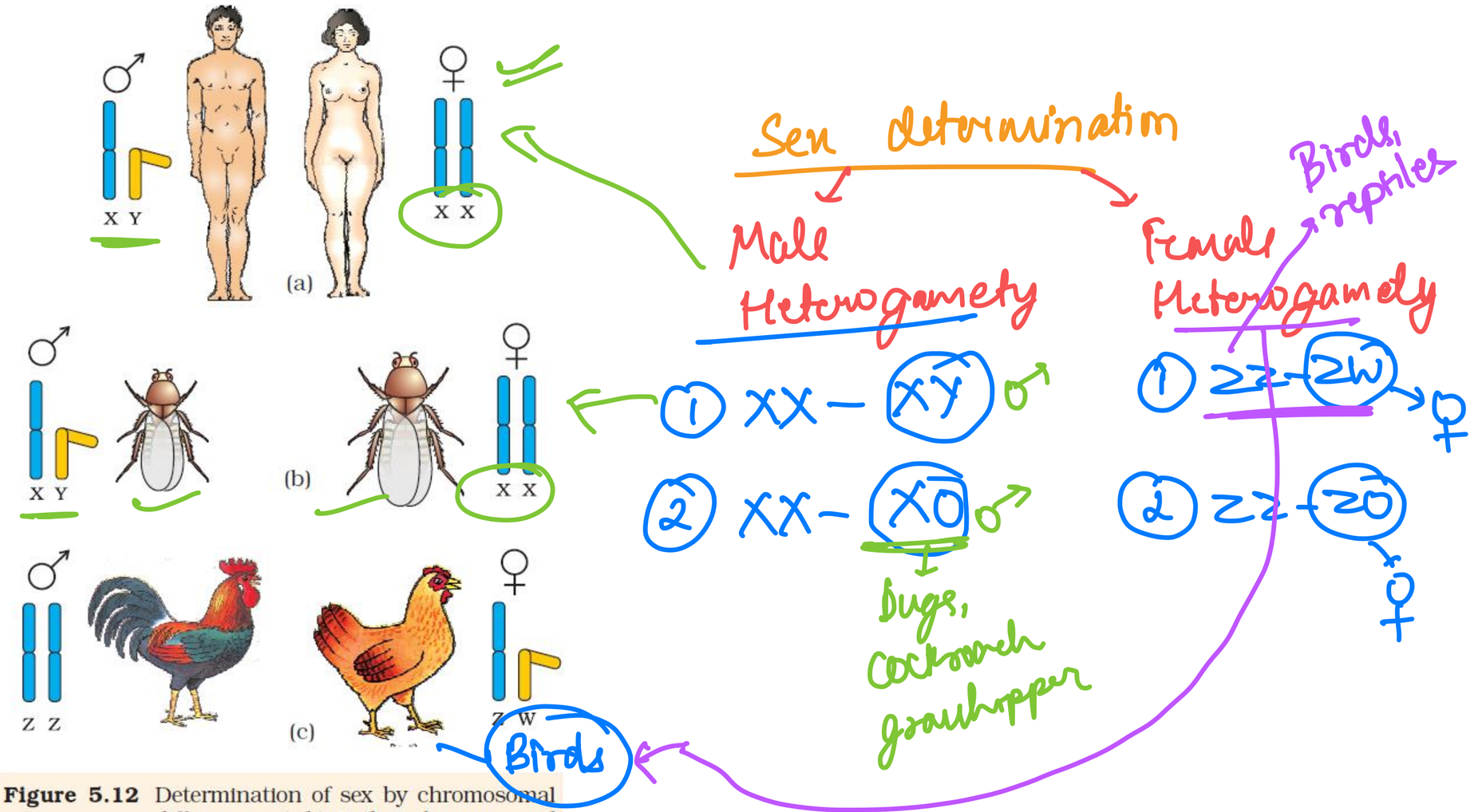


**Figure 5.12** Determination of sex by chromosomal differences: (a,b) Both in humans and in *Drosophila*, the female has a pair of XX chromosomes (homogametic) and the male XY (heterogametic) composition; (c) In many birds, female has a pair of dissimilar chromosomes ZW and male two similar ZZ chromosomes

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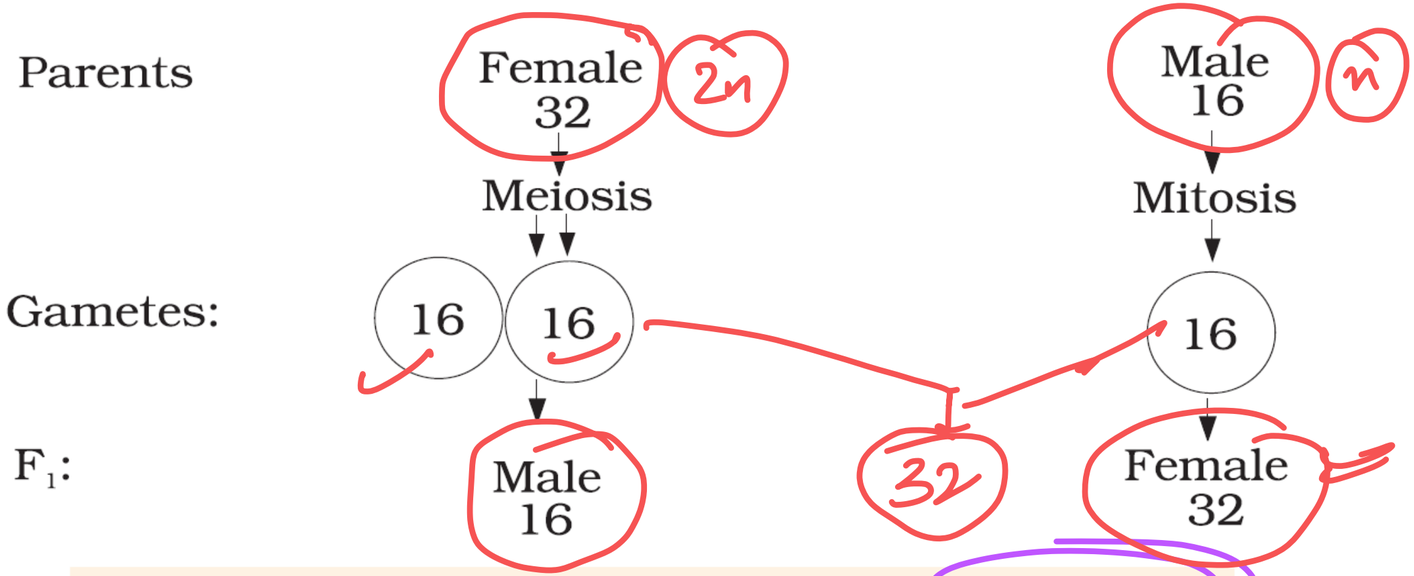


**Figure 5.13** Sex determination in honey bee

Haplo-diploidy

Haploid = male (drone)

diploid = Female
- Worker (sterile)
- Queen (fertile)

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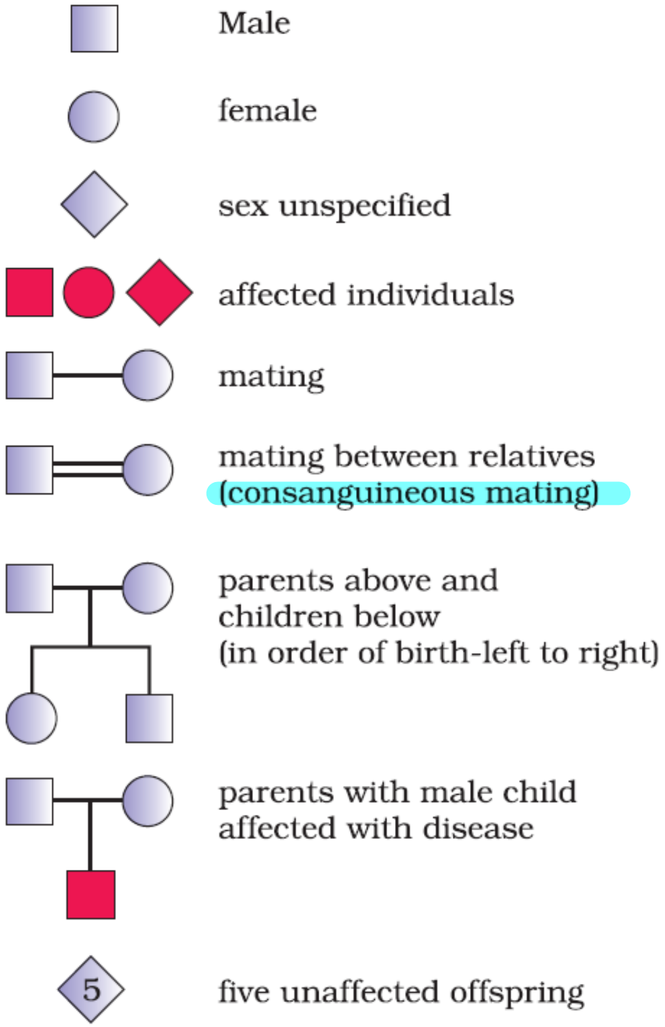
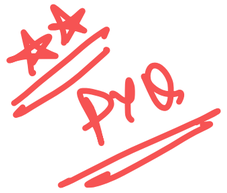
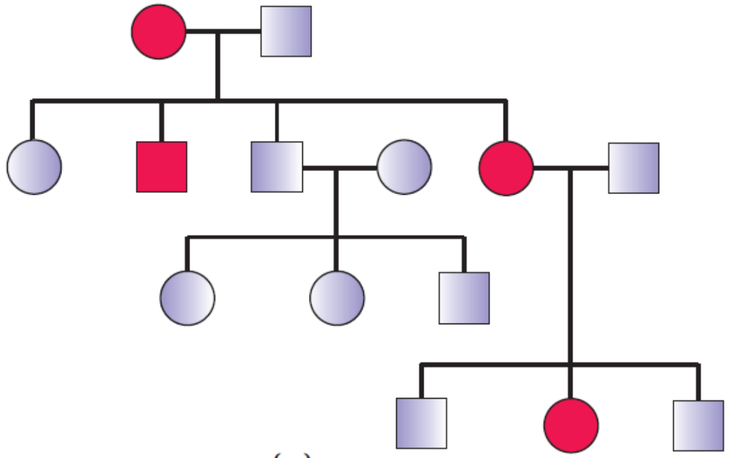
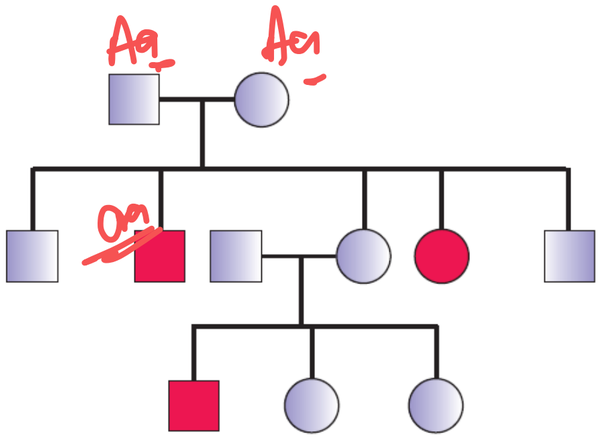



**Figure 5.13** Symbols used in the human pedigree analysis



(a)




(b)

**Figure 5.14** Representative pedigree analysis of (a) Autosomal dominant trait (for example: Myotonic dystrophy) (b) Autosomal recessive trait (for example: Sickle-cell anaemia)

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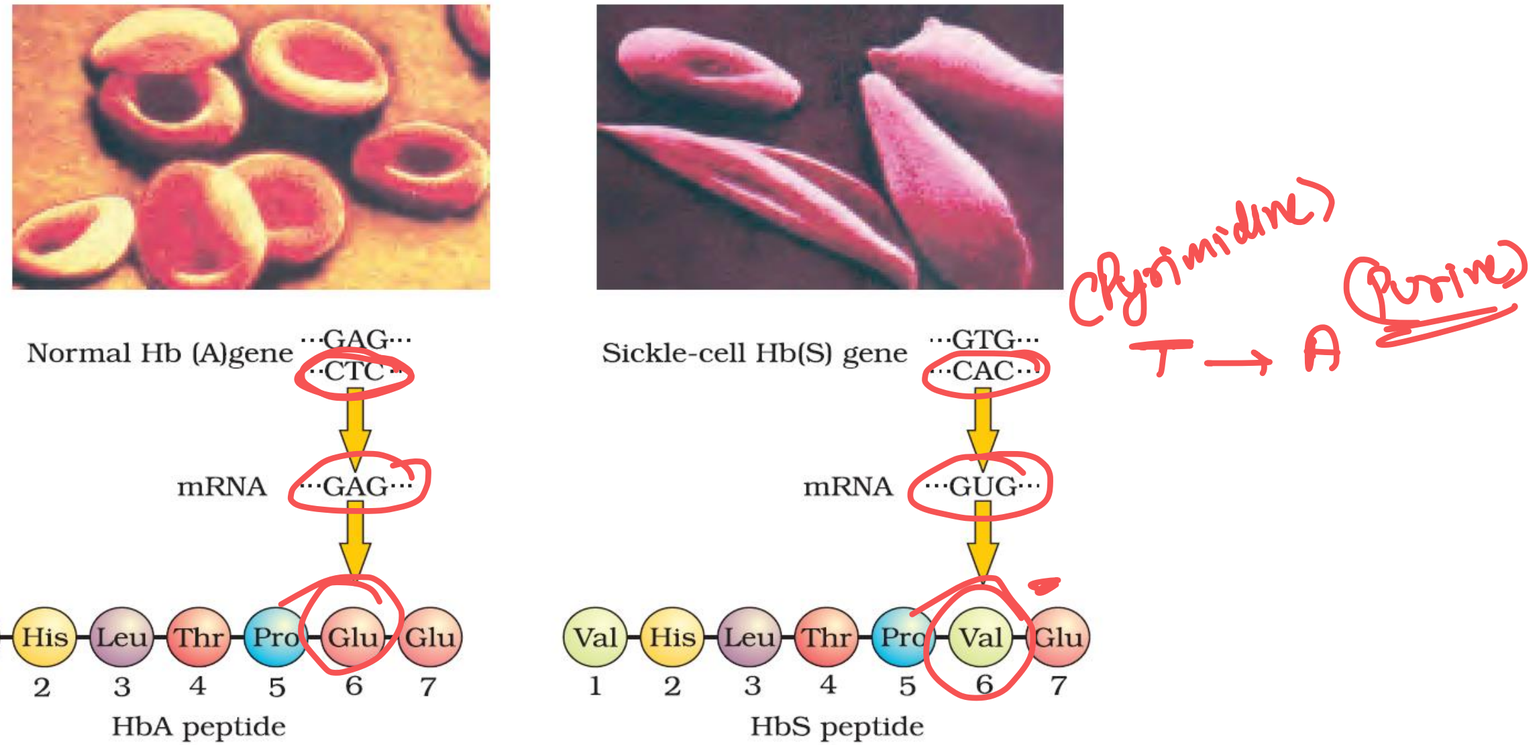



**Figure 5.15** Micrograph of the red blood cells and the amino acid composition of the relevant portion of $\beta$-chain of haemoglobin: (a) From a normal individual; (b) From an individual with sickle-cell anaemia

Sickle cell anemia

Point mutation

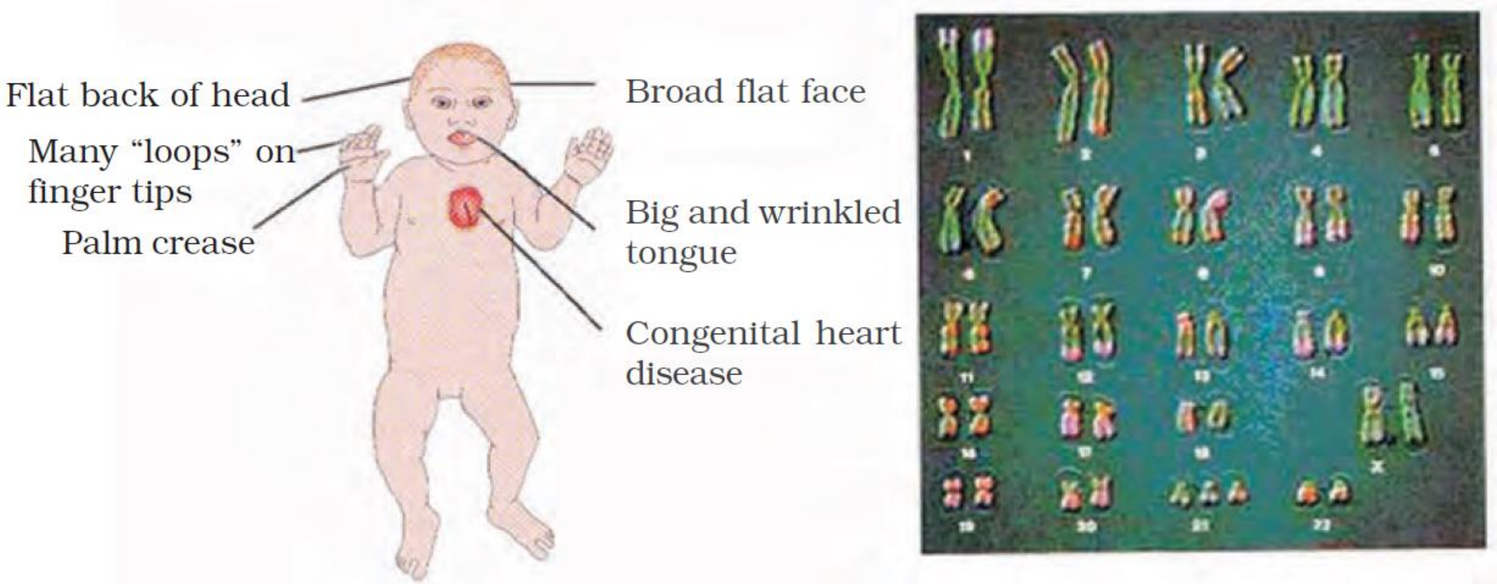
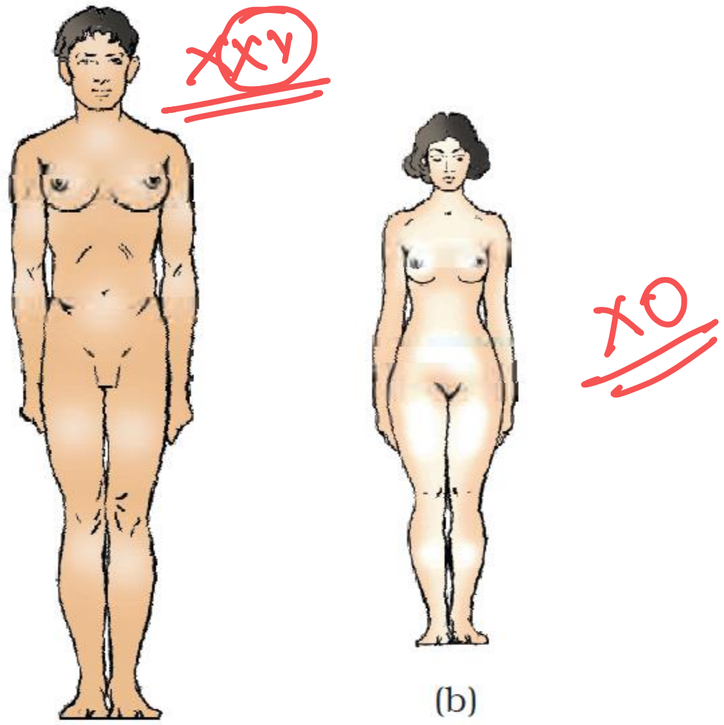



**Figure 5.16** *A representative figure showing an individual inflicted with Down's syndrome and the corresponding chromosomes of the individual*

down Syndrom = 21st Chromosome trisomy



(a)

Tall stature with feminised character

(b)

Short stature and underdeveloped feminine character

**Figure 5.17** Diagrammatic representation of genetic disorders due to sex chromosome composition in humans : (a) Klinefelter Syndrome; (b) Turner's Syndrome

# CHAPTER-6
# MOLECULAR BASIS OF INHERITANCE

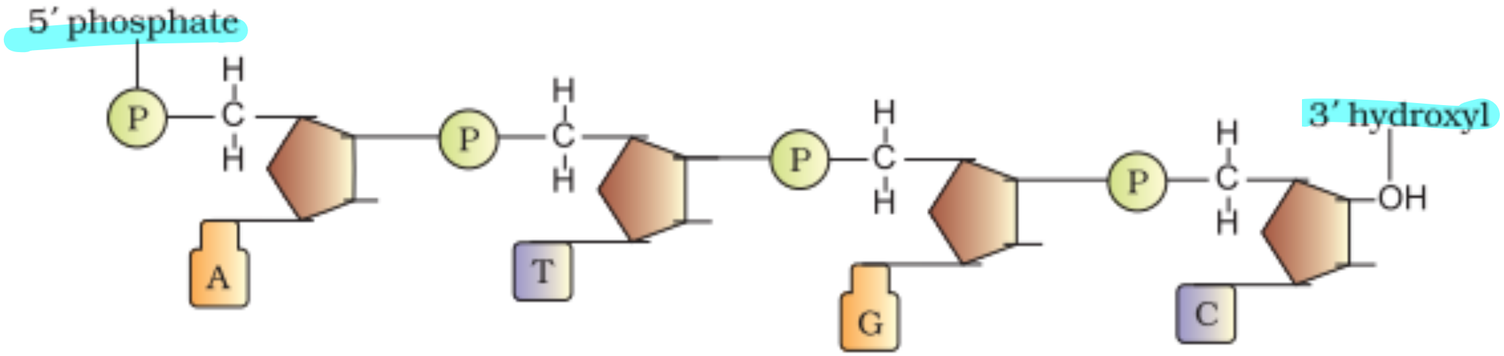



**Figure 6.1** A Polynucleotide chain

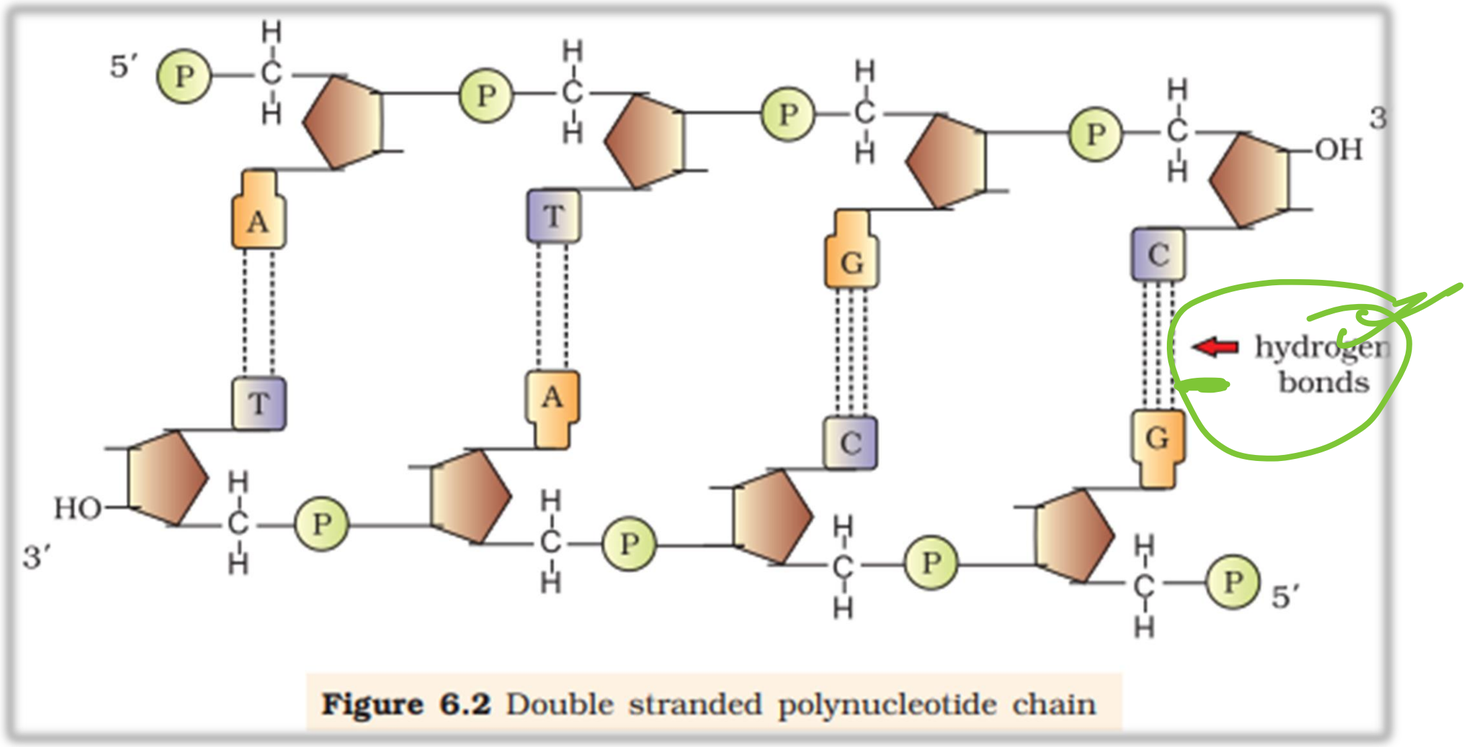



**Figure 6.2** Double stranded polynucleotide chain

A = T

G ≡ C

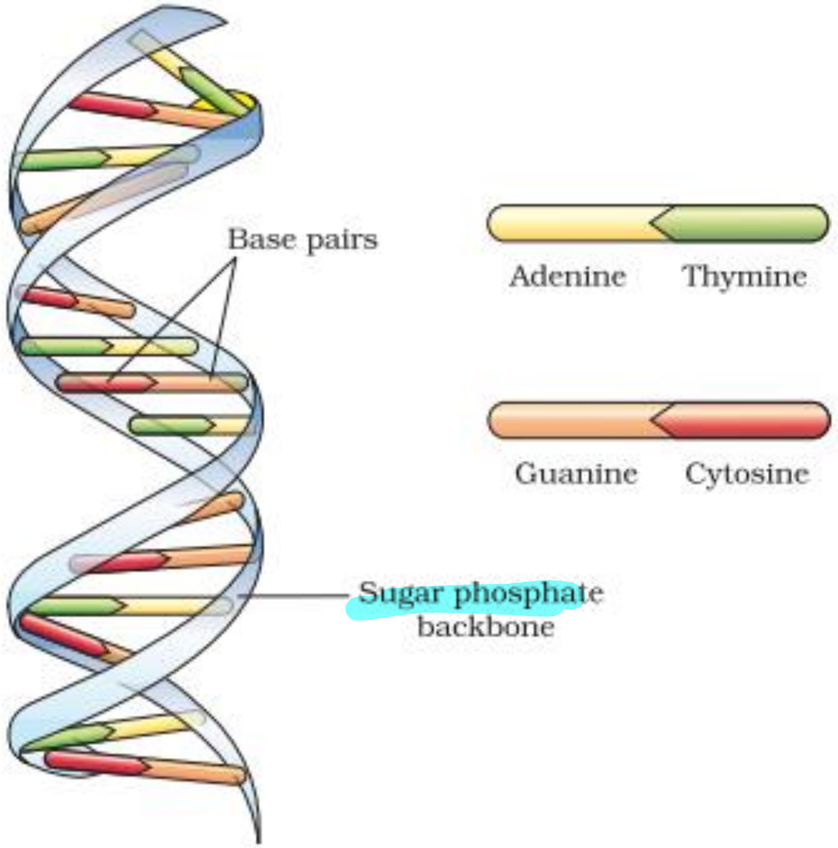



**Figure 6.3** DNA double helix

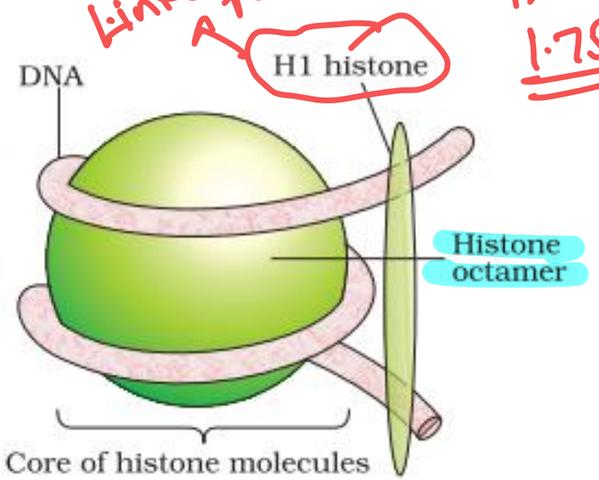



**Figure 6.4a** Nucleosome

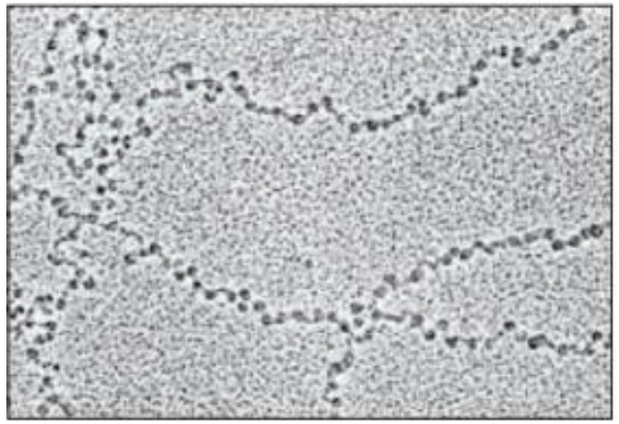


**Figure 6.4b** EM picture - 'Beads-on-String'

Linker histone

1.75

200

8

$H_2A \times 2$

$H_2B \times 2$

$H_3 \times 2$

$H_4 \times 2$

Basic amino acid

① lysine arginine

nucleosome

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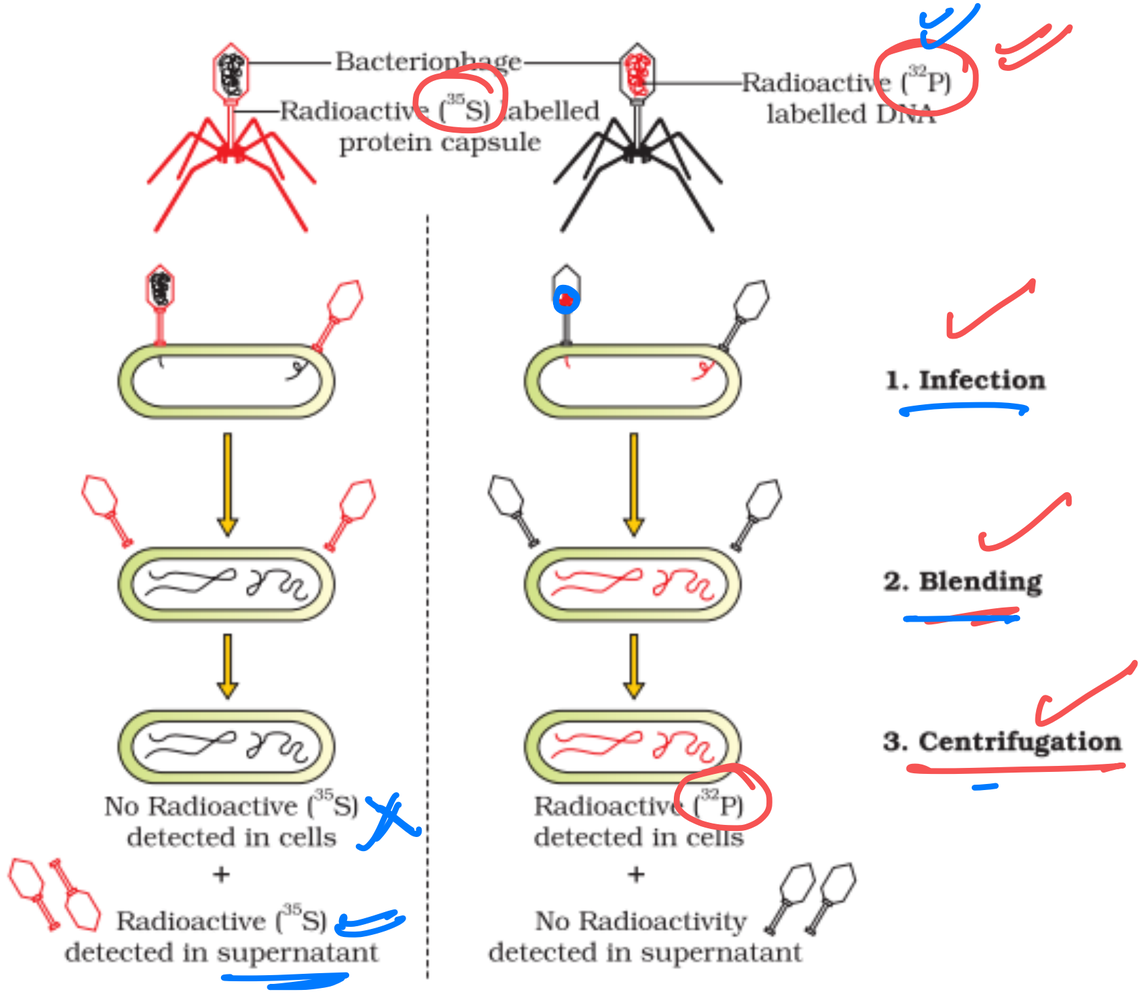


**Figure 6.5** The Hershey-Chase experiment

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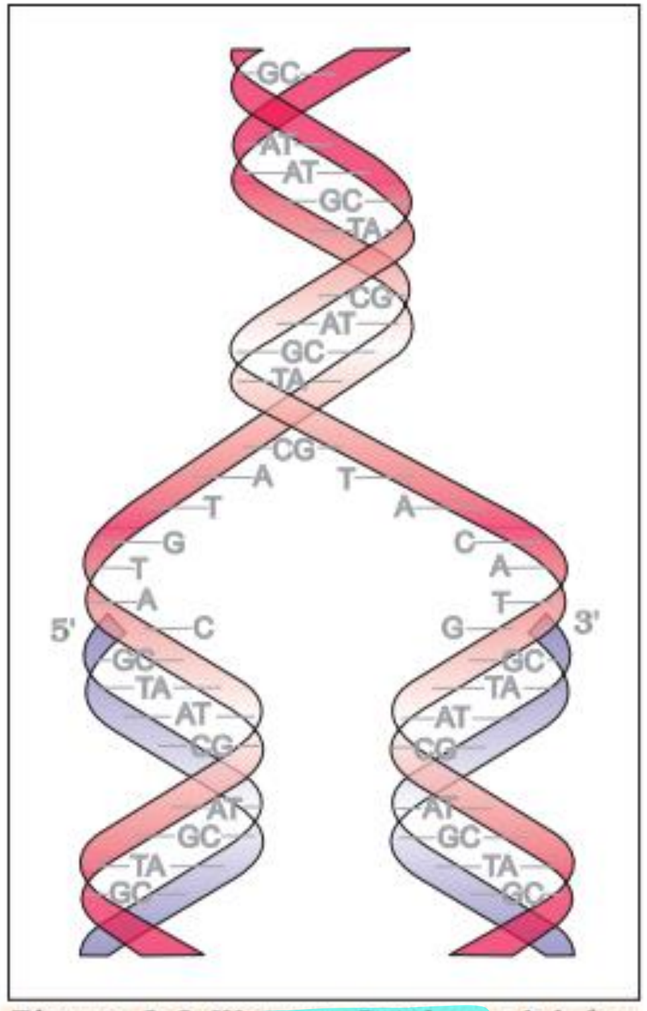


**Figure 6.6** Watson-Crick model for semiconservative DNA replication

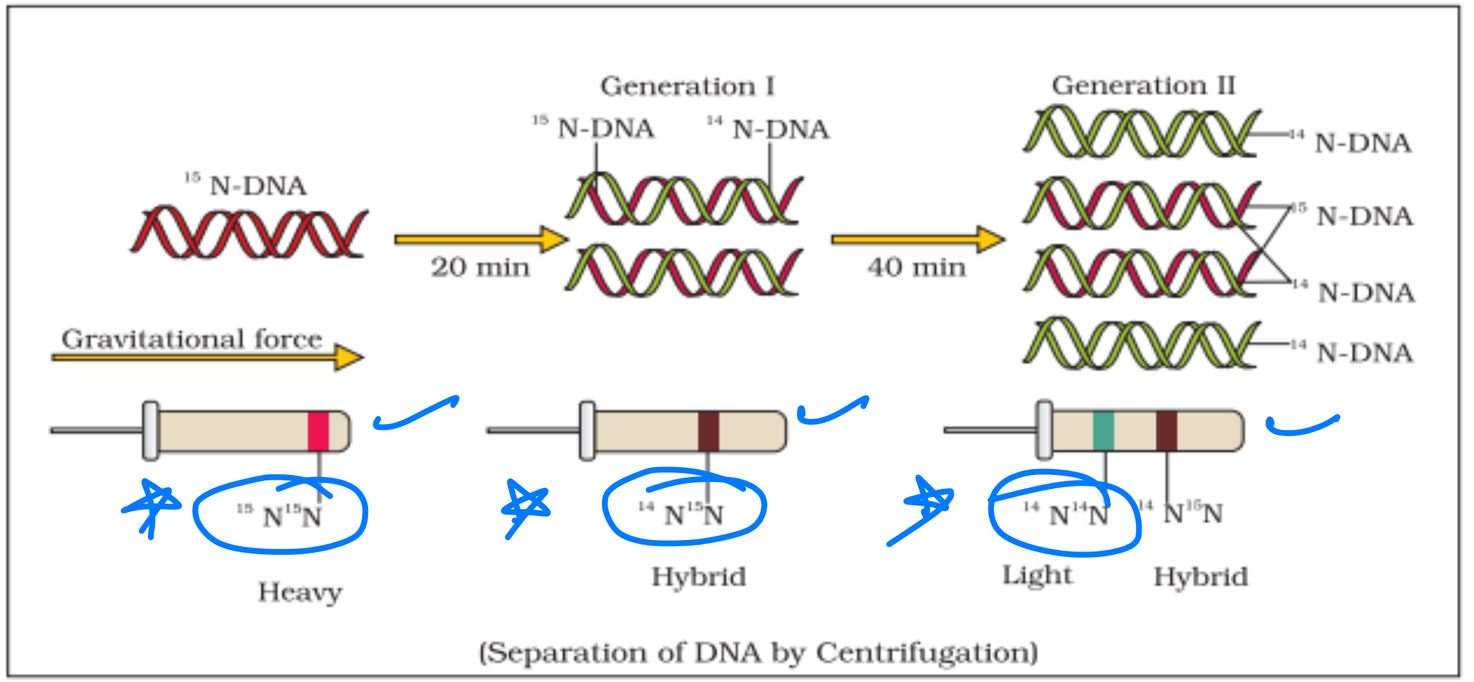


**Figure 6.7** Meselson and Stahl's Experiment

Heavy Isotope of $^{15}N$

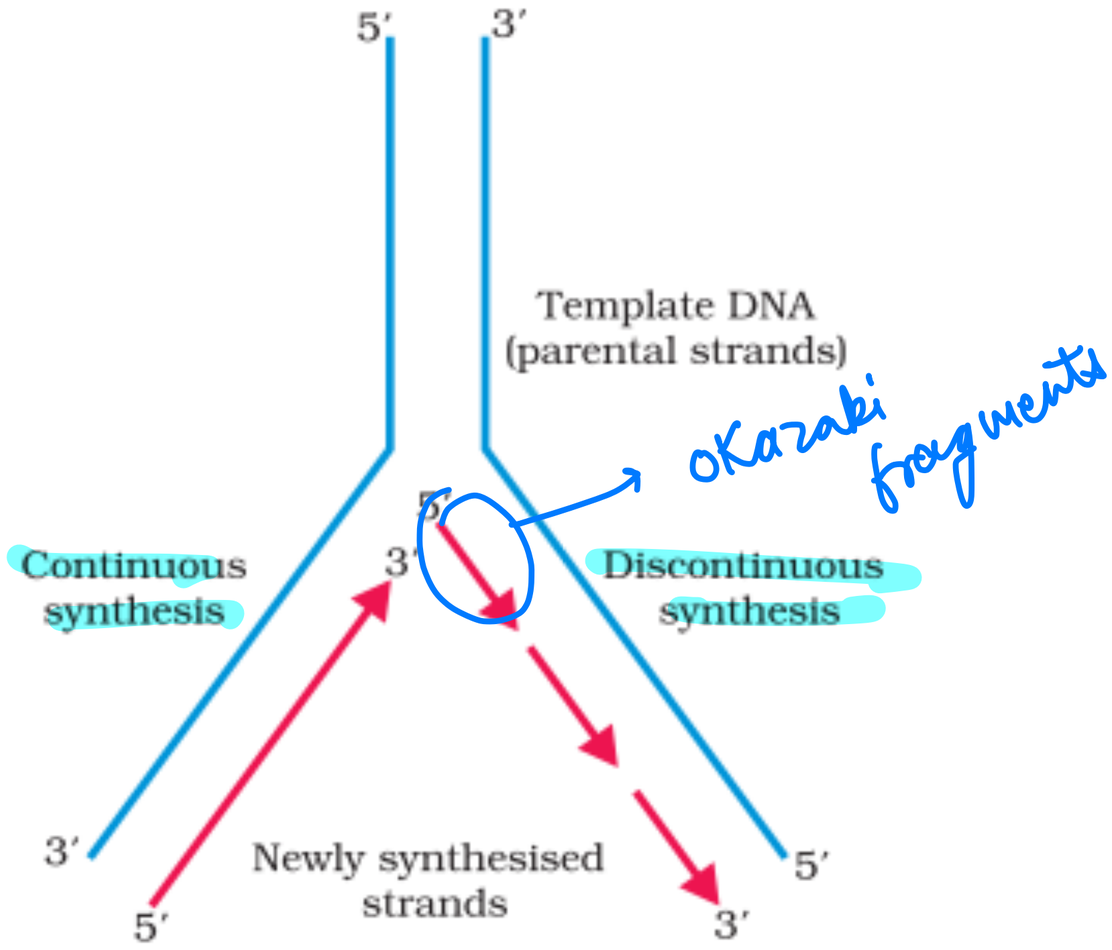


**Figure 6.8** Replicating Fork

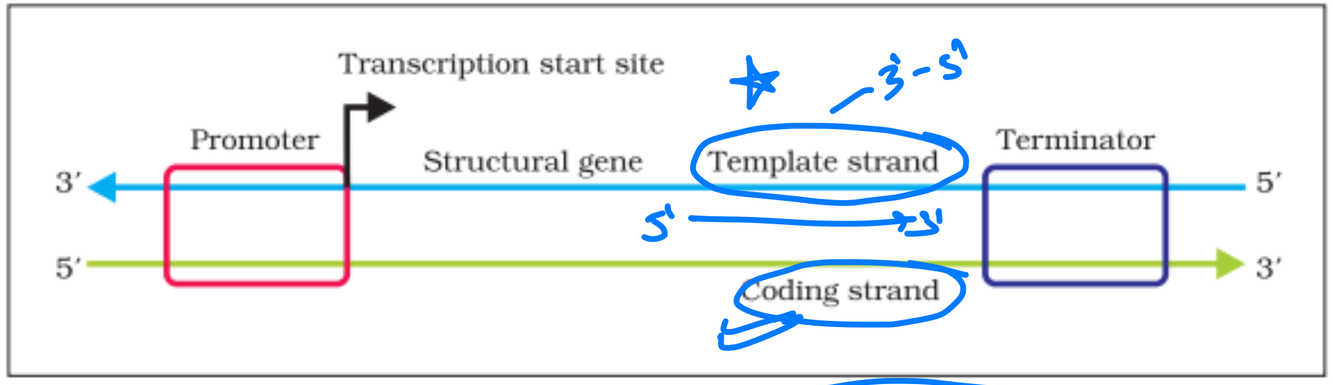


**Figure 6.9** Schematic structure of a transcription unit

① Promoter

② Structural

③ Terminator

5' → 3'

Read : template strand

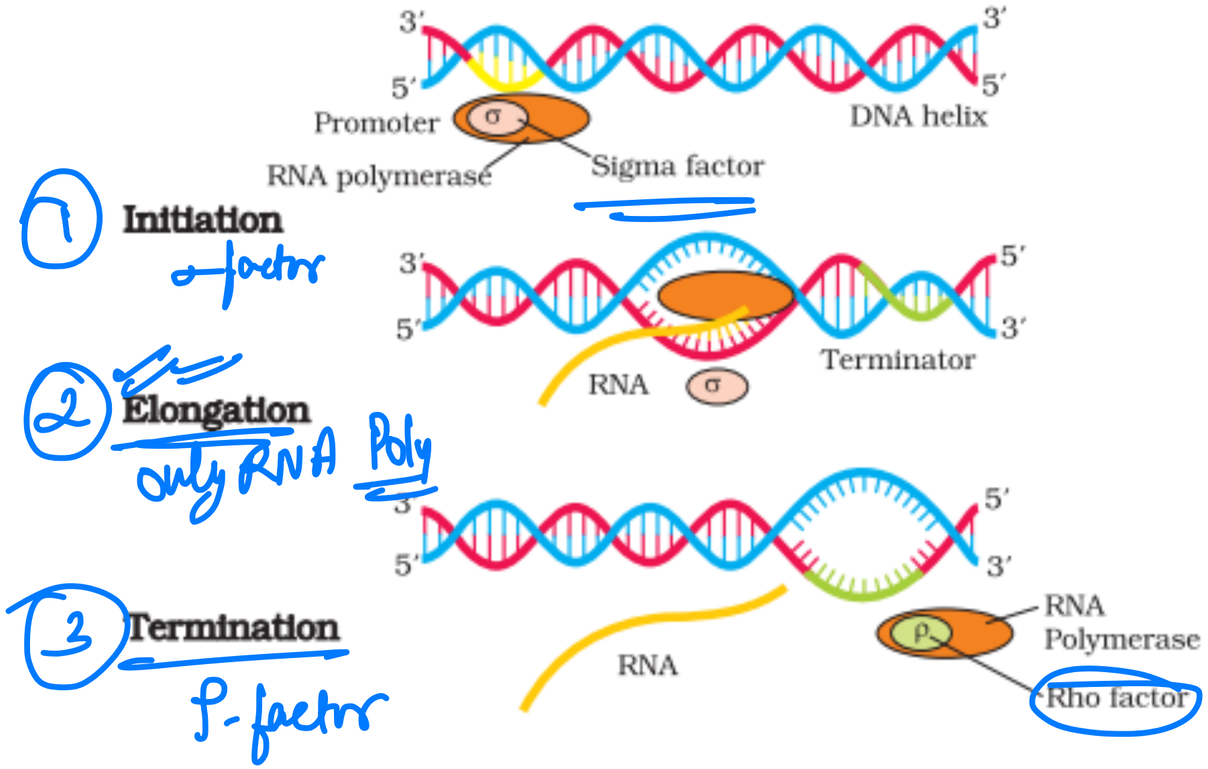


**Figure 6.10** Process of Transcription in Bacteria

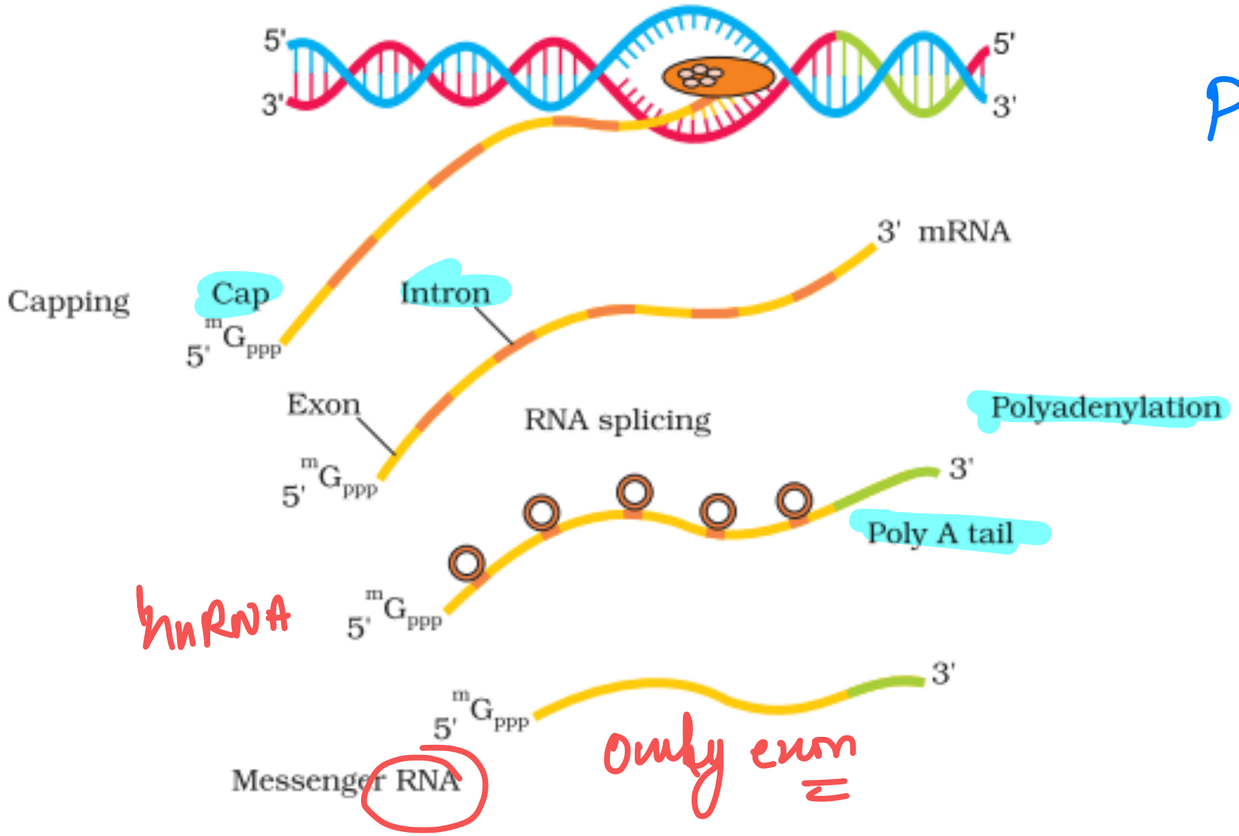


**Figure 6.11** Process of Transcription in Eukaryotes

Post transcriptim modificatim

① 5' end (7-methyl guanosine) Cap

② 3' end 'Poly A' tail

③ Splicing

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## Table 6.1: The Codons for the Various Amino Acids

| First position | Second position U | Second position C | Second position A | Second position G | Third position |
|---|---|---|---|---|---|
| U | UUU Phe | UCU Ser | UAU Tyr | UGU Cys | U |
| | UUC Phe | UCC Ser | UAC Tyr | UGC Cys | C |
| | UUA Leu | UCA Ser | UAA Stop | UGA Stop | A |
| | UUG Leu | UCG Ser | UAG Stop | UGG Trp | G |
| C | CUU Leu | CCU Pro | CAU His | CGU Arg | U |
| | CUC Leu | CCC Pro | CAC His | CGC Arg | C |
| | CUA Leu | CCA Pro | CAA Gln | CGA Arg | A |
| | CUG Leu | CCG Pro | CAG Gln | CGG Arg | G |
| A | AUU Ile | ACU Thr | AAU Asn | AGU Ser | U |
| | AUC Ile | ACC Thr | AAC Asn | AGC Ser | C |
| | AUA Ile | ACA Thr | AAA Lys | AGA Arg | A |
| | AUG Met | ACG Thr | AAG Lys | AGG Arg | G |
| G | GUU Val | GCU Ala | GAU Asp | GGU Gly | U |
| | GUC Val | GCC Ala | GAC Asp | GGC Gly | C |
| | GUA Val | GCA Ala | GAA Glu | GGA Gly | A |
| | GUG Val | GCG Ala | GAG Glu | GGG Gly | G |

Codon

=

3 nucleotide

1

George Gamow

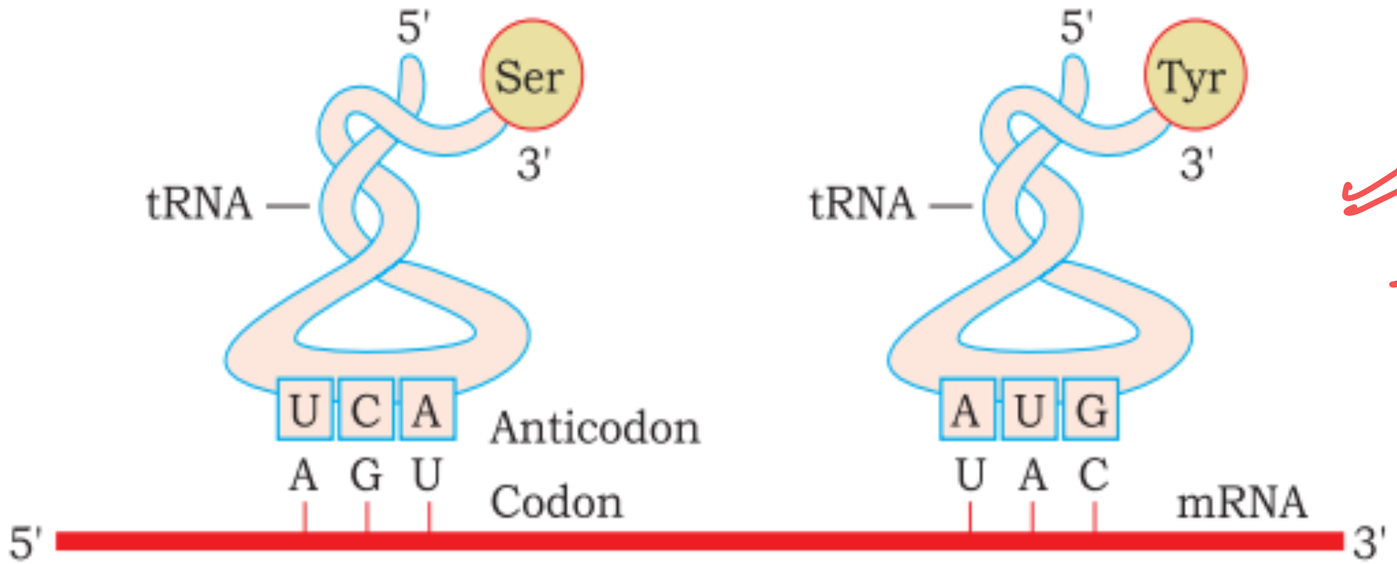


**Figure 6.12** tRNA - the adapter molecule

new tRNA → A-site entry

P-site (peptide bond)

E-site → exit

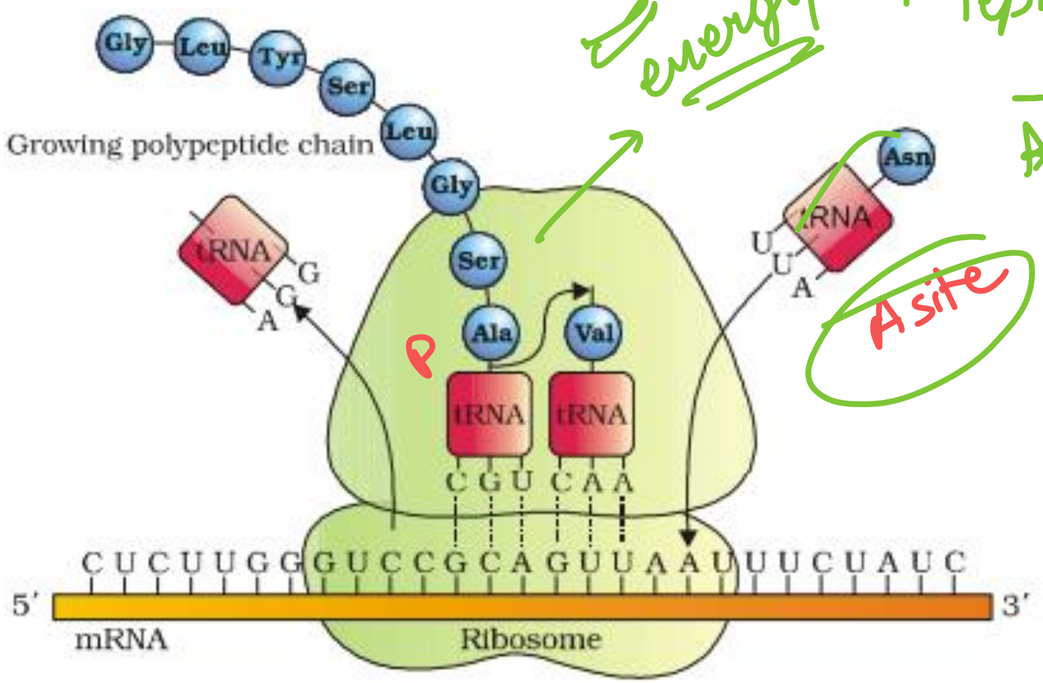


**Figure 6.13** Translation

energy → Peptidyl transferase (Ribozyme)

A site

Ribosome (23-S rRNA)

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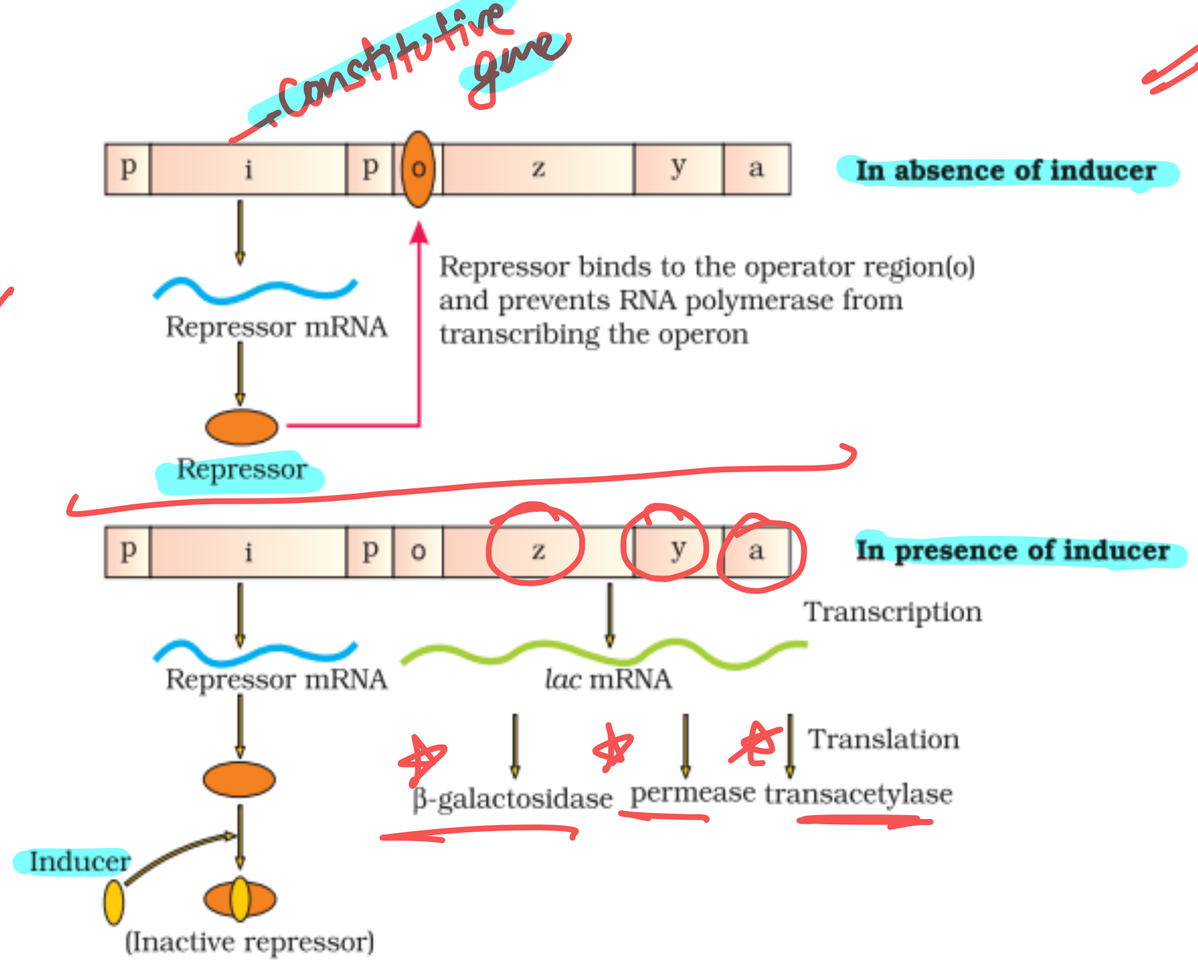


**Figure 6.14** The *lac* Operon

Jacob & Monad

-ve regulation

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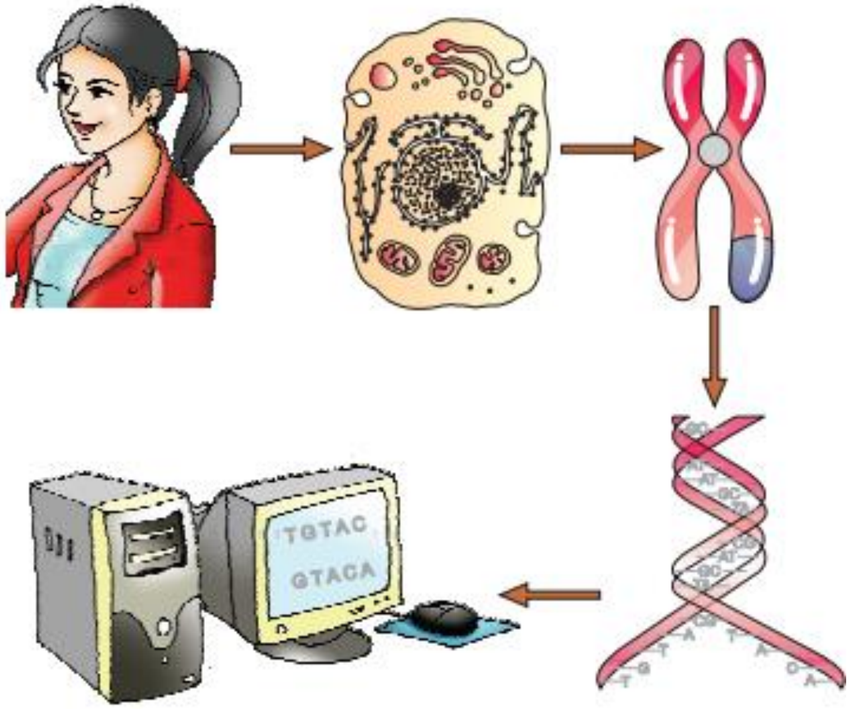


**Figure 6.15** A representative diagram of human genome project

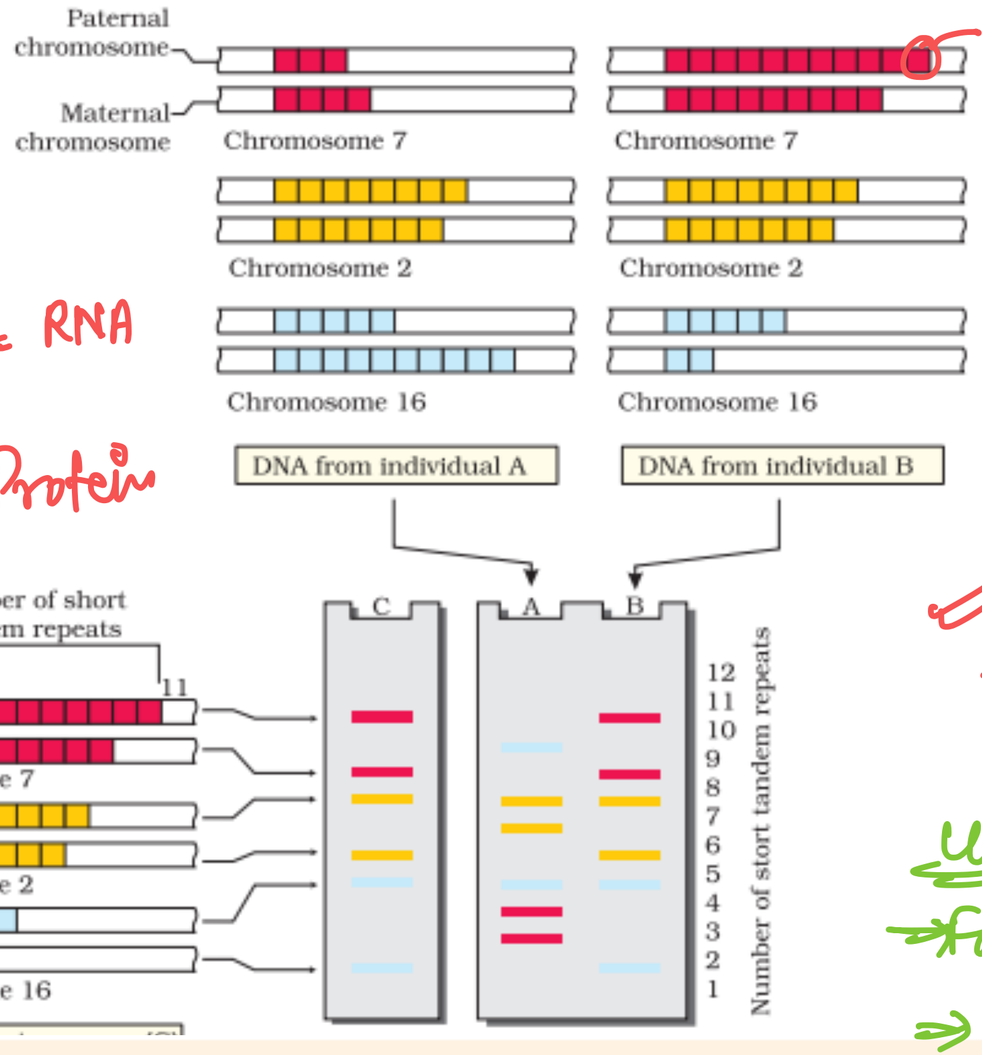


**Figure 6.16** Schematic representation of DNA fingerprinting: Few representative chromosomes have been shown to contain different copy number of VNTR. For the sake of understanding different colour schemes have been used to trace the origin of each band in the gel. The two alleles (paternal and maternal) of a chromosome also contain different copy numbers of VNTR. It is clear that the banding pattern of DNA from crime scene matches with individual B, and not with A.

repeat

C is the son/daughter of B

Northern Blot = RNA

Western Blot = Protein

gel electrophoresis

Southern blotting (DNA)

Use
→ forensic / crime scene
→ Paternal test

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# CHAPTER-7
# EVOLUTION

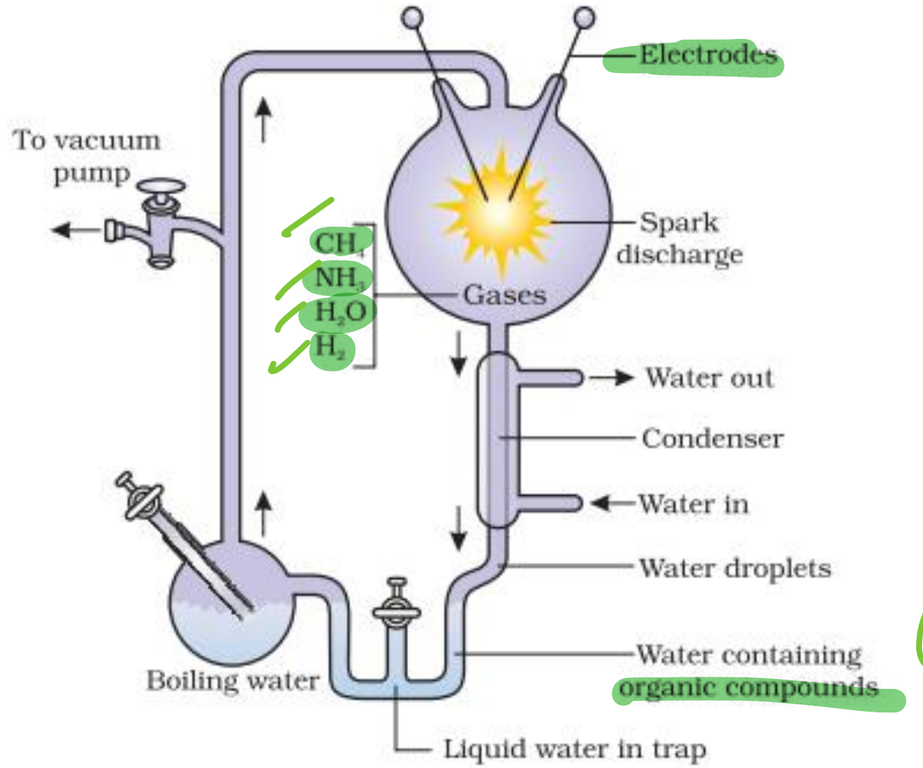


**Figure 7.1** Diagrammatic representation of Miller's experiment

AAs (amino acids)

, very theory of chemical evolution

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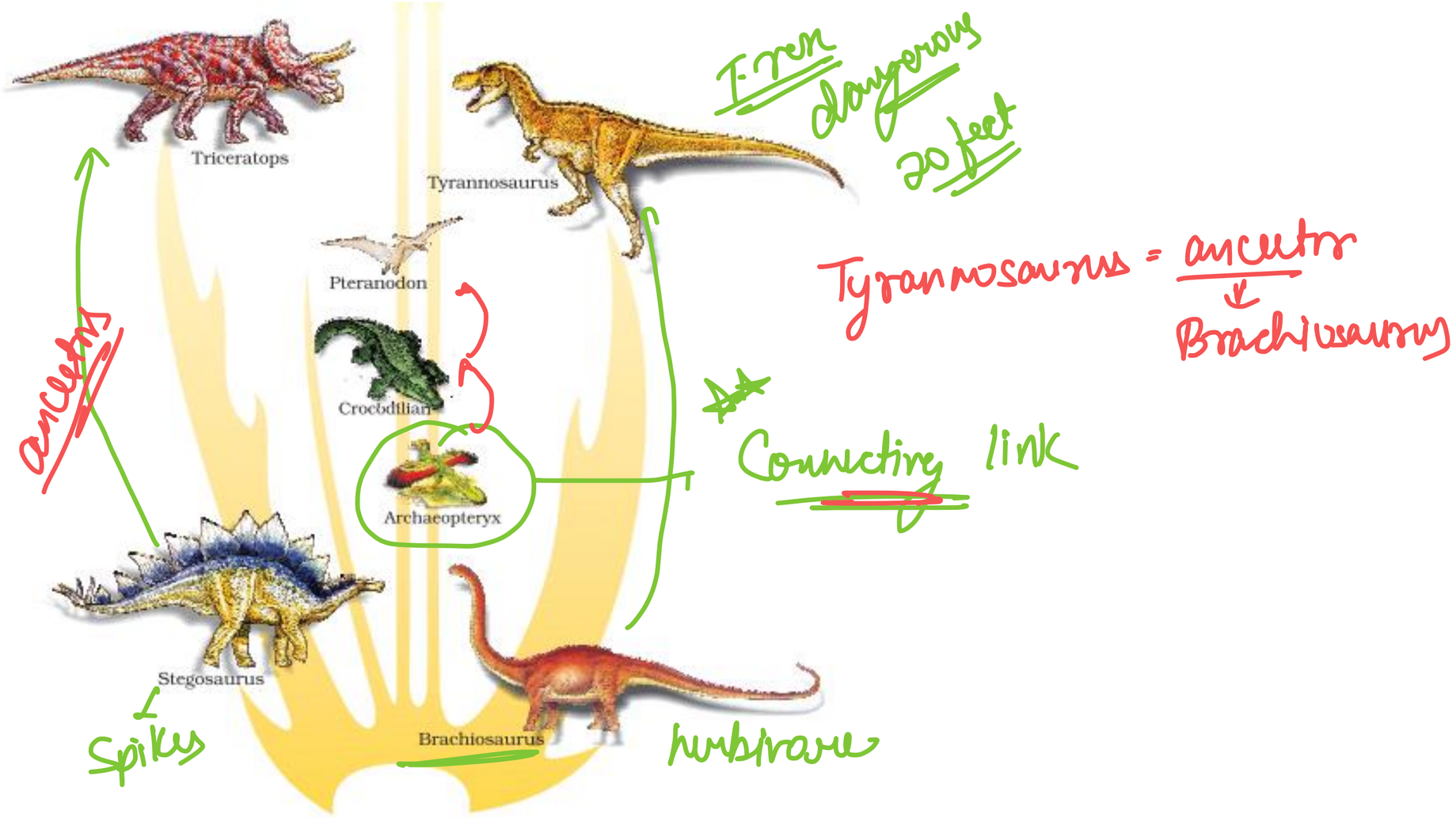
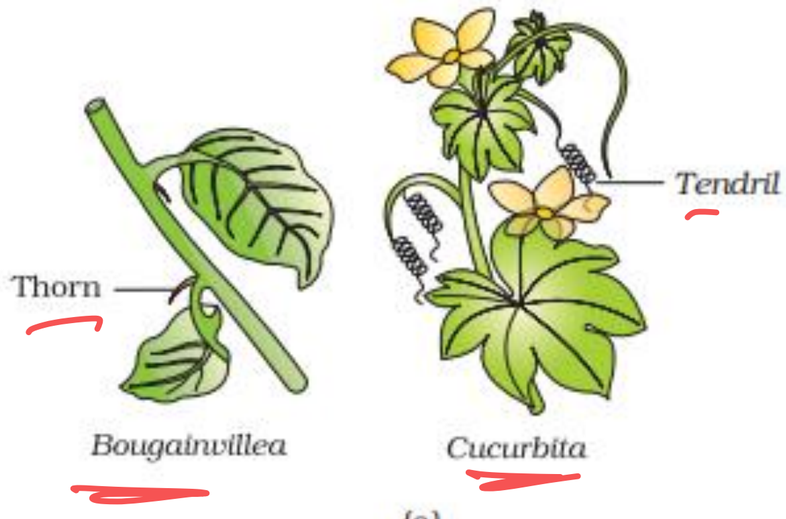



**Figure 7.2** A family tree of dinosaurs and their living modern day counterpart organisms like crocodiles and birds



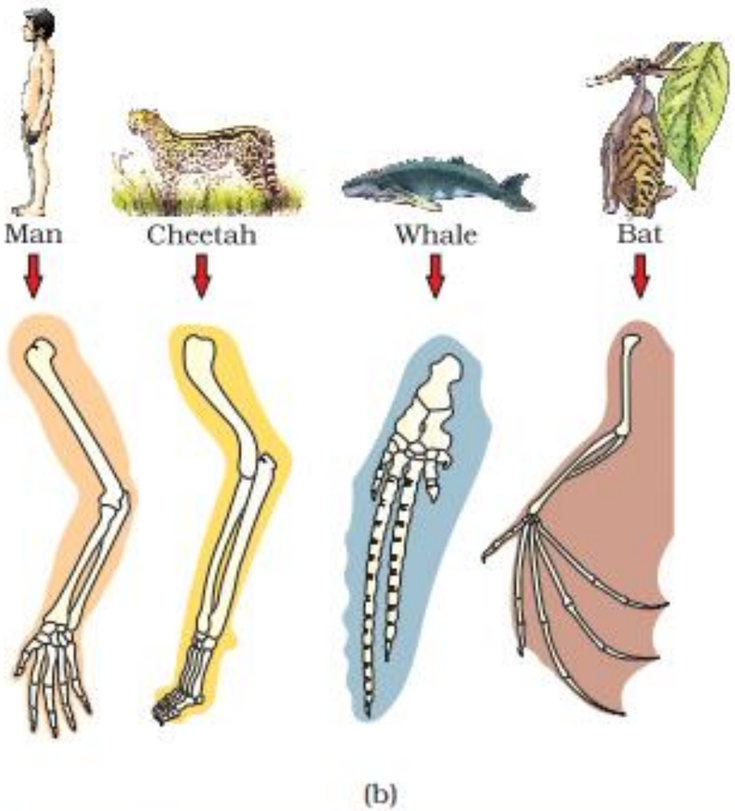




**Figure 7.3** Example of homologous organs in (a) Plants and (b) Animals

Homologous
(Origin same)
function different)

axillary
bud
modification

Homologous organ
are result of
divergent evolution

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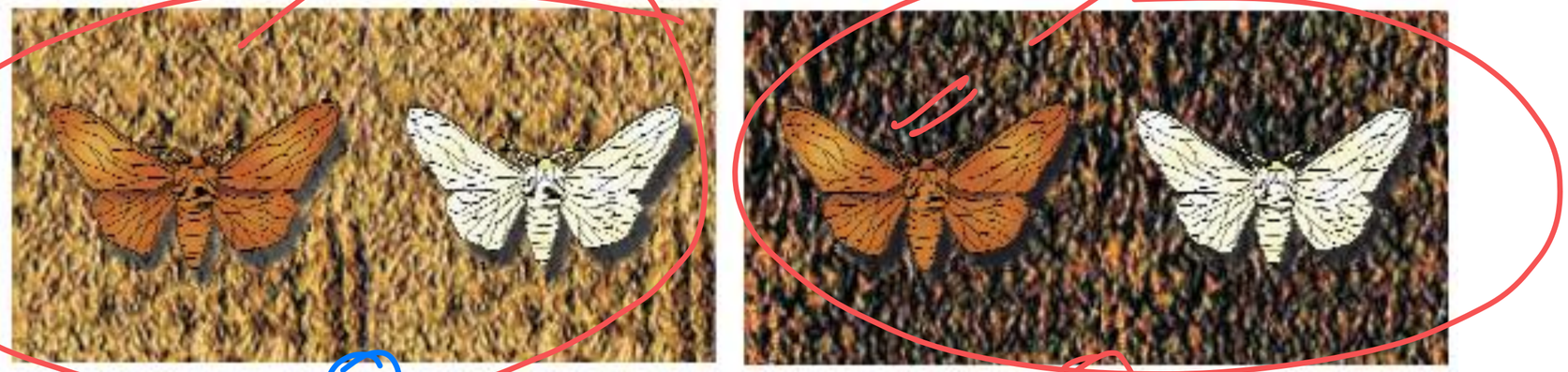
tree trunk white

Lichens

white (before)

tree trunk ∠ dark

dark (after)



(a) (b)

**Figure 7.4** Figure showing white - winged moth and dark - winged moth (melanised) on a tree trunk (a) In unpolluted area (b) In polluted area

Biston Betularia (moth)

Predator ∠ attack ∠ dark winged

Predator attack ⇒ white winged

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**Figure 7.5** Variety of beaks of finches that Darwin found in Galapagos Island

- Adaptive radiation
  - Darwin
  - Galapagos island
  - Beak
    - Seed eating → finches
    - → leaves

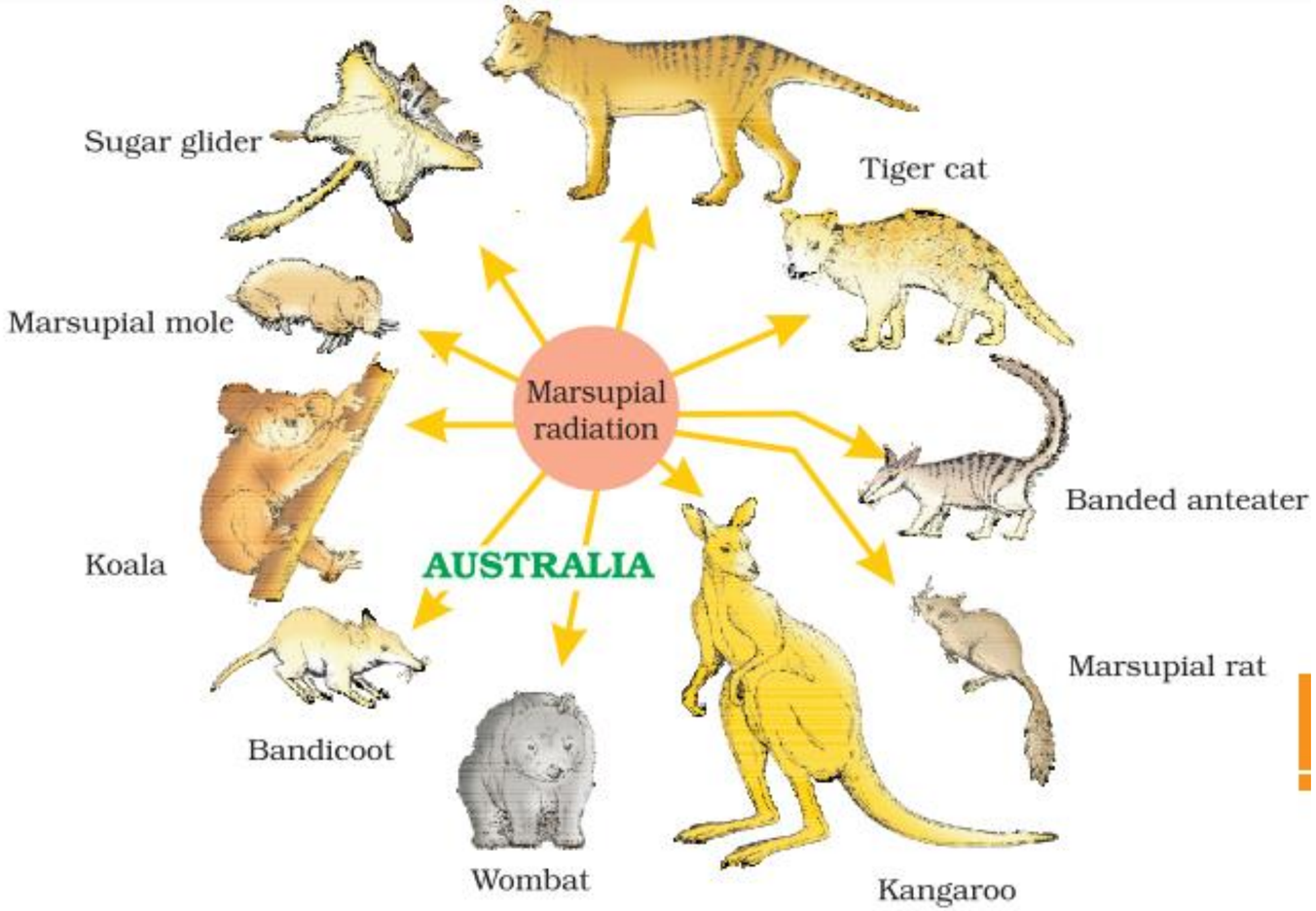


**Figure 7.6** Adaptive radiation of marsupials of Australia

Adaptive radiation

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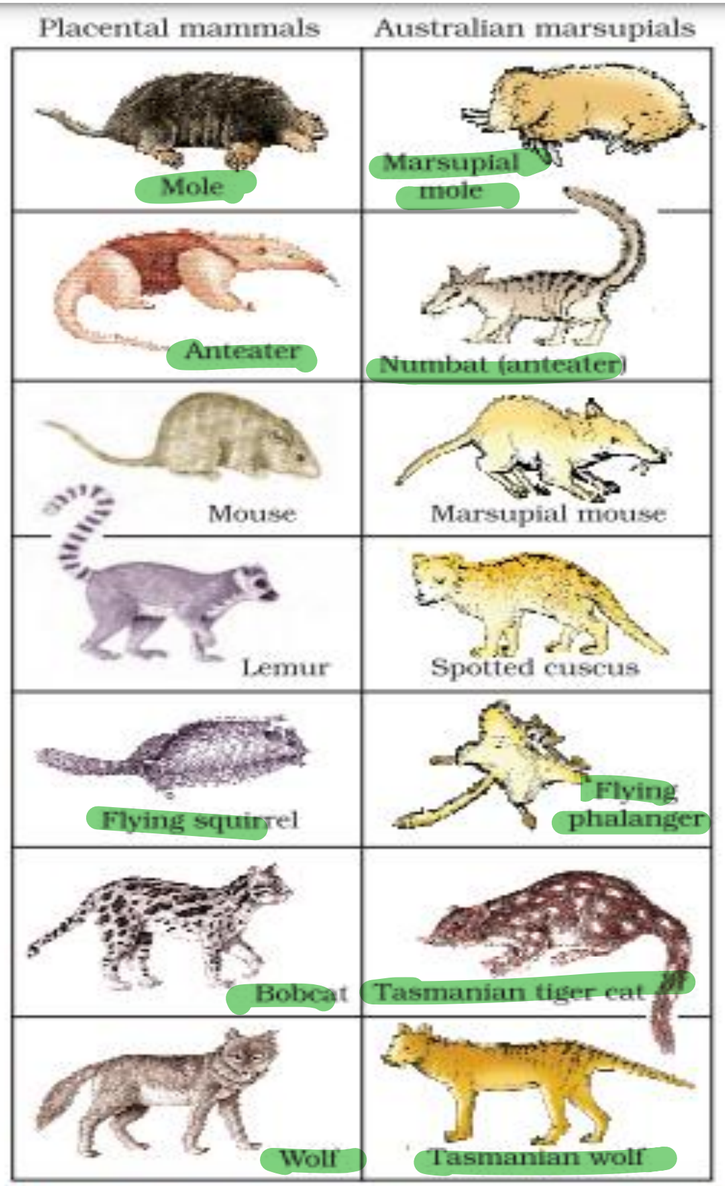


**Figure 7.7** Picture showing convergent evolution of Australian Marsupials and placental mammals

Convergent evolution

**

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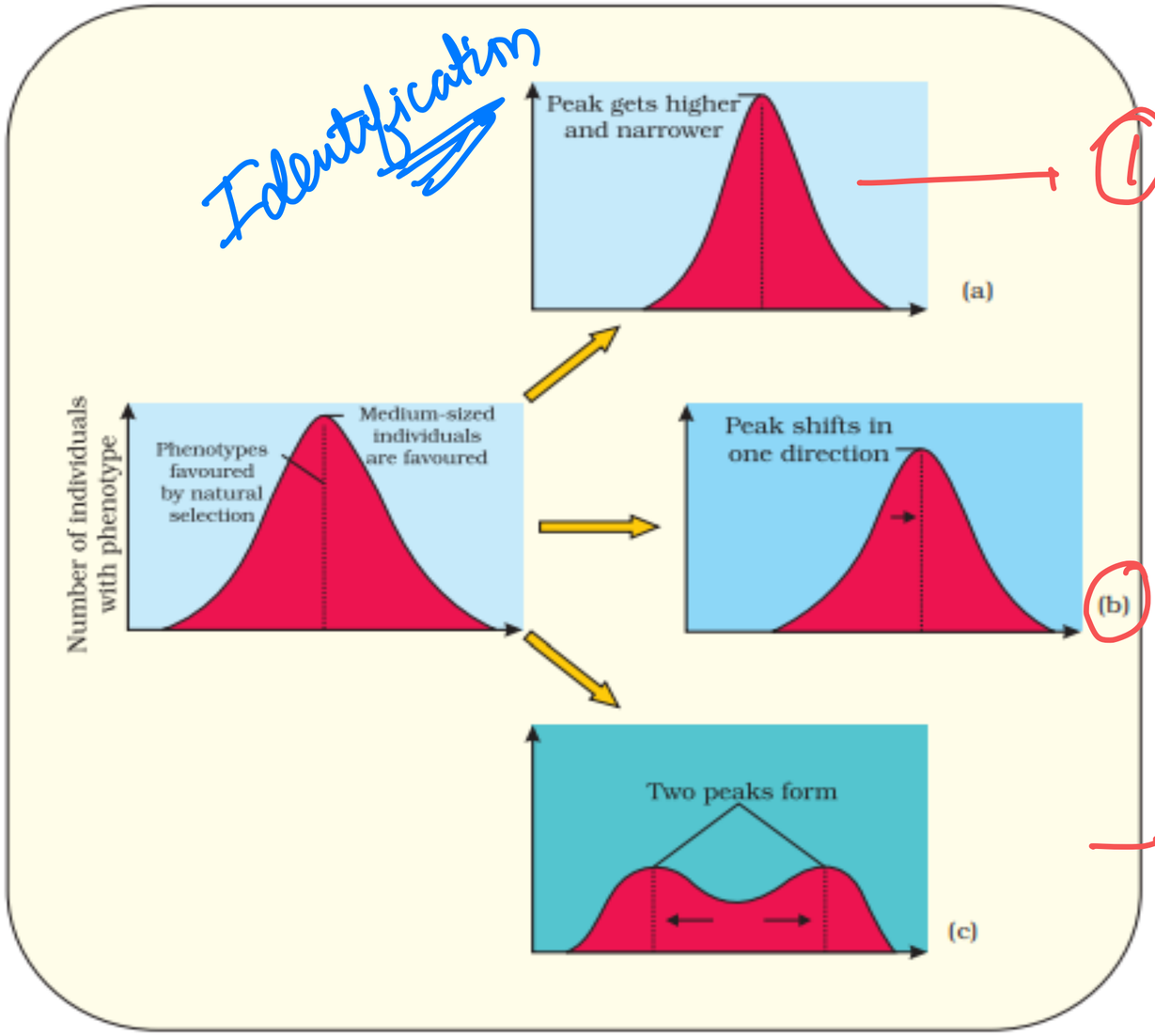


Identification

① Mean character peak

- Peak (extreme value) (either 1)

Peak - ②

extreme

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**Figure 7.8** Diagrammatic representation of the operation of natural selection on different traits : (a) Stabilising (b) Directional and (c) Disruptive

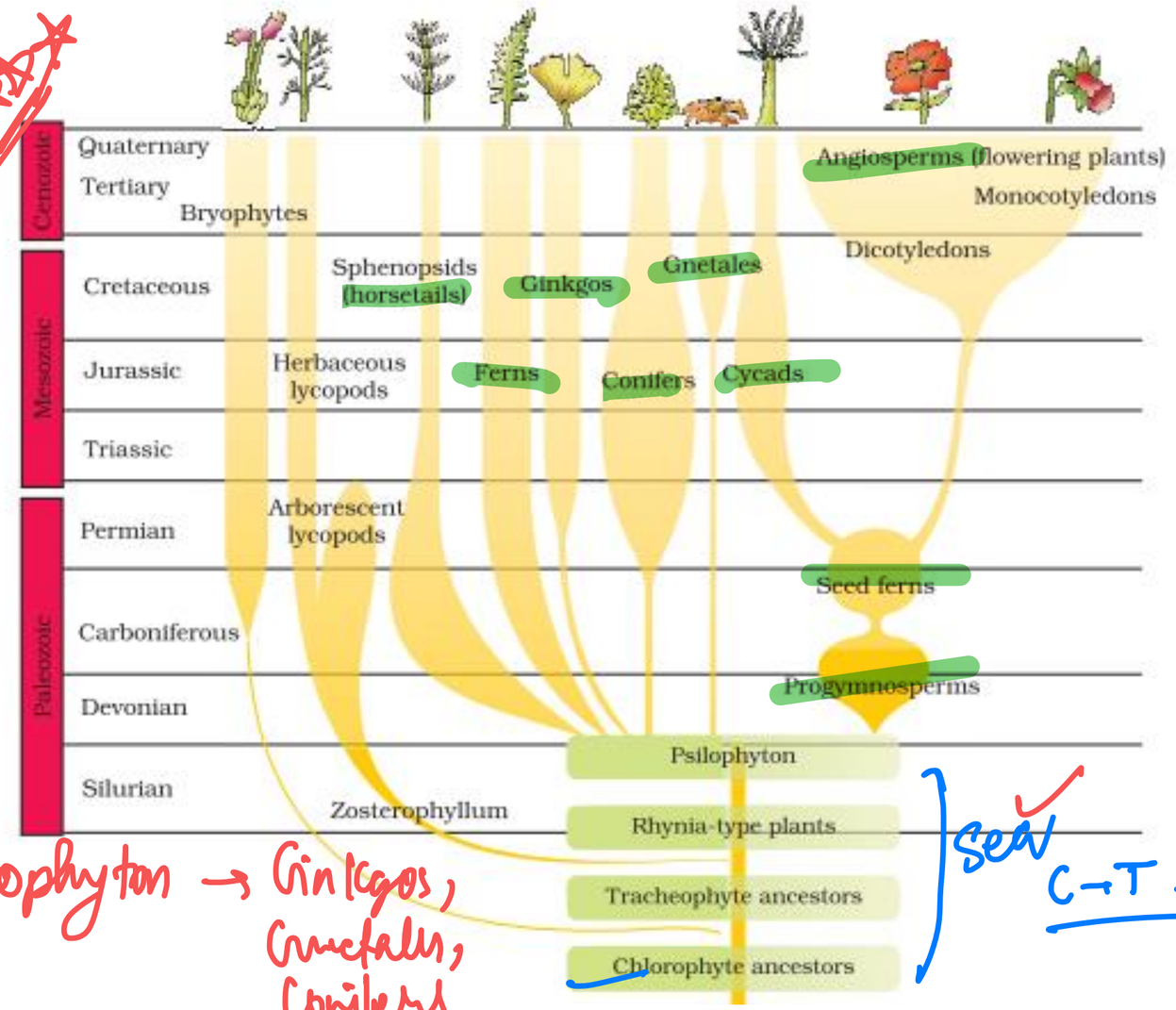


**Figure 7.9** A sketch of the evolution of plant forms through geological periods

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① Chlorophyte → Bryophyte

② Tracheophyte → Zosteroplyllum → Lycopods

Psilophyton → Ginkgos, Cycadales, Conifers

Seed

C → T → R → P

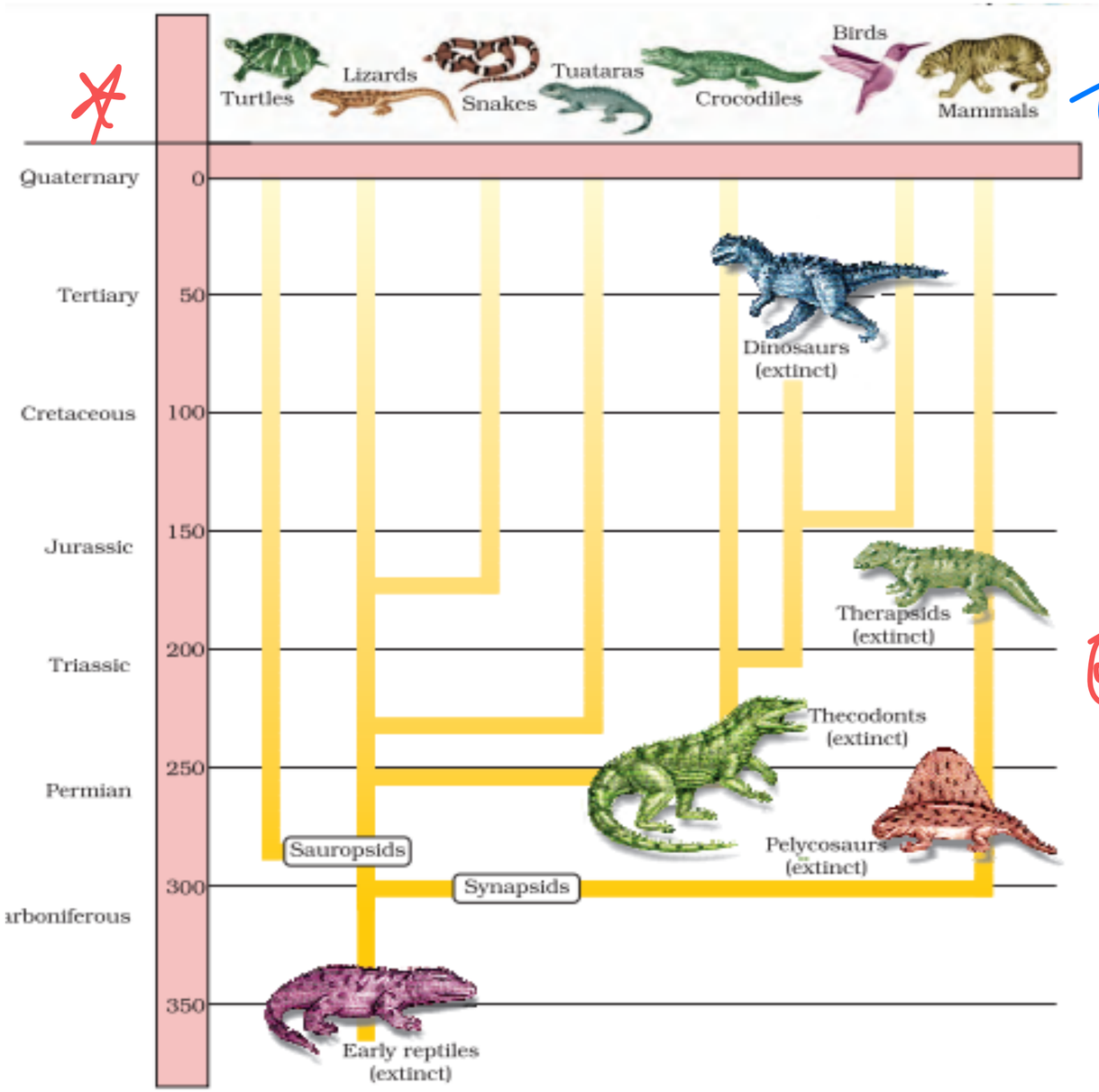


**Figure 7.10** Representative evolutionary history of vertebrates through geological periods

① Modern day reptiles + birds
↓
ancestor
↓
Sauropsid

② Modern day mammals
↓
direct ancestor
↓
therapsid
↓
Synapsid

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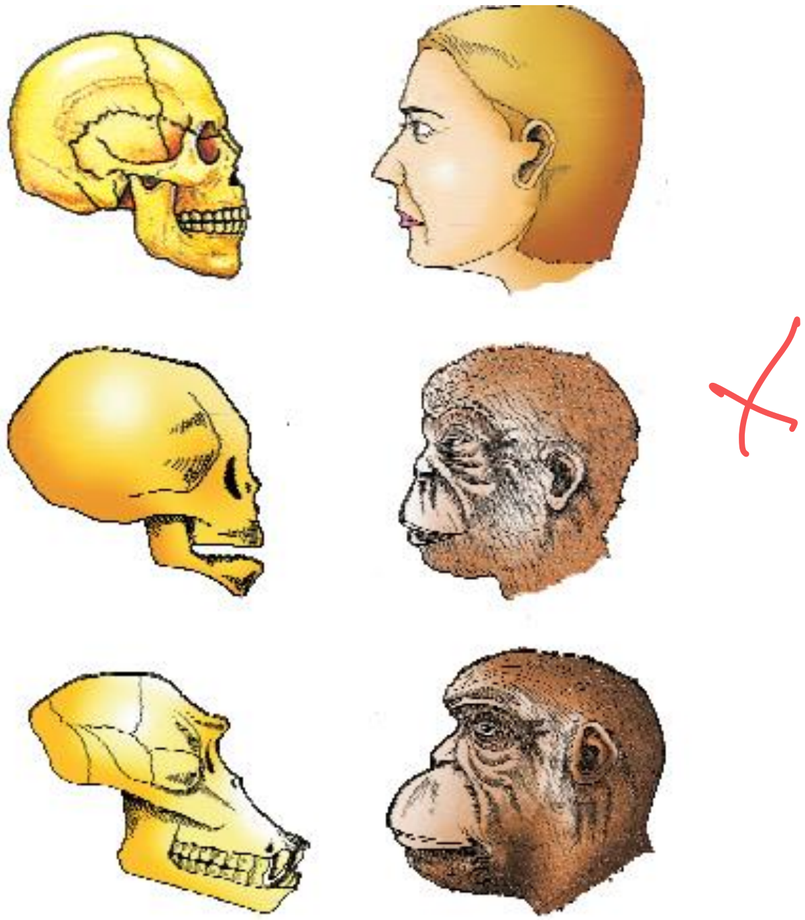



**Figure 7.11** A comparison of the skulls of adult modern human being, baby chimpanzee and adult chimpanzee. The skull of baby chimpanzee is more like adult human skull than adult chimpanzee skull

# CHAPTER-8
# HUMAN HEALTH AND DISEASE

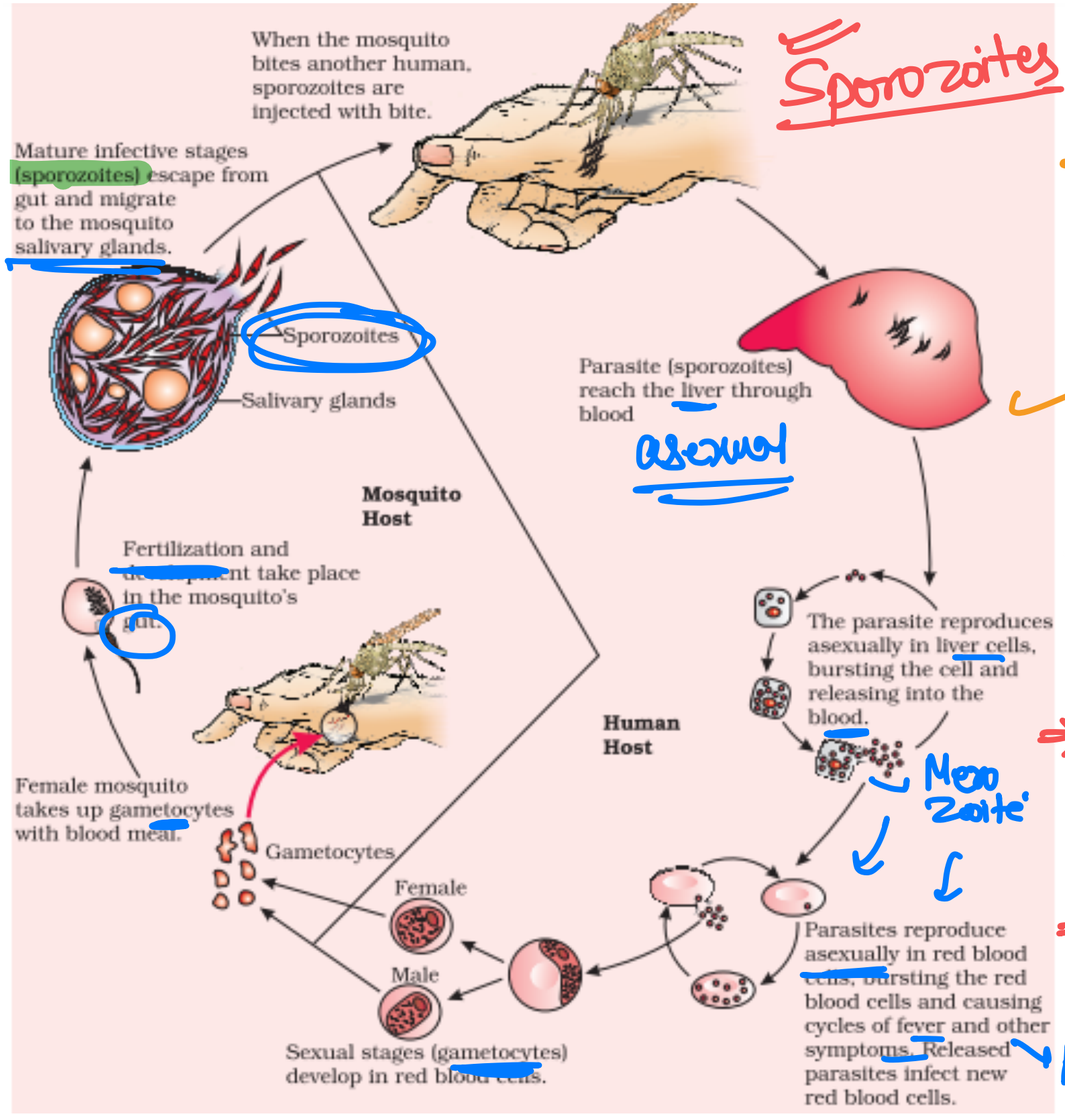


**Figure 8.1** Stages in the life cycle of *Plasmodium*

Sporozoites

Plasmodium (Protozoan)

Host = (2)

Prim Host (Mosquito)

Sec Host ⇒ Human

⇒ Stage (Human infect)
- Sporozoite

⇒ toxin: Haemozoin

Merozoite

RBC burst

Stage (Mosquito entry)
- Gametocyte

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**Figure 8.2** Diagram showing inflammation in one of the lower limbs due to elephantiasis

Filarial worm (Wuchereria)

[ Filariasis

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**Figure 8.3** Diagram showing ringworm affected area of the skin

Trichoderma,
Epidermophyton

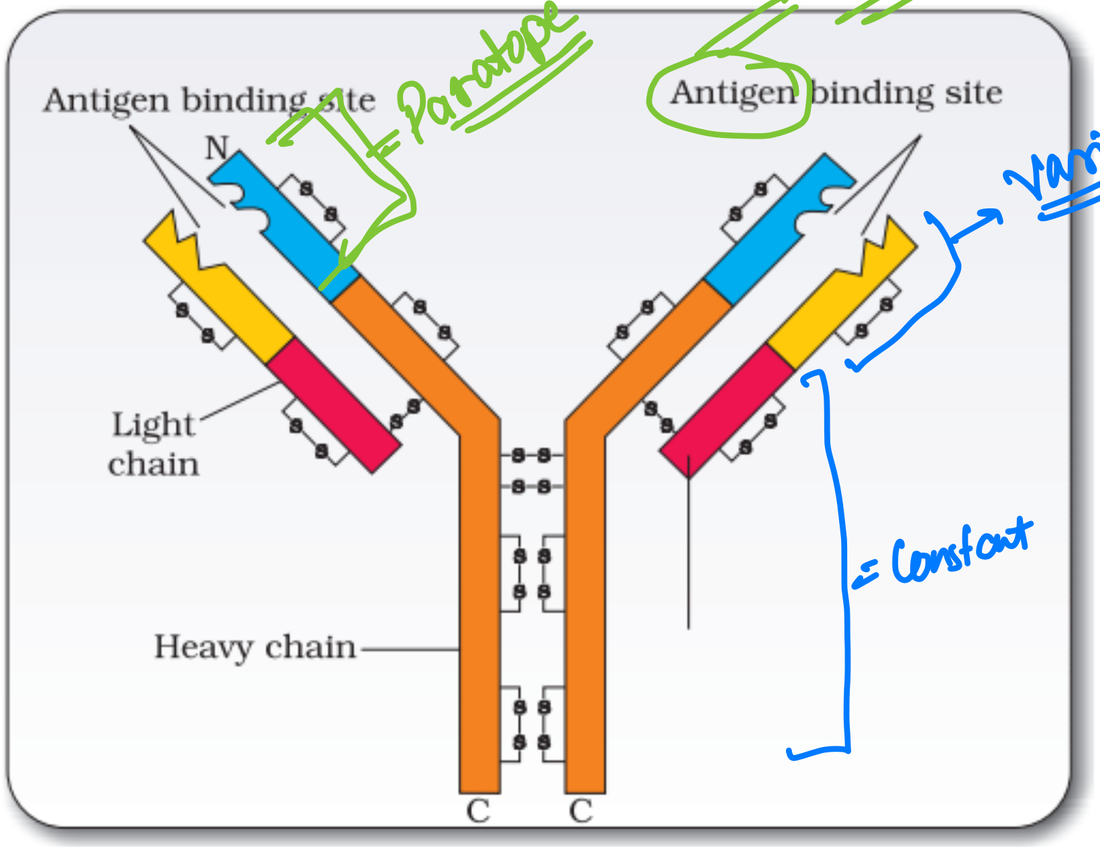


**Figure 8.4** Structure of an antibody molecule

epitope

Paratope

variable

= Constant

Formula: $H_2L_2$

Bonds = disulphide

B - lymphocyte

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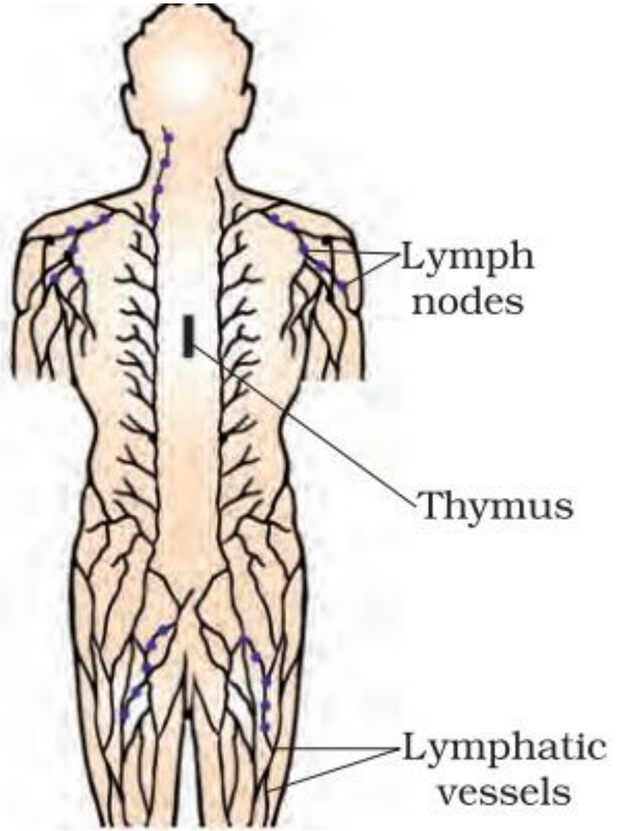


**Figure 8.5** Diagrammatic representation of Lymph nodes

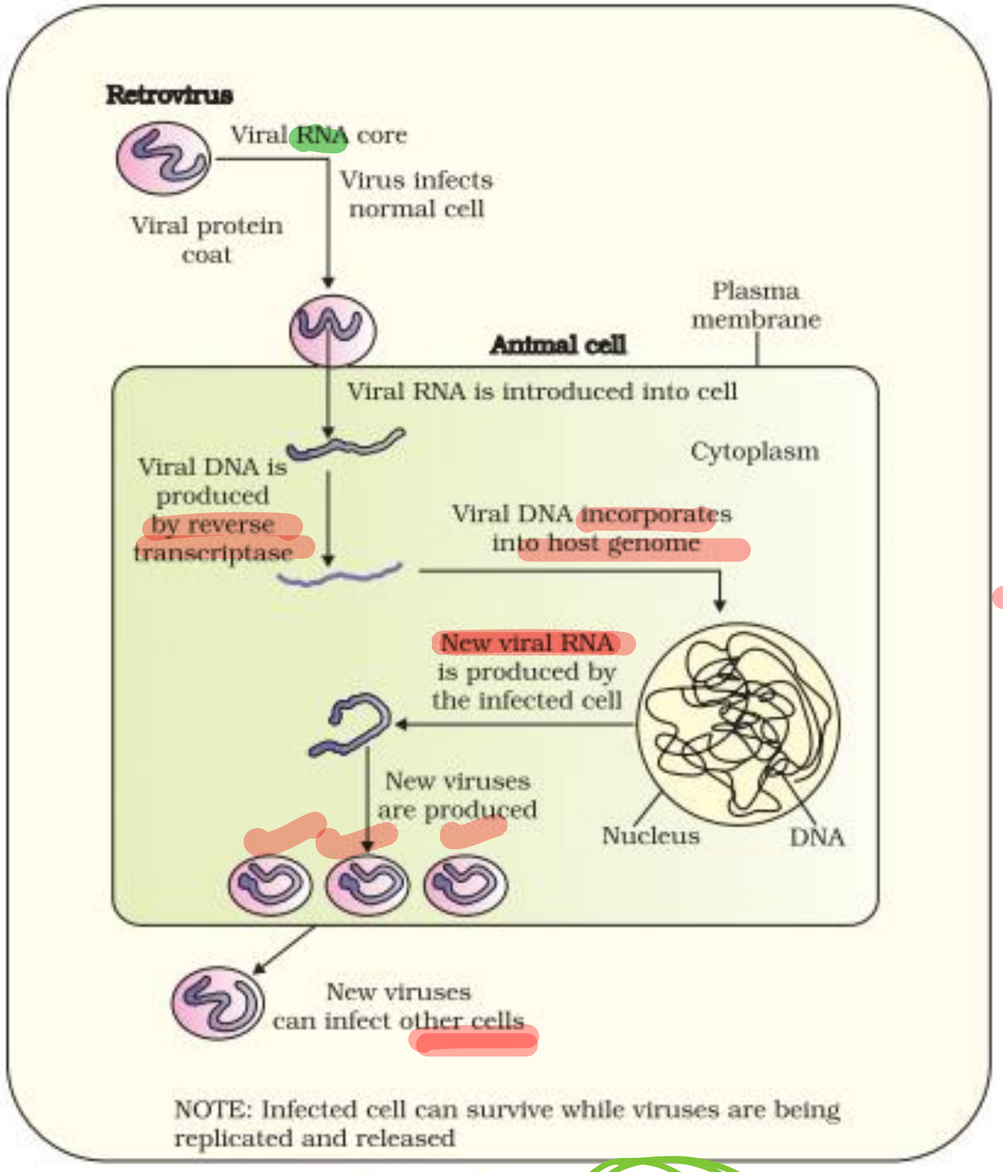


**Figure 8.6** Replication of retrovirus

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① Retrovirus

↓

RNA → DNA

(Reverse transcription)

Reverse transcriptase.

Retro = RNA

Virus

Cells = Macrophages

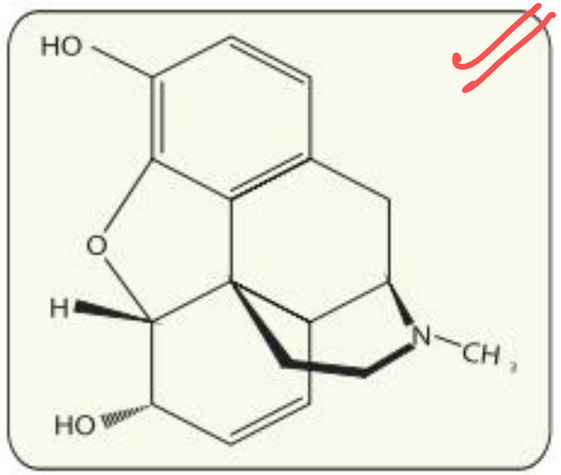



**Figure 8.7** Chemical structure of Morphine

**Figure 8.8** Opium poppy

Identify = Source = use

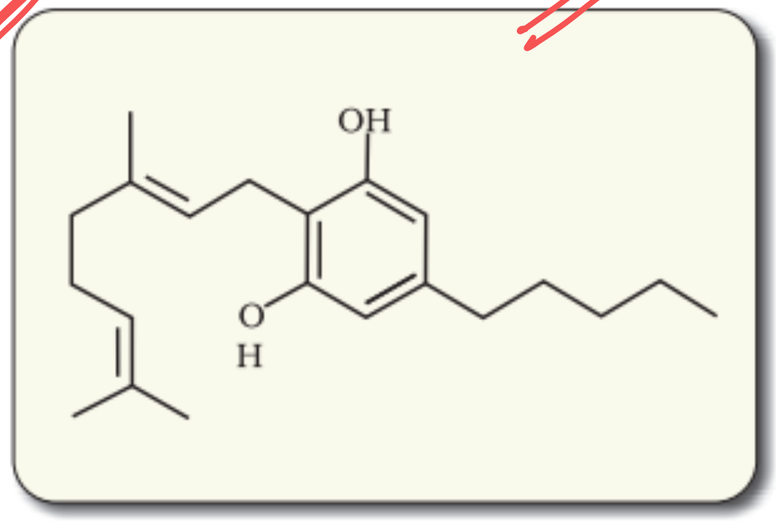



**Figure 8.9** Skeletal structure of cannabinoid molecule

**Figure 8.10** Leaves of *Cannabis sativa*

**Figure 8.11** Flowering branch of *Datura*

Property
↓
Hallucinogen

# CHAPTER-9
# STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

(a)

(b)

**Figure 9.1** Improved breed of cattle and chickens (a) Jersey (b) Leghorn

Hybrid

Figure 9.2 Mule

Inter specific Hybridisation

Male donkey × Female Horse

(a)

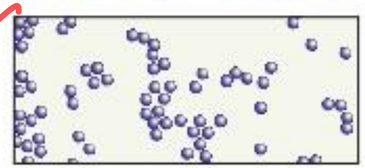

(b)


(c)

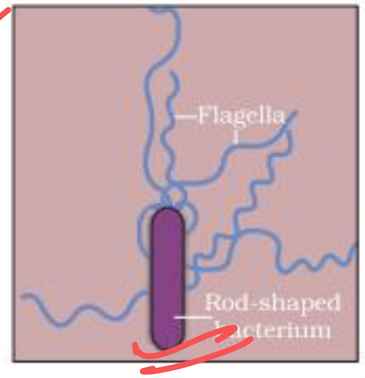
**Figure 9.3** Some Indian hybrid crops: (a) Maize; (b) Wheat; (c) Garden peas

# CHAPTER-10
# MICROBES IN HUMAN WELFARE

(a)

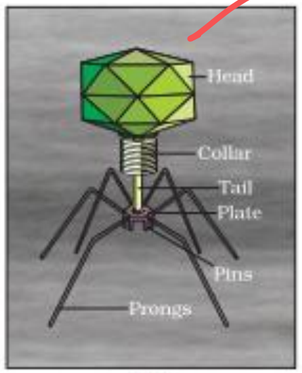


(b)

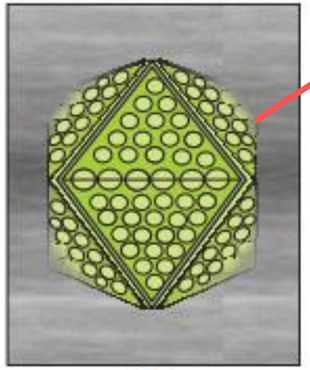



(c)

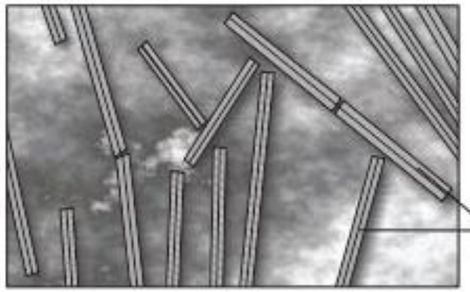
**Figure10.1** Bacteria: (a) Rod-shaped, magnified 1500X; (b) Spherical shaped, magnified1500X; (c) A rod-shaped bacterium showing flagella, magnified 50,000X




(a)



(b)




(c)

**Figure 10.2** Viruses: (a) A bacteriophage; (b) Adenovirus which causes respiratory infections; (c) Rod-shaped Tobacco Mosaic Virus (TMV). Magnified about 1,00,000–1,50,000X

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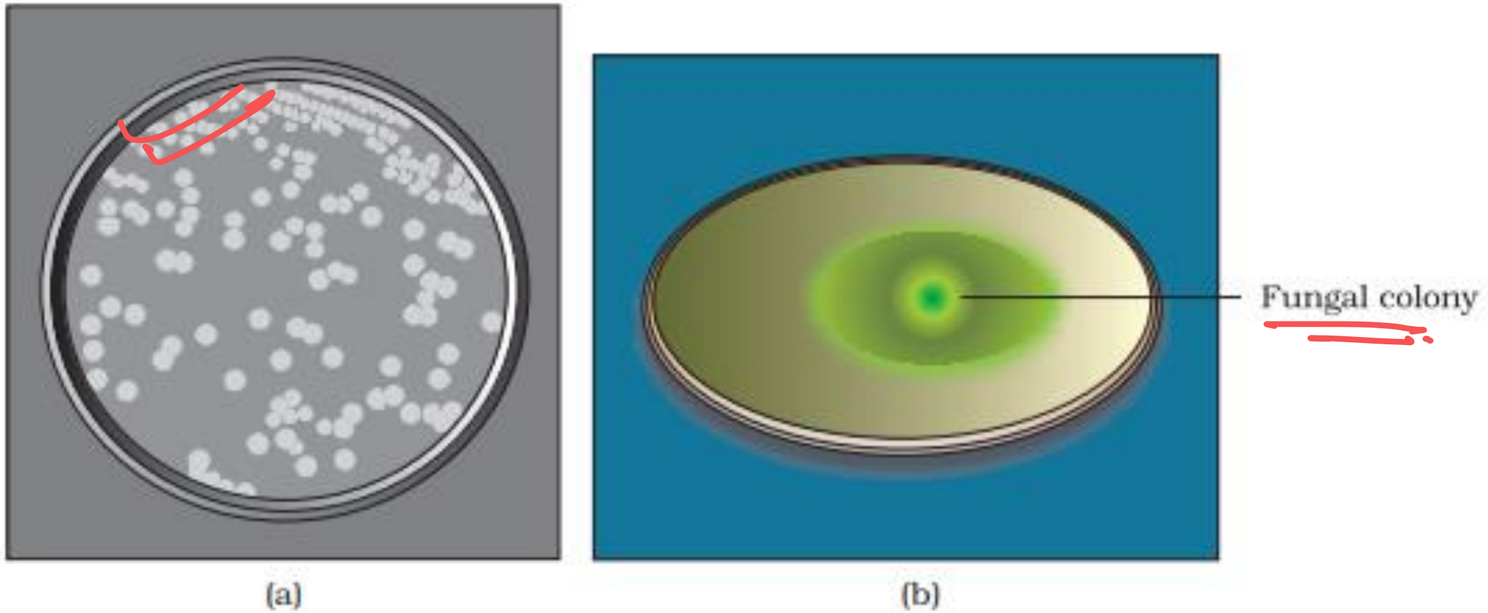


**Figure 10.3** (a) Colonies of bacteria growing in a petri dish; (b) Fungal colony growing in a petri dish

**Figure 10.4** Fermentors

**Figure 10.5** Fermentation Plant

Bacteria, fungus = Fermenters

Vessel = fermentors

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**Figure 10.6** Secondary treatment

**Figure 10.7** An aerial view of a sewage plant

aeration tank

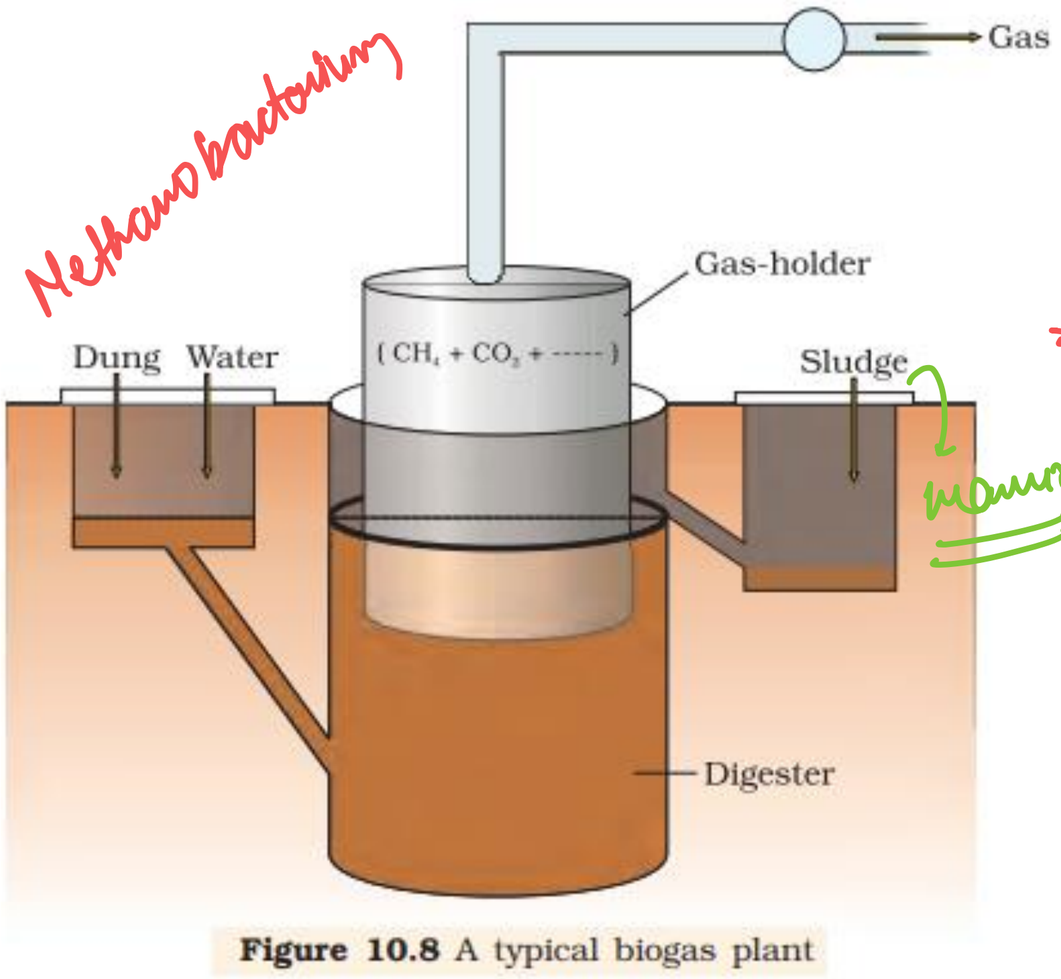


**Figure 10.8** A typical biogas plant

Methanobacterium

Biogas = $CH_4, CO_2, H_2$

IARI = Indian agriculture research institute

manure

KVIC = Khadi & village industries commission

Anaerobic sludge digester - Biogas = $CH_4, CO_2, H_2S$

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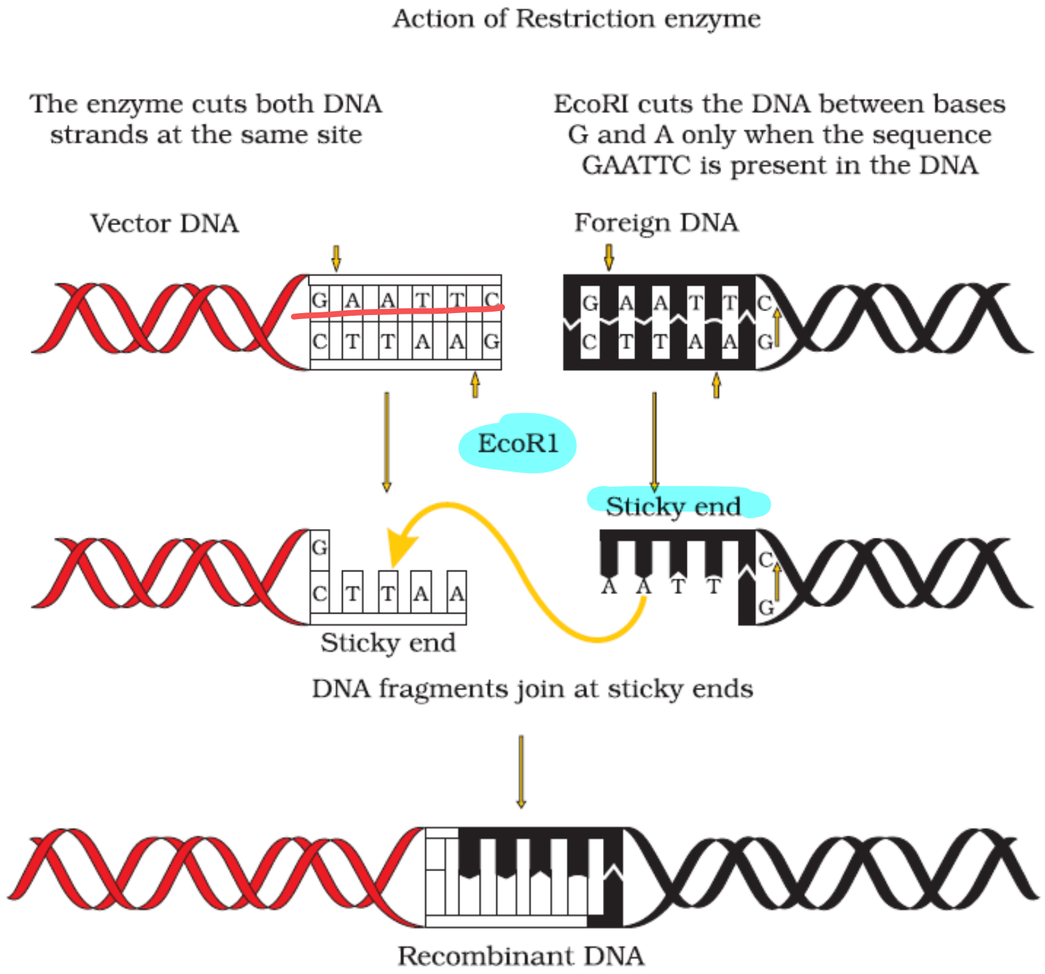
# CHAPTER-11 BIOTECHNOLOGY : PRINCIPLES AND PROCESSES




EcoRI = GAATTC

⇒ sticky end

labeling

⇒ ligase


**Figure 11.1** Steps in formation of recombinant DNA by action of restriction endonuclease enzyme - EcoRI

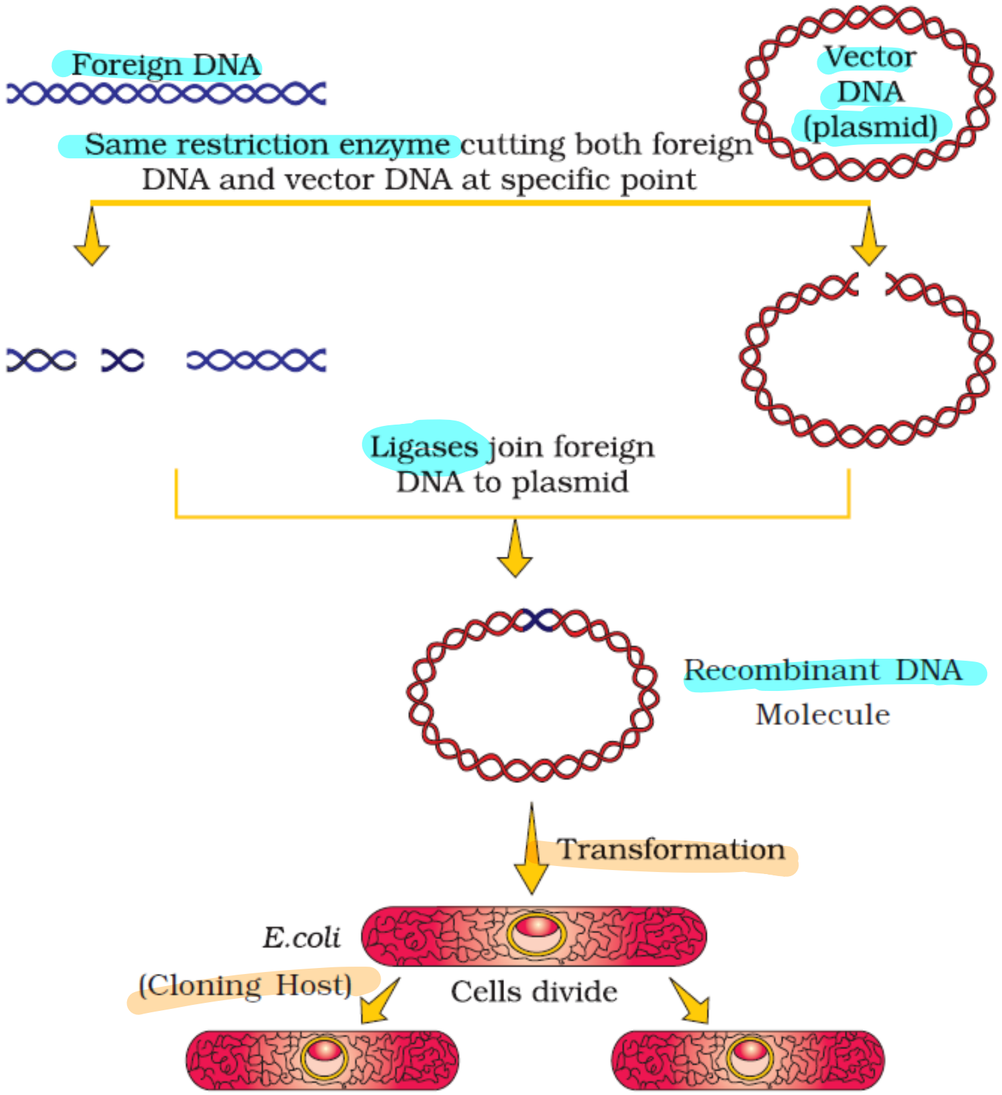



**Figure 11.2** Diagrammatic representation of recombinant DNA technology

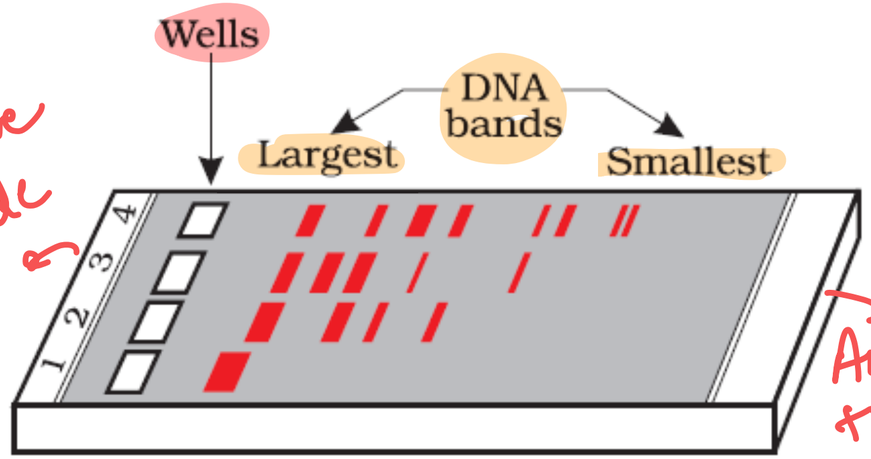



**Figure 11.3** A typical agarose gel electrophoresis showing migration of undigested (lane 1) and digested set of DNA fragments (lane 2 to 4)

Labeling

DNA → -ve

→ Gel electrophoresis

→ Agarose

⇒ Anode / Cathode

Basis : Size of DNA

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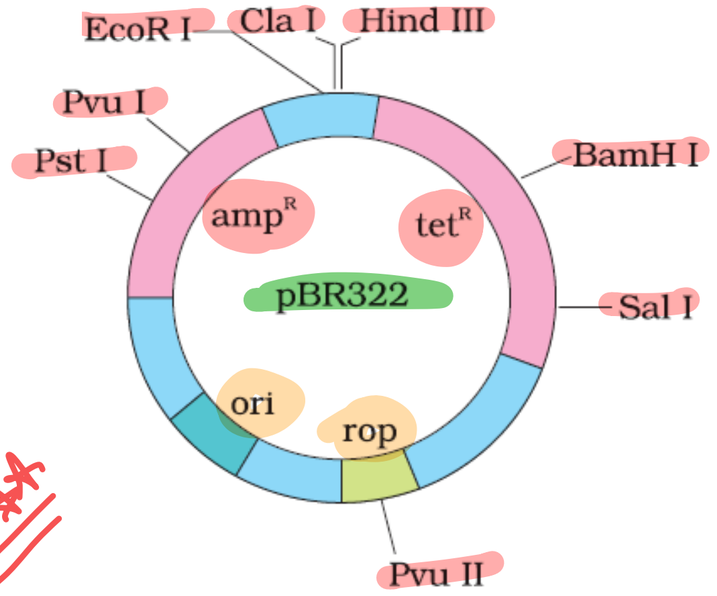


**Figure 11.4** *E. coli* cloning vector pBR322 showing restriction sites (*Hind* III, *Eco*R I, *Bam*H I, *Sal* I, *Pvu* II, *Pst* I, *Cla* I), ori and antibiotic resistance genes (amp$^R$ and tet$^R$). rop codes for the proteins involved in the replication of the plasmid.

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Label

① Plasmid (vector)

theory

pBR322

② tetR , ampR

BamH I
Sal I

PvuI
PstI

③ rop

Pvu II

total = 6

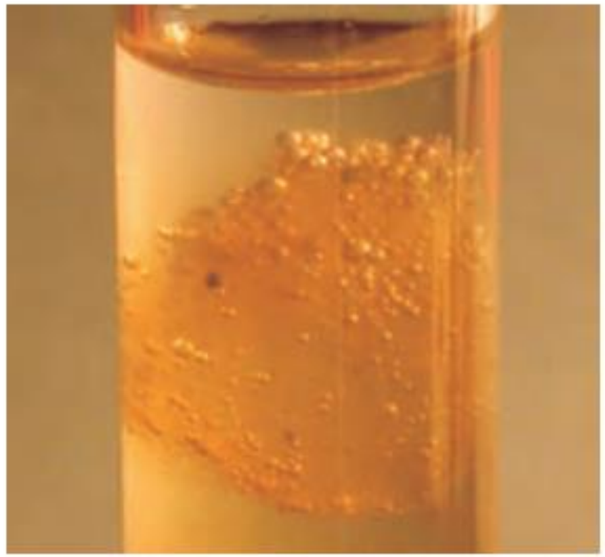

**Figure 11.5** DNA that separates out can be removed by spooling

Chilled ethanol

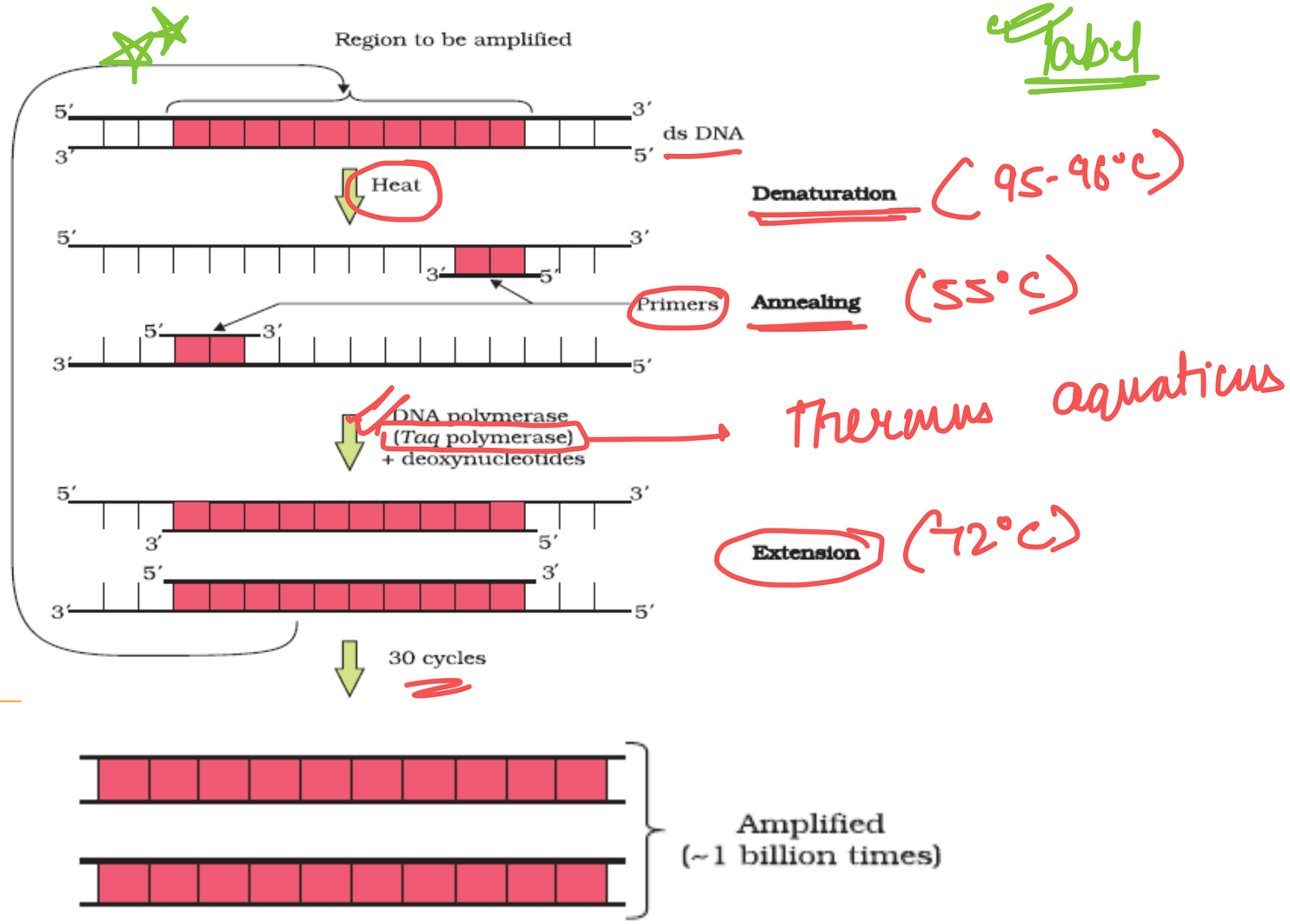


**Figure 11.6** Polymerase chain reaction (PCR): Each cycle has three steps: (i) Denaturation; (ii) Primer annealing; and (iii) Extension of primers

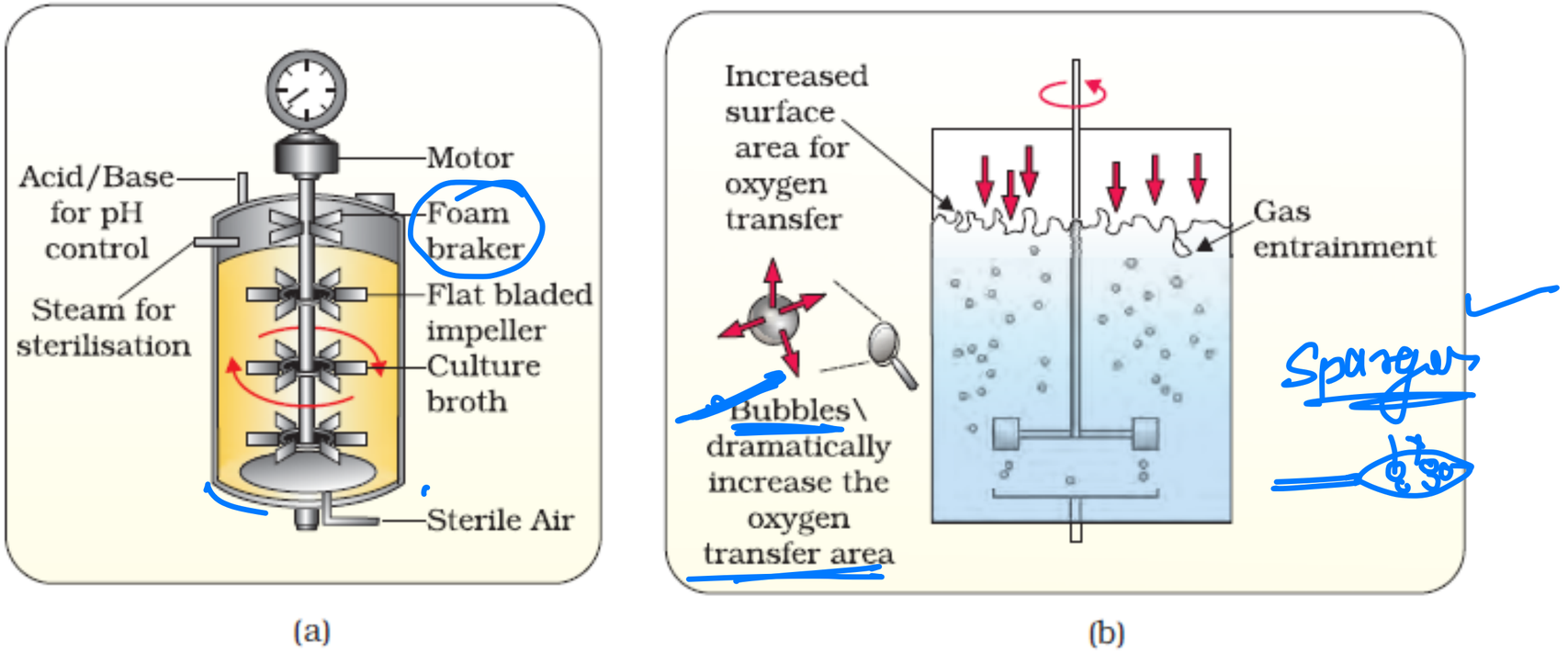


**Figure 11.7** (a) Simple stirred-tank bioreactor; (b) Sparged stirred-tank bioreactor through which sterile air bubbles are sparged

downstreaming

1. Identification

# CHAPTER-12
# BIOTECHNOLOGY AND IT'S APPLICATIONS

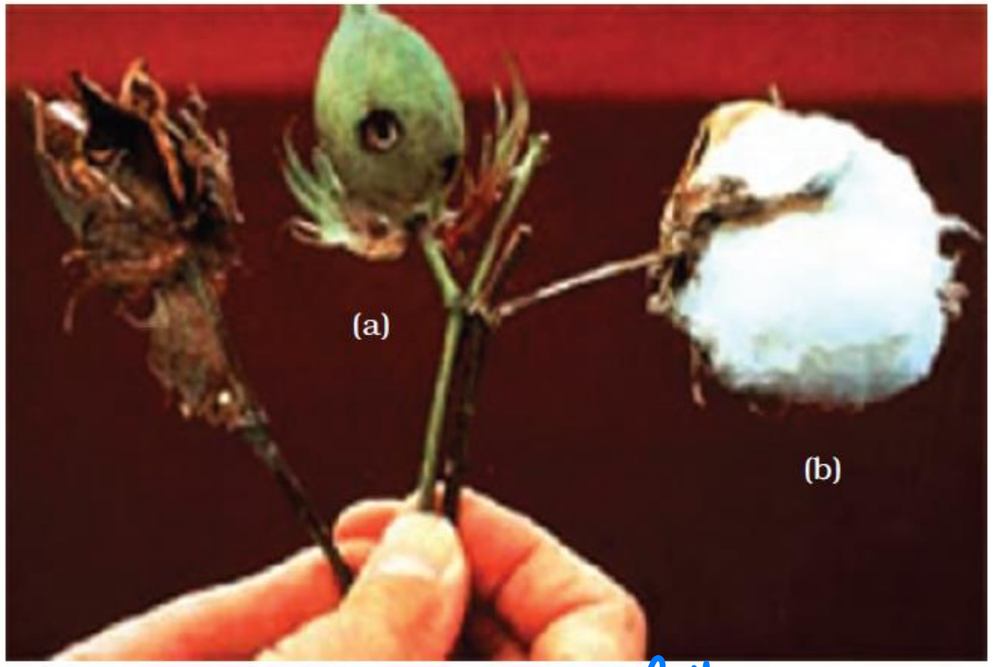


**Figure 12.1** Cotton boll: (a) destroyed by bollworms; (b) a fully mature cotton boll

Cotton

I.I.

Bt gene = cry IAc

= Bacillus thuringeneis

= cry IIAb

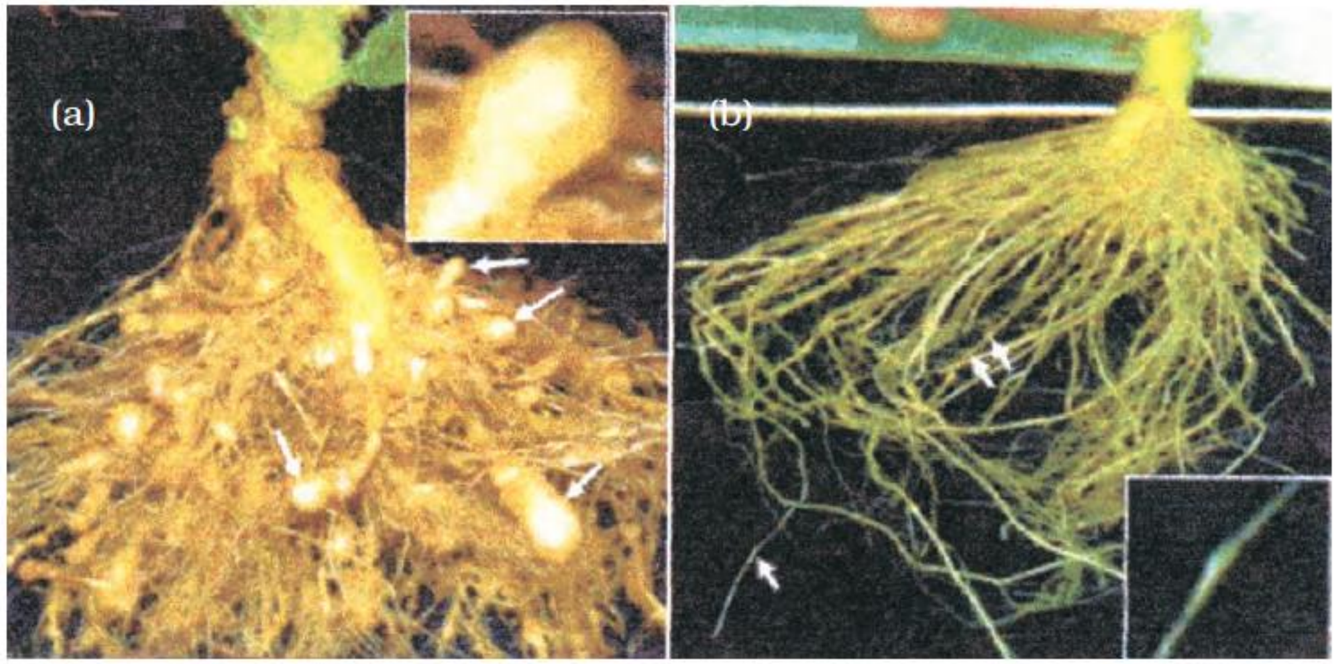


**Figure 12.2** Host plant-generated dsRNA triggers protection against nematode infestation: (a) Roots of a typical control plants; (b) transgenic plant roots 5 days after deliberate infection of nematode but protected through novel mechanism.

Meloidogyne incognita

mRNA silencing ⇒ dsRNA

RNAi = RNA interference

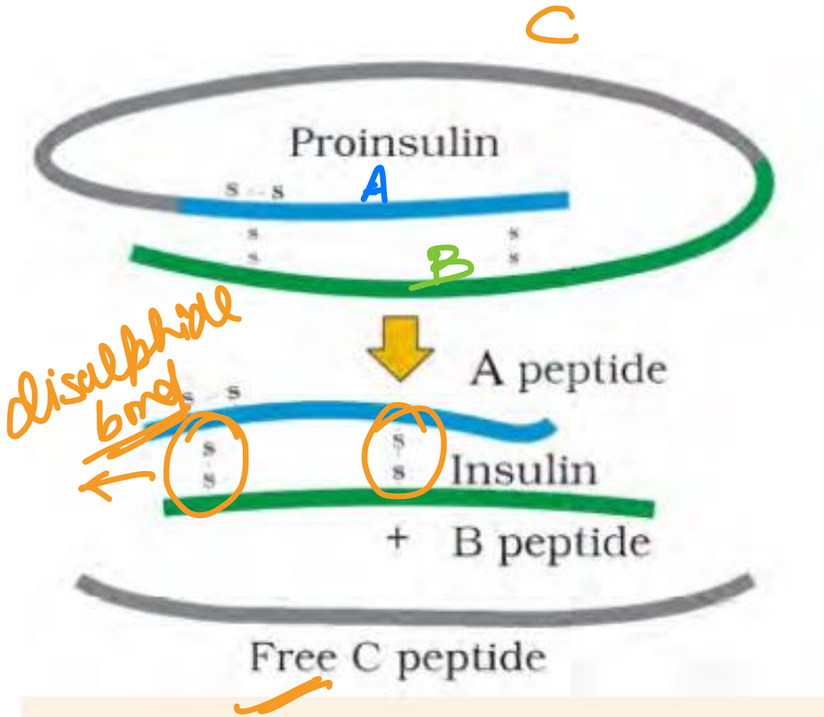


**Figure 12.3** Maturation of pro-insulin into insulin (simplified)

① Slaughtered Cattles, pigs

② r DNA Challenge

E.Coli

Proinsulin → Mature insulin

Proinsulin → 3 chain: A, B, C

Mature insulin → 2 chain: A, B

③ Eli lily (1983)

gene A = A

gene B = B

Disulphide Bond

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# CHAPTER-13
# ORGANISMS AND POPULATIONS

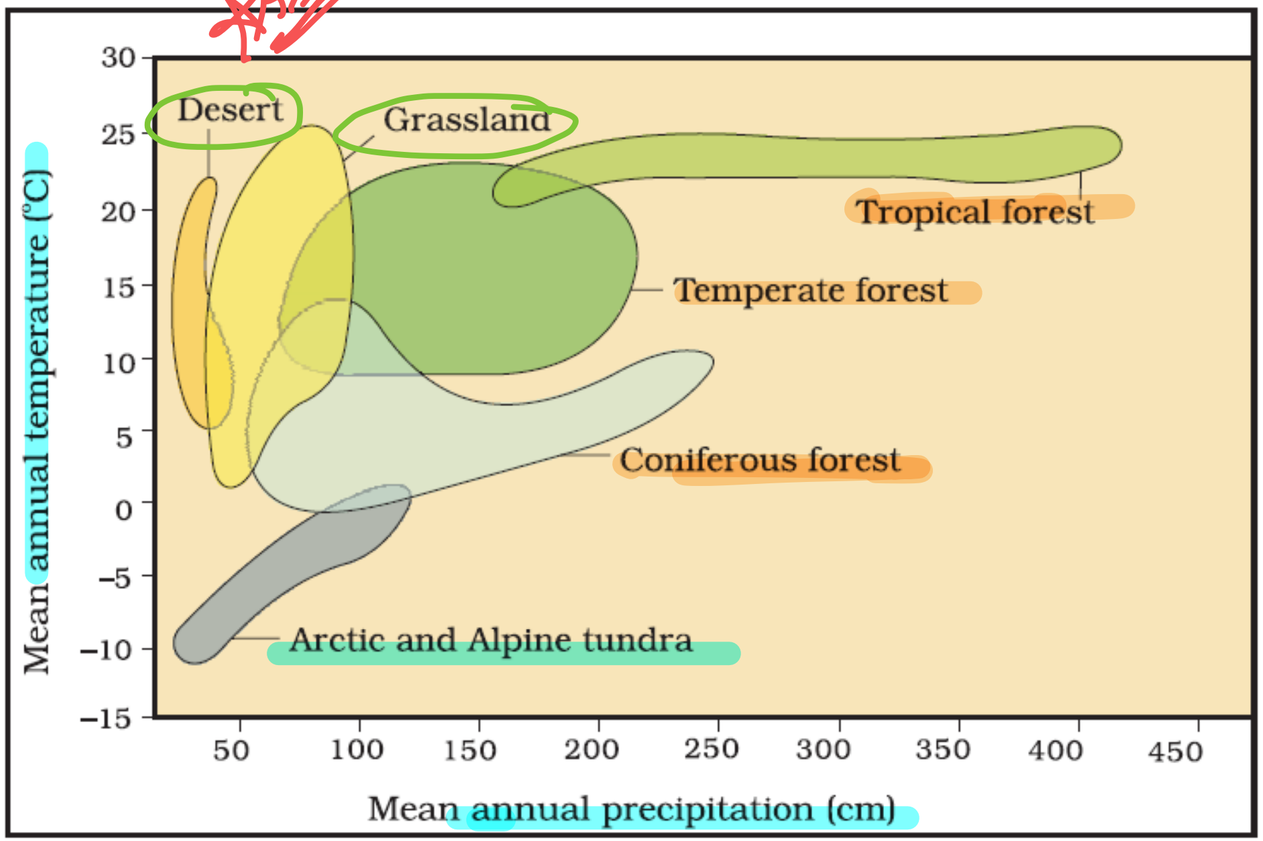


**Figure 13.1** Biome distribution with respect to annual temperature and precipitation

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(a)

(b)

(c)

(d)

**Figure 13.2** Major biomes of India : (a) Tropical rain forest; (b) Deciduous forest; (c) Desert; (d) Sea coast

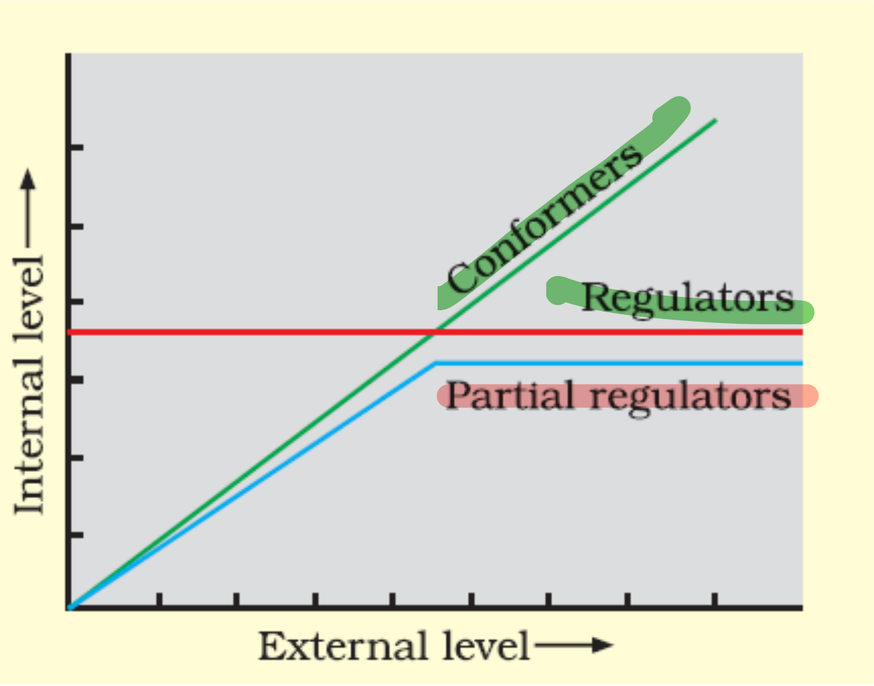


**Figure 13.3** Diagrammatic representation of organismic response

PYQ

→ label

99% animals, all plants
↓
Conformers

Mammals, birds
↓
Regulators
(Homeotherm)

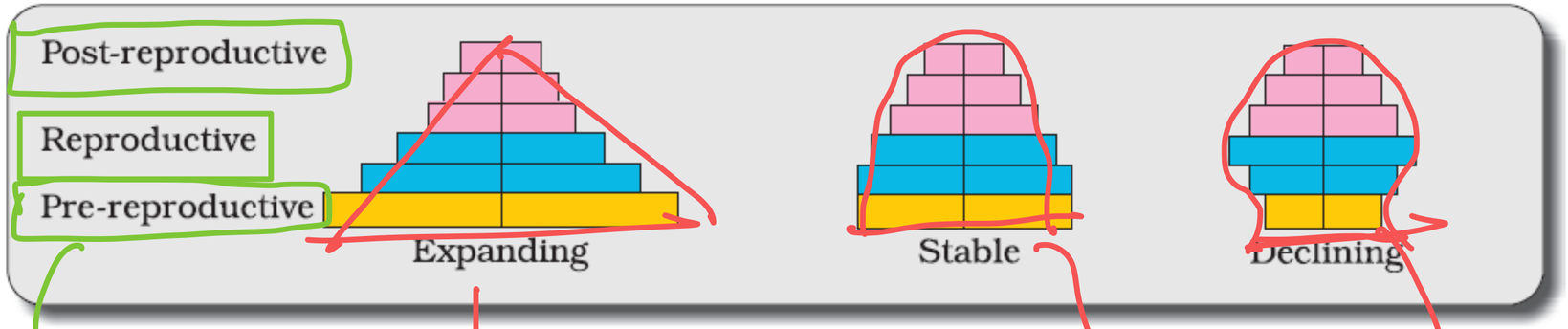


**Figure 13.4** Representation of age pyramids for human population

identify

identification

Pyramid shape

developing

Pre repro > Repro

bell shaped

Pre repro = Repro

Urn shape

Pre repro < Repro

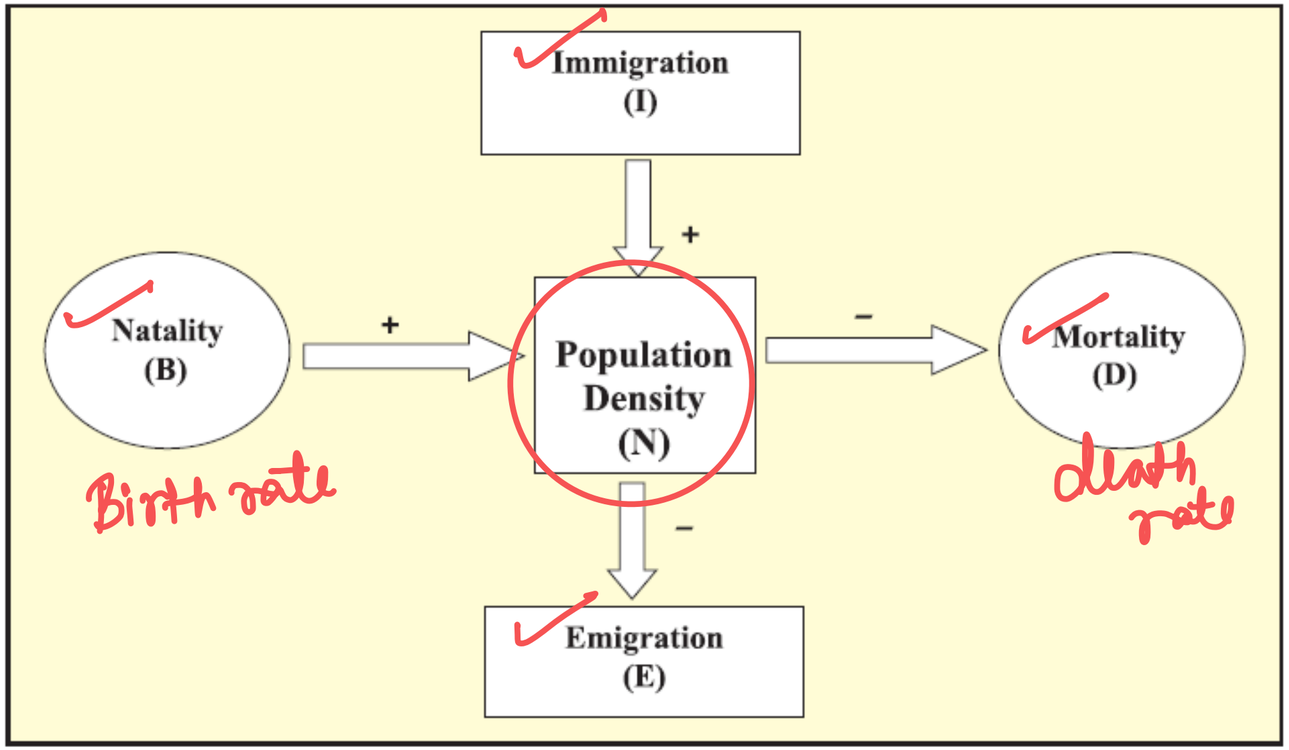


Figure 13.5

add = Natality + I

reduce = Mortality & E

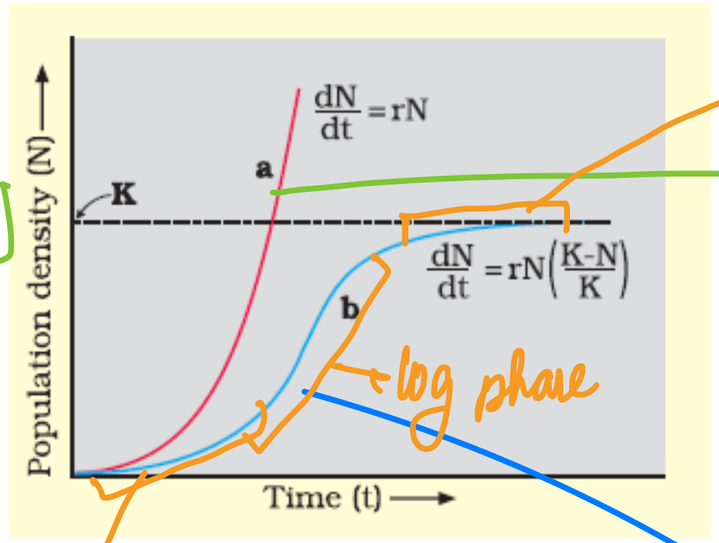


**Figure 13.6** Population growth curve
**a** when responses are not limiting the growth, plot is exponential,
**b** when responses are limiting the growth, plot is logistic,
**K** is carrying capacity

stationary phase (asymptote)

exponential growth (resources unlimited)

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

log phase

log phase

Logistic growth (resource limited)

K = carrying capacity

$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$

asymptote = $K = N$

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(a) (b)

**Figure 13.7** Mutual relationship between fig tree and wasp: (a) Fig flower is pollinated by wasp; (b) Wasp laying eggs in a fig fruit

Fig tree - wasp = Mutualism

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**Figure 13.8** Showing bee-a pollinator on orchid flower

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Mutualism

Orchid ⇄ Pollination

Bumble bee

reward

Sexual deceit

Pseudocopulation

# CHAPTER-14
# ECOSYSTEM

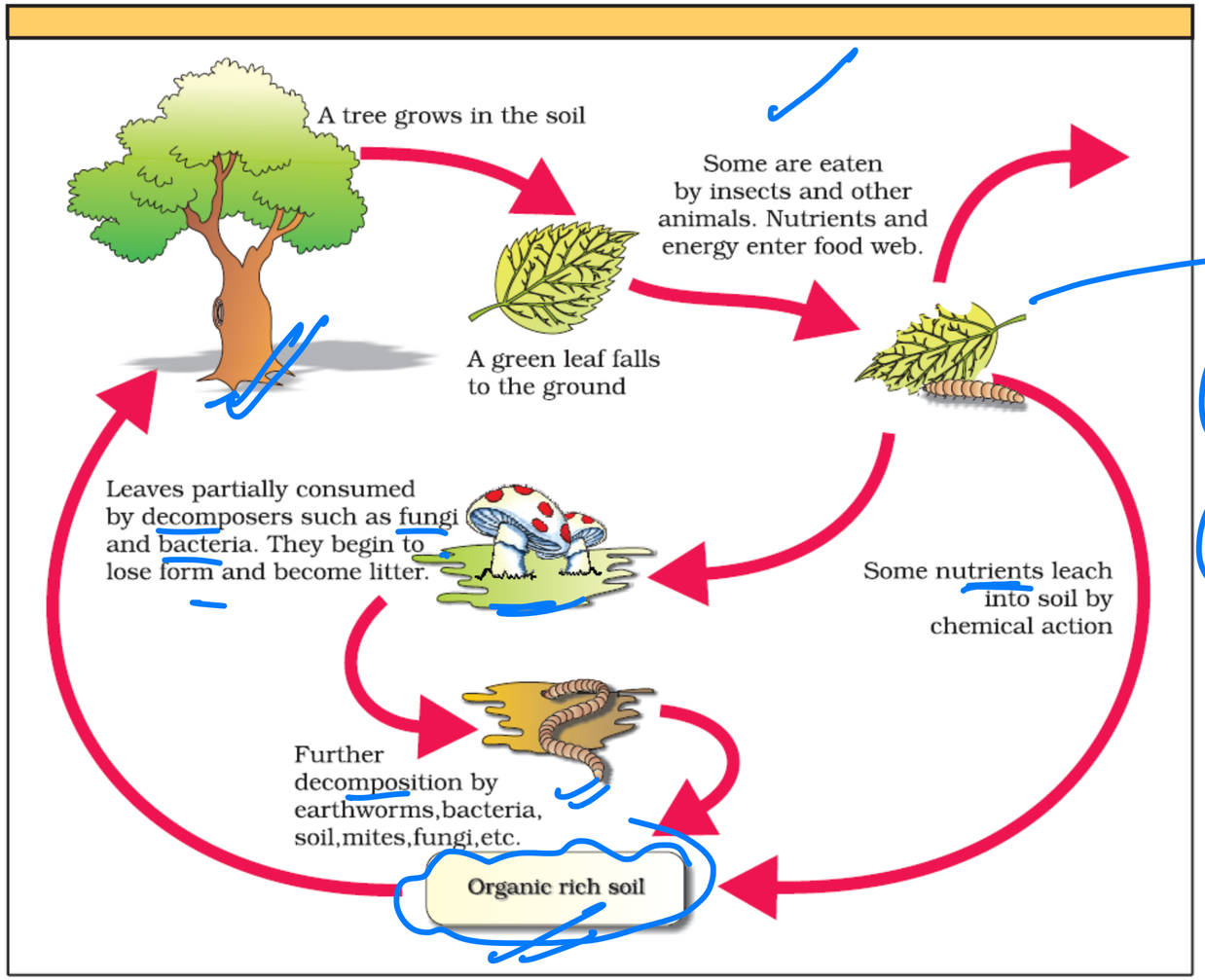


**Figure 14.1** Diagrammatic representation of decomposition cycle in a terrestrial ecosystem

1. Fragmentation
2. Catabolism
3. Humification
4. Mineralisation
5. Leaching

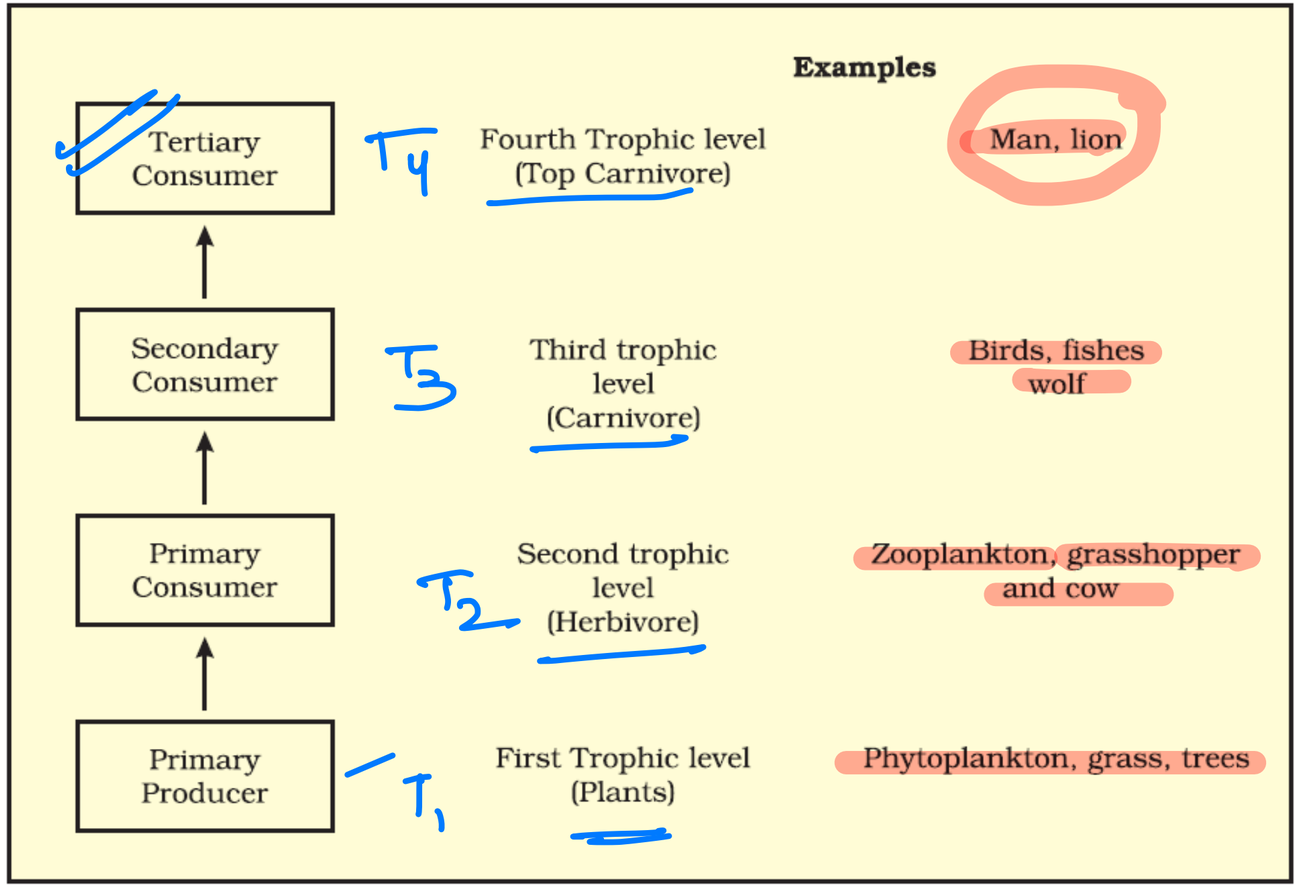


**Figure 14.2** Diagrammatic representation of trophic levels in an ecosystem

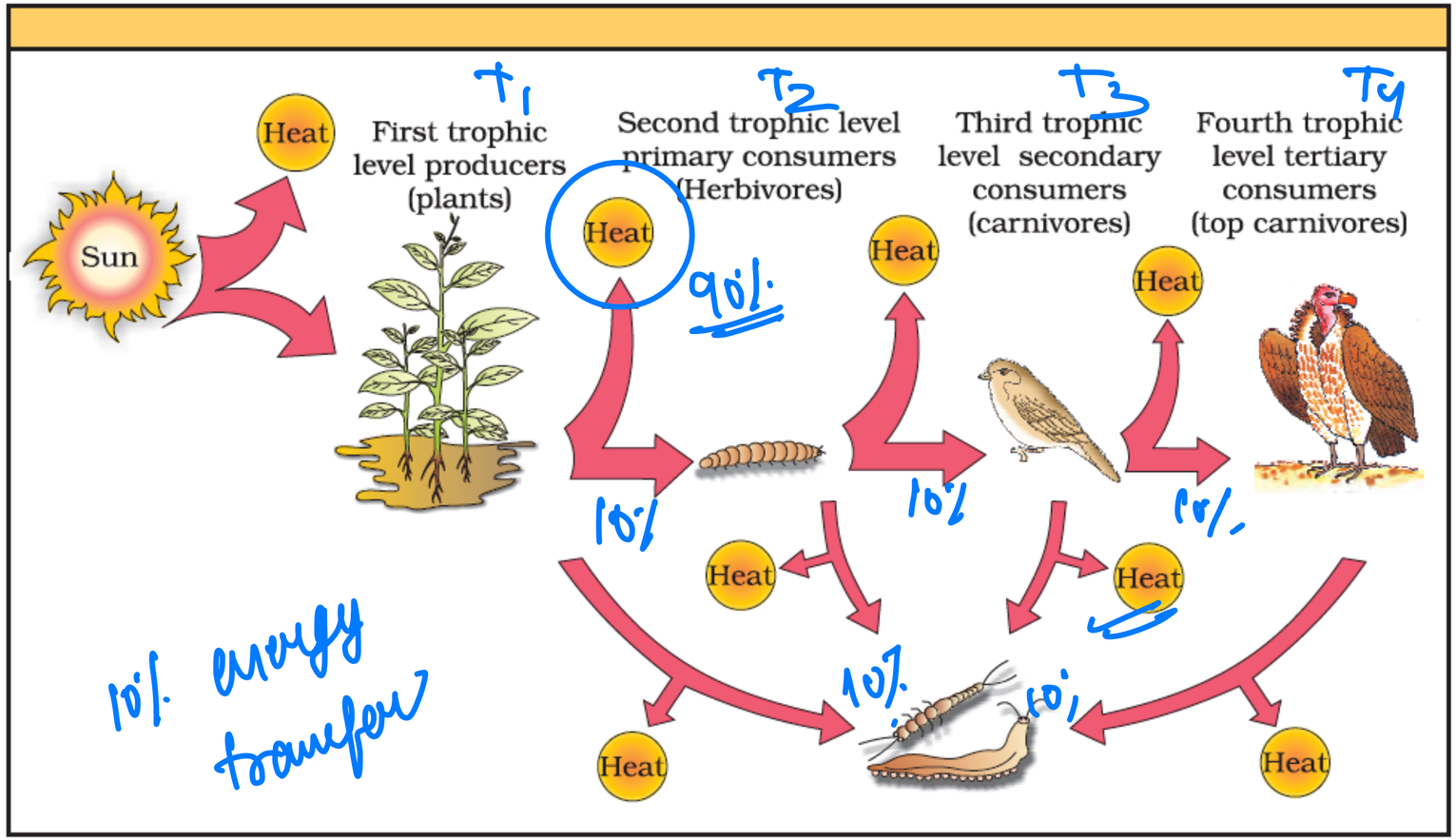


**Figure 14.3** Energy flow through different trophic levels

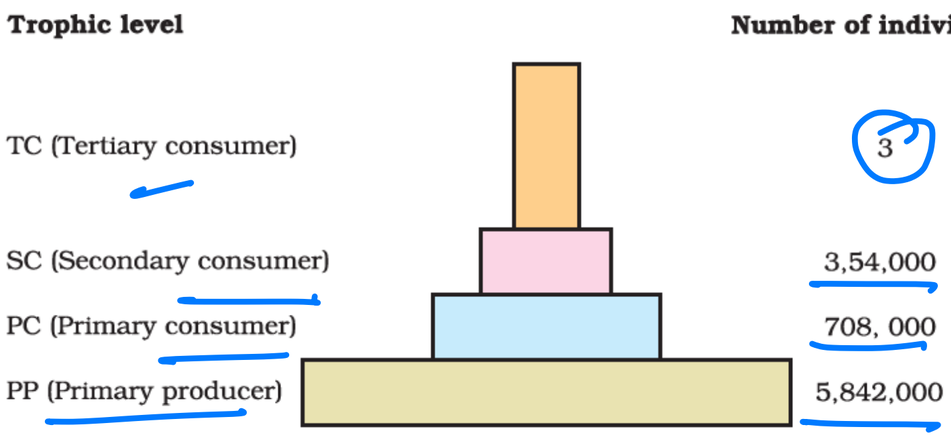


**Figure 14.4 (a)** Pyramid of numbers in a grassland ecosystem. Only three top-carnivores are supported in an ecosystem based on production of nearly 6 millions plants

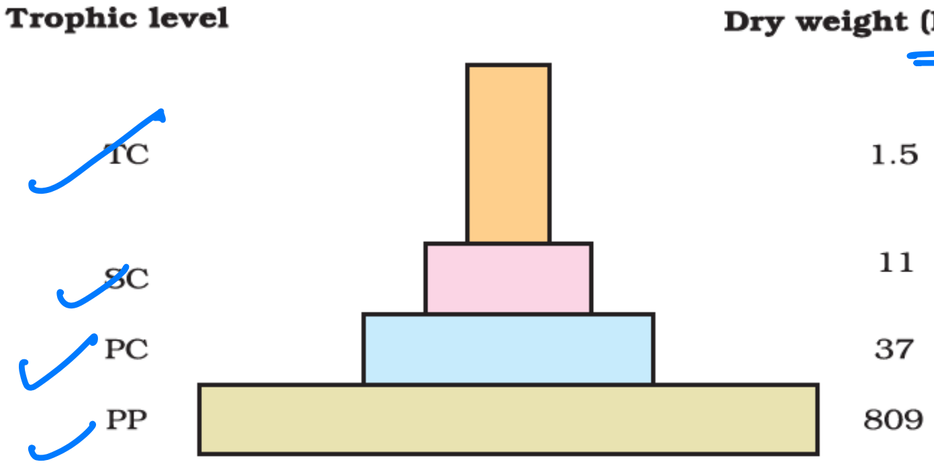


**Figure 14.4 (b)** Pyramid of biomass shows a sharp decrease in biomass at higher trophic levels

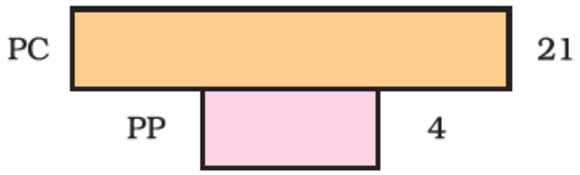


**Figure 14.4 (c)** Inverted pyramid of biomass-small standing crop of phytoplankton supports large standing crop of zooplankton

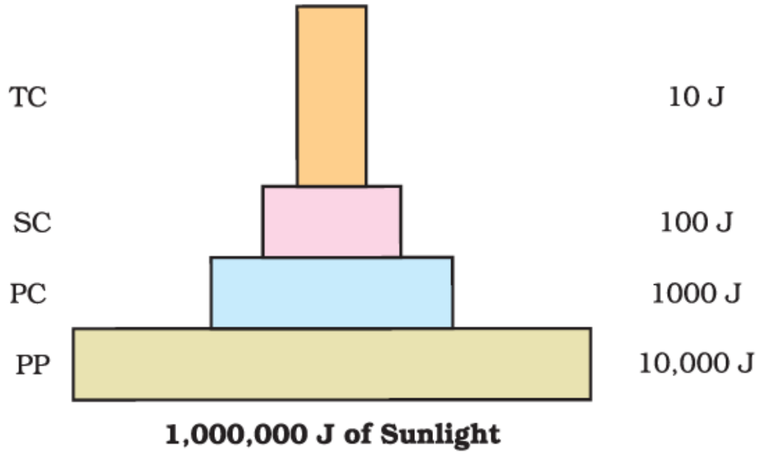


**Figure 14.4 (d)** An ideal pyramid of energy. Observe that primary producers convert only 1% of the energy in the sunlight available to them into NPP

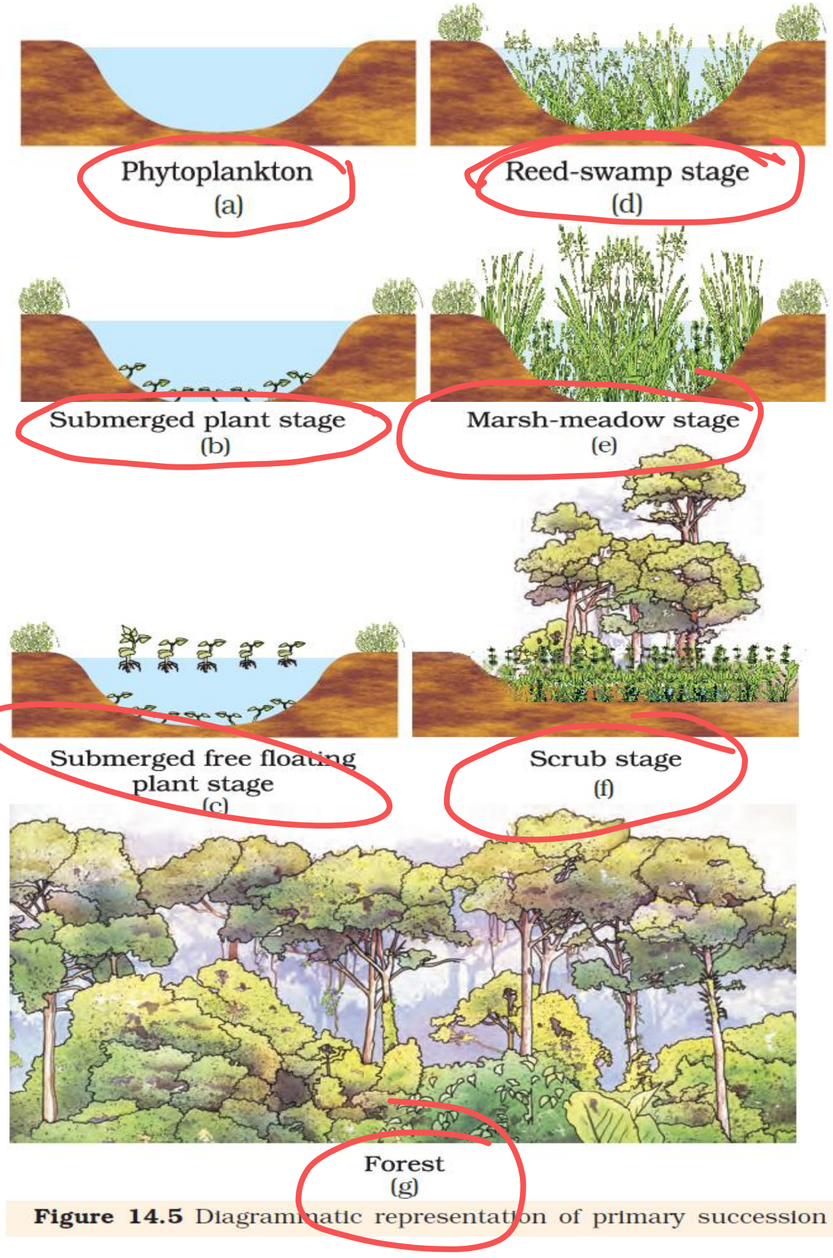


**Figure 14.5** Diagrammatic representation of primary succession

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Primary Succession

Hydrarch

Pioneer : Phytoplankton

climax : mesic (forest)

Sequence

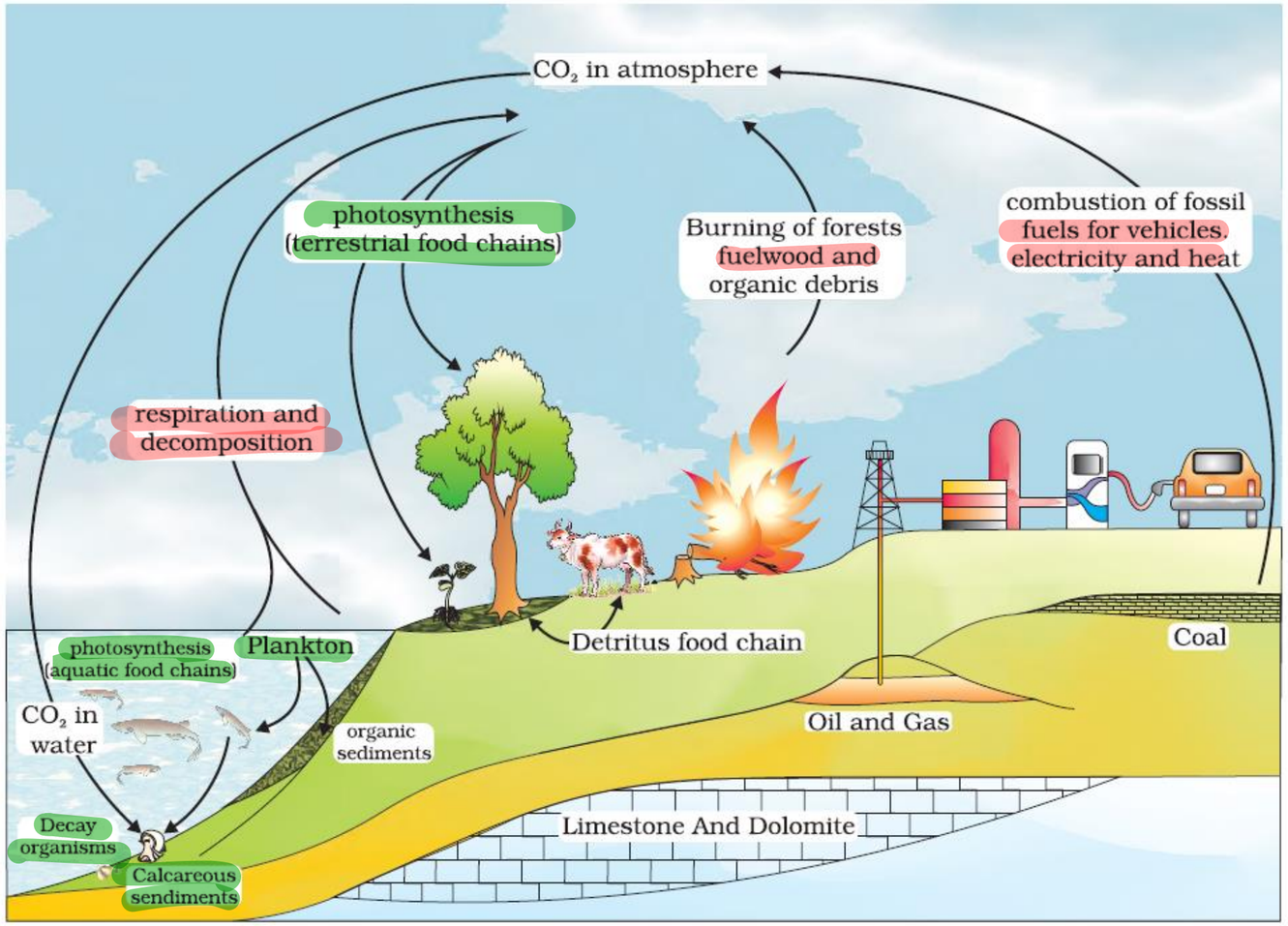


**Figure 14.6** Simplified model of carbon cycle in the biosphere

Carbon cycle

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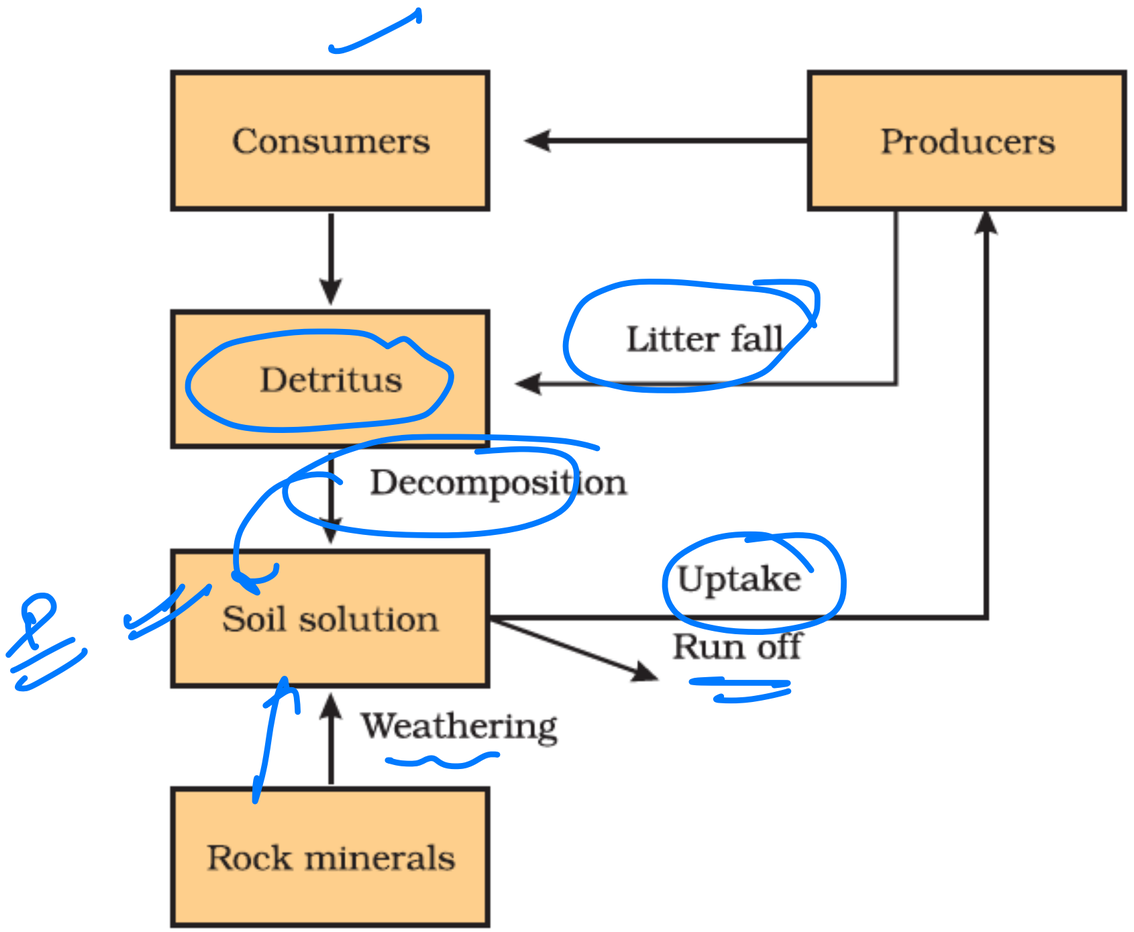


**Figure 14.7** A simplified model of phosphorus cycling in a terrestrial ecosystem

# CHAPTER-15
# BIODIVERSITY AND CONSERVATION

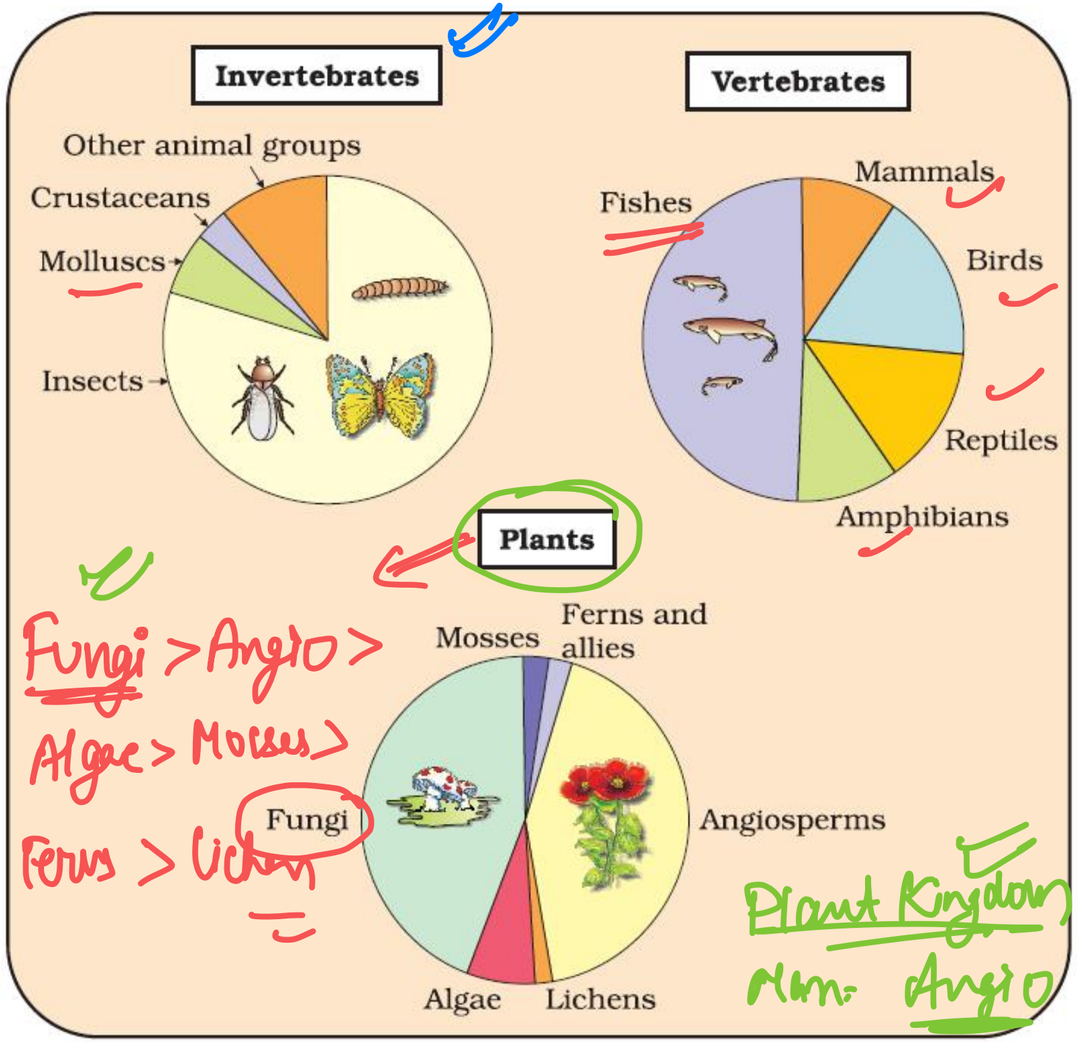


**Figure 15.1** Representing global biodiversity: proportionate number of species of major taxa of plants, invertebrates and vertebrates

Invertebrates > Vertebrate

Fish > Bird > Mam

Rep Amp

→ direct pie chart

animals > Plant

70% 22%

70% insect

Fungi > Angio >

Algae > Mosses >

Ferns > Lichen

Plant Kingdom

Non Angio

Invertebrates

Insect > Other animal group > Mollusc > Crustacean

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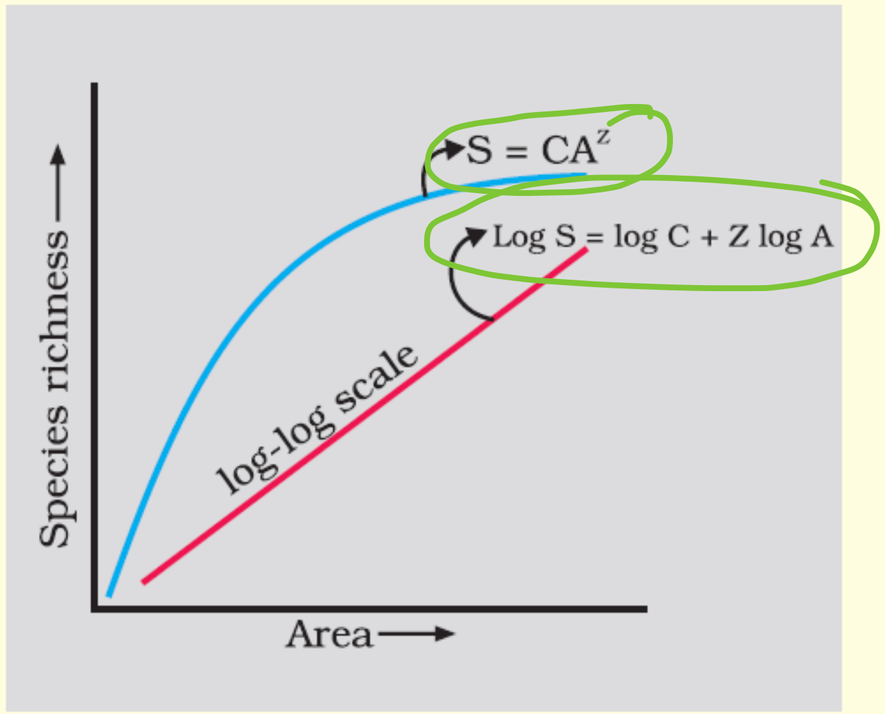


**Figure 15.2** Showing species area relationship. Note that on log scale the relationship becomes linear

S: Species richness
C: Y intercept
A: area
⇒ Species : area
richness ↓

Rectangular hyperbola

⇒ log graphs Straight line

Z: Slope (0.1-0.2)

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# CHAPTER-16
# ENVIRONMENTAL ISSUES

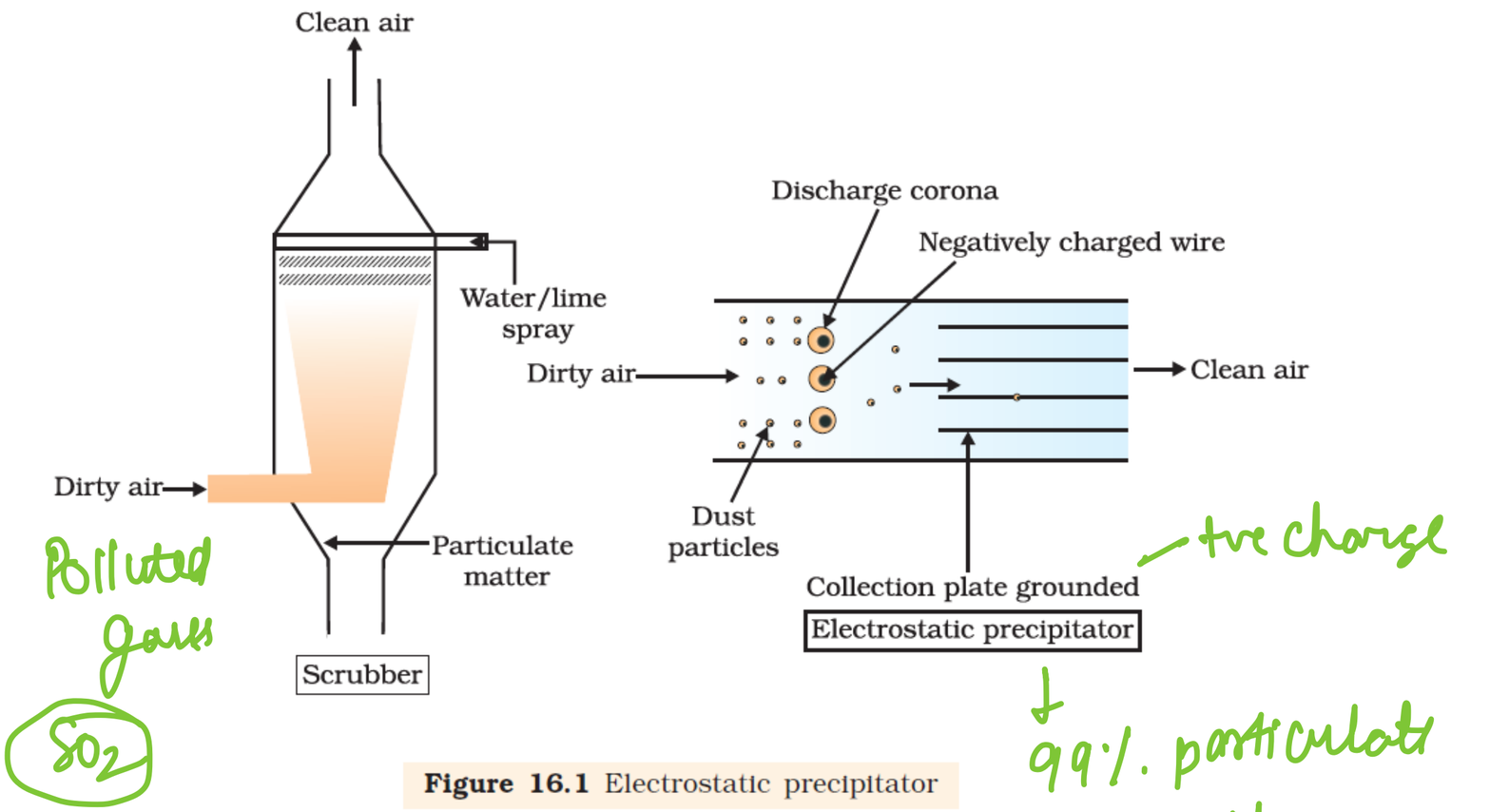


**Figure 16.1** Electrostatic precipitator

Polluted gases

$SO_2$

+ve charge

↓

99% particulate matter

thermal power plant

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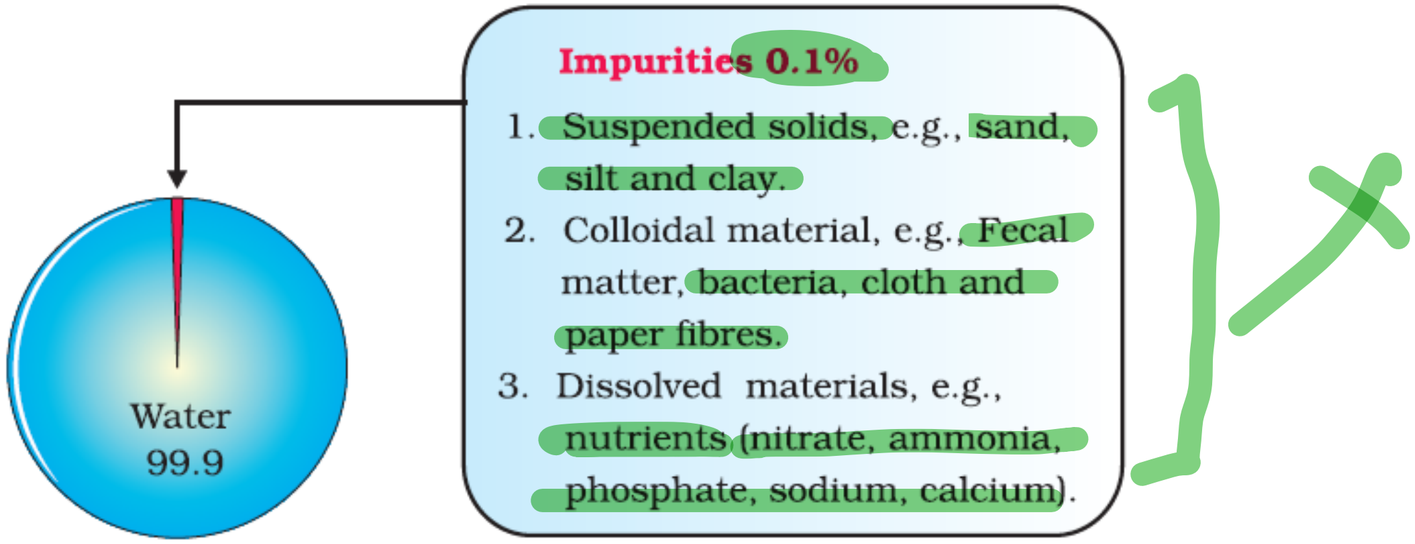


**Figure 16.2** Composition of waste water

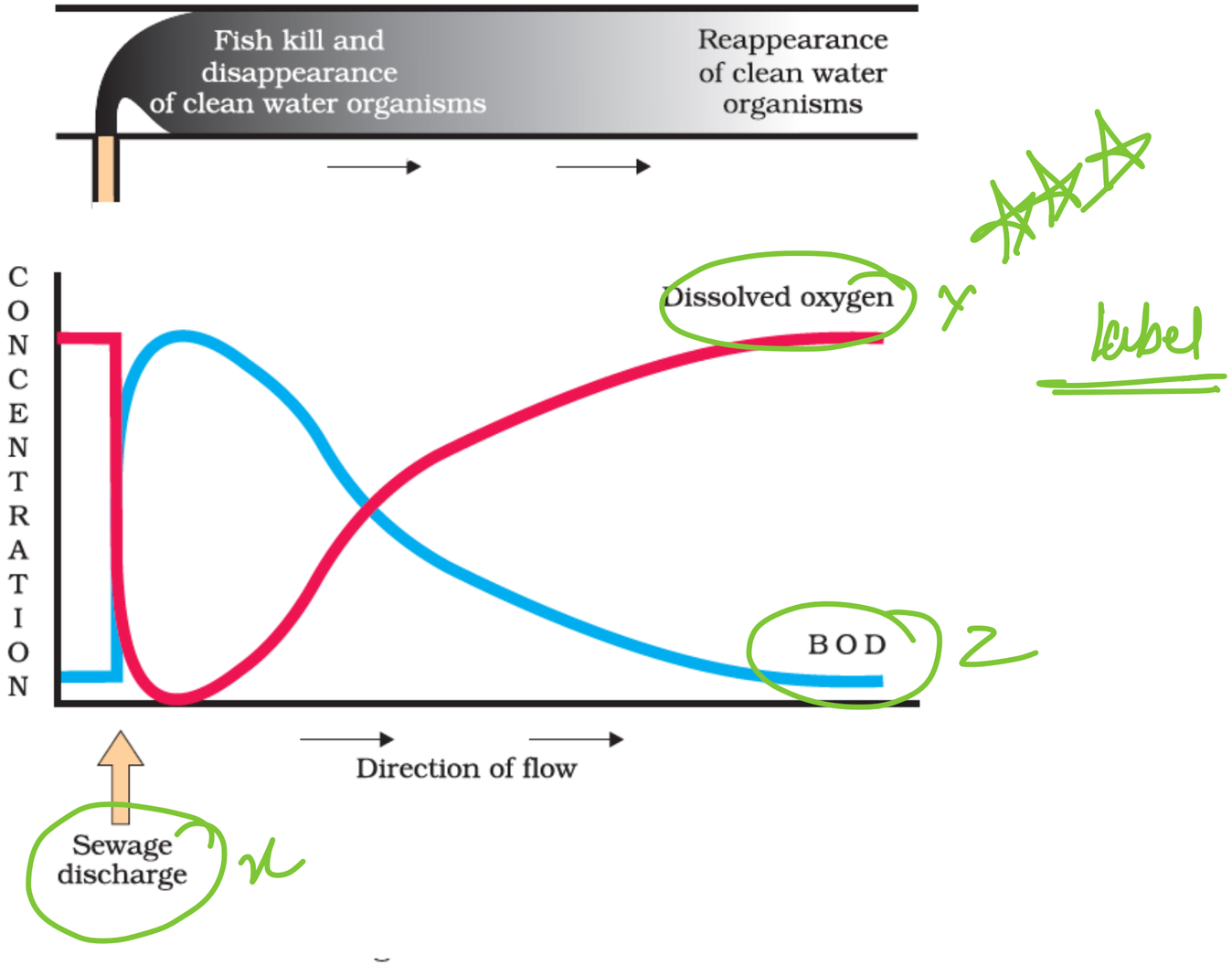


**Figure 16.3** Effect of sewage discharge on some important characteristics of a river

**Figure 16.4** Pictorial view of an algal bloom

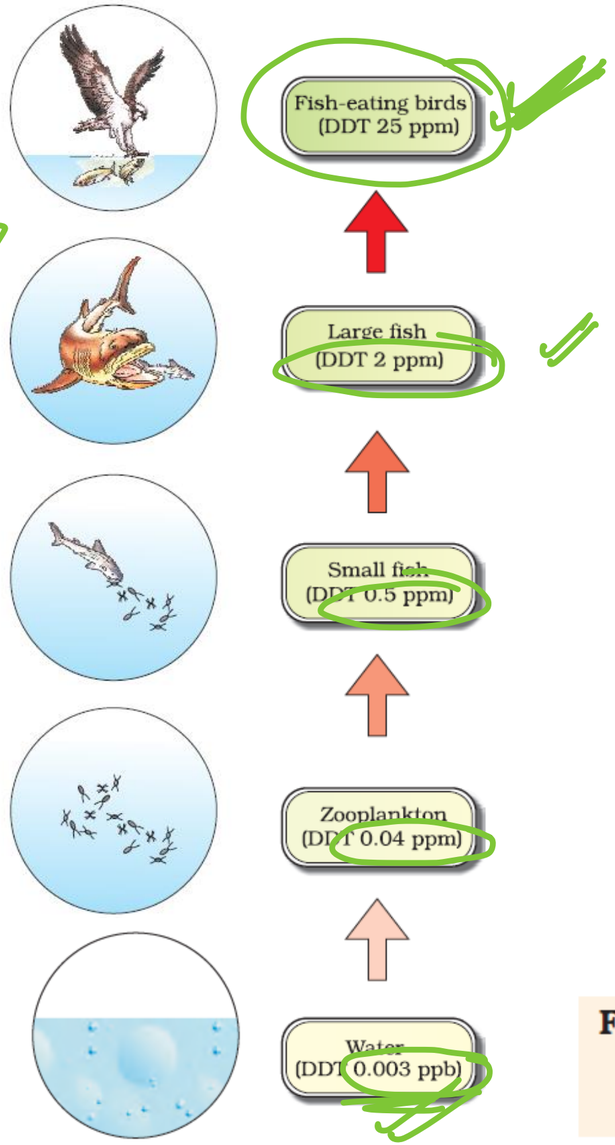


**Figure 16.5** Biomagnification of DDT in an aquatic food chain

Resists
toxic = metabolise X
excrete out X
theory
① Biomagnification
② Birds : Calcium metabolism X
egg covering X
↓
birds population ↓
DDT

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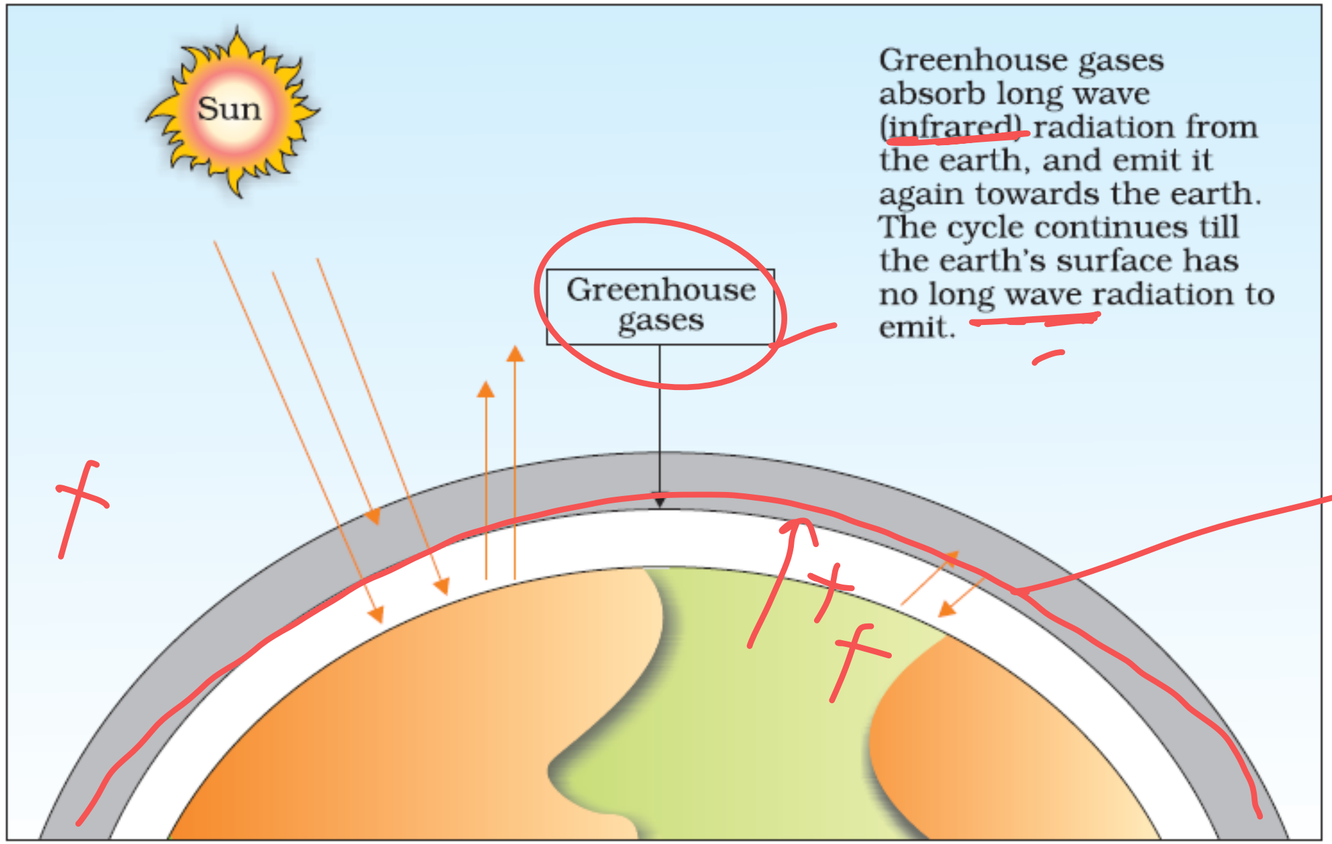


**Figure 16.6** Sunlight energy at the outermost atmosphere

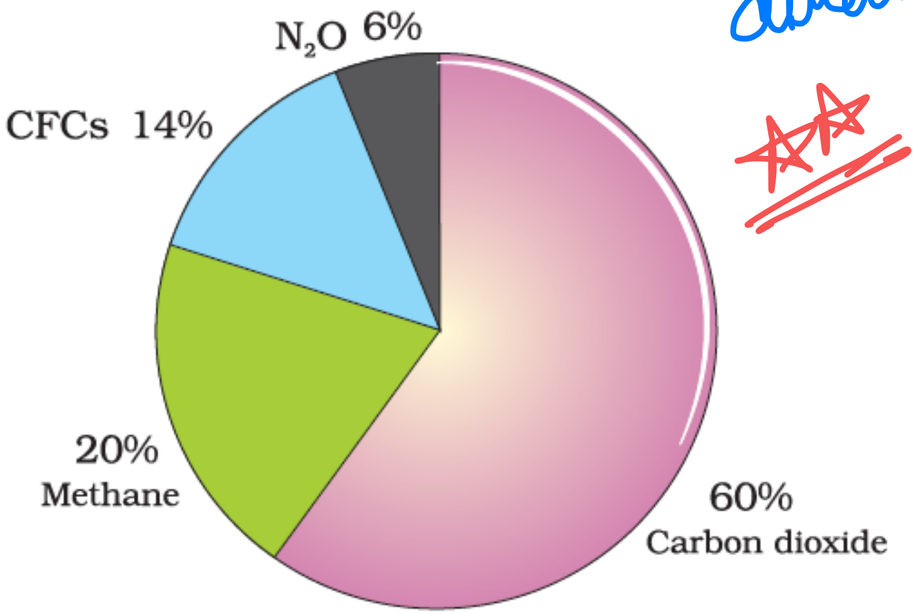


**Figure 16.7** Relative contribution of various greenhouse gases to total global warming

direct diagram

$CO_2 > CH_4 > CFC > N_2O$

60% 20% 14% 6%

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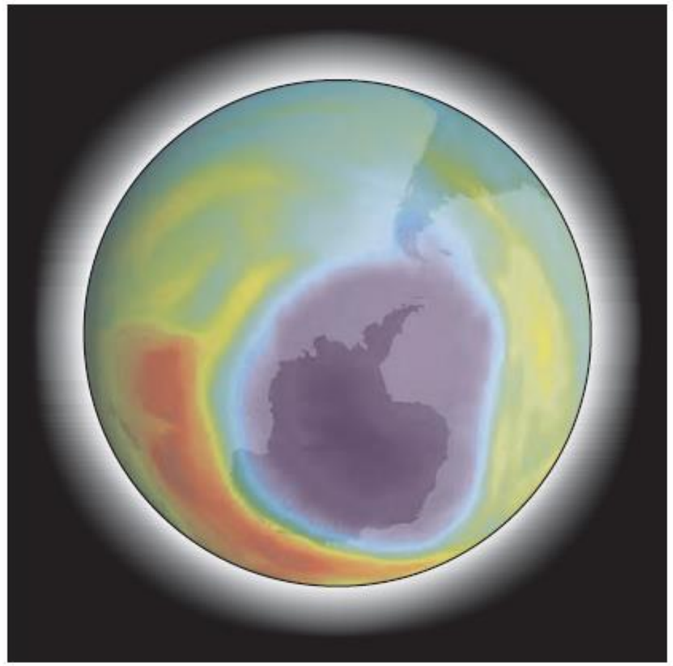

**Figure 16.8** Ozone hole is the area above Antarctica, shown in purple colour, where the ozone layer is the thinnest. Ozone thickness is given in Dobson unit (see carefully the scale shown in colour violet to red). The ozone hole over Antarctica develops each year between late August and early October. *Courtesy: NASA*

thickness =

Dobson unit

DU

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# THANK YOU