LINKAGE AND RECOMBINATION

NCERT line:
"Morgan carried out several dihybrid crosses in Drosophila to study genes that were sex-linked. The crosses were similar to the dihybrid crosses carried out by Mendel in peas."

Hinglish explanation:
Morgan ne Drosophila (fruit fly) me dihybrid crosses kiye, jaise Mendel ne peas me kiye the, lekin yahan focus **sex-linked genes** par tha.
Example: Jaise school me ek science experiment repeat karte ho, waise hi Mendel ke pea experiment ko fruit fly me repeat kiya gaya.

Hidden NEET concept:

- Sex-linked traits = genes located on sex chromosomes (X or Y)
- Drosophila = model organism for genetics

NEET MCQs:

1. Morgan studied which type of genes in Drosophila?
   A) Autosomal
   B) Sex-linked
   C) Mitochondrial
   D) Polygenic
   Answer: B

---

2. NCERT line:
"For example Morgan hybridised yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their F1 progeny. He observed that the two genes did not segregate independently of each other and the F2 ratio deviated very significantly from the 9:3:3:1 ratio (expected when the two genes are independent)."

Hinglish explanation:
Example me, yellow-bodied & white-eyed females ko brown-bodied & red-eyed males se cross kiya. F1 ke intercross ke baad F2 me expected 9:3:3:1 ratio nahi mila. Matlab ye genes **independently segregate nahi kar rahe the**.
Example: Jaise do friends hamesha saath me aate hain, independent behavior nahi dikhate, waise ye genes bhi linked behave kar rahe the.

Hidden NEET concept:

- Linked genes = located close on same chromosome → no independent assortment
- Deviation from Mendelian ratio = clue for linkage

NEET MCQs:

1. When two genes are linked, F2 ratio in dihybrid cross:
   A) Always 9:3:3:1
   B) Deviates from 9:3:3:1
   C) Always 3:1
   D) Independent
   Answer: B

---

3. NCERT line:
"Morgan and his group knew that the genes were located on the X chromosome and saw quickly that when the two genes in a dihybrid cross were situated on the same chromosome, the proportion of parental gene combinations were much higher than the non-parental type."

Hinglish explanation:
Morgan ne dekha ki ye genes **X chromosome** par hain aur jab same chromosome par hote hain, to parental combinations F2 me zyada milte hain aur non-parental (recombinant) kam.
Example: Jaise do siblings hamesha ek saath games khelte hain, naye combinations kam bante hain.

Hidden NEET concept:

- Parental types = original gene combination
- Non-parental types = result of recombination

NEET MCQs:

1. Higher frequency in F2 indicates:
   A) Independent assortment
   B) Gene linkage
   C) Mutation
   D) Epistasis
   Answer: B

---

4. NCERT line:
"Morgan attributed this due to the physical association or linkage of the two genes and coined the term linkage to describe this physical association of genes on a chromosome and the term recombination to describe the generation of non-parental gene combinations."

Hinglish explanation:
Morgan ne kaha ki ye genes **physically linked** hain.

- **Linkage** = genes physically together on chromosome
- **Recombination** = non-parental gene combination ka formation (crossing over ke wajah se)
  Example: Jaise ek magnet me do iron pieces chipke rehte hain, lekin kabhi kabhi vibration se separate hoke naya combination ban jata hai.

Hidden NEET concept:

- Linkage → low recombination
- Crossing over during meiosis = source of recombinant gametes

NEET MCQs:

1. Term 'linkage' refers to:
   A) Independent assortment
   B) Physical proximity of genes on chromosome
   C) Mutation
   D) Dominance
   Answer: B
2. Term 'recombination' refers to:
   A) DNA replication
   B) Formation of non-parental gene combinations
   C) Cell division
   D) Protein synthesis
   Answer: B

---

5. NCERT line:
"Morgan and his group also found that even when genes were grouped on the same chromosome, some genes were very tightly linked (showed very low recombination) while others were loosely linked (showed higher recombination)."

Hinglish explanation:
Genes same chromosome par hone ke bawajood, kuch tightly linked hote hain → rarely recombine
Kuch loosely linked hote hain → zyada recombination hoti hai
Example: Jaise ek pair of friends hamesha saath hote hain (tight linkage), aur kuch friends kabhi kabhi alag ho jate hain (loose linkage).

Hidden NEET concept:

- Recombination frequency ∝ distance between genes
- Tight linkage = <10% recombination, Loose linkage = >10% recombination

NEET MCQs:

1. Tightly linked genes show:
   A) High recombination frequency
   B) Low recombination frequency
   C) 50% recombination frequency
   D) Independent assortment
   Answer: B

2. Loose linkage indicates:
   A) Genes far apart on chromosome
   B) Genes close together
   C) Same gene
   D) Autosomal genes only
   Answer: A

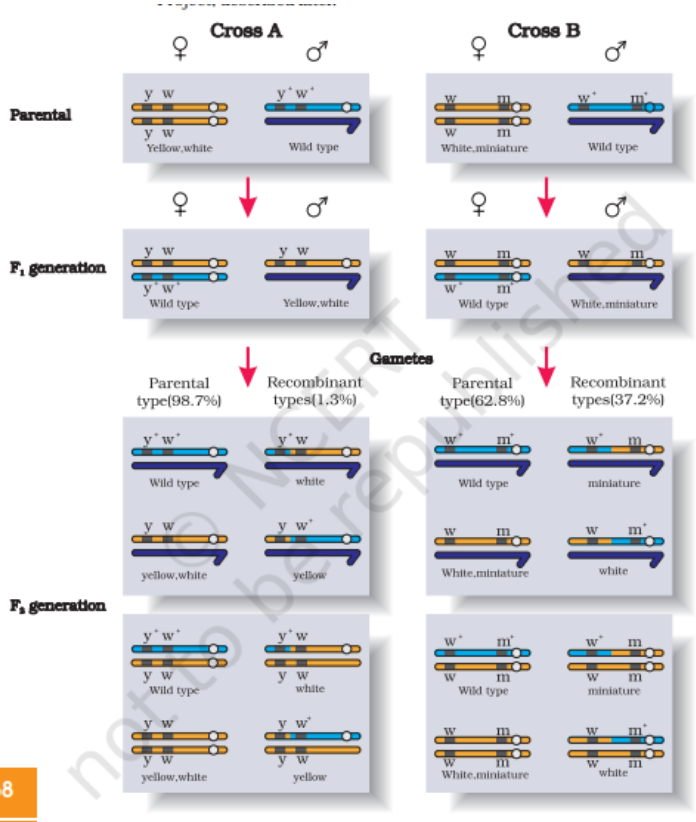

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Figure 4.11 Linkage: Results of two dihybrid crosses conducted by Morgan. Cross A shows crossing between gene y and w; Cross B shows crossing between genes w and m. Here dominant wild type alleles are represented with (+) sign in superscript
Note: The strength of linkage between y and w is higher than w and m.

TRANSLATION

1. <u>NCERT line:</u>
"Translation refers to the process of polymerisation of amino acids to form a polypeptide."

<u>Hinglish explanation:</u>
Translation ka matlab hai amino acids ko join karke **polypeptide chain** banana. Ye process RNA ke instructions ke according hota hai.
Example: Jaise Lego blocks ko instructions ke hisab se jod kar ek structure banta hai, waise hi amino acids join hoke protein bante hain.

<u>Hidden NEET concept:</u>

- Translation = mRNA directed protein synthesis

- Amino acids joined by **peptide bond**

NEET MCQs:

1. Translation is the process of:
   A) DNA replication
   B) Protein synthesis
   C) RNA transcription
   D) Lipid synthesis
   Answer: B

---

2. NCERT line:
"The order and sequence of amino acids are defined by the sequence of bases in the mRNA."

Hinglish explanation:
mRNA ke codons (3 bases) define karte hain ki kaunsa amino acid kaunsa position pe aaega.
Example: Jaise recipe ke steps decide karte hain ki ingredient kab aur kaise use hoga, waise hi mRNA sequence determine karta hai amino acid sequence.

Hidden NEET concept:

- Codon = 3 nucleotide sequence coding for one amino acid
- Universal genetic code

NEET MCQs:

1. Sequence of amino acids in a polypeptide is determined by:
   A) tRNA
   B) mRNA codons
   C) rRNA
   D) DNA only
   Answer: B

---

3. NCERT line:
"Formation of a peptide bond requires energy. Therefore, in the first phase itself amino acids are activated in the presence of ATP and linked to their cognate tRNA – a process commonly called as charging of tRNA or aminoacylation of tRNA."

Hinglish explanation:
Peptide bond formation ke liye energy chahiye. Amino acids ATP ke presence me **tRNA se attach** hote hain. Ye process **charging of tRNA** ya **aminoacylation** kehlata hai.
Example: Jaise car me petrol fill karna zaruri hai engine start karne ke liye, waise hi amino acids ko tRNA pe attach karna zaruri hai peptide bond banane ke liye.

Hidden NEET concept:

- Aminoacyl-tRNA synthetase = enzyme for charging tRNA
- Energy from ATP → formation of aminoacyl-tRNA

NEET MCQs:

1. Amino acid is attached to tRNA by:
   A) Ribosome
   B) Aminoacyl-tRNA synthetase
   C) RNA polymerase
   D) Ligase
   Answer: B

---

4. NCERT line:
"The cellular factory responsible for synthesising proteins is the ribosome. The ribosome consists of structural RNAs and about 80 different proteins. In its inactive state, it exists as two subunits; a large subunit and a small subunit."

Hinglish explanation:
Protein banane ka factory **ribosome** hai. Ribosome me RNA + 80 proteins hote hain. Ribosome do parts me hota hai: **small subunit** aur **large subunit**.
Example: Jaise ek car assembly line me do separate units hote hain – ek base ready karta hai aur dusra final assembly karta hai, waise ribosome ke do subunits milke protein banate hain.

Hidden NEET concept:

- Ribosome = site of translation
- Large subunit = peptide bond formation
- Small subunit = mRNA binding

NEET MCQs:

1. Ribosome consists of:
   A) Only RNA
   B) Only proteins
   C) rRNA + proteins
   D) DNA + proteins
   Answer: C

---

5. NCERT line:
"When the small subunit encounters an mRNA, the process of translation of the mRNA to protein begins. There are two sites in the large subunit, for subsequent amino acids to bind to and thus, be close enough to each

other for the formation of a peptide bond. The ribosome also acts as a catalyst (23S rRNA in bacteria is the enzyme- ribozyme) for the formation of peptide bond."

Hinglish explanation:
Small subunit mRNA se bind hoti hai → translation start. Large subunit me **do sites** hote hain jahan amino acids aake **peptide bond** banate hain. Ribosome ka rRNA catalytic role play karta hai → ek **ribozyme** ke tarah.
Example: Jaise chef ingredients ko exact distance pe rakhta hai taaki cooking efficiently ho, waise ribosome amino acids ko sahi position me laata hai.

Hidden NEET concept:

- Ribosome = peptidyl transferase activity (rRNA as catalyst)
- A site = incoming aminoacyl-tRNA, P site = growing peptide chain

NEET MCQs:

1. Catalytic activity for peptide bond formation in bacteria is by:
   A) tRNA
   B) 23S rRNA
   C) mRNA
   D) Aminoacyl-tRNA synthetase
   Answer: B

---

6. NCERT line:
"A translational unit in mRNA is the sequence of RNA that is flanked by the start codon (AUG) and the stop codon and codes for a polypeptide. An mRNA also has some additional sequences that are not translated and are referred as untranslated regions (UTR)."

Hinglish explanation:
Translational unit = mRNA ka wo region jo **start codon (AUG)** se **stop codon** tak hota hai aur polypeptide code karta hai. Baaki mRNA me untranslated regions (UTR) hote hain jo translate nahi hote.
Example: Jaise recipe book me kuch instructions sirf heading ya notes hote hain, wo follow nahi karte cooking me, waise hi UTR translate nahi hote.

Hidden NEET concept:

- Start codon = AUG (Methionine)
- Stop codons = UAA, UAG, UGA
- UTRs = regulatory sequences

NEET MCQs:

1. Start codon for translation:
   A) UAA
   B) AUG
   C) UAG

D) UGA
Answer: B

2. Stop codon includes:
A) AUG
B) UAA, UAG, UGA
C) AAA
D) GGG
Answer: B

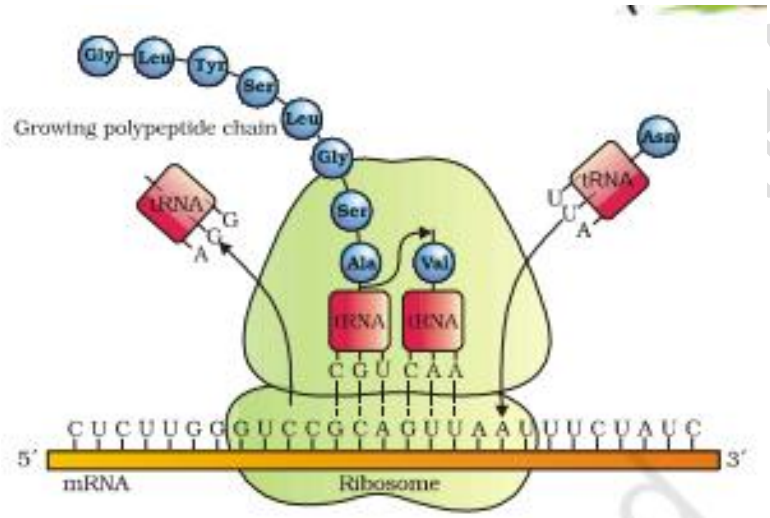

Figure 5.13 Translation

THE LAC OPERON

1. <u>NCERT line:</u>
"The elucidation of the lac operon was also a result of a close association between a geneticist, Francois Jacob and a biochemist, Jacque Monod. They were the first to elucidate a transcriptionally regulated system."

<u>Hinglish explanation:</u>
Lac operon ko sabse pehle **Jacob aur Monod** ne discover kiya. Ye ek **transcriptionally regulated system** hai, matlab gene ka expression control hota hai transcription level par.
Example: Jaise ek factory me manager decide karta hai kaunsa machine kab chalega, waise hi operon decide karta hai kaunsa gene kab express hoga.

<u>Hidden NEET concept:</u>

- Lac operon = first example of **gene regulation in prokaryotes**
- Transcriptional regulation = mRNA synthesis ke level par control

<u>NEET MCQs:</u>

1. Who elucidated the lac operon?
   A) Mendel
   B) Watson & Crick
   C) Jacob & Monod
   D) Hershey & Chase
   Answer: C

---

2. NCERT line:
"In lac operon (here lac refers to lactose), a polycistronic structural gene is regulated by a common promoter and regulatory genes. Such arrangement is very common in bacteria and is referred to as operon."

Hinglish explanation:
Lac operon me **polycistronic mRNA** produce hota hai, matlab ek mRNA me **multiple structural genes** hote hain. Ye genes **common promoter aur regulator gene** ke under control me hote hain. Ye arrangement bacteria me common hai, isse **operon** kehte hain.
Example: Jaise ek train me multiple coaches ek engine se control hote hain, waise hi multiple genes ek promoter se control hote hain.

Hidden NEET concept:

- Polycistronic mRNA = single mRNA coding for multiple proteins
- Operon = regulatory unit in prokaryotes

NEET MCQs:

1. Polycistronic mRNA is found in:
   A) Prokaryotes
   B) Eukaryotes
   C) Both
   D) None
   Answer: A

---

3. NCERT line:
"The lac operon consists of one regulatory gene (the i gene – here the term i does not refer to inducer, rather it is derived from the word inhibitor) and three structural genes (z, y, and a)."

Hinglish explanation:
Lac operon me:

- **Regulatory gene:** i gene (codes for repressor; "i" = inhibitor)
- **Structural genes:** z, y, a (code for proteins needed for lactose metabolism)

Hidden NEET concept:

- i gene → lac repressor
- Structural genes = enzymes & proteins for lactose utilization

NEET MCQs:

1. Regulatory gene of lac operon is:
   A) z
   B) y
   C) i
   D) a
   Answer: C

---

4. NCERT line:
"The i gene codes for the repressor of the lac operon."

Hinglish explanation:
i gene **repressor protein** banata hai, jo lac operon ke promoter se bind karke transcription ko rokta hai jab lactose absent ho.
Example: Jaise gatekeeper entry rokta hai jab visitor pass nahi dikhata, waise hi repressor mRNA transcription rokta hai.

Hidden NEET concept:

- Repressor = negative regulation
- Lactose presence → binds repressor → operon ON

NEET MCQs:

1. Function of i gene in lac operon:
   A) Codes β-galactosidase
   B) Codes repressor protein
   C) Codes permease
   D) Codes transacetylase
   Answer: B

---

5. NCERT line:
"The z gene codes for beta-galactosidase (β-gal), which is primarily responsible for the hydrolysis of the disaccharide, lactose into its monomeric units, galactose and glucose."

Hinglish explanation:
z gene **β-galactosidase** banata hai, jo lactose ko glucose aur galactose me todta hai.
Example: Jaise scissors ek rope ko do parts me cut karte hain, waise hi β-gal lactose ko split karta hai.

Hidden NEET concept:

- z gene = lacZ = hydrolytic enzyme for lactose
- Important for inducible enzyme system

NEET MCQs:

1. β-galactosidase hydrolyzes:
   A) Glucose
   B) Sucrose
   C) Lactose
   D) Maltose
   Answer: C

---

6. NCERT line:
"The y gene codes for permease, which increases permeability of the cell to β-galactosides."

Hinglish explanation:
y gene **permease** banata hai, jo lactose ko cell ke andar transport karta hai (membrane permeability increase karta hai).
Example: Jaise gate open karke delivery person ko entry milti hai, waise permease lactose ko cell me allow karta hai.

Hidden NEET concept:

- lacY = permease = transport protein

NEET MCQs:

1. Role of lacY gene:
   A) Breaks lactose
   B) Transport of lactose into cell
   C) Represses operon
   D) Acetylation of sugars
   Answer: B

---

7. NCERT line:
"The a gene encodes a transacetylase. Hence, all the three gene products in lac operon are required for metabolism of lactose."

Hinglish explanation:
a gene **transacetylase** banata hai. Lac operon ke tino proteins milke lactose metabolism me kaam karte hain.
Example: Jaise kitchen me chef, assistant, aur utensils sab milke cooking complete karte hain, waise hi Z, Y, A enzymes lactose metabolism ke liye needed hain.

Hidden NEET concept:

- lacA = transacetylase, minor role in metabolism
- Operon = functional gene cluster for related pathway

NEET MCQs:

1. lacA gene codes for:
   A) β-galactosidase
   B) Permease
   C) Transacetylase
   D) Repressor
   Answer: C

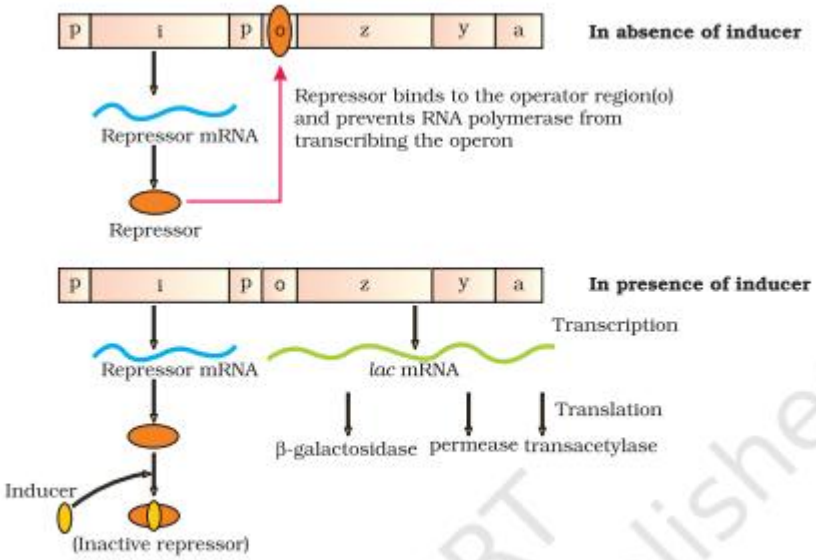

Figure 5.14 The *lac* Operon

HARDY-WEINBERG PRINCIPLE

1. NCERT line:
"In a given population one can find out the frequency of occurrence of alleles of a gene or a locus. This frequency is supposed to remain fixed and even remain the same through generations. Hardy-Weinberg principle stated it using algebraic equations."

Hinglish explanation:
Population me har gene ke **allele frequency** ko measure kiya ja sakta hai. Hardy-Weinberg principle kehta hai

ki agar ideal conditions ho, ye frequency **generations me constant** rehti hai.
Example: Jaise ek jar me red aur blue balls ka ratio fixed ho aur har baar same proportion rahe, waise hi allele frequency constant rehna chahiye.

Hidden NEET concept:

- Hardy-Weinberg principle = mathematical model for **genetic equilibrium**

NEET MCQs:

1. Hardy-Weinberg principle is concerned with:
   A) Protein synthesis
   B) Allele frequency in population
   C) Mendelian inheritance
   D) Chromosome mutation
   Answer: B

---

2. NCERT line:
"This principle says that allele frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium."

Hinglish explanation:
Allele frequencies stable rehte hain → **genetic equilibrium**. Gene pool = population ke **total genes + alleles**.
Example: Jaise ek library me books ka collection same rehta hai har saal, waise hi gene pool stable rehta hai.

Hidden NEET concept:

- Genetic equilibrium = no evolution occurring
- Gene pool = sum total of all alleles in a population

NEET MCQs:

1. Genetic equilibrium refers to:
   A) Change in allele frequency
   B) Constant allele frequency
   C) Random mating only
   D) Speciation
   Answer: B

---

3. NCERT line:
"Sum total of all the allelic frequencies is 1. Individual frequencies, for example, can be named p, q, etc. In a diploid, p and q represent the frequency of allele A and allele a."

Hinglish explanation:
Total allelic frequency = 1.

- p = frequency of allele A
- q = frequency of allele a
- p + q = 1

Hidden NEET concept:

- Basic formula of Hardy-Weinberg: **p + q = 1**
- Diploid population considered

NEET MCQs:

1. In a diploid population with two alleles, p + q equals:
   A) 0
   B) 0.5
   C) 1
   D) 2
   Answer: C

---

4. NCERT line:
"The frequency of AA individuals in a population is simply p^2. Similarly of aa is q^2, of Aa 2pq. Hence, $p^2 + 2pq + q^2 = 1$. This is a binomial expansion of $(p+q)^2$."

Hinglish explanation:

- Homozygous dominant (AA) = p^2
- Homozygous recessive (aa) = q^2
- Heterozygous (Aa) = 2pq
- Total = 1 → **$p^2 + 2pq + q^2 = 1$**
  Example: Jaise probability ka calculation – agar red ball ka probability p hai aur blue ka q hai, to 2 red, 2 blue ya red+blue combinations ka probability bhi calculate kiya ja sakta hai.

Hidden NEET concept:

- Binomial expansion → predict genotype frequency in population
- Assumes random mating, large population, no mutation, no selection

NEET MCQs:

1. Genotype frequency of heterozygotes = ?
   A) p^2
   B) q^2
   C) 2pq

D) p + q
Answer: C

---

5. NCERT line:
"When frequency measured, differs from expected values, the difference (direction) indicates the extent of evolutionary change. Disturbance in genetic equilibrium, or Hardy-Weinberg equilibrium, i.e., change of frequency of alleles in a population would then be interpreted as resulting in evolution."

Hinglish explanation:
Agar observed allele frequency expected se alag hai → **evolution ho rahi hai**. Hardy-Weinberg equilibrium = baseline, deviation = evolutionary change.
Example: Jaise weather forecast me 30°C expect kiya tha, lekin 35°C aaya → change ka indication, waise hi allele frequency me deviation evolution dikhaata hai.

Hidden NEET concept:

- Deviation from H-W equilibrium = **microevolution**
- Tool to study natural selection and evolution

NEET MCQs:

1. Deviation from Hardy-Weinberg equilibrium indicates:
   A) Genetic drift
   B) Mutation
   C) Evolution
   D) Random mating
   Answer: C

---

6. NCERT line:
"Five factors are known to affect Hardy-Weinberg equilibrium. These are gene migration or gene flow, genetic drift, mutation, genetic recombination and natural selection. When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as in the new population."

Hinglish explanation:
H-W equilibrium affect karte hain:

1. **Gene flow/migration** → alleles new population me jate hain
2. **Genetic drift** → random allele frequency changes in small population
3. **Mutation** → new alleles
4. **Genetic recombination** → new combinations
5. **Natural selection** → favorable alleles increase

Example: Jaise ek village se log migrate karte hain aur local food habits change kar dete hain, waise hi gene flow allele frequency change karta hai.

Hidden NEET concept:

- Factors causing deviation = forces of evolution
- Microevolution = allele frequency change in population

NEET MCQs:

1. Which of the following does **not** disturb Hardy-Weinberg equilibrium?
   A) Mutation
   B) Genetic drift
   C) Random mating
   D) Natural selection
   Answer: C
2. Gene flow causes:
   A) Increase in genetic variation in both populations
   B) Decrease in variation
   C) No change
   D) Fixation of alleles
   Answer: A

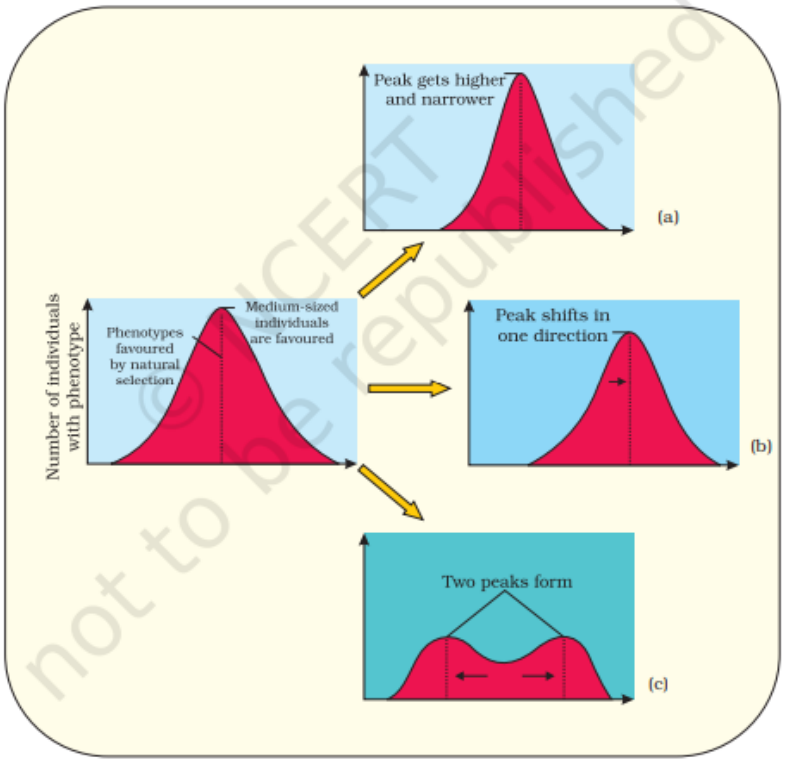

Figure 6.8 Diagrammatic representation of the operation of natural selection on different traits : (a) Stabilising (b) Directional and (c) Disruptive

AIDS

1. NCERT line:
"The word AIDS stands for Acquired Immuno Deficiency Syndrome. This means deficiency of immune system, acquired during the lifetime of an individual indicating that it is not a congenital disease. 'Syndrome' means a group of symptoms."

Hinglish explanation:
AIDS ka full form hai **Acquired Immuno Deficiency Syndrome**.

- **Acquired** → lifetime me milta hai, congenital nahi
- **Immuno Deficiency** → immune system weak ho jata hai
- **Syndrome** → ek group of symptoms
  Example: Jaise diabetes ek condition hai jisme body sugar regulate nahi kar pati, waise hi AIDS me immunity weak hoti hai aur kai symptoms ek saath aate hain.

Hidden NEET concept:

- AIDS = immunodeficiency disease caused by virus
- Acquired = not inherited, develops after infection

NEET MCQs:

1. AIDS is a/an:
   A) Congenital disease
   B) Acquired disease
   C) Bacterial infection
   D) Autoimmune disease
   Answer: B

---

2. NCERT line:
"AIDS was first reported in 1981 and in the last twenty-five years or so, it has spread all over the world killing more than 25 million persons."

Hinglish explanation:
AIDS pehli baar **1981** me report hua aur aaj tak duniya bhar me 25 million se zyada logon ki death hui hai.
Example: Jaise pandemic viral diseases ka global impact dikhta hai, waise hi AIDS ka worldwide effect hai.

Hidden NEET concept:

- Timeline: First reported 1981

- Epidemiology: global spread & mortality

NEET MCQs:

1. First report of AIDS was in:
   A) 1971
   B) 1981
   C) 1991
   D) 2001
   Answer: B

---

3. NCERT line:
"AIDS is caused by the Human Immuno deficiency Virus (HIV), a member of a group of viruses called retrovirus, which have an envelope enclosing the RNA genome."

Hinglish explanation:
Cause of AIDS = **HIV (Human Immunodeficiency Virus)**

- HIV = **retrovirus** (RNA virus, has reverse transcriptase)
- Enveloped virus = RNA genome enclosed by protein-lipid envelope
  Example: Jaise Trojan virus apne code ke sath computer me entry karta hai, HIV RNA genome ke sath human cells me enter karta hai.

Hidden NEET concept:

- Retrovirus = RNA virus using reverse transcriptase
- Envelope = helps virus enter host cells

NEET MCQs:

1. HIV belongs to which type of virus?
   A) DNA virus
   B) Retrovirus
   C) Bacteriophage
   D) Adenovirus
   Answer: B

---

4. NCERT line:
"Transmission of HIV-infection generally occurs by (a) sexual contact with infected person, (b) by transfusion of contaminated blood and blood products, (c) by sharing infected needles as in the case of intravenous drug abusers and (d) from infected mother to her child through placenta."

Hinglish explanation:
HIV spread hota hai **body fluids ke through**, jaise:

a) Sexual contact with infected person
b) Contaminated blood transfusion
c) Sharing needles (IV drug use)
d) Mother → fetus via placenta
Example: Jaise germs sirf contact me nahi failte, HIV bhi sirf body fluids se hi spread hota hai.

Hidden NEET concept:

- Modes of transmission = blood, sexual contact, vertical (mother-to-child)
- Not spread via casual touch

NEET MCQs:

1. HIV can spread through:
   A) Handshake
   B) Coughing
   C) Blood transfusion
   D) Sharing utensils
   Answer: C

---

5. NCERT line:
"So, people who are at high risk of getting this infection includes - individuals who have multiple sexual partners, drug addicts who take drugs intravenously, individuals who require repeated blood transfusions and children born to an HIV infected mother."

Hinglish explanation:
High-risk groups:

- Multiple sexual partners
- IV drug users
- Repeated blood transfusion patients
- Children born to HIV+ mothers
  Example: Jaise crowded area me flu easily spread hota hai, waise hi high-risk behavior me HIV ka exposure zyada hai.

Hidden NEET concept:

- High-risk behavior → increased probability of HIV infection

NEET MCQs:

1. High-risk group for HIV does NOT include:
   A) IV drug users
   B) Multiple sexual partners
   C) Casual contact with HIV patient

D) Repeated blood transfusion patients
Answer: C

---

6. NCERT line:
"It is important to note that HIV/AIDS is not spread by mere touch or physical contact; it spreads only through body fluids. It is, hence, imperative, for the physical and psychological well-being, that the HIV/AIDS infected persons are not isolated from family and society."

Hinglish explanation:
HIV **touch ya casual contact se nahi failta**. Isliye patients ko family aur society se isolate nahi karna chahiye, ye psychological support ke liye important hai.
Example: Jaise ek diabetic patient ko family support chahiye, waise hi HIV patients ko care aur acceptance chahiye.

Hidden NEET concept:

- Myths about transmission should be clarified
- Social & psychological care important

NEET MCQs:

1. HIV is **not transmitted by**:
   A) Blood transfusion
   B) Sexual contact
   C) Touch or handshake
   D) Mother-to-child
   Answer: C

---

7. NCERT line:
"There is always a time-lag between the infection and appearance of AIDS symptoms. This period may vary from a few months to many years (usually 5-10 years)."

Hinglish explanation:
HIV infection → AIDS symptoms appear hone me **time-lag hota hai**, usually 5-10 years.
Example: Jaise seeds plant me germinate hone me time lete hain, waise hi HIV infection symptoms show karne me time lagta hai.

Hidden NEET concept:

- Latent period = time between HIV infection & AIDS
- Important for diagnosis & counseling

NEET MCQs:

1. Typical latent period between HIV infection and AIDS symptoms:
   A) 1-2 months
   B) 5-10 years
   C) 20 years
   D) 1 year
   Answer: B

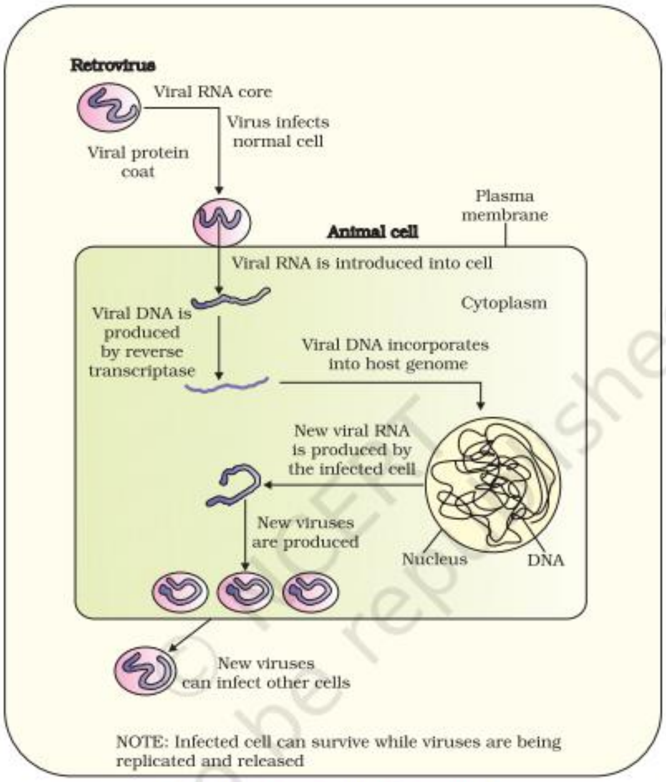

Figure 7.6 Replication of retrovirus

BT COTTON

1. <u>NCERT line:</u>
"Some strains of Bacillus thuringiensis produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes)."

<u>Hinglish explanation:</u>
Bacillus thuringiensis (Bt) bacteria kuch **proteins** banata hai jo specific insects ko maarte hain. Target insects include:

- Lepidopterans → tobacco budworm, armyworm
- Coleopterans → beetles
- Dipterans → flies, mosquitoes
  Example: Jaise neem oil sirf certain insects ko affect karta hai, waise hi Bt protein insect-specific hai.

<u>Hidden NEET concept:</u>

- Bt toxin = **insecticidal protein**
- Target-specific, not harmful to mammals

NEET MCQs:

1. Bt toxin targets which type of organisms?
   A) Bacteria
   B) Insects
   C) Fungi
   D) Plants
   Answer: B

---

2. NCERT line:
"B. thuringiensis forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein."

Hinglish explanation:
Bt bacteria apne growth ke kuch phase me **protein crystals** banata hai. Ye crystals me **toxic protein** hota hai jo insects ko maar sakta hai.
Example: Jaise chocolate me cocoa solid crystals banate hain, waise hi Bt protein crystals store hote hain.

Hidden NEET concept:

- Bt toxin stored as **crystal protoxin** → inactive form
- Activates only in insect gut

NEET MCQs:

1. Bt crystals are:
   A) Active toxins
   B) Inactive protoxins
   C) DNA sequences
   D) Antibiotics
   Answer: B

---

3. NCERT line:
"Actually, the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals."

Hinglish explanation:
Bt toxin **inactive protoxin** hota hai. Jab insect isko khata hai, insect ke **alkaline gut** me crystal solubilise hote hain aur toxin **active** ho jata hai.
Example: Jaise medicine ka coated tablet stomach me dissolve ho kar active hota hai, waise hi Bt protoxin insect gut me activate hota hai.

Hidden NEET concept:

- Activation = **pH-dependent**
- Specificity = insect gut pH

NEET MCQs:

1. Bt toxin becomes active in insect due to:
   A) Acidic pH
   B) Alkaline pH
   C) Neutral pH
   D) Heat
   Answer: B

---

4. NCERT line:
"The activated toxin binds to the surface of midgut epithelial cells and create pores that cause cell swelling and lysis and eventually cause death of the insect."

Hinglish explanation:
Active toxin insect **midgut cells** se bind hota hai → pores create karta hai → cells swell & lyse → insect eventually dies.
Example: Jaise chemical corrosive effect se pipe leak ho jata hai, waise toxin pore create karke cells destroy karta hai.

Hidden NEET concept:

- Mode of action = pore formation → cell lysis
- Specific to insect midgut

NEET MCQs:

1. Bt toxin kills insects by:
   A) Blocking DNA replication
   B) Creating pores in midgut cells
   C) Inhibiting protein synthesis
   D) Blocking mitochondria
   Answer: B

---

5. NCERT line:
"Specific Bt toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as cotton. The choice of genes depends upon the crop and the targeted pest, as most Bt toxins are insect-group specific."

Hinglish explanation:
Bt toxin genes ko **plants (cotton, maize, etc.) me insert** kiya gaya. Har crop me **target pest-specific** gene use hota hai.
Example: Jaise tailor suit design crop ke size aur requirement ke hisaab se karta hai, waise Bt gene selection pest & crop specific hoti hai.

Hidden NEET concept:

- Bt cotton = **genetically modified plant**
- Pest-specific gene incorporation

NEET MCQs:

1. Bt gene is inserted into plants for:
   A) Herbicide resistance
   B) Insect resistance
   C) Drought tolerance
   D) Flower color change
   Answer: B

---

6. NCERT line:
"The toxin is coded by a gene cryIAc named cry. There are a number of them, for example, the proteins encoded by the genes cryIAc and cryIIAb control the cotton bollworms, that of cryIAb controls corn borer."

Hinglish explanation:

- **cry genes** = code for Bt toxins
- cryIAc & cryIIAb → cotton bollworm control
- cryIAb → corn borer control
  Example: Jaise different medicines different bacteria ke liye use hote hain, waise hi cry gene type pest-specific hai.

Hidden NEET concept:

- cry gene → encodes insecticidal protein
- Specific cry genes → target specific insect species

NEET MCQs:

1. cryIAc gene in Bt cotton is used against:
   A) Corn borer
   B) Cotton bollworm
   C) Beetles
   D) Mosquitoes
   Answer: B

2. Bt toxin specificity depends on:
   A) Plant species
   B) Insect group
   C) Soil type
   D) Water content
   Answer: B

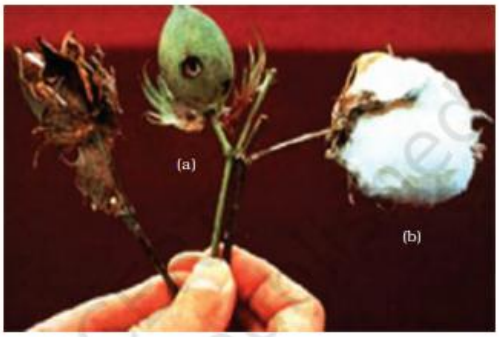

Figure 10.1 Cotton boll: (a) destroyed by bollworms; (b) a fully mature cotton boll