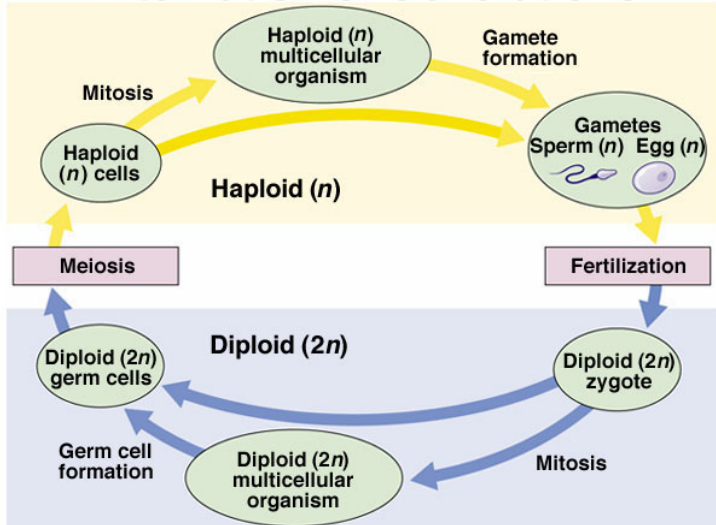
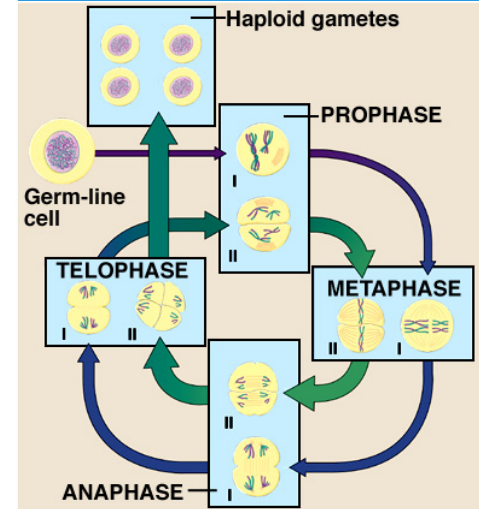


Alternation of Generations

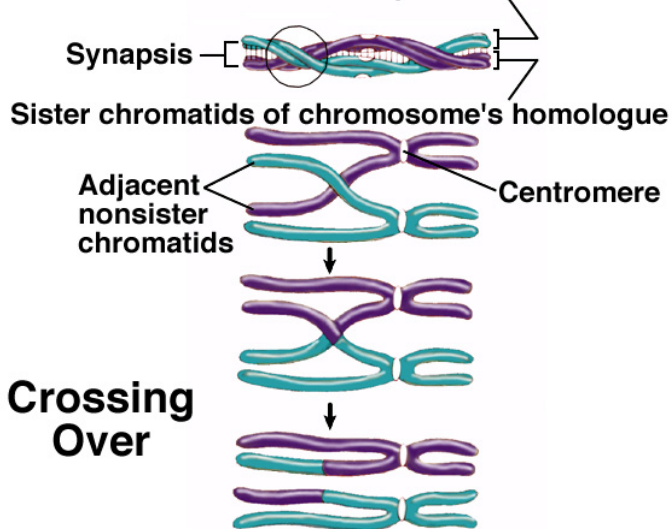


Meiosis

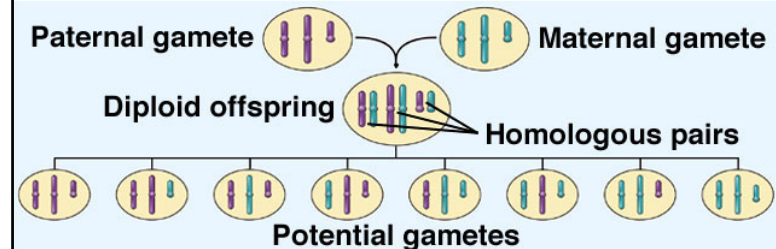
MEIOSIS



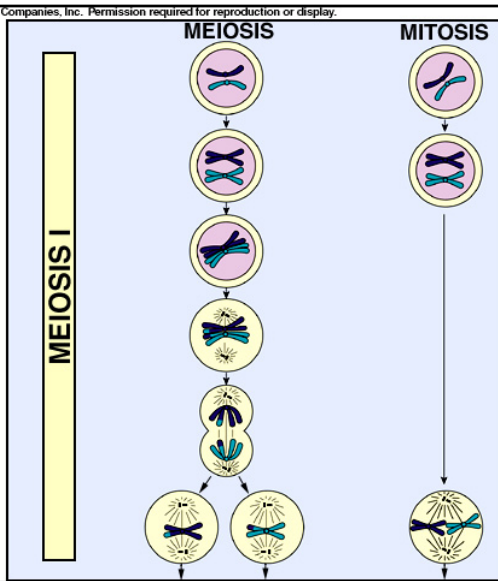
Sister chromatids of one duplicated chromosome



Independent Assortment



A Comparison of Meiosis and Mitosis



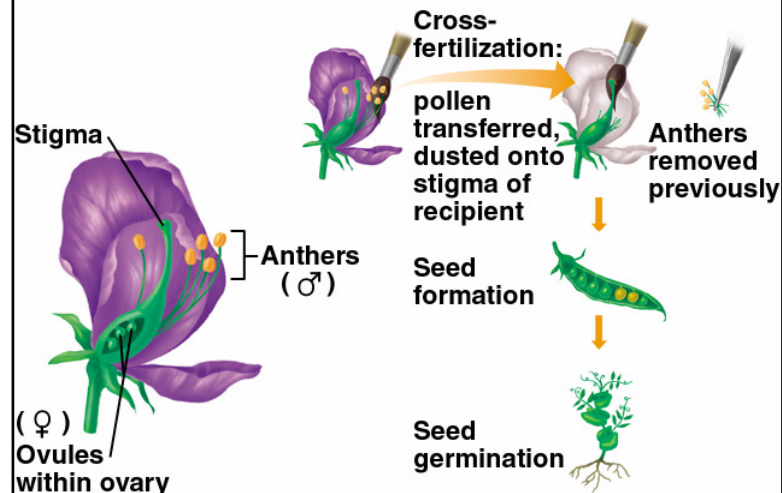
Chapter 1

Genetics: From Genes to Genomes

Hartwell/Hood/Goldberg/Reynolds/Silver/Veres

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Experiments with garden peas



Monohybrid crosses

Generation Parental (P)
(pure-breeding)

Yellow peas (♂: pollen) × Green peas (♀: eggs)

First filial (F₁)

All yellow

Self-fertilization

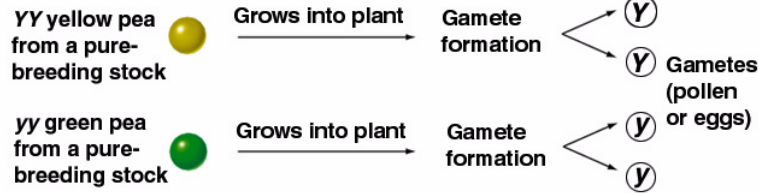
Second filial (F₂)

6022 yellow : 2001 green

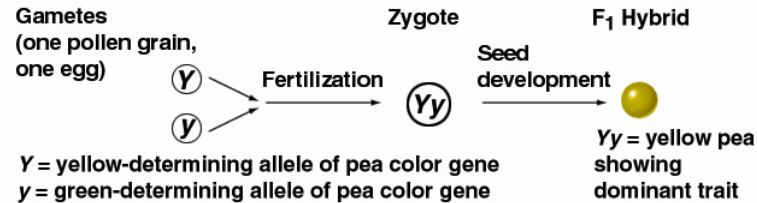
3 : 1

The law of segregation

(a) The two alleles for each trait separate during gamete formation.

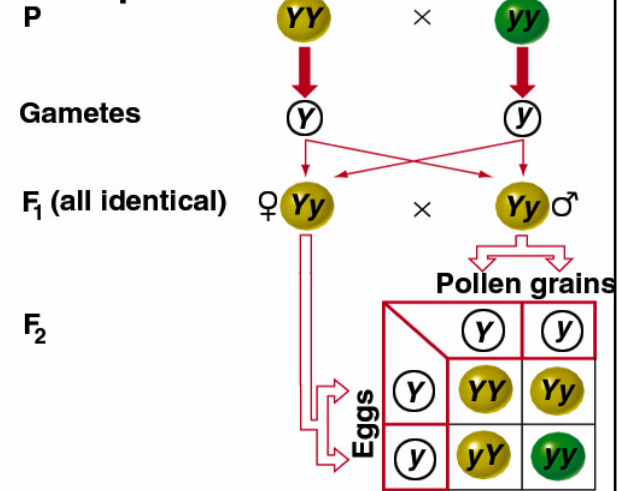


(b) Two gametes, one from each parent, unite at random at fertilization.



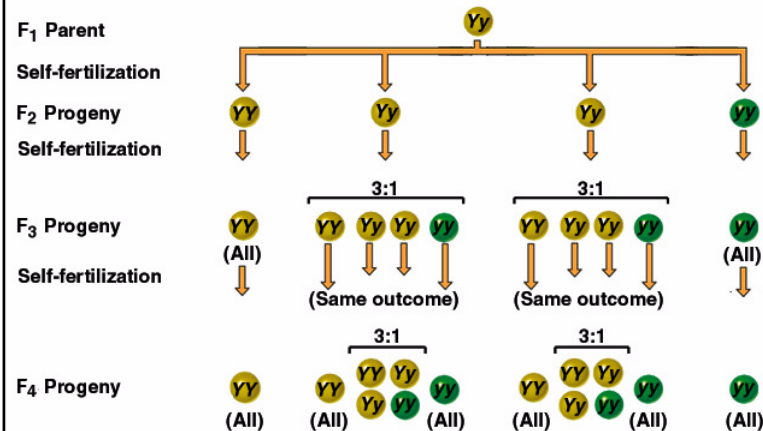
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The Punnett Square



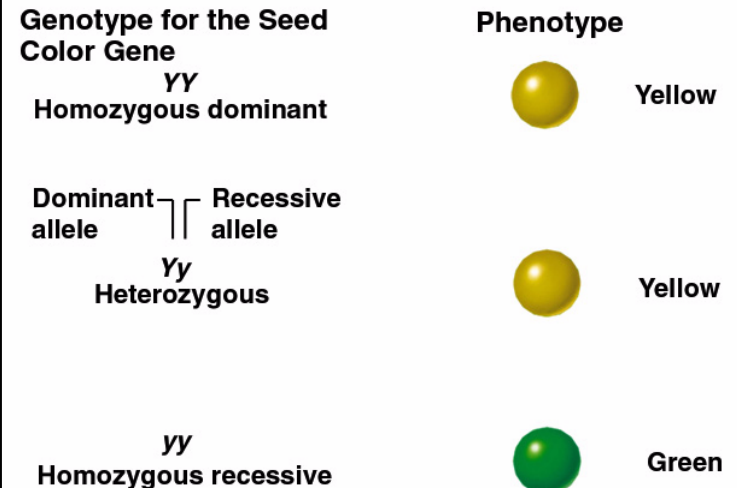
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Two types of yellow peas



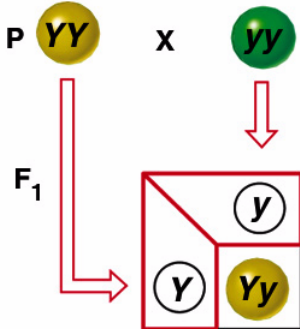
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Genotype and phenotype

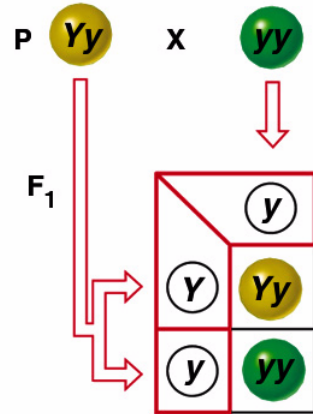


Test crosses

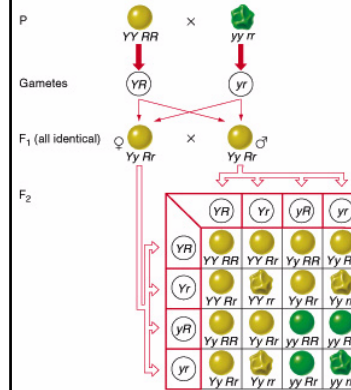
Cross A



Cross B

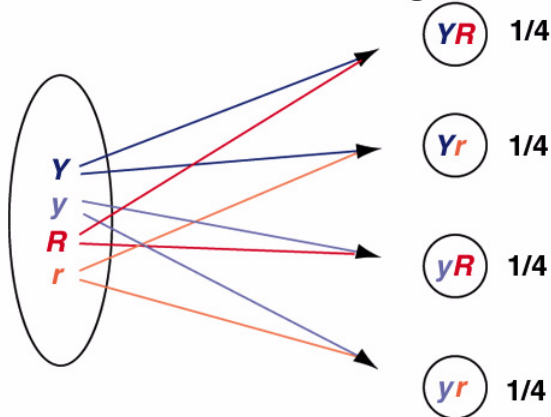


Dihybrid crosses

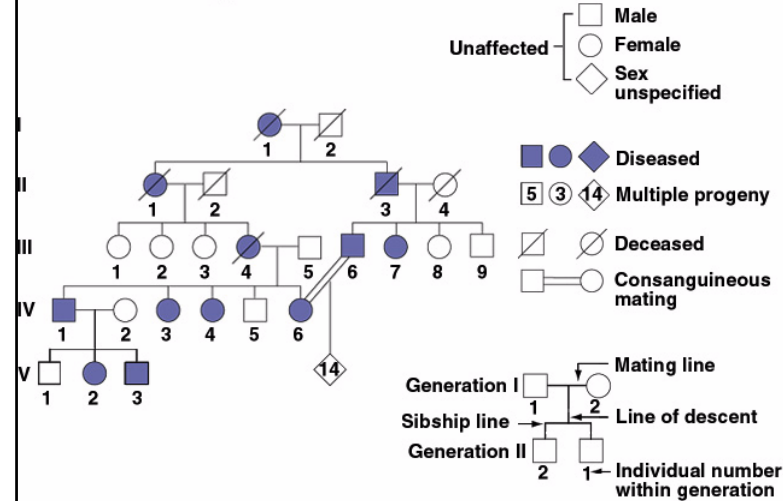


Law of independent assortment

Alleles in parental cell → Gamete formation → Possible allele combinations in gametes

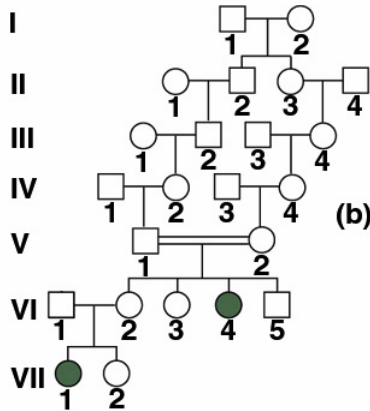


Pedigree of a dominant trait

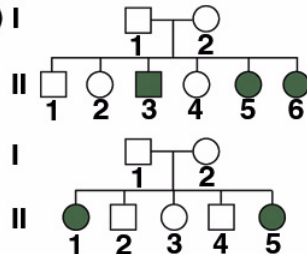


Pedigree of a recessive trait

(a) I

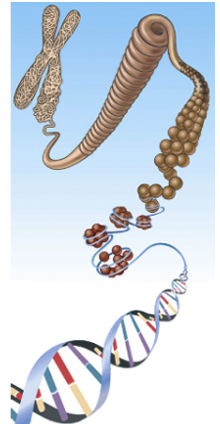


(b) I



Chapter 5: Genetics and Cellular Function

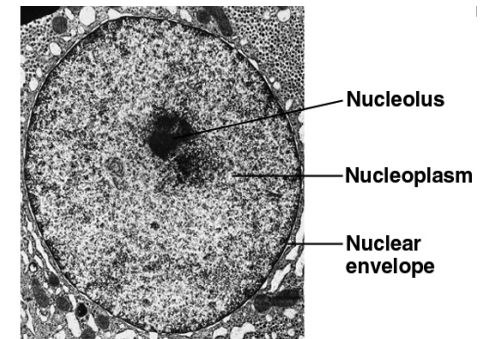
- Nucleus and nucleic acids
- Protein synthesis and secretion
- DNA replication and the cell cycle
- Chromosomes and heredity



Nuclear Structure

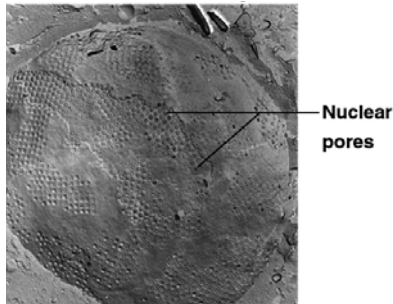
- Most cells have single nucleus
- Enucleate - no nucleus (mature RBC's)
- Multinucleate - 2 - 50 nuclei (skeletal muscle)
- Nuclear envelope - surrounds nucleus, has two unit membranes
- Nuclear pores - perforate nuclear envelope
- Nucleoplasm - material within nucleus
- Chromatin - DNA and associated proteins
- Nucleoli-dark staining, produce ribosome subunits

Nucleus TEM



Nuclear Envelope, SEM

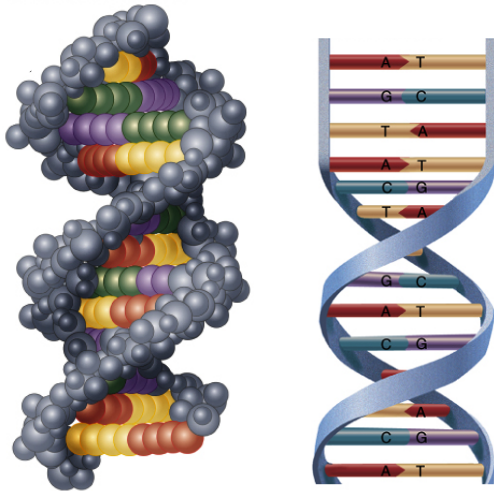
- Nuclear pores
 - formed by a ring shaped complex of proteins
 - regulates traffic through envelope
 - holds nuclear envelope together



Chromatin

- DNA and associated proteins, looks like granular thread
- Nucleosomes - cluster of eight proteins, histones, serve as spools to protect and organize DNA
- Supercoils - preparation for cell division

DNA Structure: Twisted Ladder



DNA Function

- Serves as code for protein synthesis, cell replication and reproduction
- Gene - sequence of DNA nucleotides that codes for one polypeptide
- Genome - all the genes of one person

RNA Structure and Function

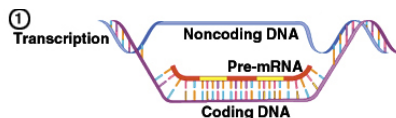
- Only one nucleotide chain
- Much smaller
 - transfer RNA (tRNA) has 70 - 90 bases
 - messenger RNA (mRNA) has over 10,000 bases
 - DNA has over a billion base pairs
- Ribose replaces deoxyribose as the sugar
- Uracil replaces thymine as a nitrogenous base
- Essential function
 - interpret DNA code
 - direct protein synthesis

Control of Protein Synthesis

- DNA directs the synthesis of enzymes and other proteins
 - other substances synthesized depend on enzymes
 - thus indirectly under genetic control

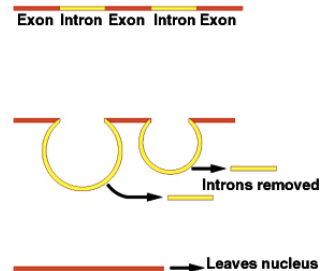
Transcription

- Copy genetic instructions from DNA to RNA
- RNA polymerase
 - binds to DNA
 - at site selected by chemical messengers from cytoplasm
 - opens DNA helix
 - transcribes bases from 1 strand of DNA into pre-mRNA
 - rewinds DNA helix

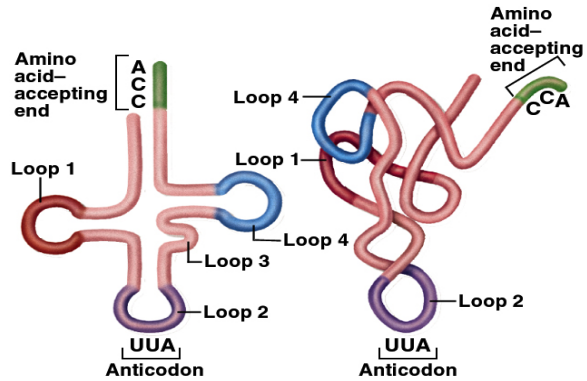


Posttranscriptional Modification

- Pre-mRNA contains
 - exons - “sense” portions
 - introns - “nonsense portions”
must be removed
- Modification
 - enzymes remove introns and splice exons together
- Functional mRNA leaves nucleus to be translated



Transfer RNA (tRNA)



- Activation by ATP binds specific amino acid
- Anticodon binds to complementary codon of mRNA

Translation of mRNA

- Ribosome
 - attaches to mRNA
 - reads mRNA
 - start codon (AUG) begins protein synthesis
 - binds activated tRNA
- Growth of polypeptide chain
 - reads next codon
 - binds next tRNA
 - links amino acids on tRNA's
 - releases first tRNA
 - repeats until stop codon reached