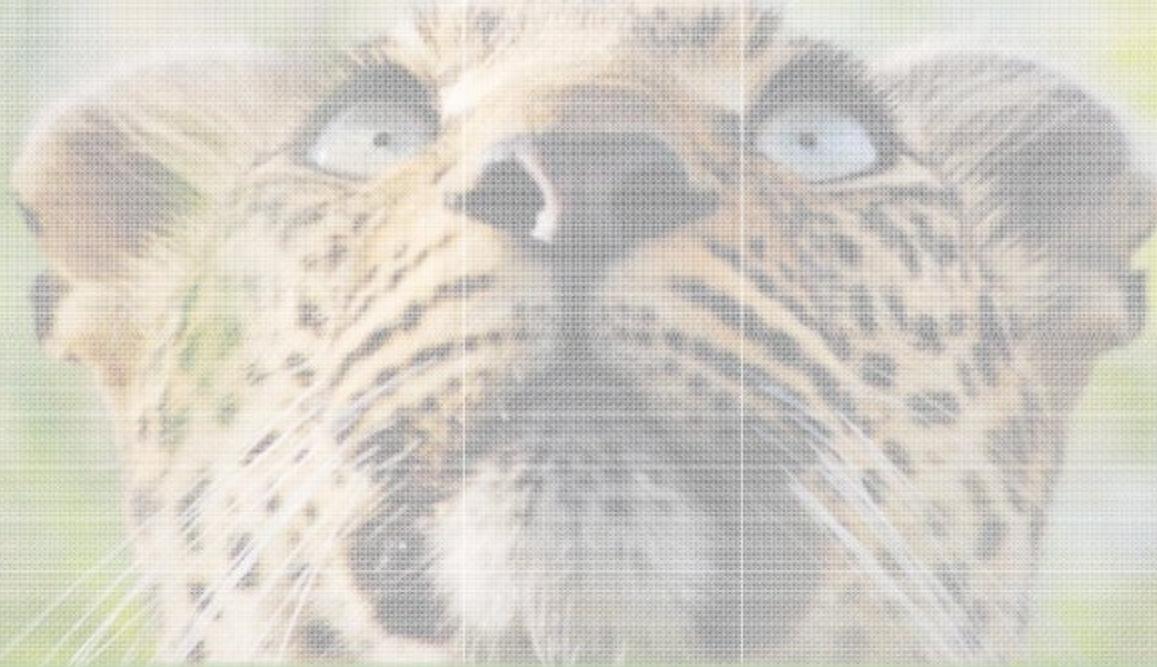


# Chapter 8

## The Cellular Basis of Reproduction and Inheritance



PowerPoint Lectures for

***Biology: Concepts & Connections, Sixth Edition***  
***Campbell, Reece, Taylor, Simon, and Dickey***

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**Lecture by Richard L. Myers**  
**Translated by Nabih A. Baeshen**

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# **CONNECTIONS BETWEEN CELL DIVISION AND REPRODUCTION**

## 8.1 Like begets like, more or less

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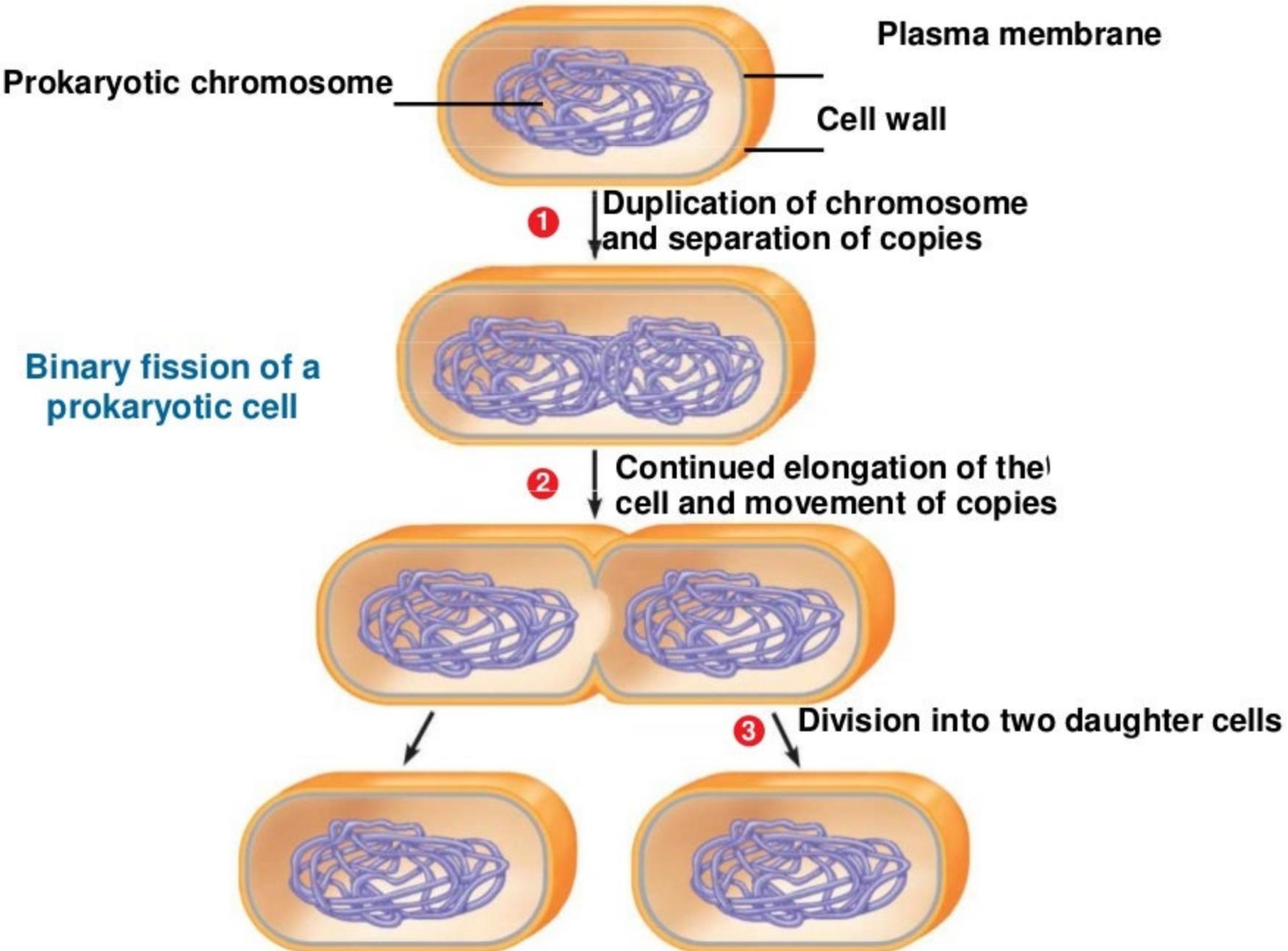
- Living organisms reproduce by two methods
  - **Asexual reproduction**
    - Offspring are identical to the original cell or organism
    - Involves inheritance of all genes from one parent
  - **Sexual reproduction**
    - Offspring are similar to parents, but show variations in traits
    - Involves inheritance of unique sets of genes from two parents

## 8.3 Prokaryotes reproduce by binary fission

---

- **Binary fission** means “dividing in half”

- **Occurs in prokaryotic cells**
- **Two identical cells arise from one cell**
- **Steps in the process:**
  - A single circular chromosome duplicates, and the copies begin to separate from each other
  - The cell elongates, and the chromosomal copies separate further
  - The plasma membrane grows inward at the midpoint to divide the cells



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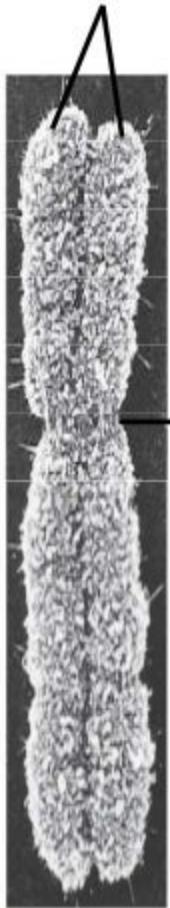
# **THE EUKARYOTIC CELL CYCLE AND MITOSIS**

## 8.4 The large, complex chromosomes of eukaryotes duplicate with each cell division

---

- Eukaryotic chromosomes are composed of **chromatin**
  - Chromatin = DNA + proteins
  - To prepare for division, the chromatin becomes highly compact, and the chromosomes are visible with a microscope
  - Early in the division process, chromosomes duplicate
  - Each chromosome appears as two sister chromatids, containing identical DNA molecules
  - Sister chromatids are joined at the centromere, a narrow region

Sister chromatids



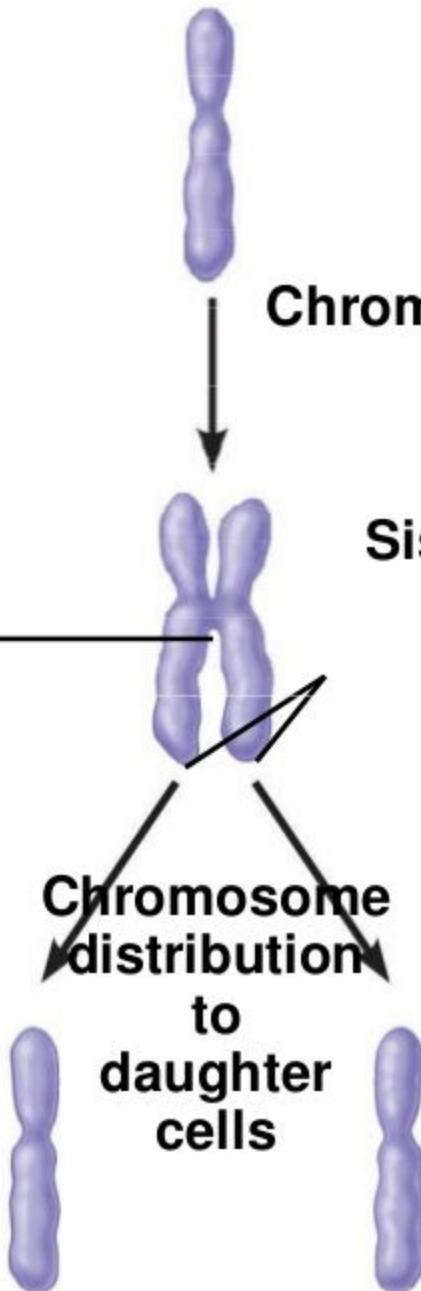
Electron micrograph  
of a duplicated chromosome

Chromosome duplication

Sister chromatids

Centromere

Chromosome  
distribution  
to  
daughter  
cells



Chromosome duplication  
and distribution

## 8.5 The cell cycle multiplies cells

- **The cell cycle** is an ordered sequence of events for cell division
- It consists of two stages

**Interphase:** duplication of cell contents

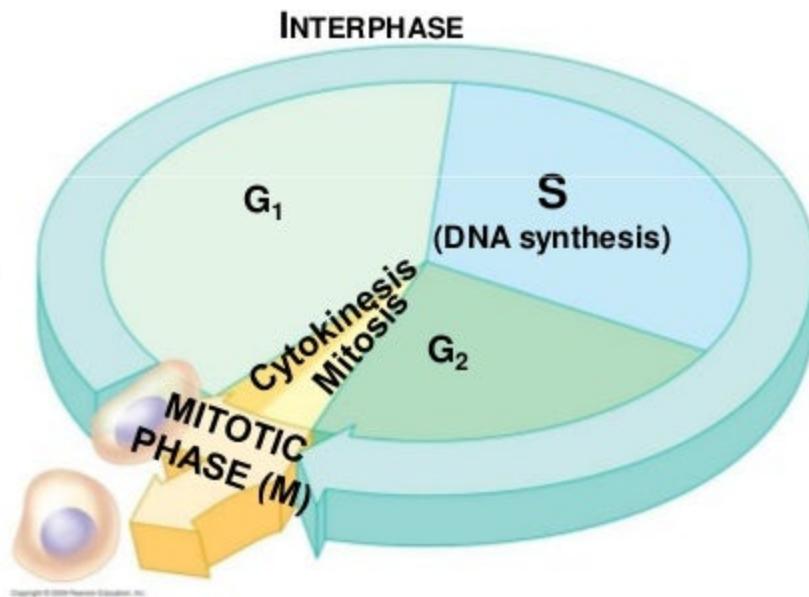
G<sub>1</sub>: growth, increase in cytoplasm

S: duplication of chromosomes

G<sub>2</sub>: growth, preparation for division

**Mitotic phase:** division of the nucleus

Cytokinesis: division of cytoplasm



**The eukaryotic cell cycle**

## 8.6 Cell division is a continuum of dynamic changes

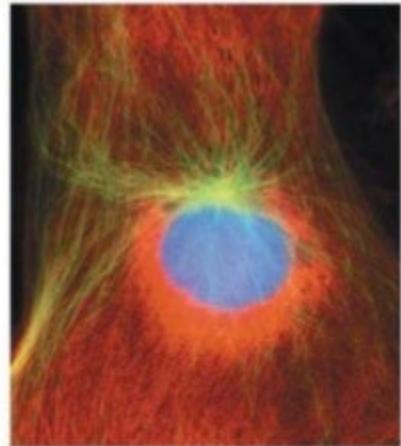
---

- **Mitosis** progresses through a series of stages
  - **Prophase**
  - **Prometaphase**
  - **Metaphase**
  - **Anaphase**
  - **Telophase**
- **Cytokinesis** often overlaps telophase

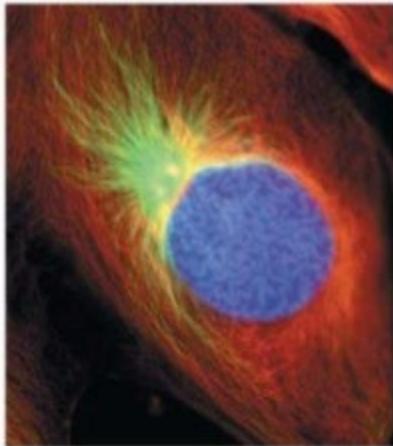
## 8.6 Cell division is a continuum of dynamic changes

---

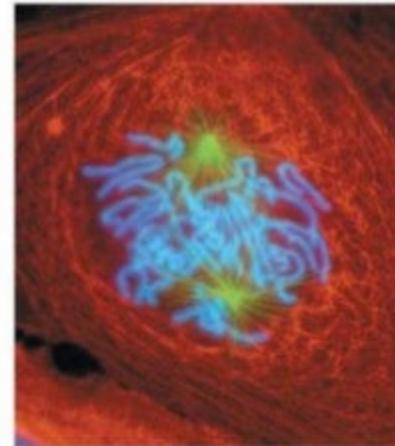
- **A mitotic spindle** is required to divide the chromosomes
  - **The mitotic spindle is composed of microtubules**
  - **It is produced by centrosomes, structures in the cytoplasm that:**
    - Organize microtubule arrangement
    - Contain a pair of centrioles in animal cells
  - **The role of centrioles in cell division is unclear**



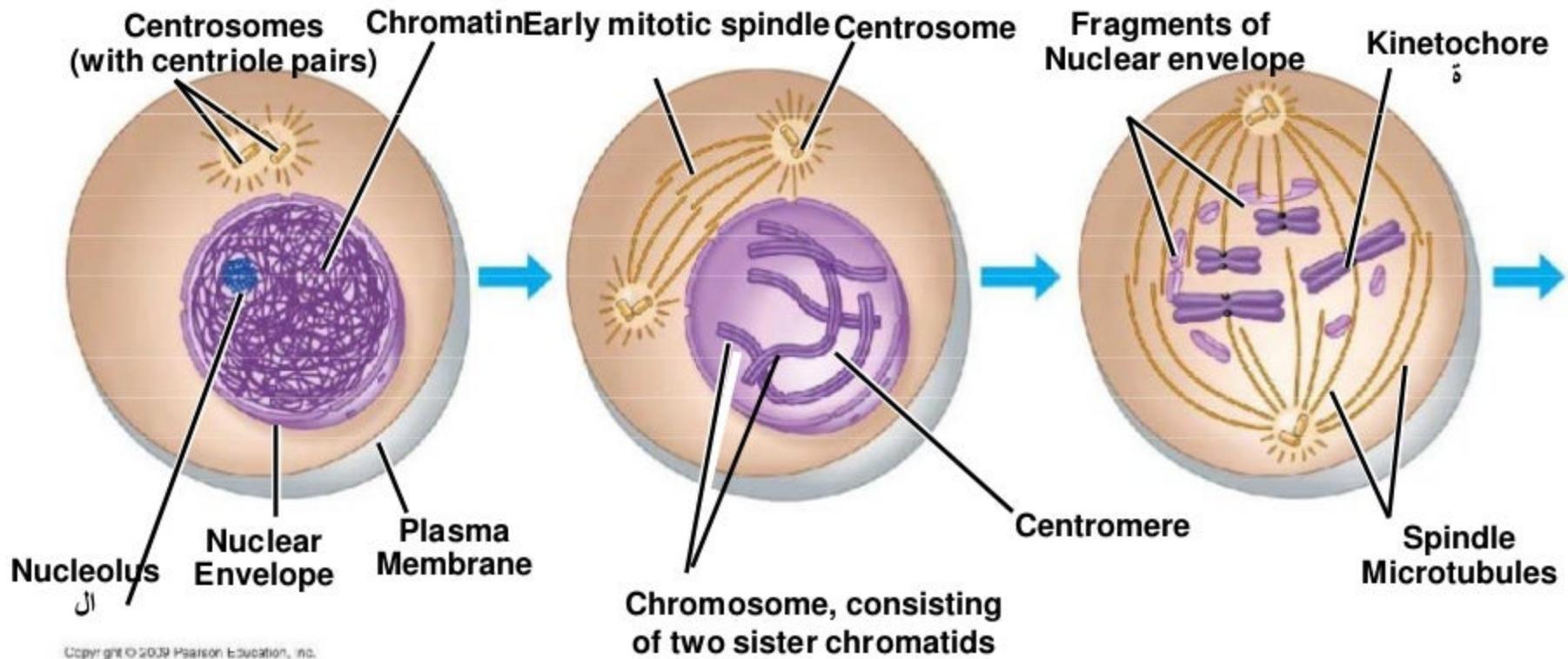
INTERPHASE



PROPHASE



PROMETAPHASE



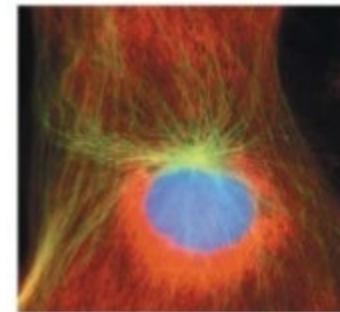
## 8.6 Cell division is a continuum of dynamic changes

---

- Interphase

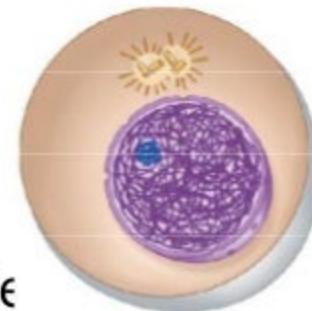
- In the cytoplasm

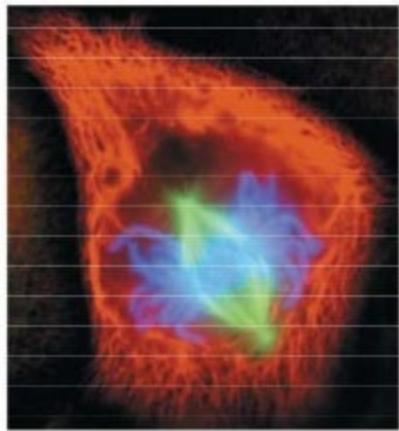
- Cytoplasmic contents double
    - Two centrosomes form



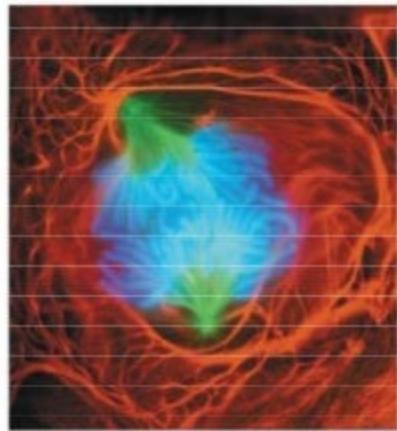
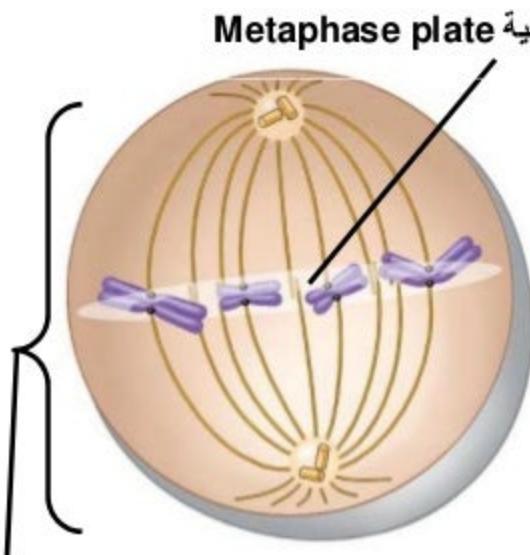
- In the nucleus

- Chromosomes duplicate during the S phase
    - Nucleoli, sites of ribosome assembly, are visible

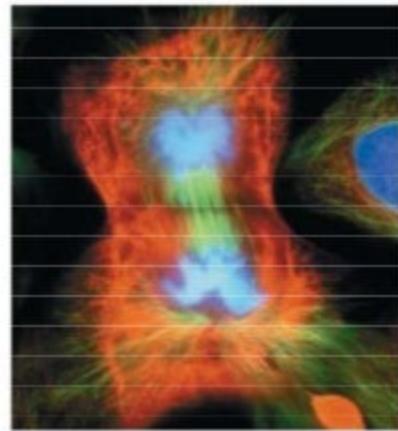
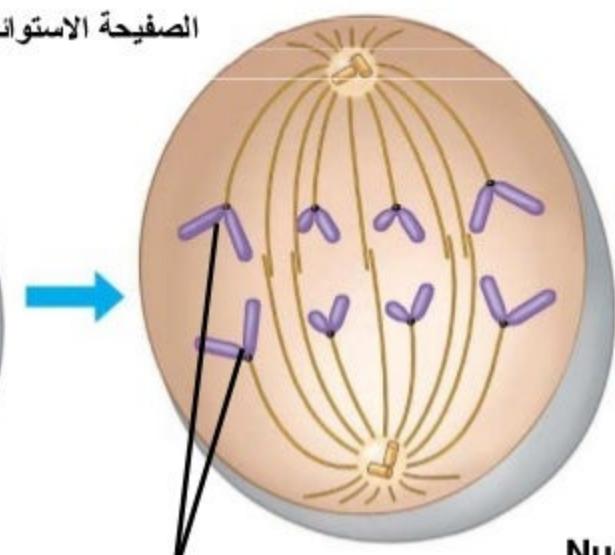




METAPHASE الطور الاستوائي



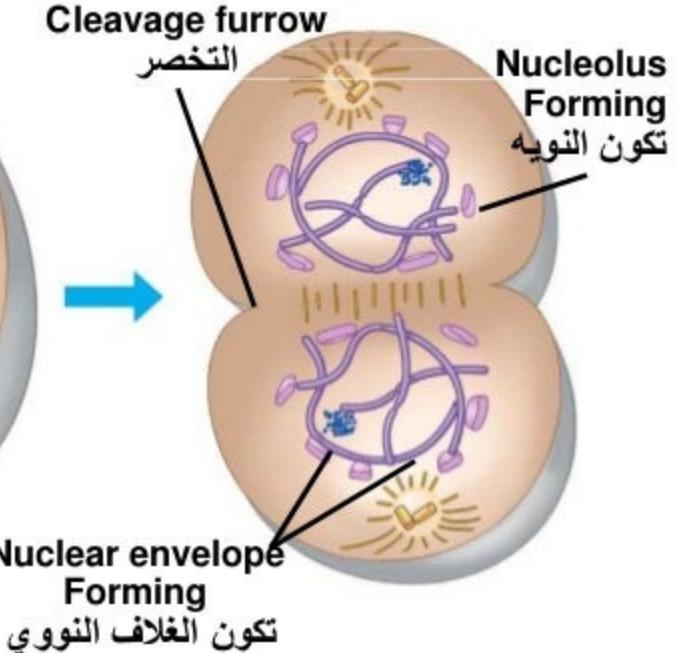
ANAPHASE الطور الانفصال



TELOPHASE AND CYTOKINESIS

الطور النهائي والانقسام السيتوبلازمي

Cleavage furrow التخسر

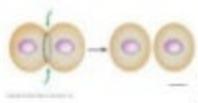
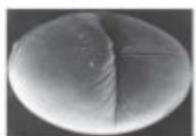


## 8.7 Cytokinesis differs for plant and animal cells

### ▪ Cytokinesis cells

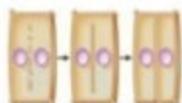
#### Cleavage in animal

- A cleavage furrow forms from a contracting ring of microfilaments, interacting with myosin
- The cleavage furrow deepens to separate the contents into two cells



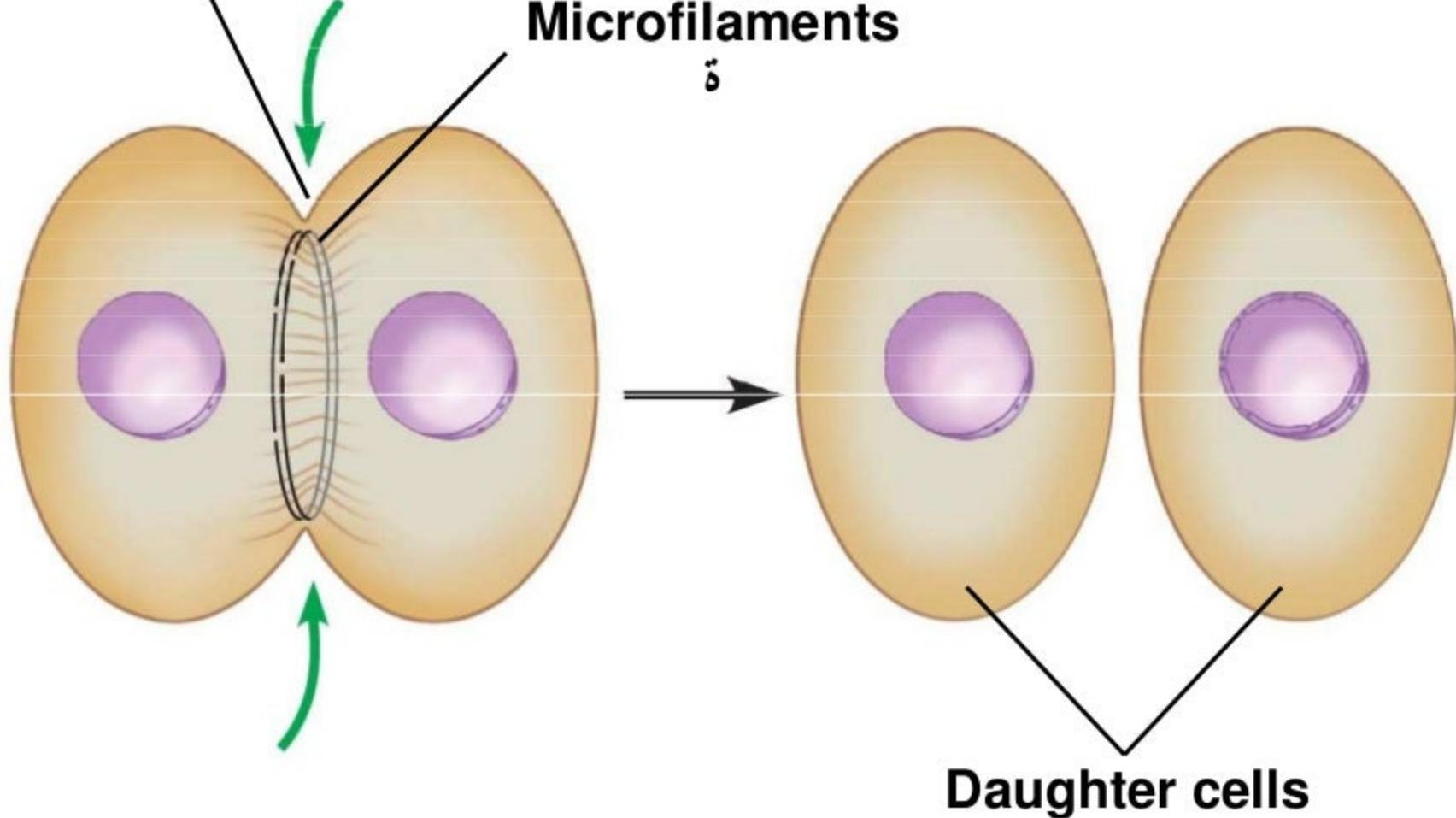
#### Cytokinesis in plant cells

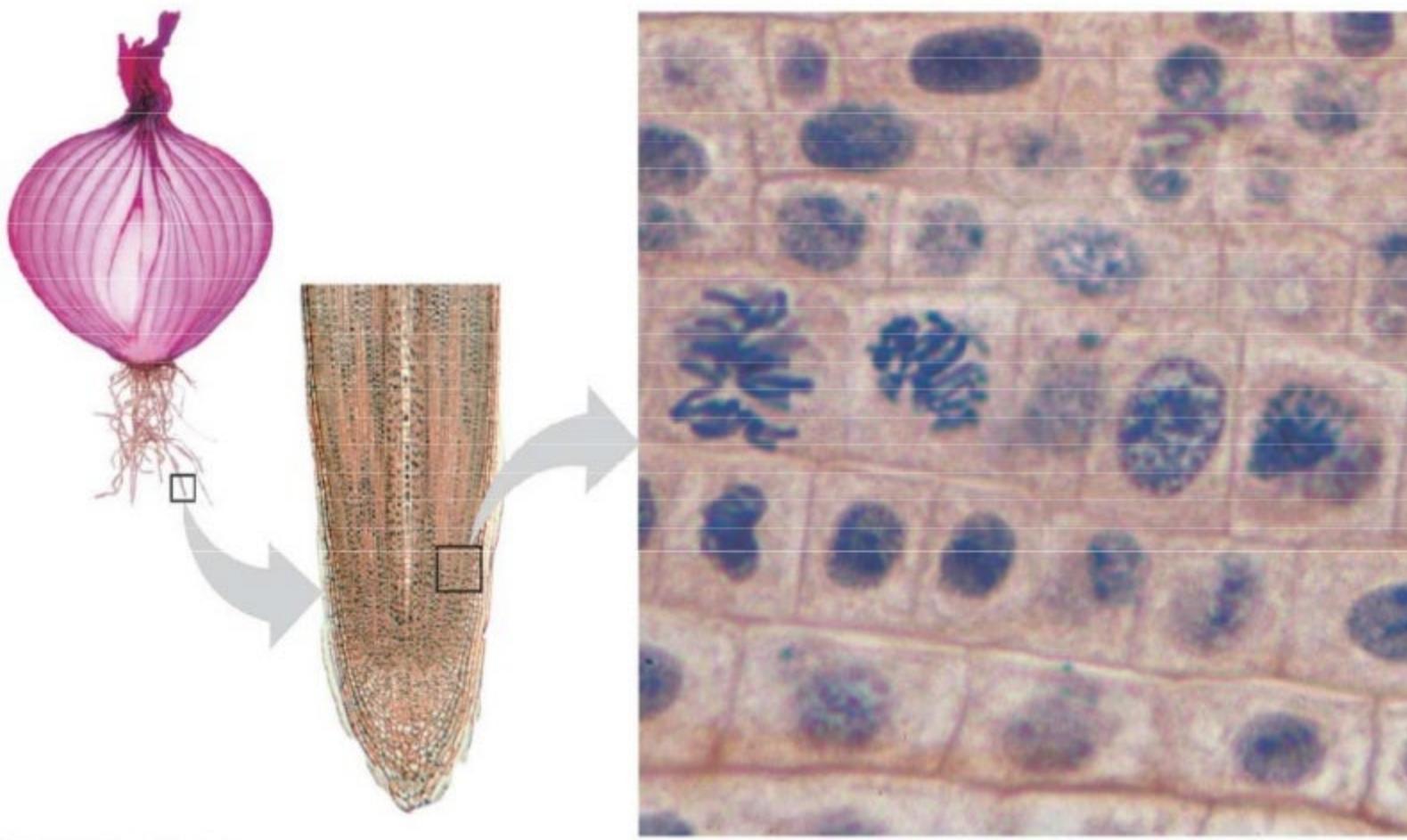
- A cell plate forms in the middle from vesicles containing cell wall material
- The cell plate grows outward to reach the edges, dividing the contents into two cells
- Each cell has a plasma membrane and cell wall



**Cleavage furrow**

**Contracting ring of  
Microfilaments**

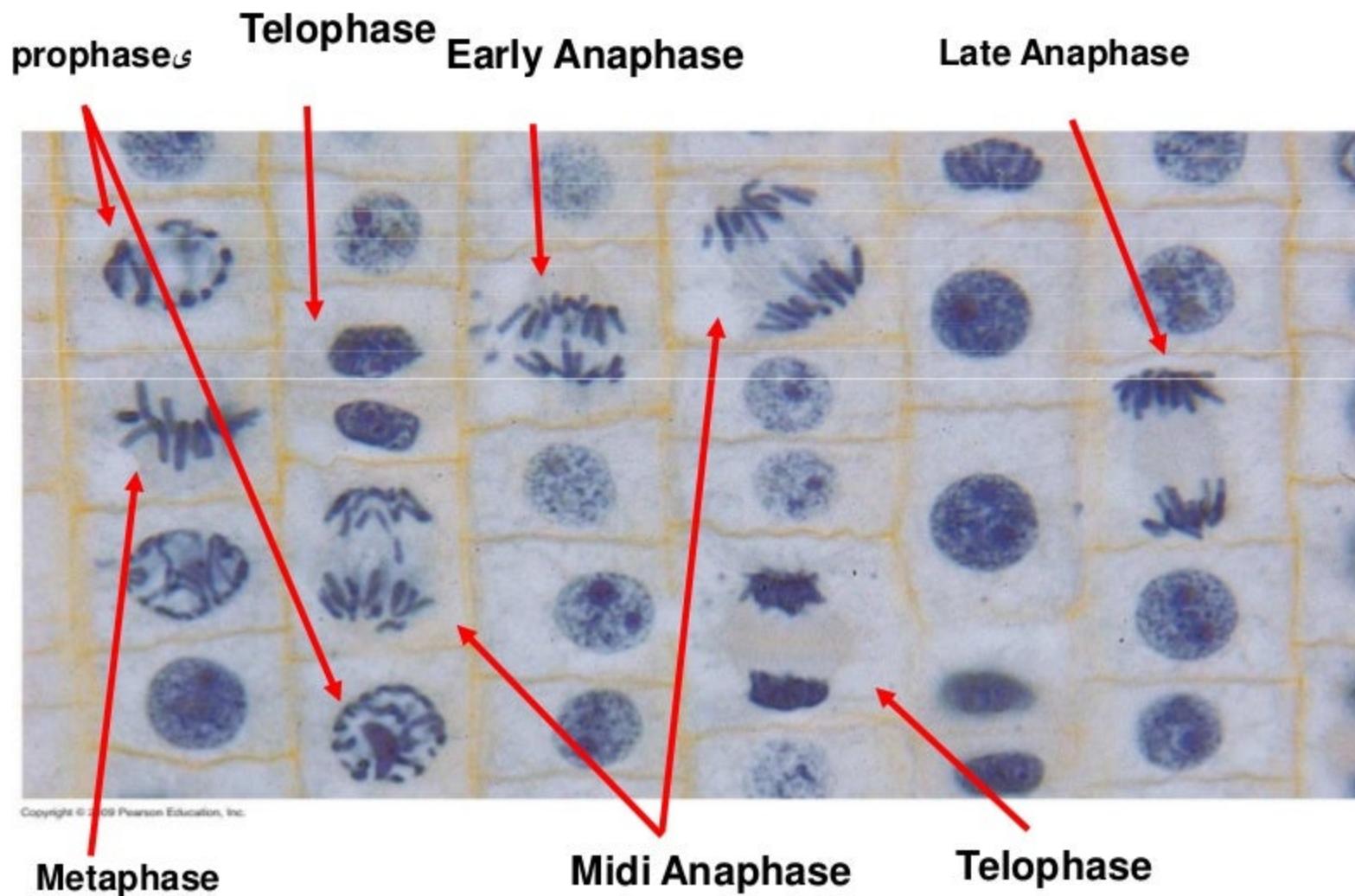




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## Growth (in an onion root) (

# Mitosis



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# **MEIOSIS AND CROSSING OVER**

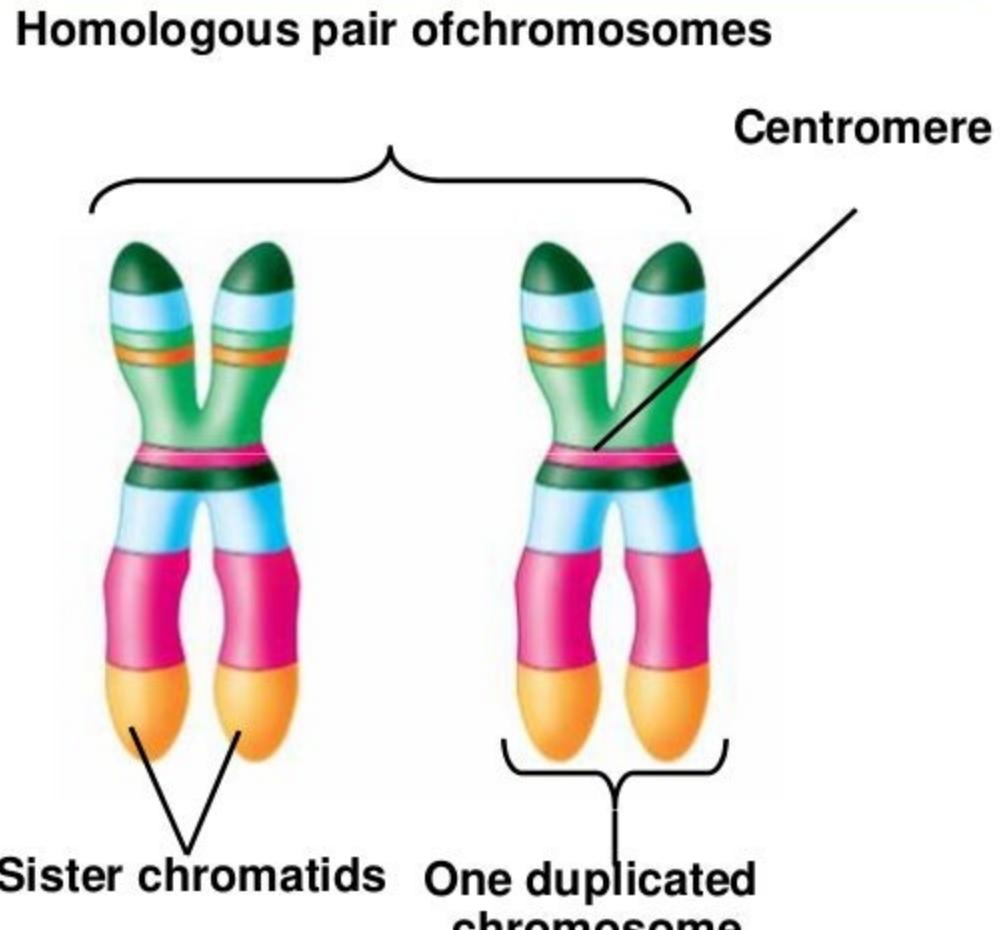
## 8.12 Chromosomes are matched in homologous pairs

---

- **Somatic cells** have pairs of homologous chromosomes, receiving one member of each pair from each parent
  - Length
  - Centromere position
  - Gene locations
    - A locus (plural, *loci*) is the position of a gene
    - Different versions of a gene may be found at the same locus on maternal and paternal chromosomes

## 8.12 Chromosomes are matched in homologous pairs

- The human sex chromosomes X and Y differ in size and genetic composition
- Pairs of autosomes have the same size and genetic composition



**A homologous pair of chromosomes**

## 8.13 Gametes have a single set of chromosomes

---

- **Meiosis** is a process that converts diploid nuclei to haploid nuclei
  - Diploid cells have two homologous sets of chromosomes
  - Haploid cells have one set of chromosomes
  - Meiosis occurs in the sex organs, producing gametes—sperm and eggs
- **Fertilization** is the union of sperm and egg
  - The zygote has a diploid chromosome number, one set from each parent

## 8.14 Meiosis reduces the chromosome number from diploid to haploid

---

- **Like mitosis, meiosis is preceded by interphase**
  - Chromosomes duplicate during the S phase
- **Unlike mitosis, meiosis has two divisions**
  - **During meiosis I**, homologous chromosomes separate
    - The chromosome number is reduced by half
  - **During meiosis II**, sister chromatids separate
    - The chromosome number remains the same

## **8.14 Meiosis reduces the chromosome number from diploid to haploid**

---

- Events in the nucleus during meiosis I**

- Prophase I**

- Chromosomes coil and become compact**
- Homologous chromosomes come together as pairs by synapsis**
- Each pair, with four chromatids, is called a tetrad**
- Nonsister chromatids exchange genetic material by crossing over**

## MEIOSIS I: Homologous chromosomes separate

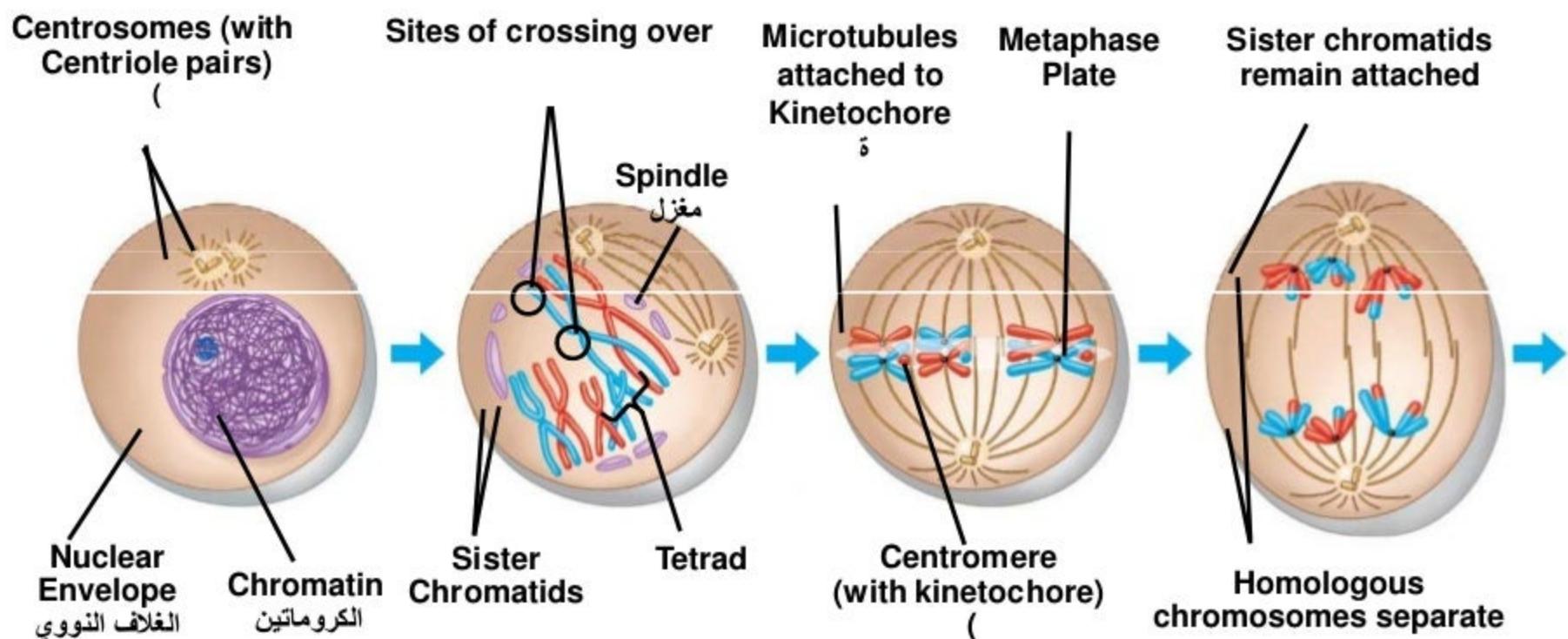
الانقسام الاختزالي الأول: انفصال الأزواج الكروموسومية المتماثلة

INTERPHASE  
الطور البيني

PROPHASE I  
الطور التمهيدي الأول

METAPHASE I  
الطور الاستوائي الأول

ANAPHASE I  
الطور الانفصالي الأول



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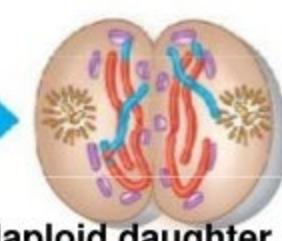
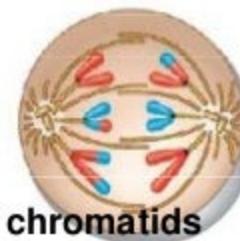
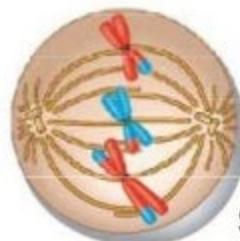
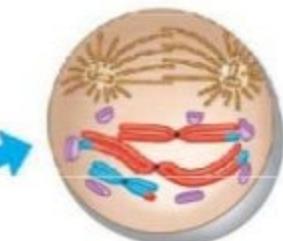
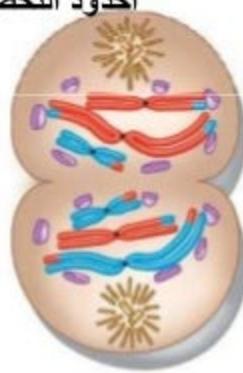
The stages of miosis I

## MEIOSIS II: Sister chromatids separate

الانقسام الاختزالي الثاني: انفصال الكروماتيدات الشقيقة

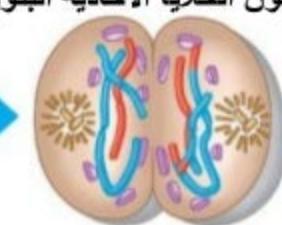
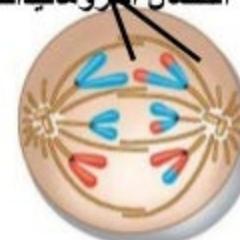
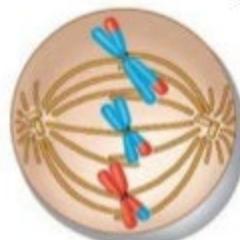
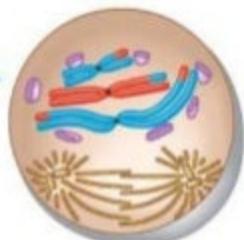


Cleavage furrow  
أخدود التخصر



Sister chromatids  
Separate  
انفصال الكروماتيدات الشقيقة

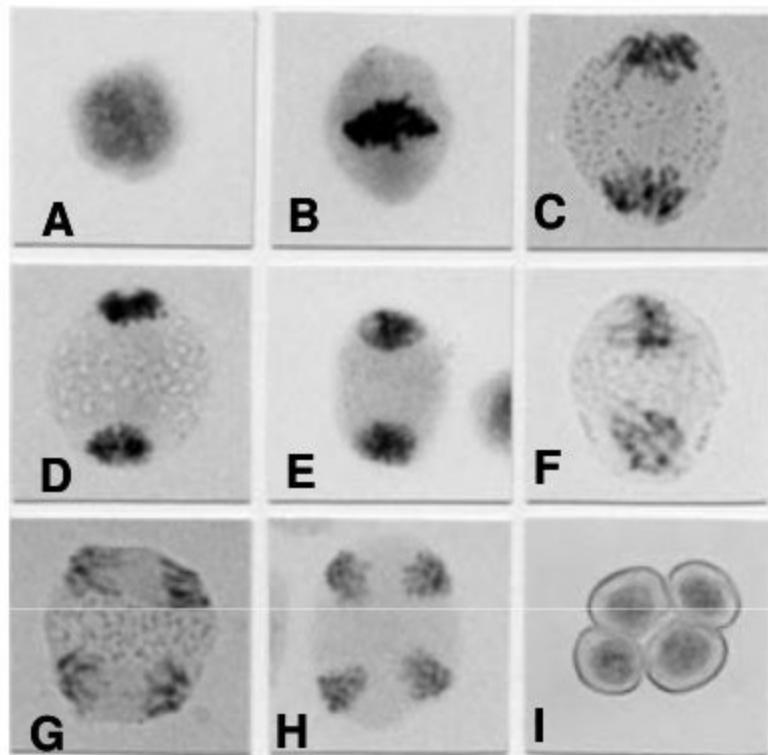
Haploid daughter  
cells forming  
تكون الخلايا الأحادية البنوية



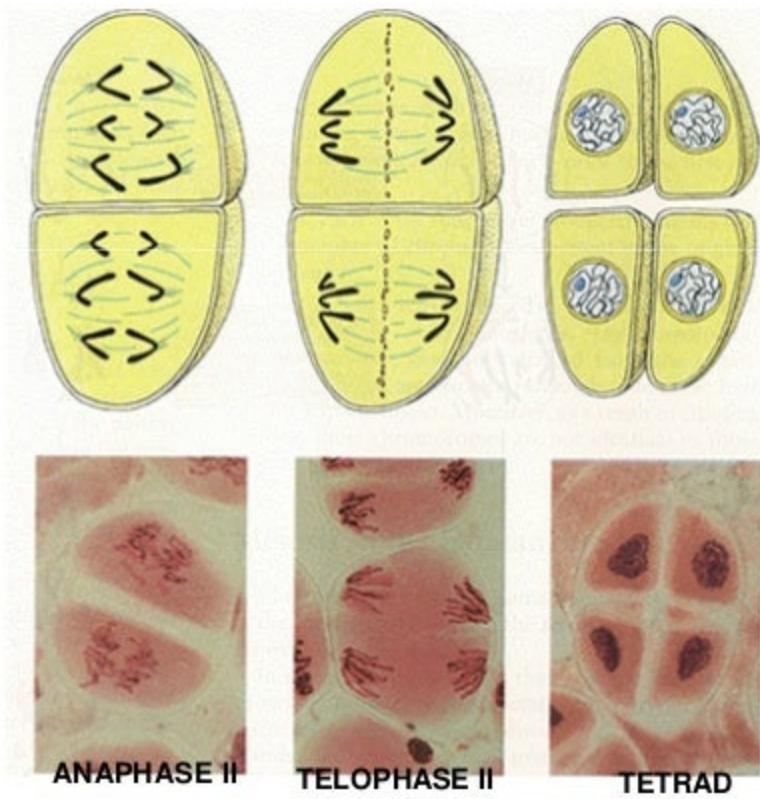
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The stages of miosis II

# MEIOSIS

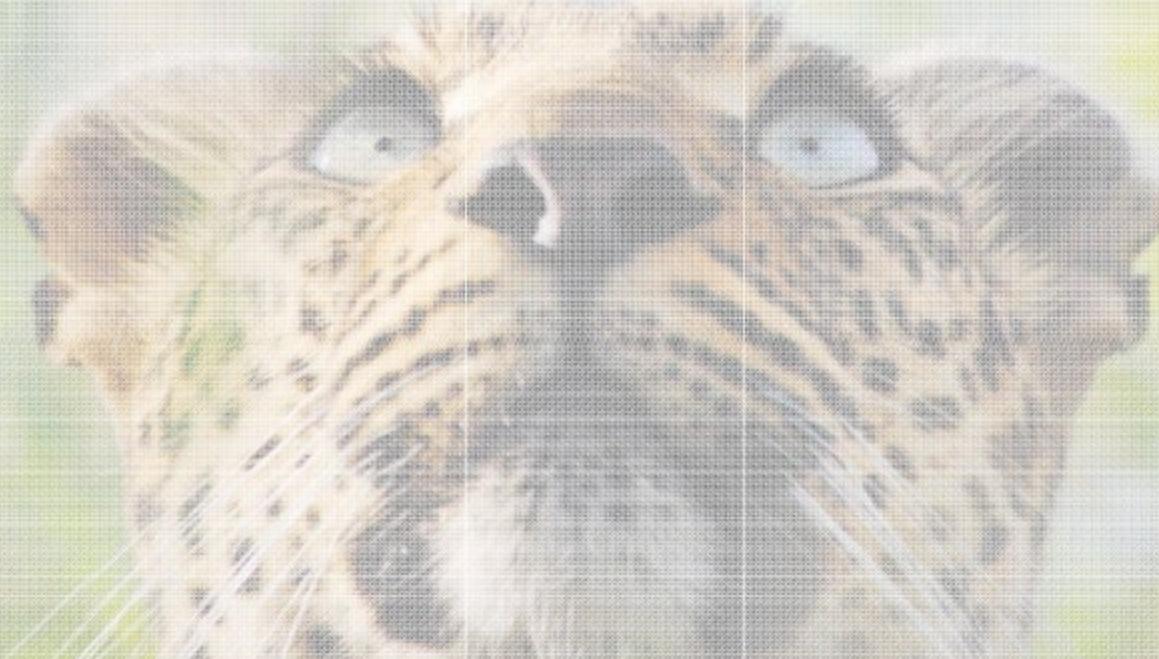


- A. PROPHASE I
- B. METAPHASE I
- C. ANAPHASE I
- D. TELOPHASE I
- E. PROPHASE II
- F. METAPHASE II
- G. ANAPHASE II
- H. TELOPHASE II الخط
- I. TETRAD



# Chapter 9

## Patterns



PowerPoint Lectures for

***Biology: Concepts & Connections, Sixth Edition***  
***Campbell, Reece, Taylor, Simon, and Dickey***

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**Lecture by Richard L. Myers  
Translated by Nabih A. Baeshen**

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# **MENDEL'S LAWS**

## 9.1 The science of genetics has ancient roots

---

- **Pangenesis** was an early explanation for inheritance
  - It was proposed by Hippocrates
  - Particles called **pangenes** came from all parts of the organism to be incorporated into eggs or sperm
  - Characteristics acquired during the parents' lifetime could be transferred to the offspring
  - Aristotle rejected pangenesis and argued that instead of particles, the potential to produce the traits was inherited
- Blending was another idea, based on plant breeding
  - Hereditary material from parents mixes together to form an intermediate trait, like mixing paint



## 9.2 Experimental genetics began in an abbey garden

---

- Gregor Mendel discovered principles of genetics in experiments with the garden pea
  - Mendel showed that parents pass heritable factors to offspring (heritable factors are now called **genes**)
  - Advantages of using pea plants
    - Controlled matings
    - Self-fertilization or cross-fertilization
    - Observable characteristics with two distinct forms
  - True-breeding strains

Character الصفة	Dominant Trait الهيئه السائدة	Recessive Trait الهيئه المترقبة
Flower color لون	Purple	White
Flower position موقع الورقة	Axial	Terminal
Seed color لون البذرة	Yellow أصفر	Green أخضر
Seed shape شكل البذرة	Round مستدير	Wrinkled مجعد
Pod shape شكل قرن البنور	Inflated كاملة	Constricted مُخصرة
Pod color لون قرن البنور	Green خضراء	Yellow صفراء
Stem length طول الساق	Tall طويل	Dwarf قصير

The seven pea characteristics studied by Mendel  
الصفات السبعة التي درسها موندل

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## 9.3 Mendel's law of segregation describes the inheritance of a single character

---

- **Example of a monohybrid cross**
  - Parental generation: purple flowers × white flowers
  - F<sub>1</sub> generation: all plants with purple flowers
  - F<sub>2</sub> generation:
    - of plants with purple flowers
    - of plants with white flowers
- **Mendel needed to explain**
  - Why one trait seemed to disappear in the F<sub>1</sub> generation
  - Why that trait reappeared in one quarter of the F<sub>2</sub> offspring

**P generation**  
**(true-breeding parents)**



Purple flowers

White flowers

**F<sub>1</sub> generation**



All plants have  
purple flowers

Fertilization among  
F<sub>1</sub> plants (F<sub>1</sub> ' F<sub>1</sub>)  
1

**F<sub>2</sub> generation**



¾ of plants  
have purple flowers



¼ of plants  
have white flowers

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Crosses tracking one character (flower color)

(

P plants

Gametes

F<sub>1</sub> plants (hybrids)

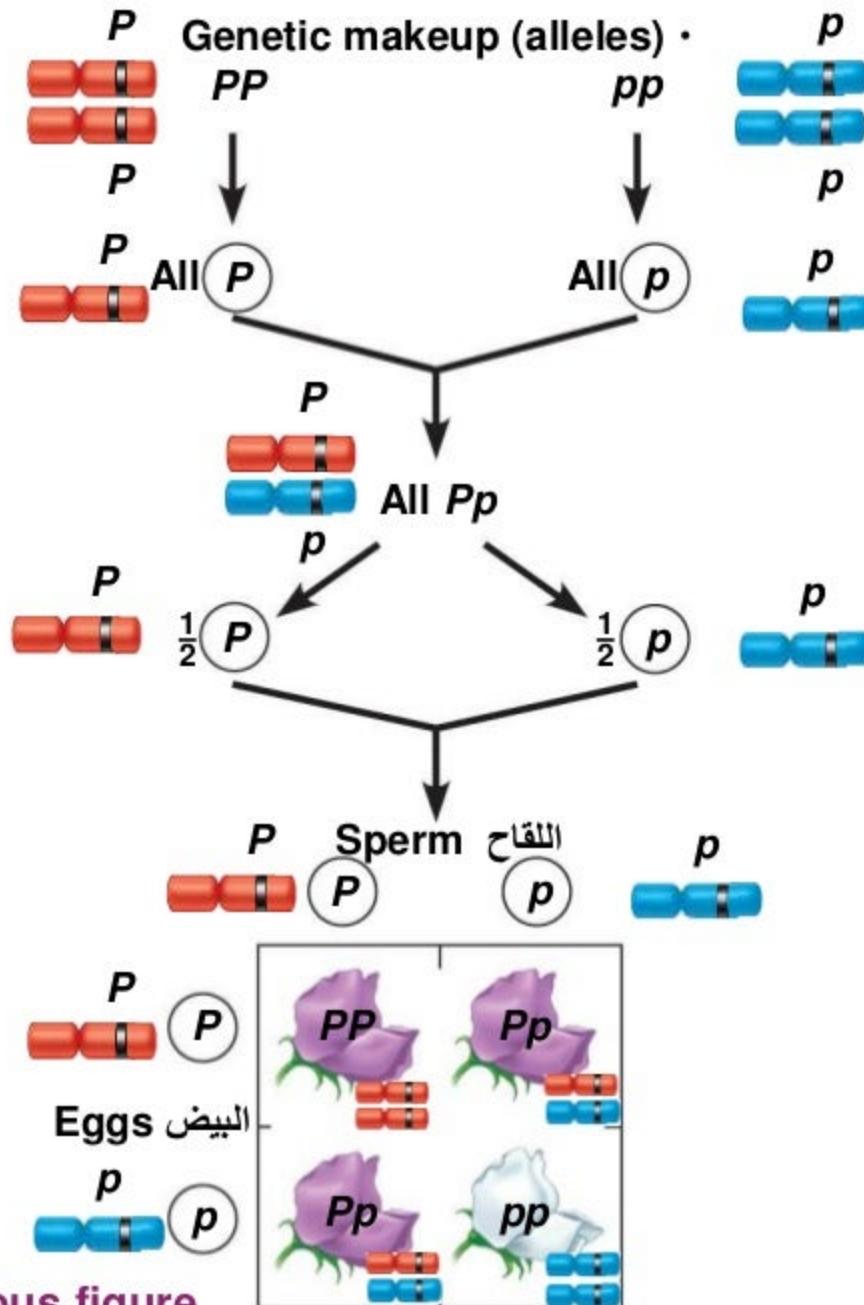
Gametes

Phenotypic ratio  
3 purple : 1 white

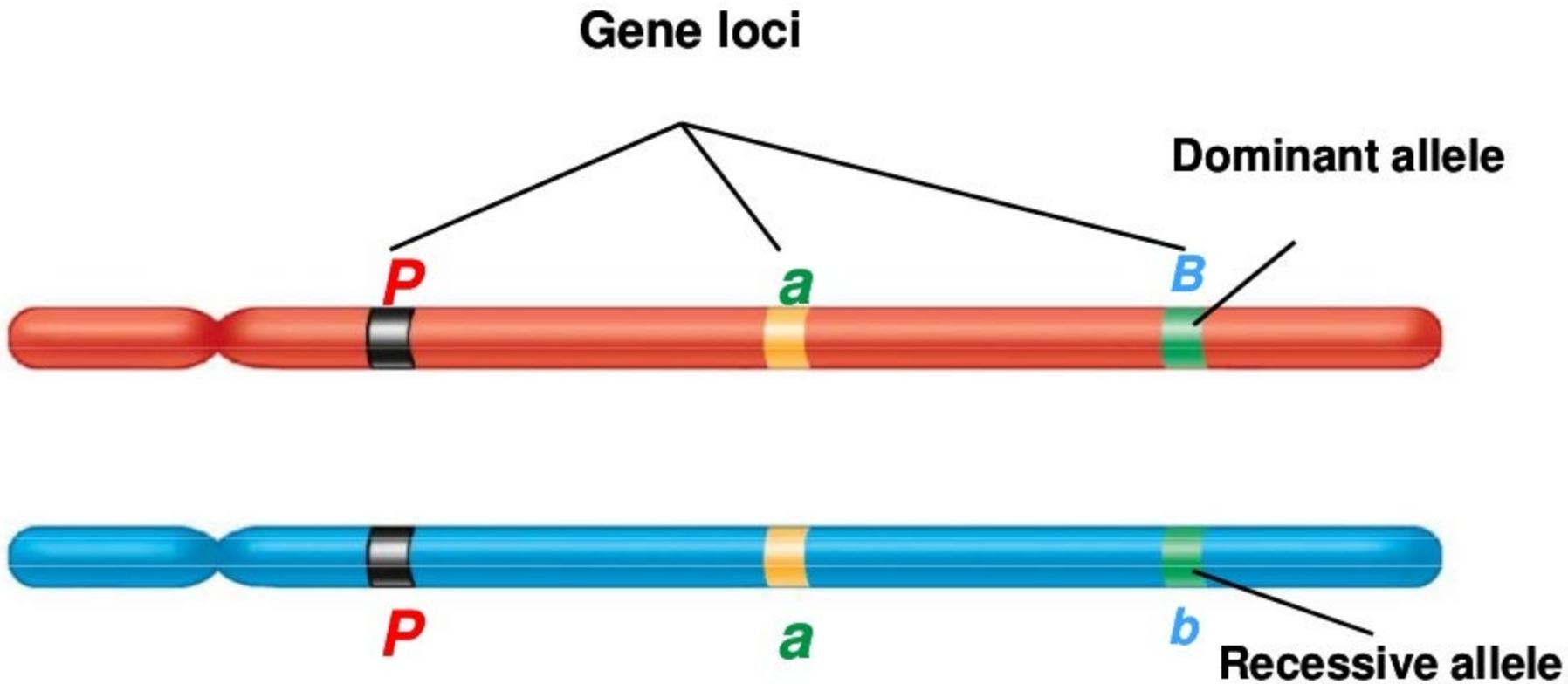
F<sub>2</sub> plants

Genotypic ratio  
1 PP : 2 Pp : 1 pp

Explanation of the crosses in previous figure



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**Genotype:**

**$PP$**

Homozygous  
for the  
dominant allele

**$aa$**

Homozygous  
for the  
recessive allele

**$Bb$**

Heterozygous  
خليط

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**Matching gene loci on homologous chromosomes**

## 9.8 CONNECTION: Genetic traits in humans can be tracked through family pedigrees

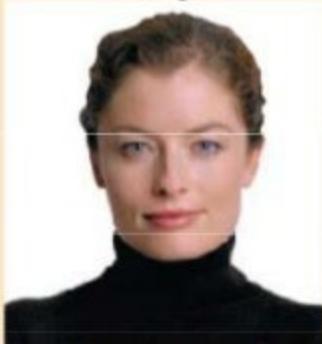
رابطة تطبيقية: يمكن اقتداء أثر الهيئات الوراثية في الانسان عبر شجرة نسب الأسرة

### ▪ A pedigree

### شجرة النسب

- Shows the inheritance of a trait in a family through multiple generations
  - توضح توارث الهيئة في أسرة ما عبر أجيال متتالية
- Demonstrates dominant or recessive inheritance
  - تبين الهيئة الوراثية السائدة أو المتنحية
- Can also be used to deduce genotypes of family members
  - يمكن استخدامها أيضاً لاستنتاج الأنواع الوراثية لأعضاء الأسرة

## Examples of single-gene inherited traits in humans

Dominant Traits	Recessive Traits
	
Freckles	No freckles
	
Widow's peak	Straight hairline
	
Free earlobe	Attached earlobe

## Examples of single-gene inherited traits in humans

	Dominant Traits	Recessive Traits
Genotype	$FF$ or $Ff$	$ff$
Phenotype	Free earlobe	Attached earlobe

First generation  
(grandparents)

(

Second generation  
(parents, aunts,  
and uncles)

or

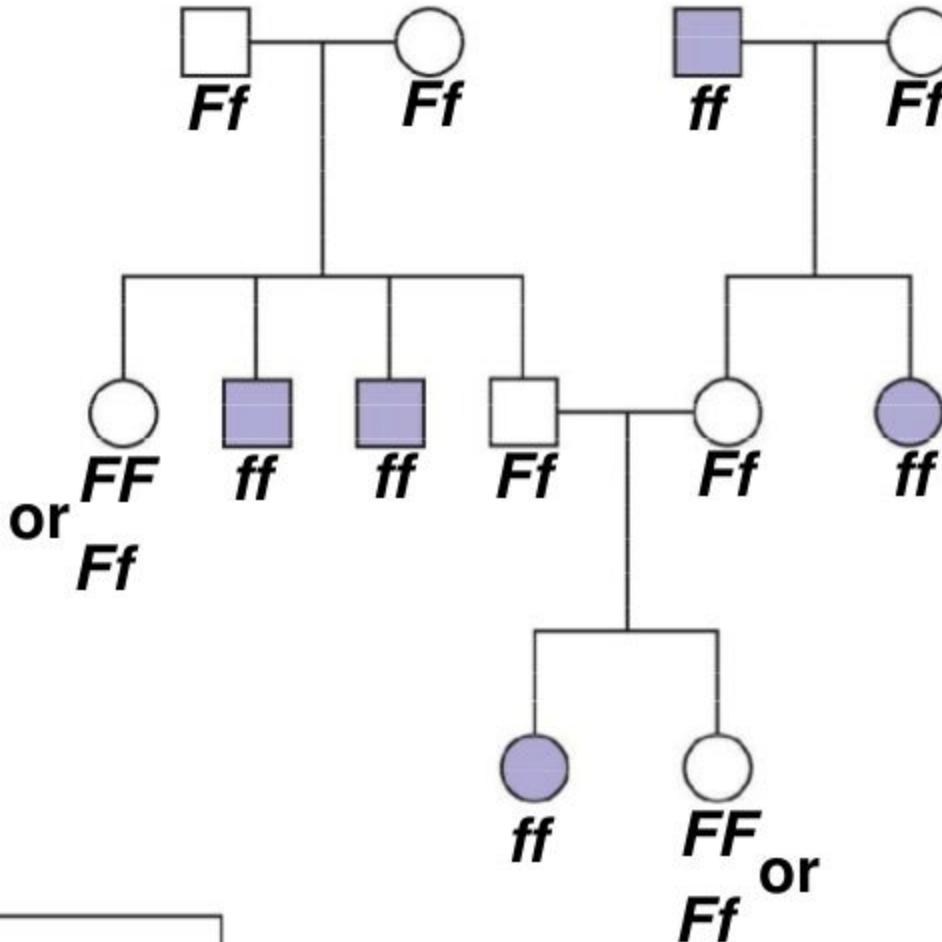
*Ff*

Third generation  
(two sisters)

(

Female

Male



Pedigree showing inheritance of attached versus free earlobe in a hypothetical family

**Parents**

**Normal**

*Dd*

♀

**Normal**

*Dd*

**Sperm**



**Offspring**

**Eggs**

*D*

*d*

<i>DD</i> Normal	<i>Dd</i> Normal (carrier) "
<i>Dd</i> Normal (carrier) " ♂	<i>dd</i> Deaf

**Offspring produced by parents who are both carriers  
for a recessive disorder**

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# **VARIATIONS ON MENDEL'S LAWS**

## 9.11 Incomplete dominance results in intermediate phenotypes

---

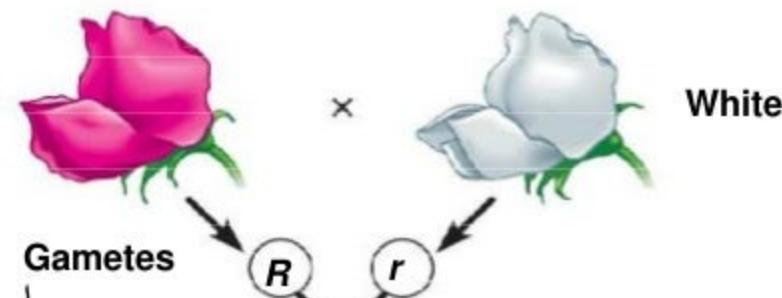
- **Incomplete dominance**

- **Neither allele is dominant over the other**
- **Expression of both alleles is observed as an intermediate phenotype in the heterozygous individual**



P generation

Red أحمر  
 $RR$



F<sub>1</sub> generation

Pink " "  
 $Rr$

Gametes

$\frac{1}{2} R$      $\frac{1}{2} r$

Sperm اللقاح

$\frac{1}{2} R$      $\frac{1}{2} r$

F<sub>2</sub> generation

$\frac{1}{2} R$

Eggs

$\frac{1}{2} r$

$\frac{1}{2} R$	$\frac{1}{2} r$
$RR$	$rR$
$Rr$	$rr$

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Incomplete dominance in snapdragon color

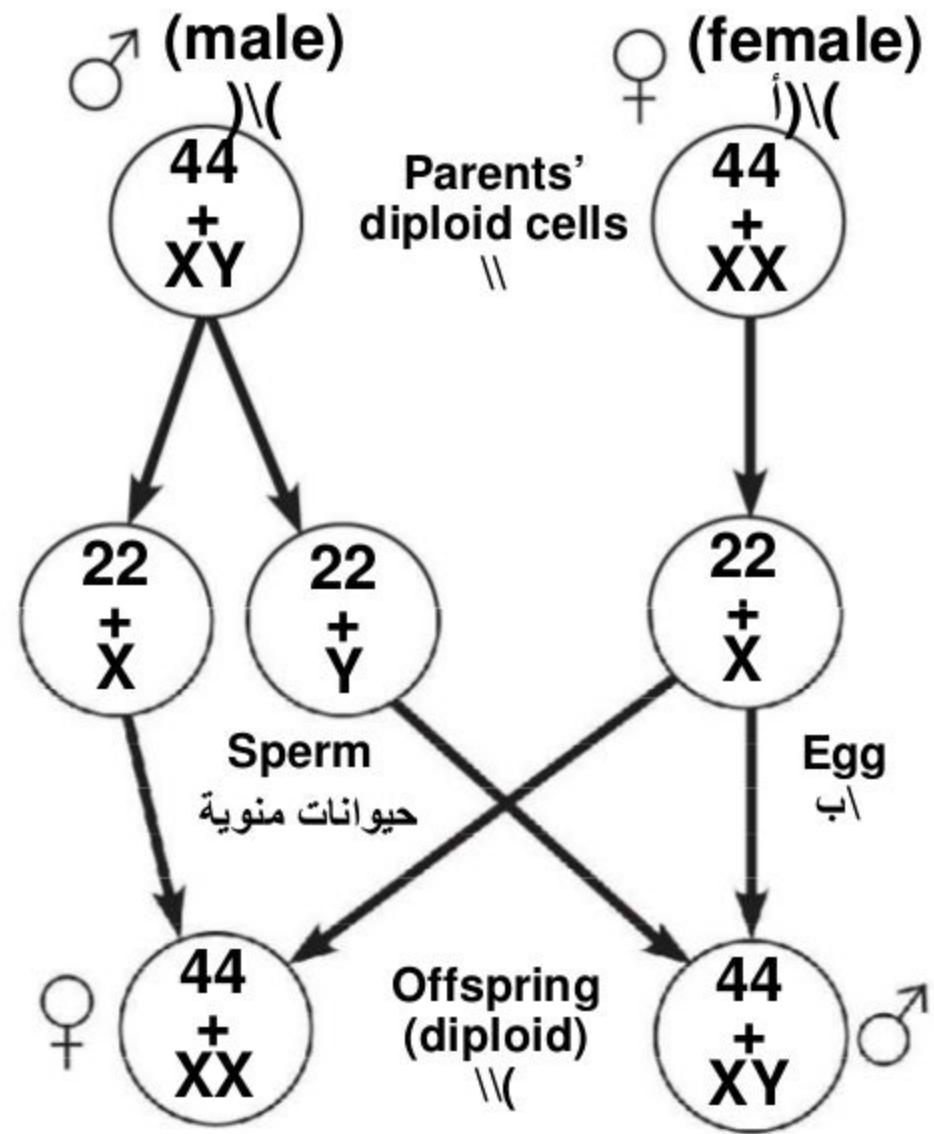
## 9.20 Chromosomes determine sex in many species

---

- **X-Y system in mammals, fruit flies**
  - **XX = female; XY = male**  
 $= XY ; \text{♀} = XX$
- **X-O system in grasshoppers and roaches**
  - **XX = female; XO = male**  
 $= XO ; = XX$
- **Z-W system in birds, butterflies, and some fishes**
  - **ZW = female, ZZ = male**  
 $= ZZ = ZW$
- **Chromosome number in ants and bees**
  - **Diploid = female; haploid = male**



X-Y system





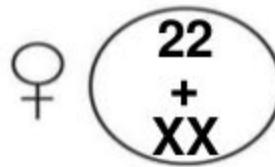
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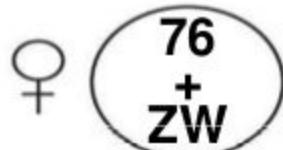
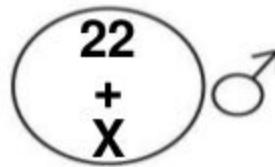
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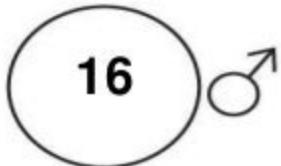
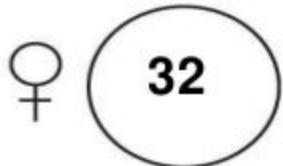
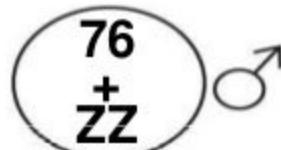
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**X-O system**  
**X-O**



**Z-W system**  
**Z-W**



**Chromosome number system**

# Chapter 10

## Molecular Biology of the Gene



PowerPoint Lectures for

***Biology: Concepts & Connections, Sixth Edition***  
***Campbell, Reece, Taylor, Simon, and Dickey***

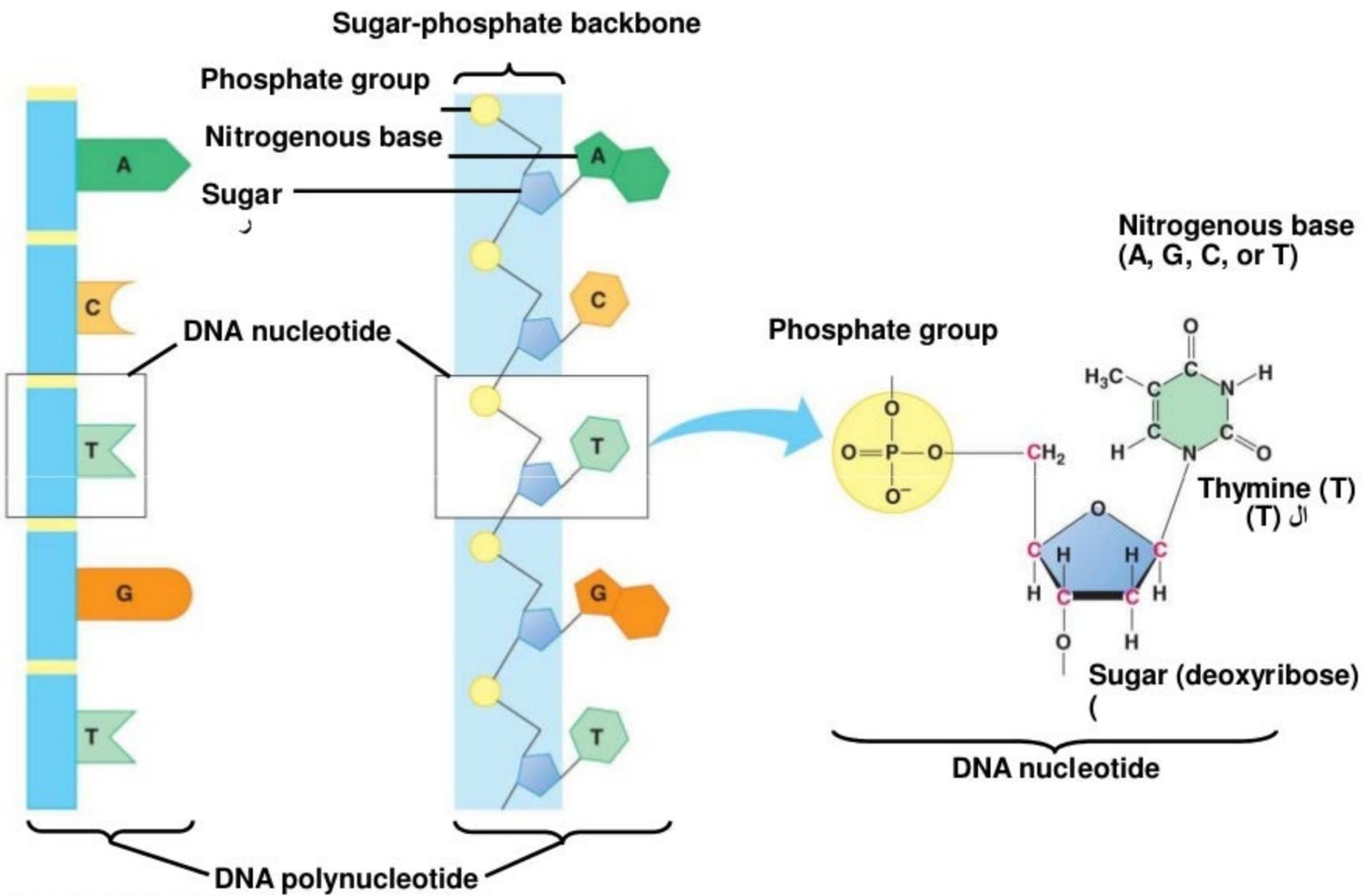
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# **MOLECULAR STRUCTURE OF THE GENETIC MATERIAL**

## 10.2 DNA and RNA are polymers of nucleotides

---

- **The monomer unit of DNA and RNA is the nucleotide, containing**
  - 5-carbon sugar
  - Phosphate group
  - Nitrogenous base
- **A sugar-phosphate backbone is formed by covalent bonding between the phosphate of one nucleotide and the sugar of the next nucleotide**
- **Nitrogenous bases extend from the sugar-phosphate backbone**



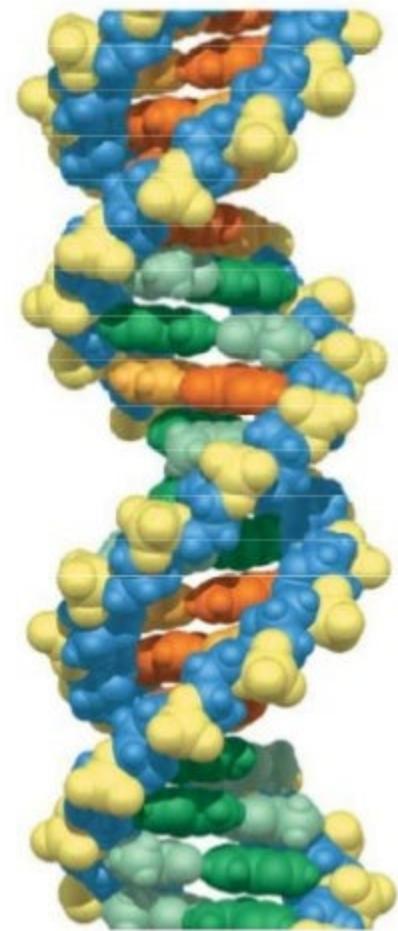
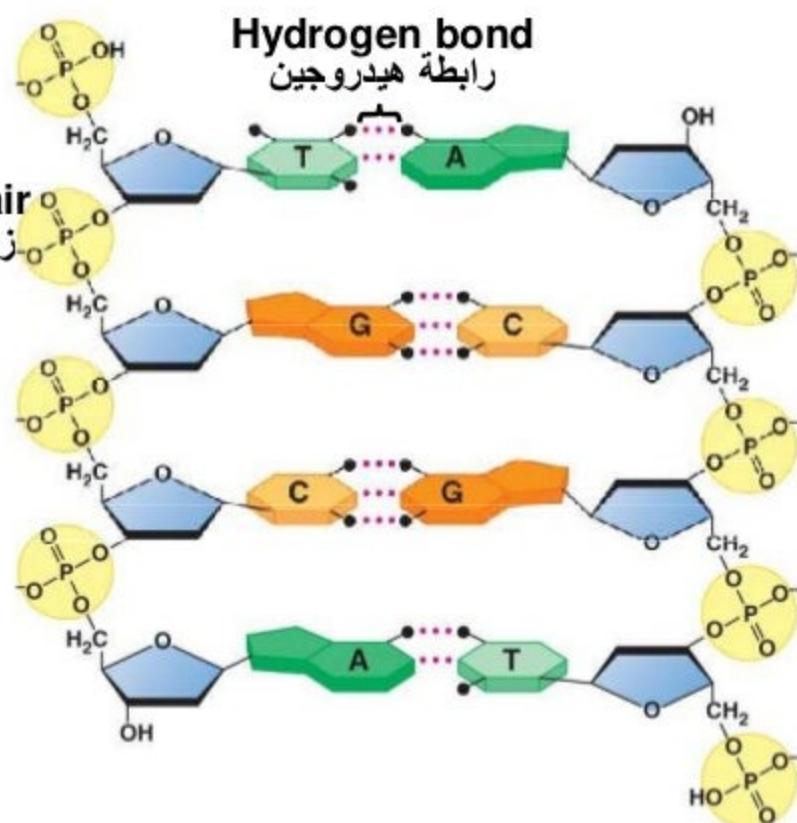
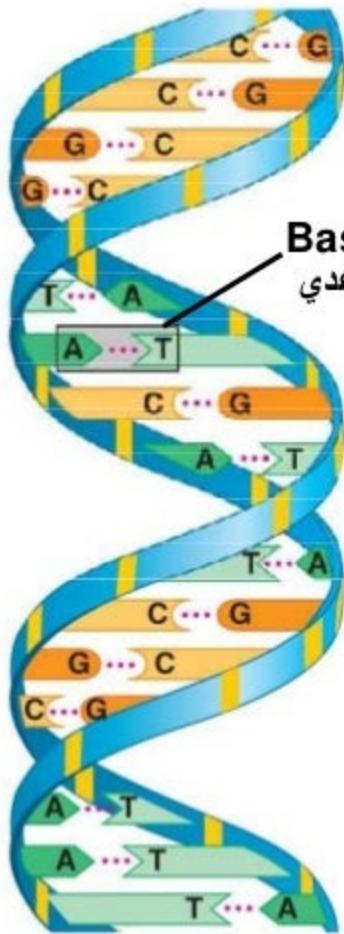
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## The structure of DNA polynucleotide

## 10.3 DNA is a double-stranded helix

---

- **DNA is composed of two polynucleotide chains joined together by hydrogen bonding between bases, twisted into a helical shape**
  - The sugar-phosphate backbone is on the outside
  - The nitrogenous bases are perpendicular to the backbone in the interior
- **Specific pairs of bases give the helix a uniform shape**
  - A pairs with T, forming two hydrogen bonds
  - G pairs with C, forming three hydrogen bonds



## Three presentations of DNA

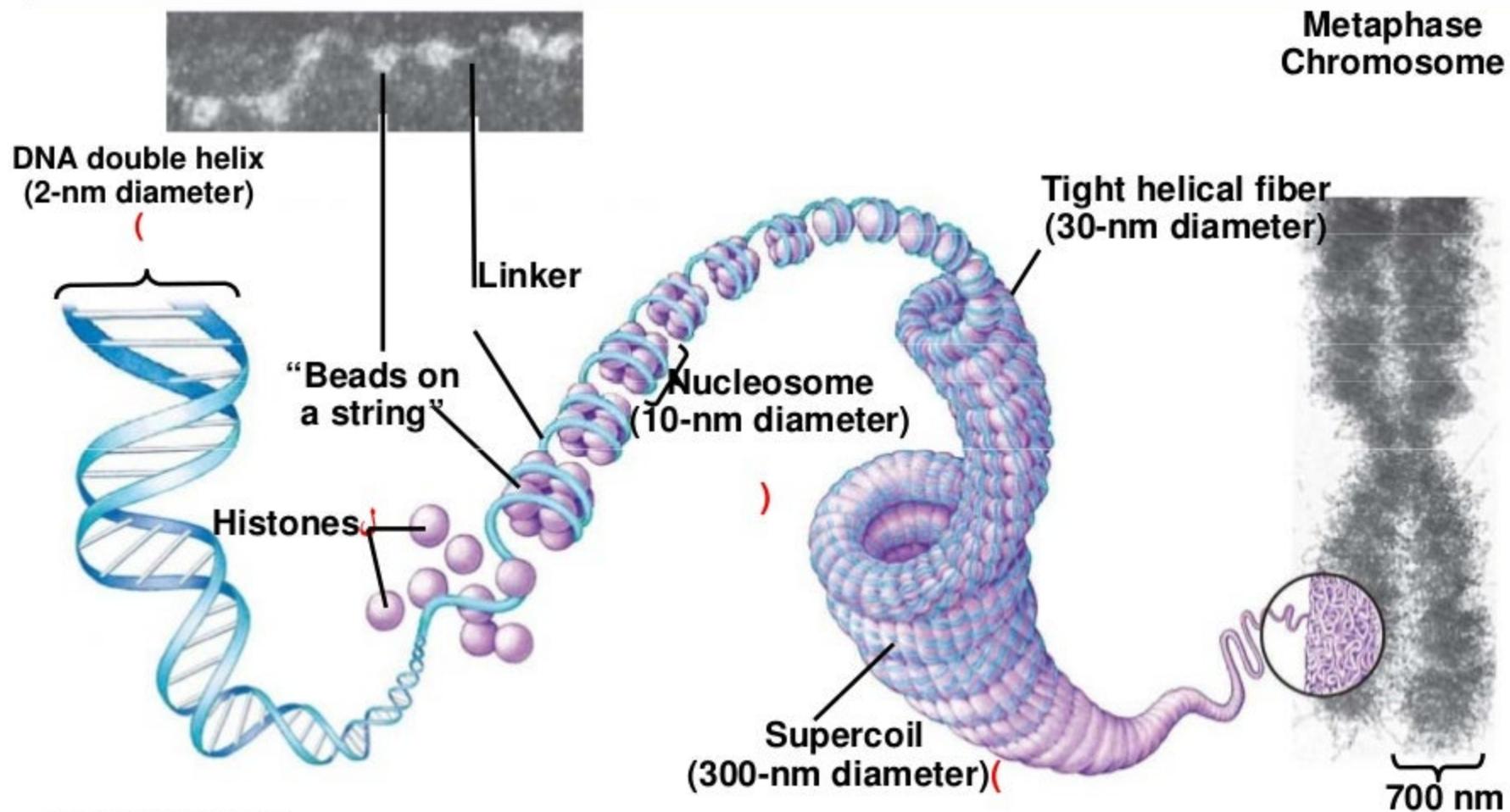
### ثلاثة عروض لشكل الدنا

## 11.3 DNA packing in eukaryotic chromosomes helps regulate gene expression

---

- Eukaryotic chromosomes undergo multiple levels of folding and coiling, called DNA **packing**
  - Nucleosomes are formed when DNA is wrapped around histone proteins
    - “Beads on a string” appearance
    - Each bead includes DNA plus 8 histone molecules
    - String is the linker DNA that connects nucleosomes
  - Tight helical fiber is a coiling of the nucleosome string
  - Supercoil is a coiling of the tight helical fiber
- Metaphase chromosome represents the highest level of packing
- DNA packing can prevent transcription

## 11.3 DNA packing in eukaryotic chromosomes helps regulate gene expression



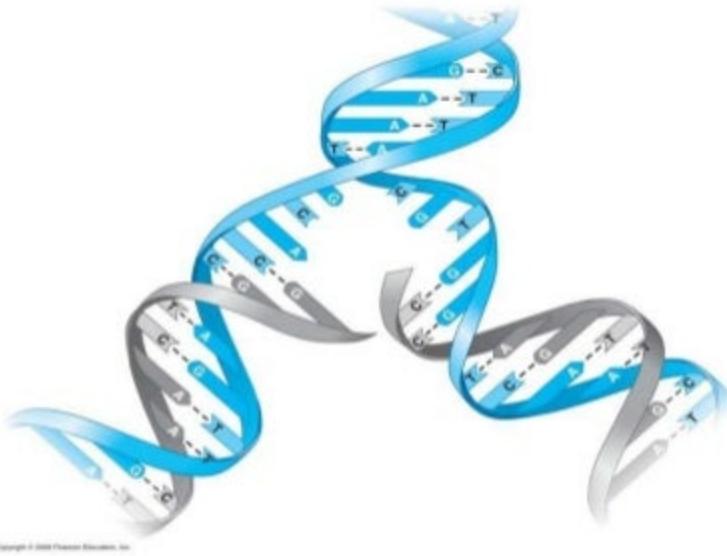
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**DNA packing in a eukaryotic chromosome**

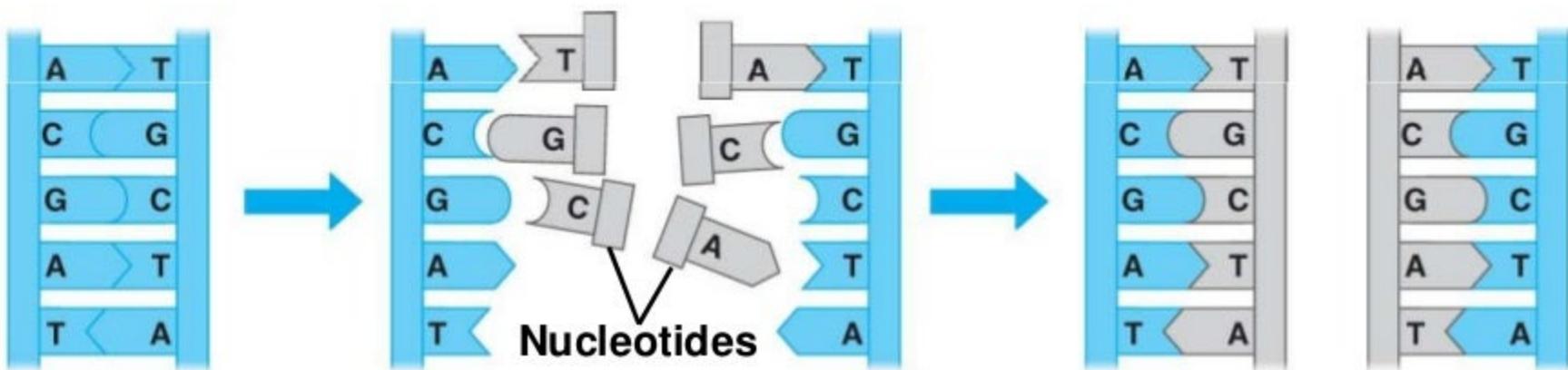
## 10.4 DNA replication depends on specific base pairing

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- DNA replication follows a semiconservative model
  - The two DNA strands separate
  - Each strand is used as a pattern to produce a complementary strand, using specific base pairing
  - Each new DNA helix has one old strand with one new strand



## Untwisting and replication of DNA semiconservativ



Parental molecule  
of DNA

Both parental strands serve  
as templates

Two identical daughter  
molecules of DNA

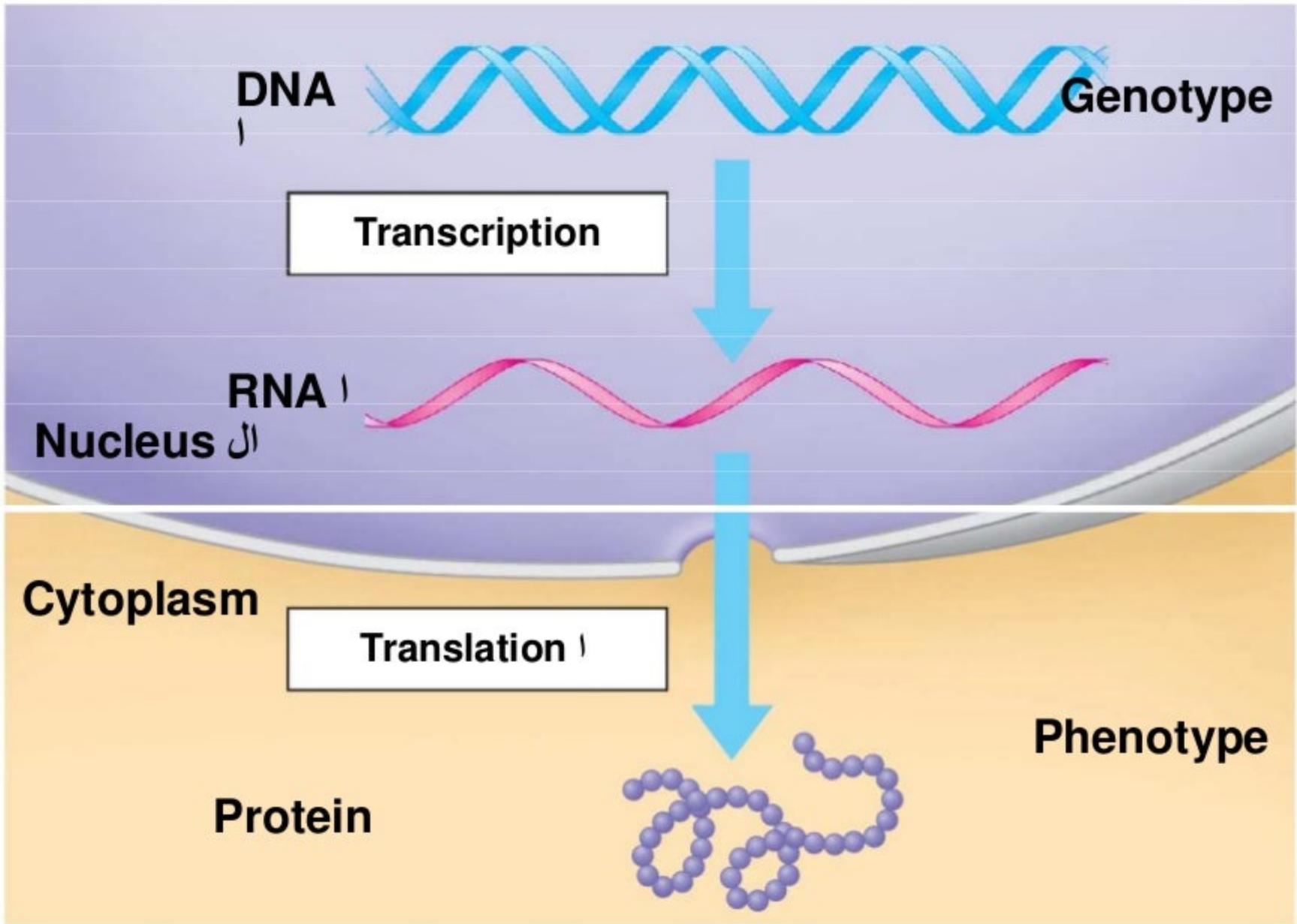
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# **THE FLOW OF GENETIC INFORMATION FROM DNA TO RNA TO PROTEIN**

## 10.6 The DNA genotype is expressed as proteins, which provide the molecular basis for phenotypic traits

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- A gene is a sequence of DNA that directs the synthesis of a specific protein
  - DNA is **transcribed** into RNA
  - RNA is **translated** into protein
- The presence and action of proteins determine the phenotype of an organism



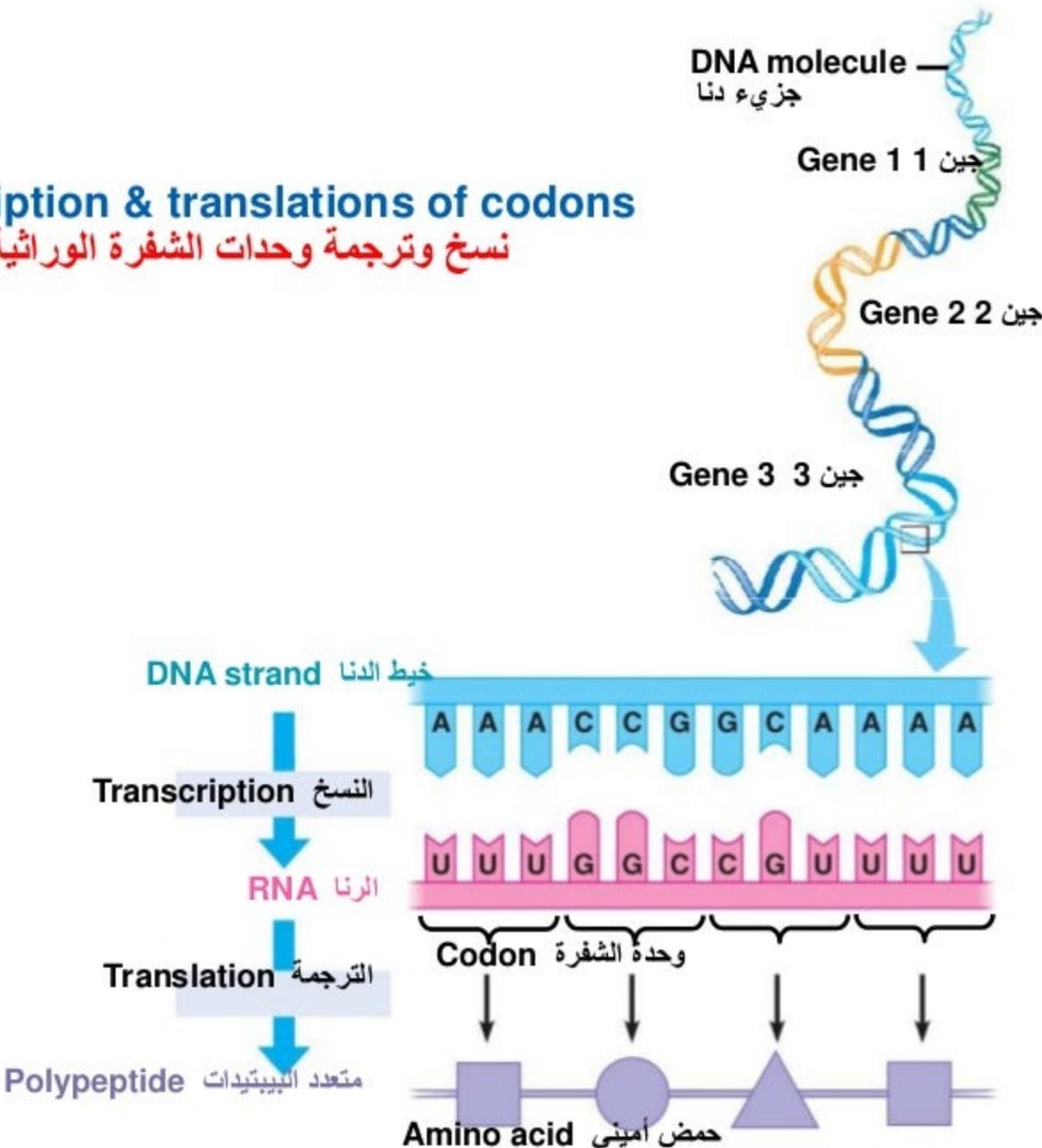
## 10.7 Genetic information written in codons is translated into amino acid sequences

---

- **The sequence of nucleotides in DNA provides a code for constructing a protein**
  - Protein construction requires a conversion of a nucleotide sequence **to** an amino acid sequence
  - Transcription** rewrites the DNA code into RNA, using the same nucleotide “language”
  - Each “word” is a codon, consisting of three nucleotides
  - Translation** involves switching from the nucleotide “language” to amino acid “language”
  - Each amino acid is specified by a codon
    - 64 codons are possible
    - Some amino acids have more than one possible codon

## Transcription & translations of codons

نسخ وترجمة وحدات الشفرة الوراثية



## 10.8 The genetic code is the Rosetta stone of life

---

- **Characteristics of the genetic code**

- **Triplet: Three nucleotides specify one amino acid**
    - **61 codons correspond to amino acids**
    - **AUG codes** for methionine and signals **the start** of transcription
    - **3 “stop” codons signal the end of translation**

**UAA**

**UGA**

**UAG**

## 10.8 The genetic code is the Rosetta stone of life

---

- **Redundant: More than one codon for some amino acids**
- **Unambiguous: Any codon for one amino acid does not code for any other amino acid**
- **Nearly universal**

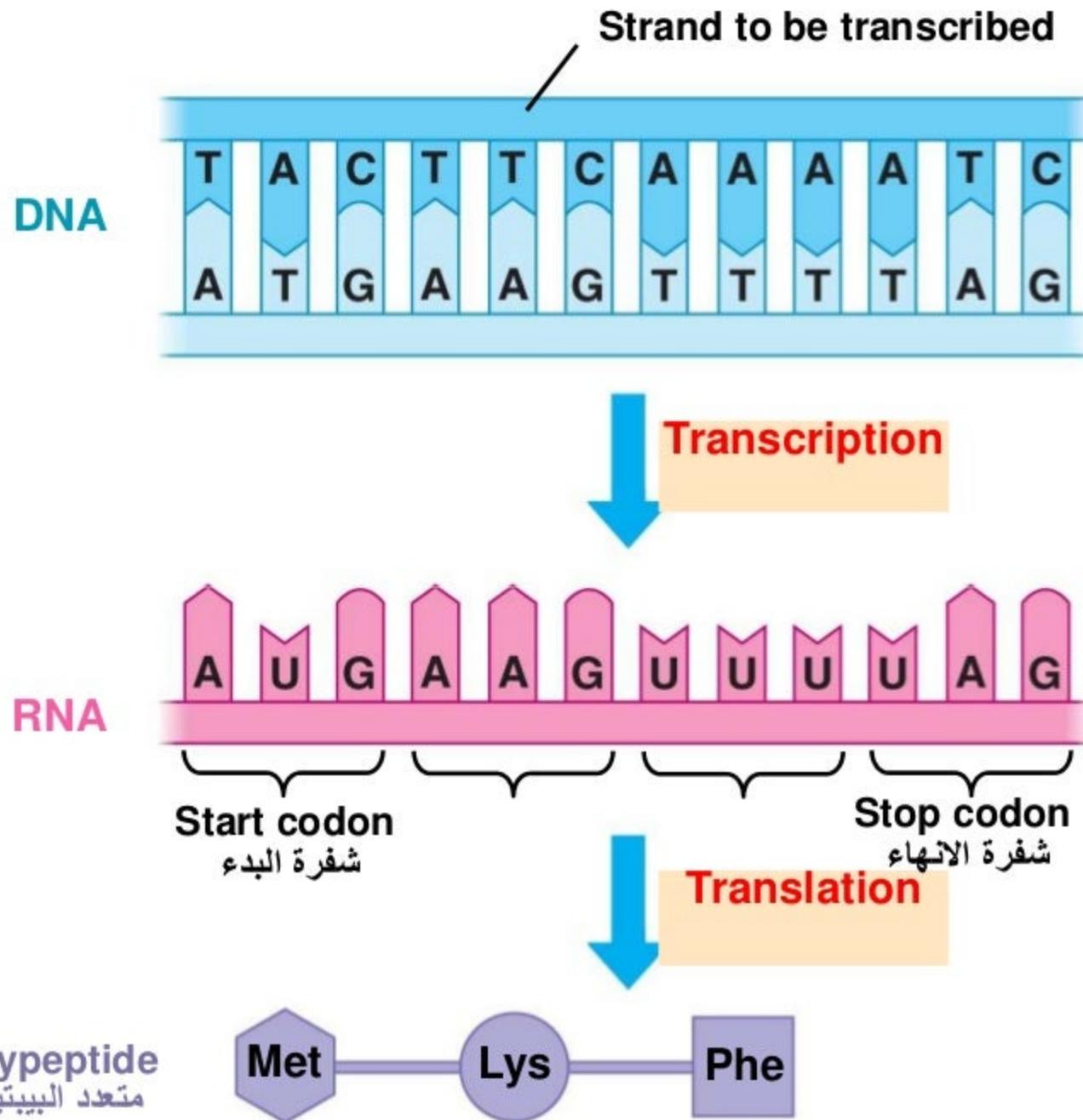
		Second base					
		U	C	A	G		
First base	U	UUU UUC UUA UUG	UCU UCC UCA UCG	UAU UAC UAA Stop UAG Stop	UGU UGC UGA Stop UGG Trp	U C A G	Third base
	C	CUU CUC CUA CUG	CCU CCC CCA CCG	CAU CAC CAA CAG	CGU CGC CGA CGG	U C A G	
	A	AUU AUC AUA AUG Met or start	ACU ACC ACA ACG	AAU AAC AAA AAG	AGU AGC AGA AGG	U C A G	
	G	GUU GUC GUA GUG	GCU GCC GCA GCG	GAU GAC GAA GAG	GGU GGC GGA GGG	U C A G	

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## Dictionary of the genetic code (RNA codons)

معجم الشفرة الوراثية "شفرات الرنا"

# Deciphering the genetic information in DNA



## 10.16 Mutations can change the meaning of genes

---

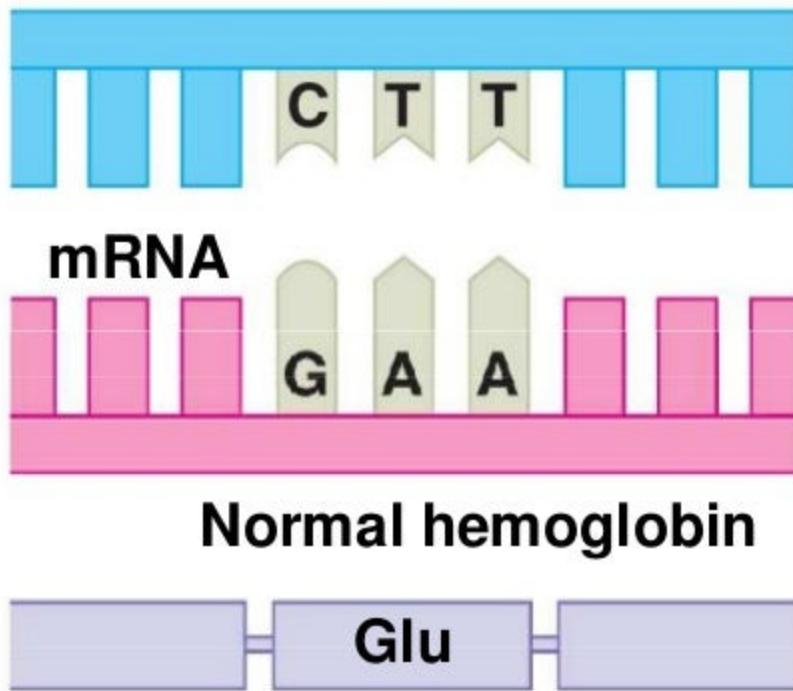
- **A mutation is a change in the nucleotide sequence of DNA**
  - **Base substitutions:** replacement of one nucleotide with another  
Effect depends on whether there is an amino acid change that **alters the function of the protein**
  - **Deletions or insertions: Alter the reading frame** of the mRNA,  
so that nucleotides are grouped into different codons  
Lead to significant changes in amino acid sequence downstream of  
mutation Cause a **nonfunctional polypeptide to be produced**

## 10.16 Mutations can change the meaning of genes

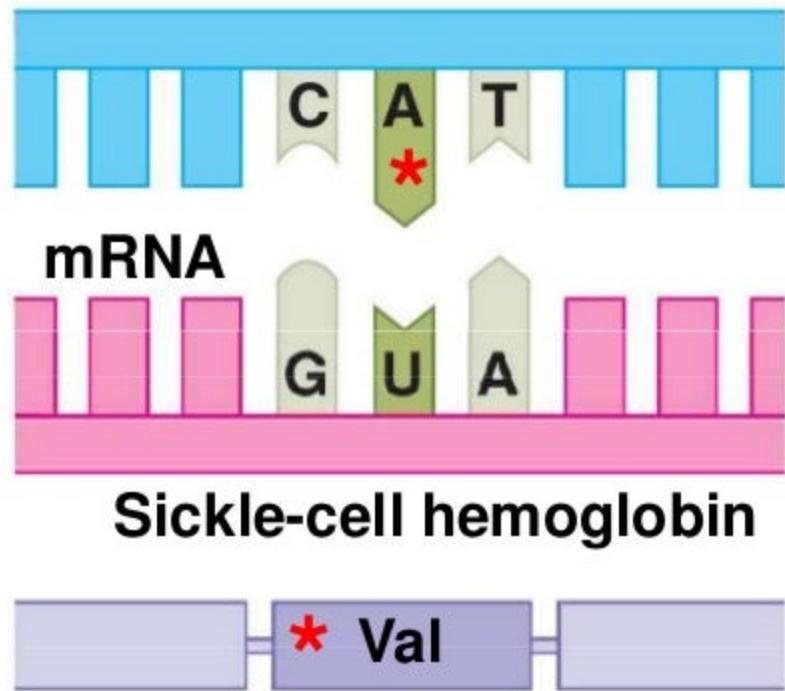
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- **Mutations can be**
  - Spontaneous: due to errors in DNA replication or recombination
  - Induced by mutagens
    - High-energy radiation
    - Chemicals! –

## Normal hemoglobin DNA



## Mutant hemoglobin DNA

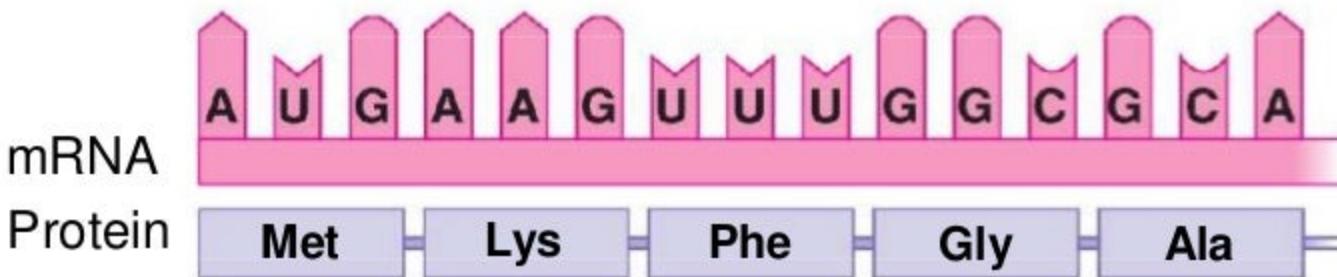


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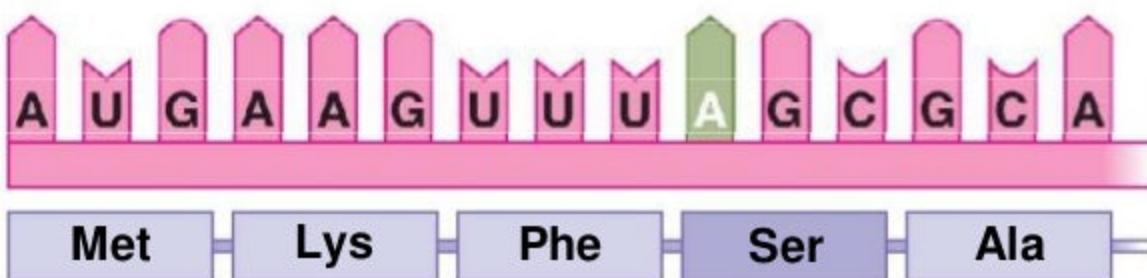
**The molecular basis of Sickle-cell disease**

## Types of mutations and their effects

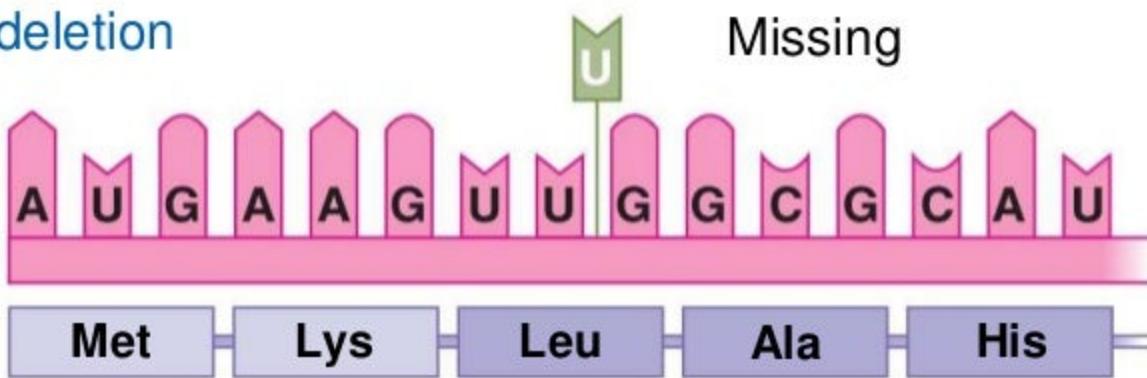
Normal gene



Base substitution



Base deletion



## Chapt. 8: The Cellular Basis of Reproduction and Inheritance

### الأساس الخلوي للتكاثر والوراثة

<u>المصطلح</u>	<u>تعريف المصطلح</u>
Asexual Reproduction	التكاثر اللا جنسي
Sexual Reproduction	التكاثر الجنسي
Binary Fission	الانشقاق الثنائي "الانقسام إلى نصفين"
Prokaryotic Cell	الخلايا أولية النواة
Two Identical Cells Arise From One Cell	ينتج خلعتين متماثلتين من خلية واحدة
Chromosome	الクロموزوم
Duplicates	يتضاعف
Copy	نسخ
Cell Elongates	تستطيل الخلية
Plasma Membrane	غشاء البلازما
Eukaryotic	حقيقية النواة
Cell Cycle	دورة الخلية
Mitosis	الانقسام الفتيلي(اللا انتصافي)
Chromatin	مادة الكروماتين
Chromatin = DNA + Proteins	الكروماتين = دنا + بروتينات
Compact Chromatin = Chromosomes	يتكون الكروماتين بدرجة عالية = الكروموزومات

المصطلح	تعريف المصطلح
<b>Duplicated Chromosomes= Two Sister Chromatids</b>	الكروموسومات المضاعفة = كروماتيداتين شقيقين كل منها يحتوي جزء واحد من الدنا متماثل لشقيقه
<b>Centromere</b>	المنطقة المركزية الضيقة في الكروموسوم
<b>Interphase Of The Cell Cycle</b>	الطور البيني في دورة الخلية
<b>Of The Cell Cycle G1</b>	مرحلة نمو 1 في دورة الخلية
<b>S Ps Phase Of The Cell Cycle=Synthesis Of DNA (Duplication Of Chromosomes)</b>	مرحلة تخليل الدنا - مضاعفة الكروموسومات
<b>G1Of The Cell Cycle</b>	مرحلة نمو 2 في دورة الخلية
<b>Mitotic Division</b>	الانقسام الفتيلي (اللانتصافي)
<b>Mitosis=Division Of The Nucleus</b>	الانقسام الفتيلي = انقسام النواة
<b>Cytokinesis= Division Of Cytoplasm</b>	انقسام السيتوبلازم = الانقسام السيتوبلازمي
<b>Centrosomes</b>	جسم مرکزي
<b>Spindle Fibers</b>	خيوط مغزلية
<b>Nuclear Envelope</b>	غلاف نووي
<b>Nucleolus</b>	النوية
<b>Spindle Microtubule</b>	أنبيبات دقيقة مغزلية
<b>Kinetochores</b>	مركز الحركة في المنطقه المركزية للكروموسوم

المصطلح	تعريف المصطلح
Metaphase	الطور الاستوائي
Anaphase	الطور الانفصالي
Telophase	الطور النهائي
Cleavage Furrow	التخلص
Cell Plate	الصفحة الخلوية
Microfilaments	الخيوط الدقيقة
Growth	نمو
Onion	بصل
Roots	جذور
Meiosis	الانقسام الاختزالي ( الانتصافي )
Crossing Over	العبور الوراثي
Chromosomes Homologous Pairs	أزواج الكروموسومات المتماثلة
Gene Location On Chromosome= Locus	الموضع الذي يحتله الجين على الكروموسوم
Maternal Chromosomes	كروموسومات الأم
Paternal Chromosomes	كروموسومات الأب
X , Y Autosomes	جميعها ما عدا الكروموسومات الجنسية
Gametes	( الامشاج )

المصطلح	تعريف المصطلح
1n (Haploid)	احادي الصيغه الصبغيه 23 في الانسان
2n (Diploid)	ثنائي الصيغه الصبغيه 46 في الانسان
Sperm	الحيوان المنوي
Egg	الببيضة
Fertilization	الخصاب
Zygote	اللاقحة (الببيضة المخصبة )
Coil	تلتف
Compact	مضغوطة
Synapsis	الاقتران
Tetrad	أربع كروماتيدات = رباعية

### Chapt.9: Patterns of Inheritance

#### أنماط الوراثة

المصطلح	تعريف المصطلح
Pangenesis	نظريّة شمولية التكوين
Blending	الخلط
Hereditary Material	المادة الوراثية
Breeding	التهجين
Heritable Factors = Genes	العوامل الوراثية = الجينات

المصطلح	تعريف المصطلح
<b>Self-Fertilization</b>	الاخضاب الذاتي
<b>Cross-Fertilization</b>	الاخضاب الخلطي
<b>Offspring</b>	الذرية = النسل
<b>Monohybrid Cross</b>	تهجين أحادى
<b>Parental Generation</b>	الجيل الأبوي
<b>F<sub>1</sub> Generation</b>	جيـل الـذـرـية 1 الـأـول
<b>F<sub>2</sub> Generation</b>	جيـل الـذـرـية 2 الـثـانـي
<b>Trait</b>	هيـنة = صـفـه
<b>True-Breeding(BB Or Bb But Not Bb)</b>	نـسـل اـصـيـل غـير هـجـين
<b>Phenotype</b>	الـنـمـط الـظـاهـري
<b>Ratio</b>	الـنـسـبـه
<b>Genotype</b>	الـنـمـط الـجـينـي
<b>Allele= One Of The Two Copies Of A Gene</b>	يوجـد نـسـختـين من كل جـين وـاحـده من الأب وـالـأـخـرى من الأم كل نـسـخـه نـسـمـى البـيل وـيمـكـن أـن يـكـونـوا مـتـشـابـهـين أو مـخـالـفـين
<b>Dominant</b>	سـائـد
<b>Recessive</b>	مـتـنـحـي
<b>AA Or Aa      Homozygous</b>	مـتـمـاـئـل الـأـلـاـنـل
<b>Aa Heterozygous</b>	مـتـغـاـير الـأـلـاـنـل

المصطلح	تعريف المصطلح
A Pedigree	شجرة النسب
Deduce	يستتبط
Bb Incomplete Dominance	رمادي سيادة غير التامة
Bb Intermediate Phenotype	رمادي نمط مظاهري وسطي
AB ( Blood Group AB) ( Co-Dominance	سيادة مشتركة ( الزمرة الدموية
Recessive Disorders (Both Alleles Have To Be Defective)	الاضطرابات المتنحية ( لا بد من ان يكون كلا الاليلين لا يعملان )
Dominant Disorders	الاضطرابات السائدة ( يكفي خلل اليل واحد ليسبب المرض )
Expression	التعبير

### Chapt.10 :Molecular Biology of the Gene البيولوجيا الجزيئية للجين

المصطلح	تعريف المصطلح
Monomer	موحد
Polymer	مكتور
Nucleotide	نيوكليوتيد

المصطلح	تعريف المصطلح
<b>DNA</b> (Deoxy Ribonucleic Acid) = <b>Polynucleotide</b>	دنا (حمض نووي ريبوزي لاكسجيني)
<b>Double-Stranded Helix</b>	حلزون مزدوج الخيوط
<b>Chain</b>	سلسله
<b>Base Pairing</b>	تزواج القواعد النيتروجينية
<b>Gene Expression</b>	التعبير الجيني
<b>Folding,</b>	الطي
<b>Coiling</b>	الالتفاف
<b>Packing</b>	تعبة
<b>Nucleosomes</b>	الأجسام النووية
<b>Linker DNA</b>	الدنا الرابط الذي يصل ما بين الأجسام النووية
<b>DNA Replication</b>	تضاعف الدنا
<b>Semiconservative Model</b>	نموذج شبه تحفظي
<b>Complementary Strand</b>	خيط مكمل
<b>Template</b>	قالب
<b>Sequence</b>	تسلاسل
<b>Transcription</b>	استنساخ
<b>Translation</b>	ترجمه

## Chapt.10 :Molecular Biology of the Gene

### البيولوجيا الجزيئية للجين

المصطلح	تعريف المصطلح
<b>RNA( Ribonucleic Acid)</b>	الرنا
<b>Codon</b>	شفرة
<b>Amino Acid</b>	حامض أميني
<b>Signal</b>	إشارة
<b>Redundancy</b>	الترادف
<b>Unambiguous</b>	عدم الغموض
<b>Spacers Or Punctuation</b>	فراغات أو فواصل أو علامات وقف
<b>Adjacent</b>	ملتصقة
<b>Mutation</b>	طفرة
<b>Substitutions</b>	استبدال
<b>Deletions</b>	الحذف
<b>Insertion</b>	الإضافة
<b>Spontaneous</b>	تلقيائي
<b>Induced</b>	مستحدث
<b>Mutagens</b>	المُطفرات