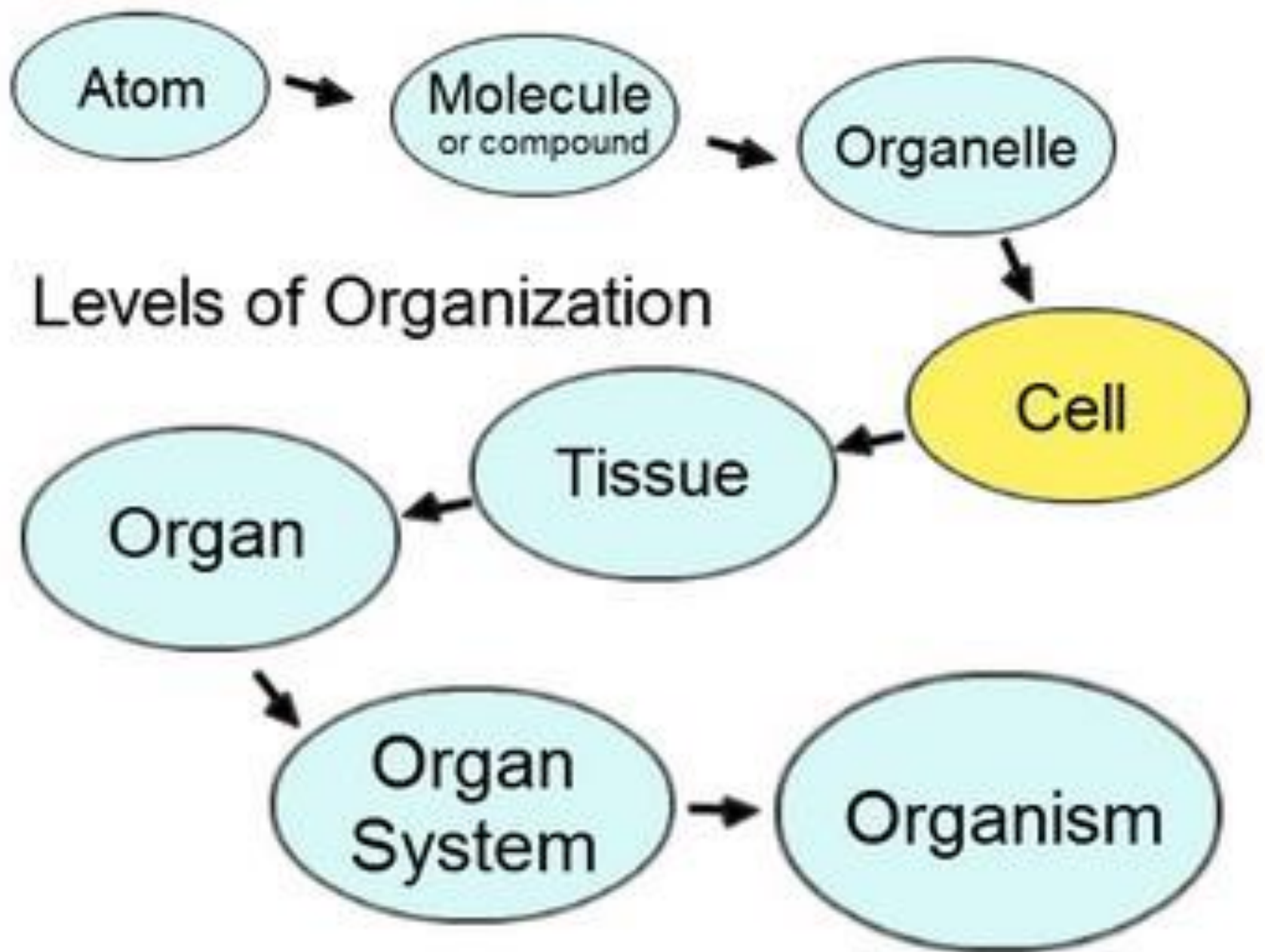


زیست شناسی مولکولی، جلسه اول:

۱- سازمان یافتگی زیستی

۲- بنیان مولکولی زندگی و نگرشی بر زیست مولکول ها

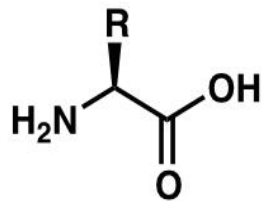




Biomolecules

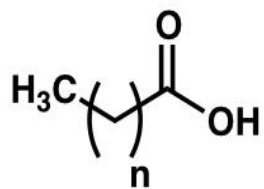
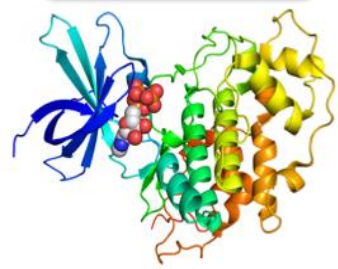
Classes of Biomolecules

- ❑ Proteins
(amino acids)
- ❑ Nucleic Acids – DNA & RNA
(nucleotides)
- ❑ Carbohydrates
(monosaccharides)
- ❑ Lipids
(fatty acids)
- ❑ Vitamins and Cofactors
- ❑ Metabolites



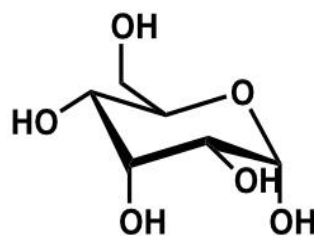
amino acids

proteins



fatty acids

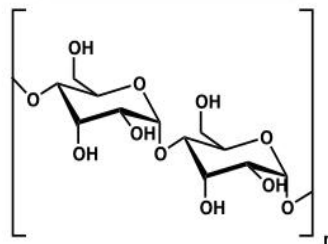
phospholipids



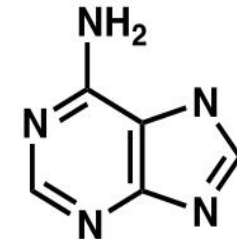
carbohydrates

glycerol

poly-saccharides



mono-saccharides



nucleobases

nucleotides

DNA / RNA

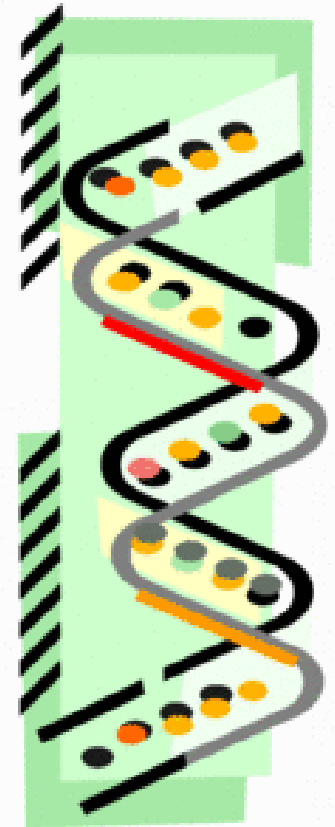


زیست شناسی مولکولی، جلسه دوم:

نقش های زیستی پروتئین ها، اسیدهای نوکلئیک، کربوهیدراتها و چربیها

Nucleic Acids

- **Not considered a nutrient macromolecule**
- **They are complex compounds that determine how the cell functions and what characteristics it has.**



8 Functions of Lipids

- **Source of energy**
- **Cellular membranes**
- **Excellent insulators**
 - **Thermal insulators**
 - **Electrical insulators (in membranes)**
- **Special roles:**
 - **Signals**
 - **Hormones, Mediators, or growth factors.**
 - **Coenzymes**
 - **Vitamins**

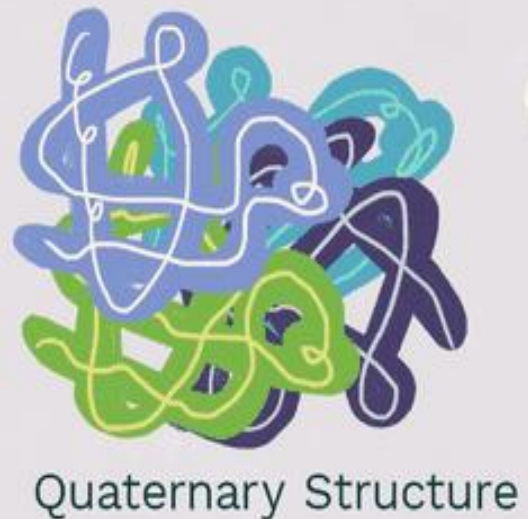
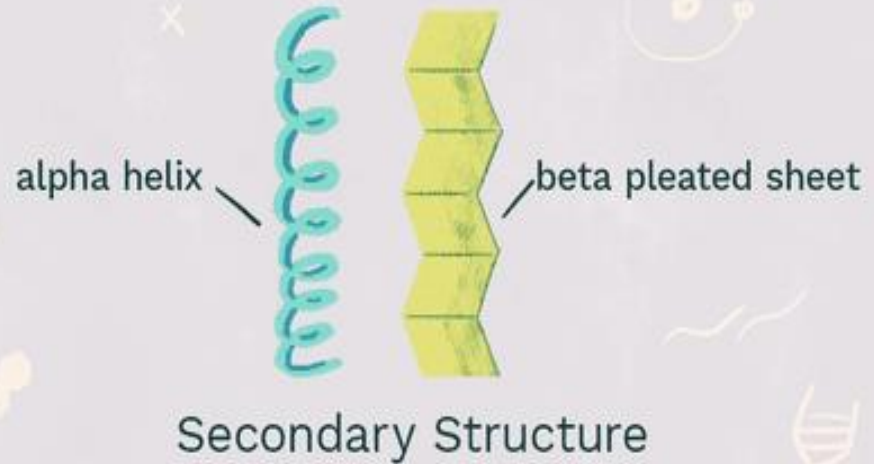
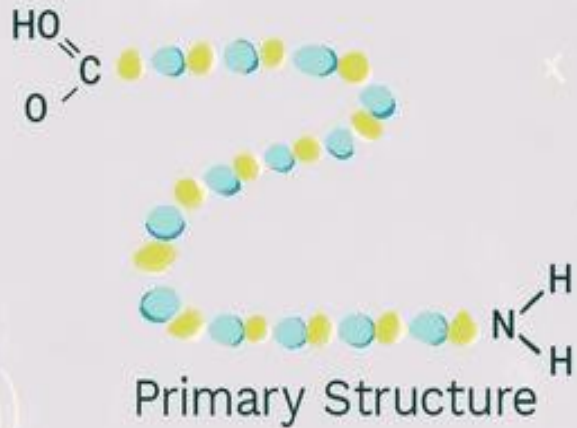
Carbohydrates Functions

- Many carbohydrates, especially glucose, are sources of energy for cells
- Others carbohydrates, such as cellulose, are structural materials
- Others such as starch and glycogen are storage materials

The function of proteins

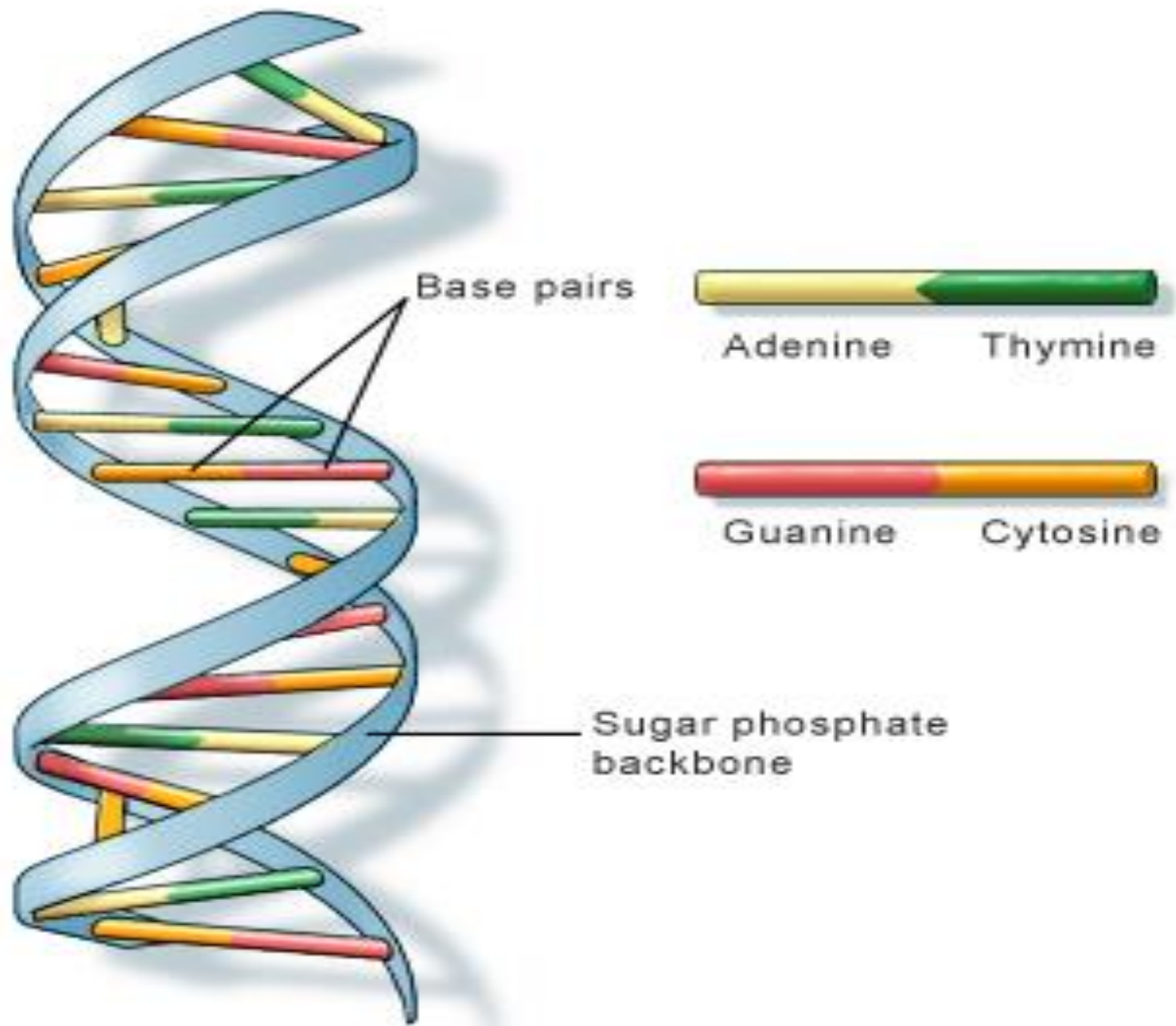
Enzymes	Biological catalysts.
Antibodies	They fight off infection.
Transport	Move materials around Ex. hemoglobin for O₂.
Regulatory	As hormones, they control metabolism.
Structural	coverings and support skin, tendons, hair, nails, bone.
Movement	muscles, cilia, flagella.

Types of Protein Structures



زیت شناسی مولکولی، جلسہ سوم:

DNA و ژن



DIFFERENT GENE CATEGORIES

Housekeeping genes	Genes turned “on” in all cells at all times (e.g. transcription machinery, translation machinery, energy conversion, etc.).
Cell type specific genes	Genes that are turned “on” in each cell that give a cell its special properties and function.
Developmental regulatory genes	Genes specific to certain stages during growth & development of a person.
Inducible genes	Genes not normally expressed but can be in response to external stimuli (e.g. hormone).

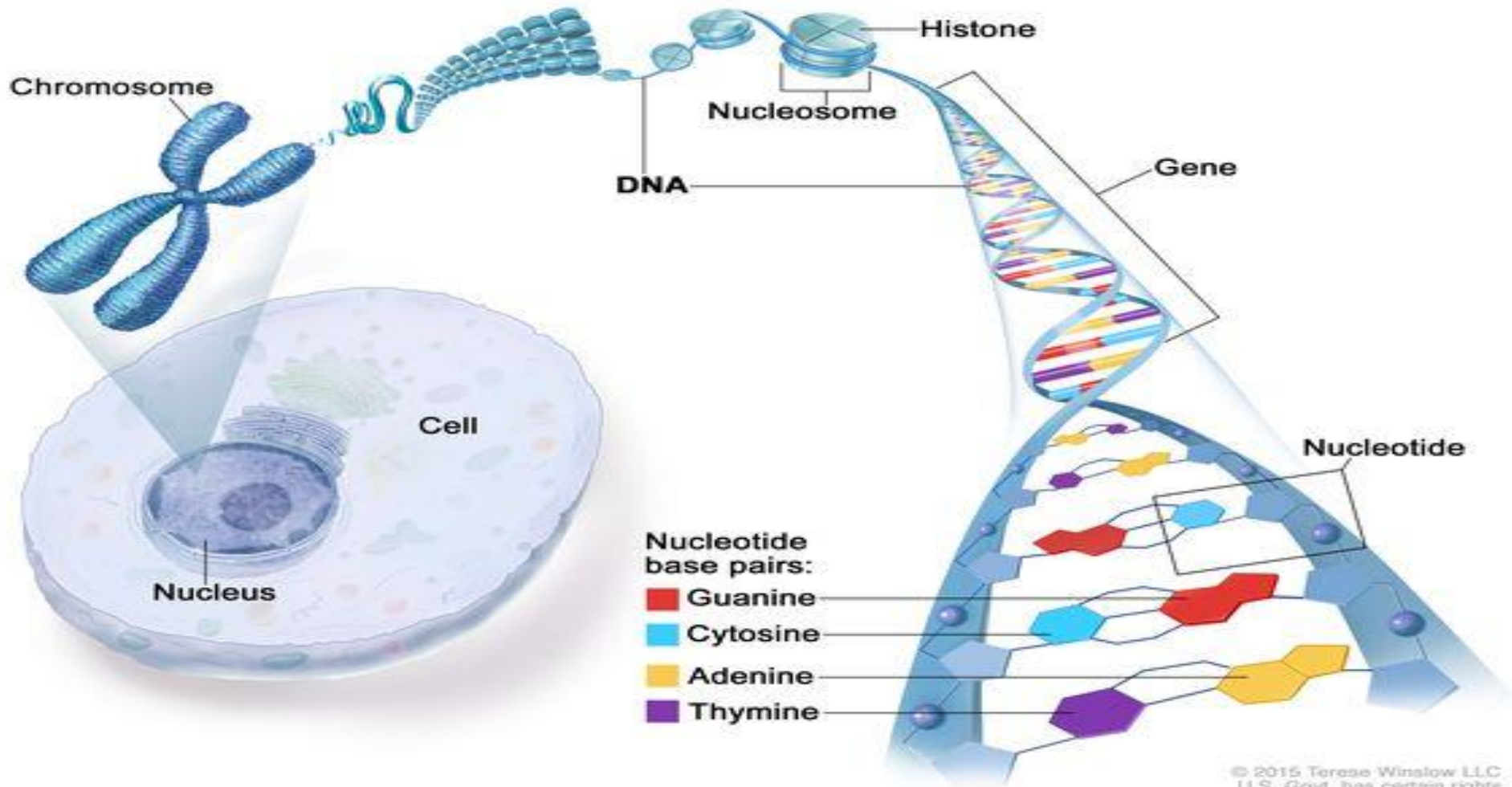
Types of Regulated Genes

- **Constitutive genes** are always expressed
 - Tend to be vital for basic cell functions (often called “housekeeping genes”)
- **Inducible genes** are normally off, but can be turned on when substrate is present
 - Common for **catabolic** enzymes (i.e. for the utilization of particular resources)
- **Repressible genes** are normally on, but can be turned off when the end product is abundant
 - Common for **anabolic** enzymes

زیست شناسی مولکولی، جلسه چهارم:

کروماتین، نوکلئوزوم، کروماتوزوم و کروموزوم

DNA Structure



- Nucleotide base pairs:**
- Guanine
 - Cytosine
 - Adenine
 - Thymine

Metaphase chromosome



1400 nm

Condensed scaffold-associated form



700 nm

Extended scaffold-associated form



Chromosome scaffold

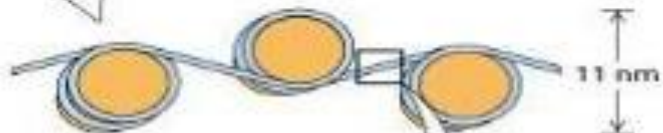
300 nm

30-nm chromatin fiber of packed nucleosomes



30 nm

"Beads-on-a-string" form of chromatin

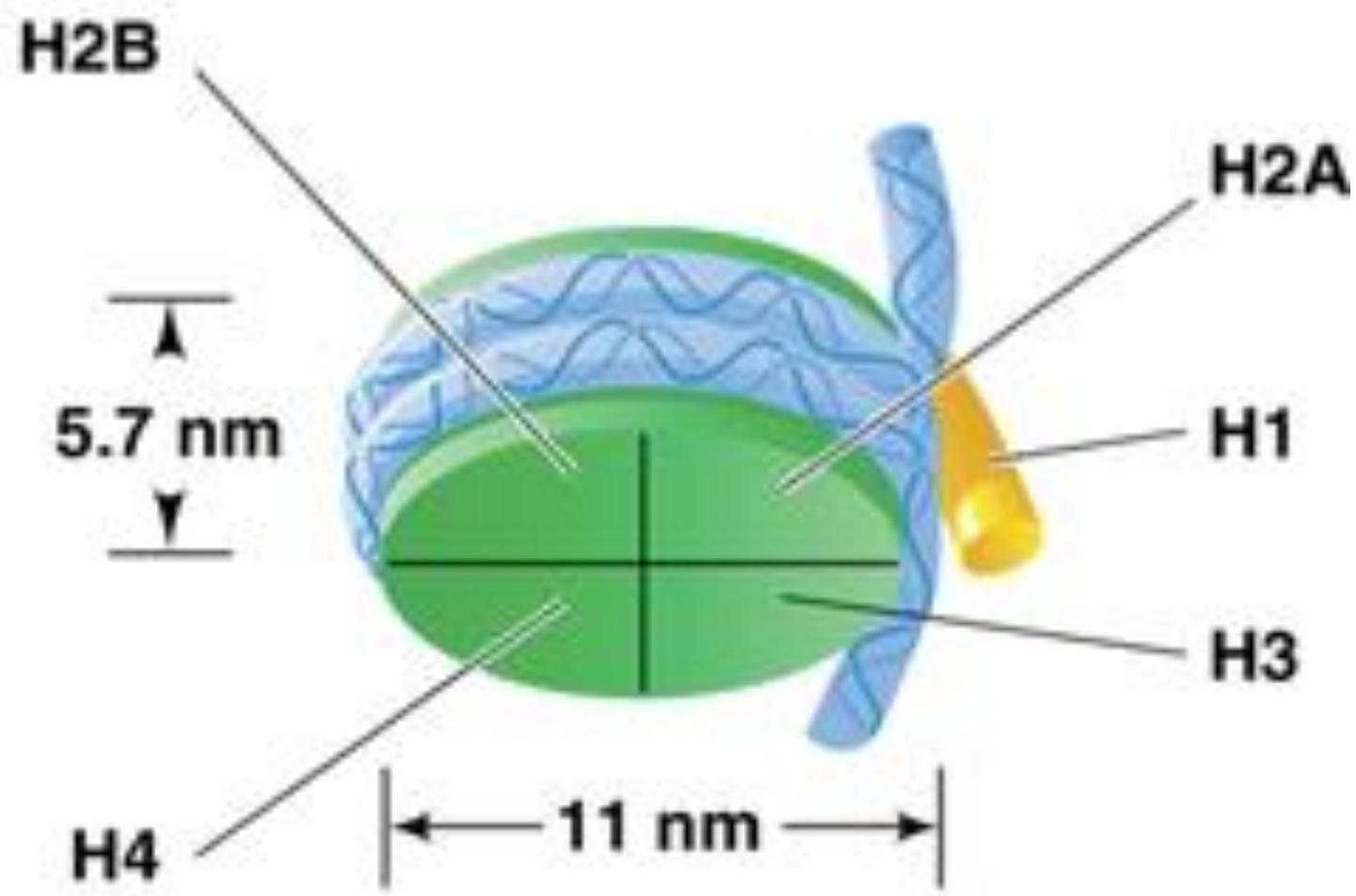


11 nm

Short region of DNA double-helix



2 nm



linker histone

nucleosome

chromatosome

(histone core + DNA)

nucleosome

