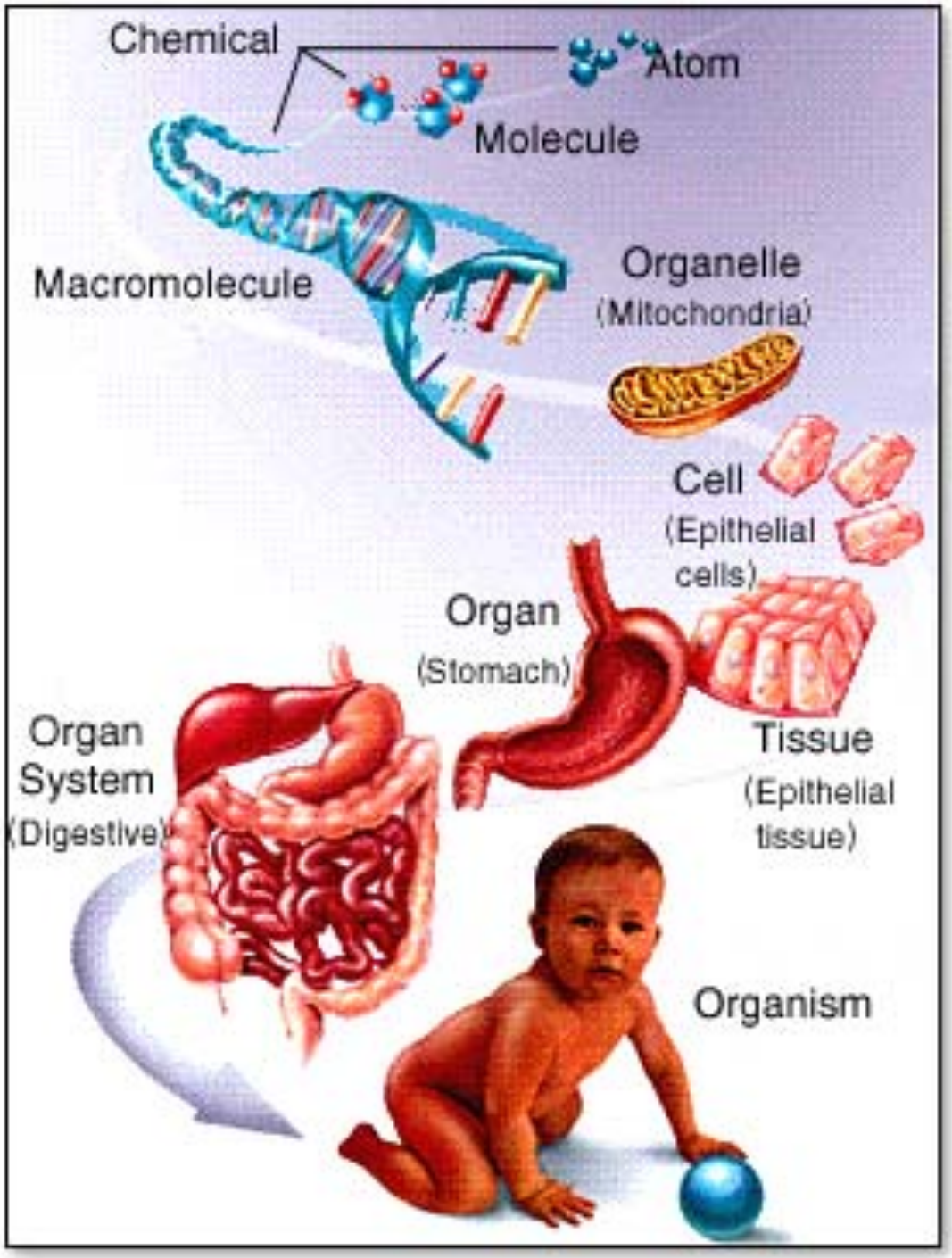
Word of the Day

Macromolecule:

large molecule


Chemical
Atom
Molecule
Macromolecule
Organelle
(Mitochondria)
Cell
(Epithelial
cells)
Organ
(Stomach)
Tissue
(Epithelial
tissue)
Organ
System
(Digestive)
Organism

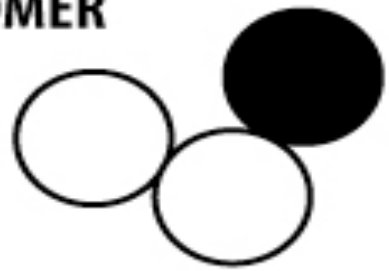
4 Biological Macromolecules

- 1. Carbohydrates
- 2. Lipids
- 3. Proteins
- 4. Nucleic Acids

Vocabulary

Structure of Monomers and Polymers

MONOMER



A monomer is a small molecule.

POLYMER

A polymer is a long-chain molecule made up of a repeated pattern of monomers.

ALL CELLS:

- USE nucleic acids (DNA) to store information
- USE proteins (enzymes) for chemical reactions
- USE lipids (fats) for the cell membrane & long-term energy storage
- USE carbohydrates for cell walls (if present) and short-term energy

Macromolecule	monomer	polymer
Carbohydrates	monosaccharide	polysaccharide
Proteins	Amino acids	Polypeptide chain
Nucleic Acids	nucleotides	DNA or RNA
Lipids*	Glycerol and fatty acids	triglycerides

Where do the macromolecules come from?

- Some cells can:
- make all of the monomers
- get monomers from food
- change other compounds into monomers

A. Carbohydrates

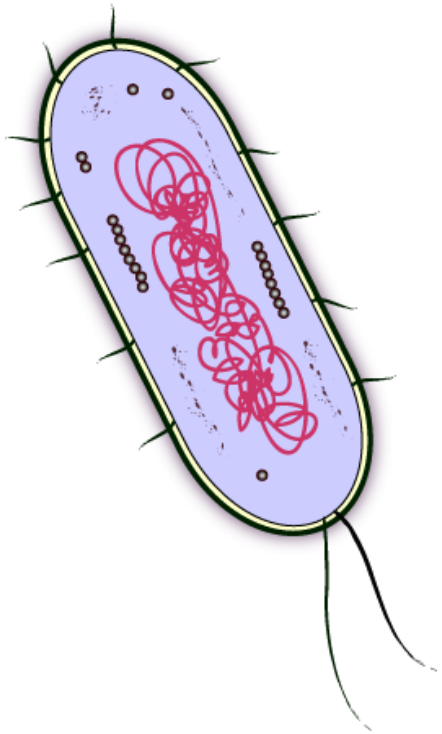
- All have general formula $C_nH_{2n}O_n$

$C_6H_{12}0_6$ Glucose

Carbohydrates

- Provide Cell structure:

Cellulose in plant cell walls

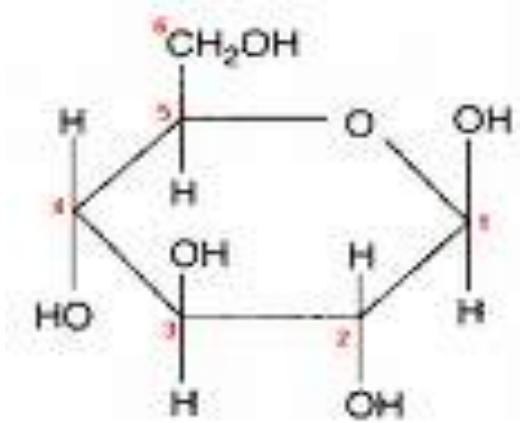


Lipopolysaccharides (LPS)
in bacterial cell wall

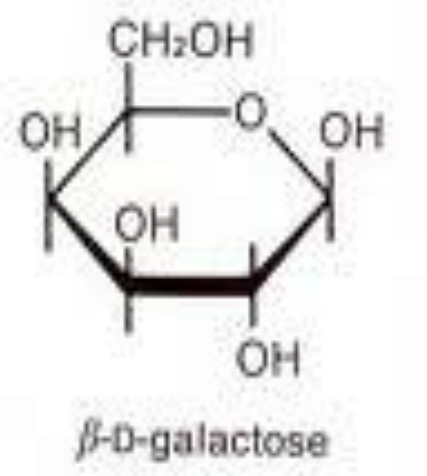
Male blue crab.
Note his blue tipped claws.

Chitin in exoskeleton

Carbohydrate Structure: Monomers

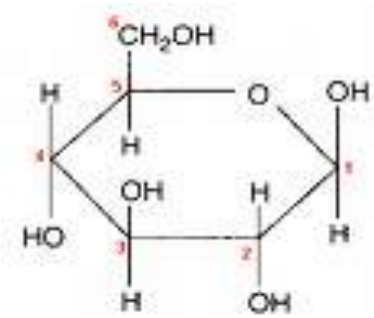


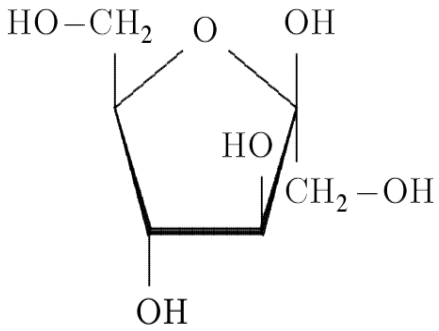
Galactose

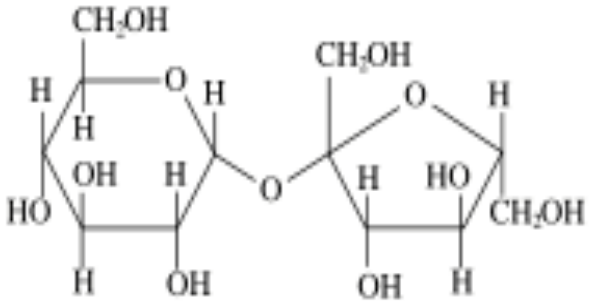


Carbohydrate Structure

- Monosaccharides can link to form disaccharides







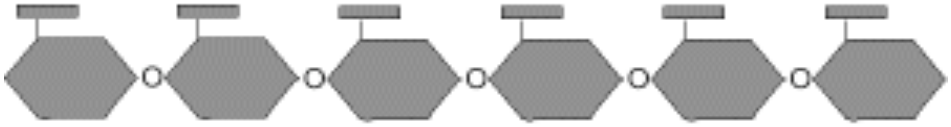
Glucose + Fructose → Sucrose

Examples of: Complex Carbohydrates

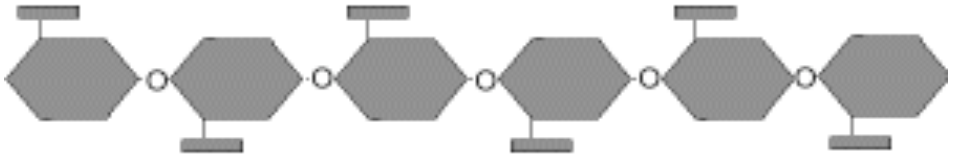
- Cellulose
  Most abundant carbohydrate on the planet!
  - Makes up plant cell walls
  - Indigestible by animals
- Starch
  - Energy storage molecule in plants
  - Can be digested by animals
- Glycogen
  - Animal energy reserve
  - Found primarily in liver and muscle

Complex Carbohydrates

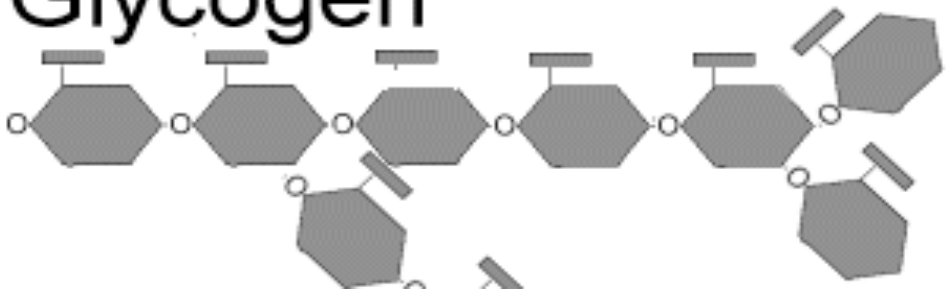
Starch



Cellulose

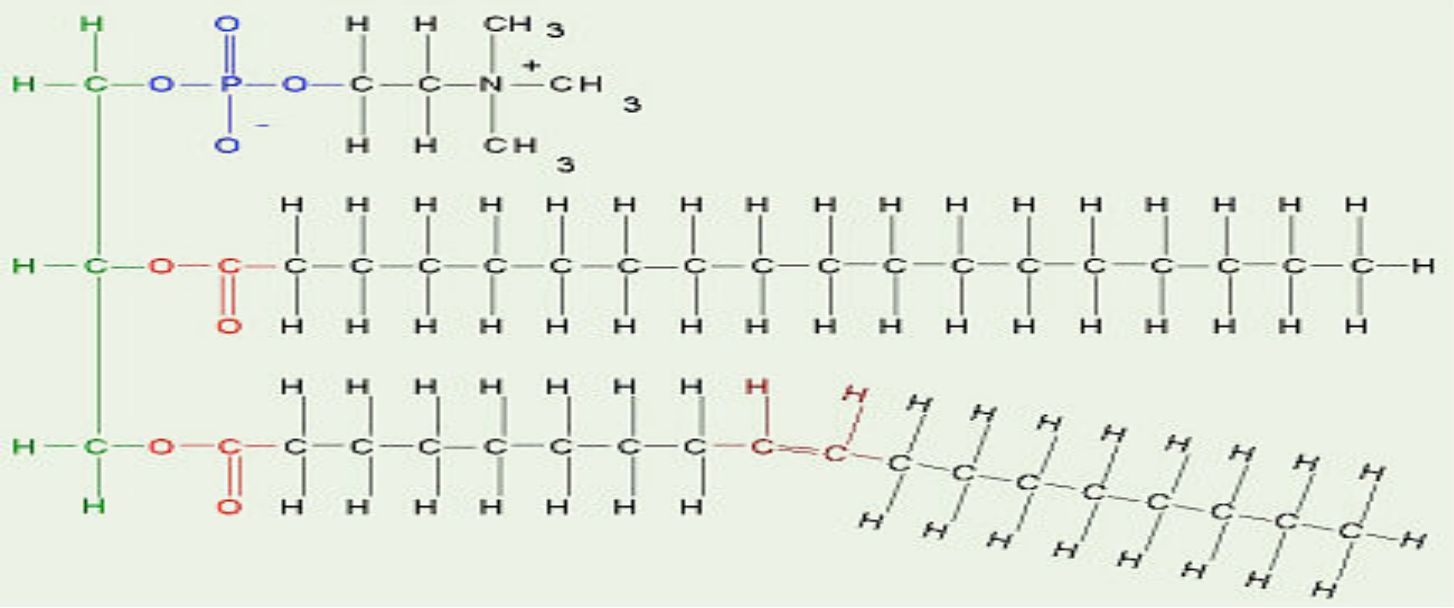


Glycogen



B. Lipids

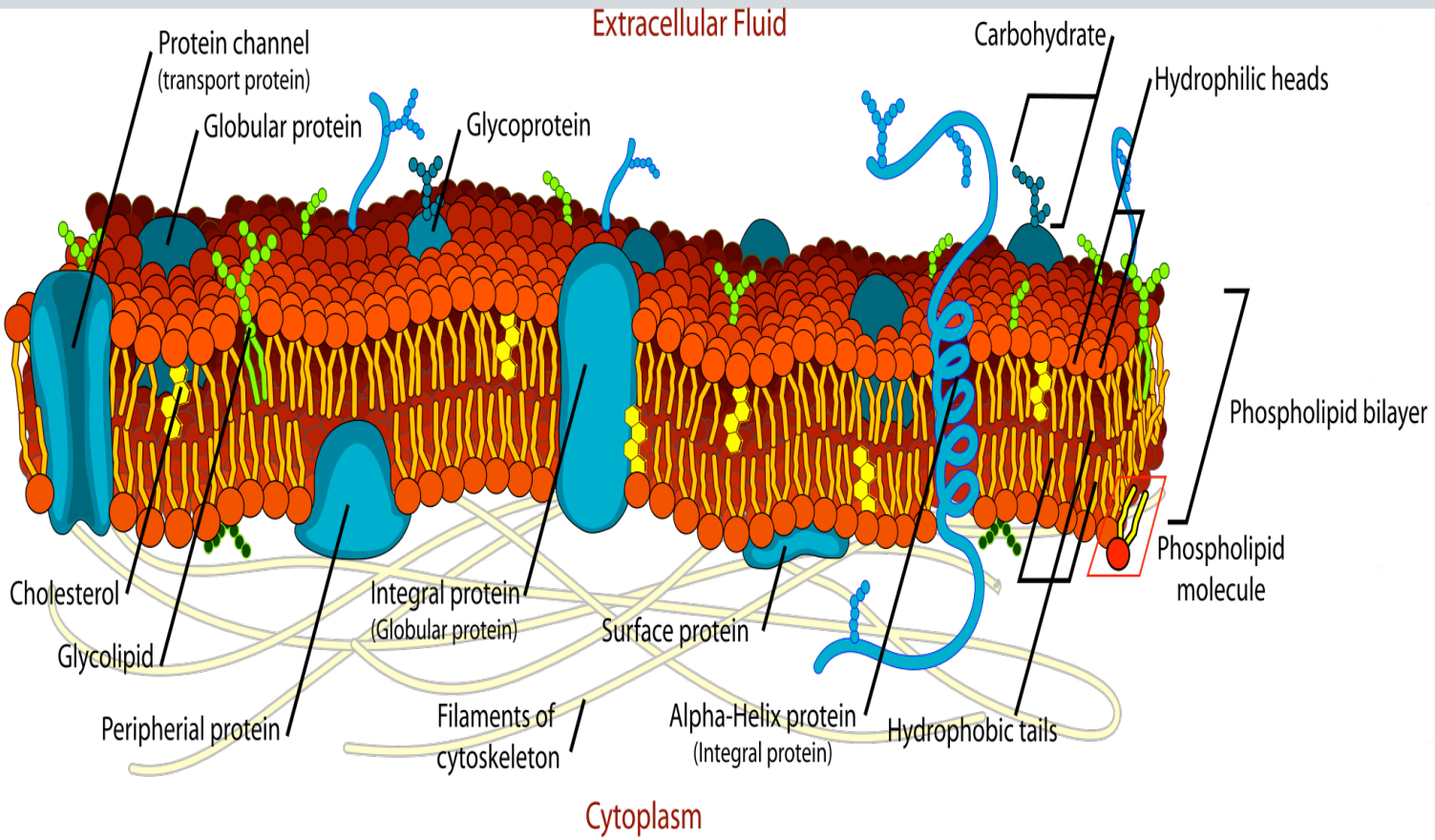
- Lipids
  - Fatty acids (Polymers of CH_2 units)
  - Glycerol



Lipids

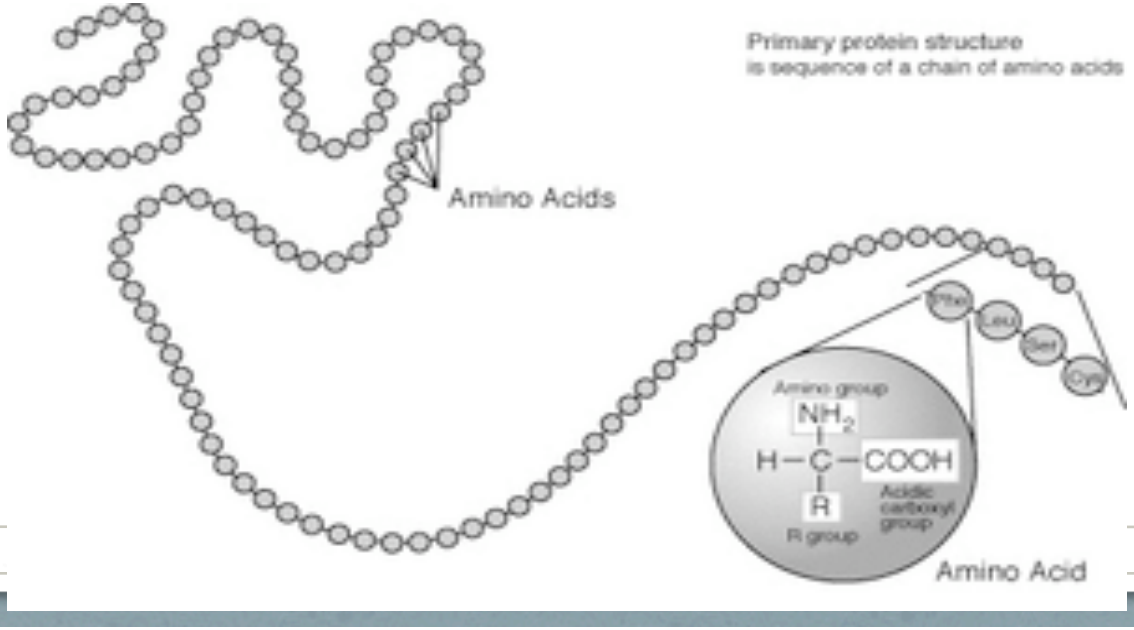
Function

- Long-term Energy Storage
- Make up cell membranes and cell compartments


Extracellular Fluid
Protein channel
(transport protein)
Globular protein
Glycoprotein
Carbohydrate
Hydrophilic heads
Phospholipid bilayer
Phospholipid
molecule
Cholesterol
Glycolipid
Peripherial protein
Integral protein
(Globular protein)
Filaments of
cytoskeleton
Surface protein
Alpha-Helix protein
(Integral protein)
Hydrophobic tails
Cytoplasm

C. Proteins

- Proteins serve many essential roles in the cell
  - Monomer is amino acid
  - 22 naturally occurring amino acids
    - The different order of these amino acids make proteins



Protein Function

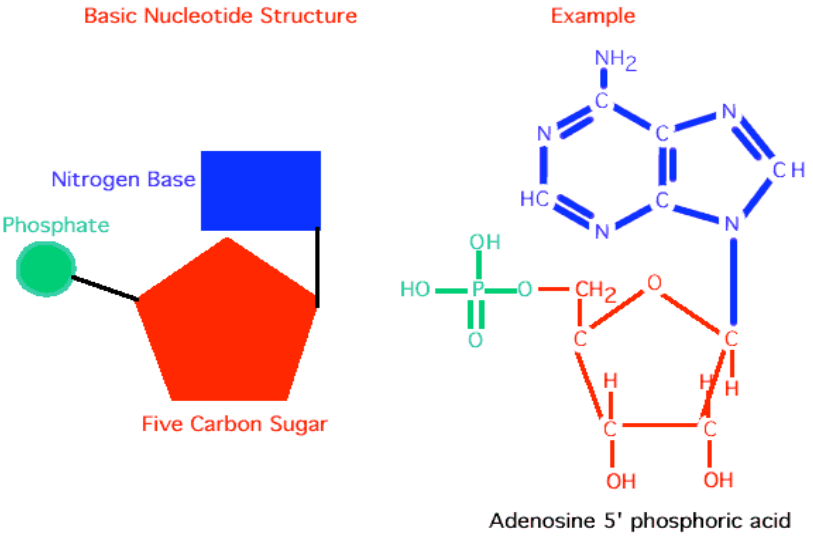
Some examples

- Structure
  - Lamins, collagen, keratin…….
- Movement -
  - Micro-tubueles, actin, myosin
- Transport-regulate transport
  - Channels, receptors, dynin, kinesin
- Communication
  - Hormones
- Chemical Catalyst
  - Enzymes (thousands of different enzymes)
- Defense
  - Antibodies, cellular immune factors
- Regulatory
  - Checkpoint proteins, cyclins, transcription factors

D. Nucleic Acids

- DNA –deoxyribonucleic acid
- RNA –ribonucleic acid

Monomer: nucleotide



Function of Nucleic Acids

- Nucleic Acids
  - Information Storage
    - DNA / RNA
  - Information transfer / Recognition
    - rRNA / tRNA / mRNA

Assignment

- Make a concept map using key vocabulary