

# Chemical Elements

- *This is stuff you should know, if not you should read ch 2-5.*
- *About 92 elements found in nature, 25 are essential to life.*
- *Four of these, C,O,N,H make up 96% of living matter.*
- *Some are required in small quantities but still essential such as I, Fe, Cu (plenty of these in nature)*

Symbol	Element	Atomic Number (See p. 34)	Percentage of Human Body Weight
O	Oxygen	8	65.0
C	Carbon	6	18.5
H	Hydrogen	1	9.5
N	Nitrogen	7	3.3
Ca	Calcium	20	1.5
P	Phosphorus	15	1.0
K	Potassium	19	0.4
S	Sulfur	16	0.3
Na	Sodium	11	0.2
Cl	Chlorine	17	0.2
Mg	Magnesium	12	0.1

Trace elements (less than 0.01%): boron (B), chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), silicon (Si), tin (Sn), vanadium (V), and zinc (Zn).

**Table 2.1**

- *Carbon, C, is unique – 4 valence. Just like Si but lighter*
- *Most if not all biological molecules are carbon based and are called organic molecules.*

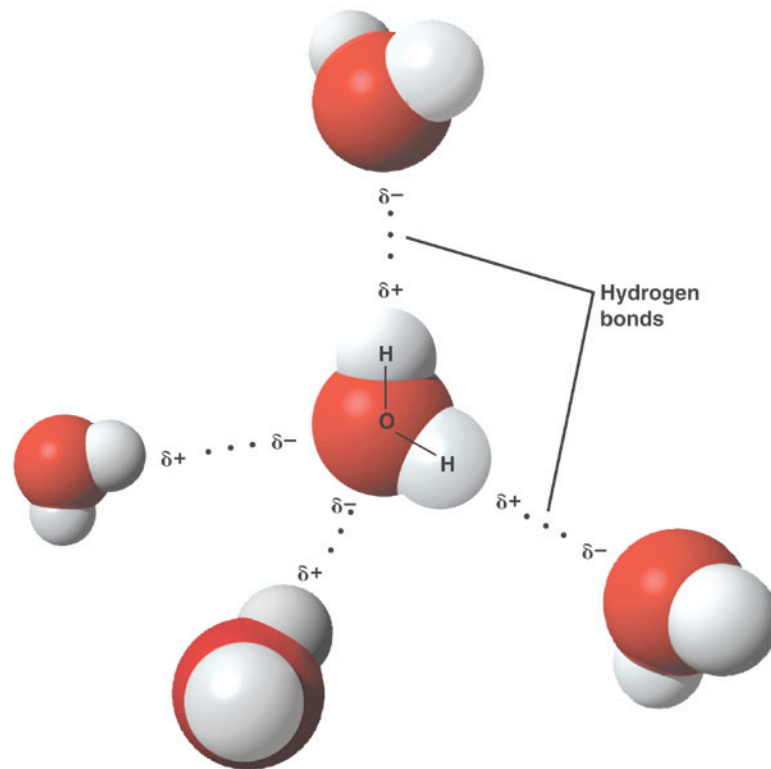
- *In life there 4 major classes of macro molecules:*

***Carbohydrates, Proteins, Lipids and nucleic acids.***

*Most are polymers ( contain many unique monomers).*

- *Anabolic reactions form large molecules*
- *Catabolic reactions break down a larger molecule, chemical reaction*
- *Dehydration removes water and condensation, continue two monomers often endergonic (need energy) starch protein, Fat made this way.*
- *Hydrolysis split apart polymer often exergonic (release energy)*

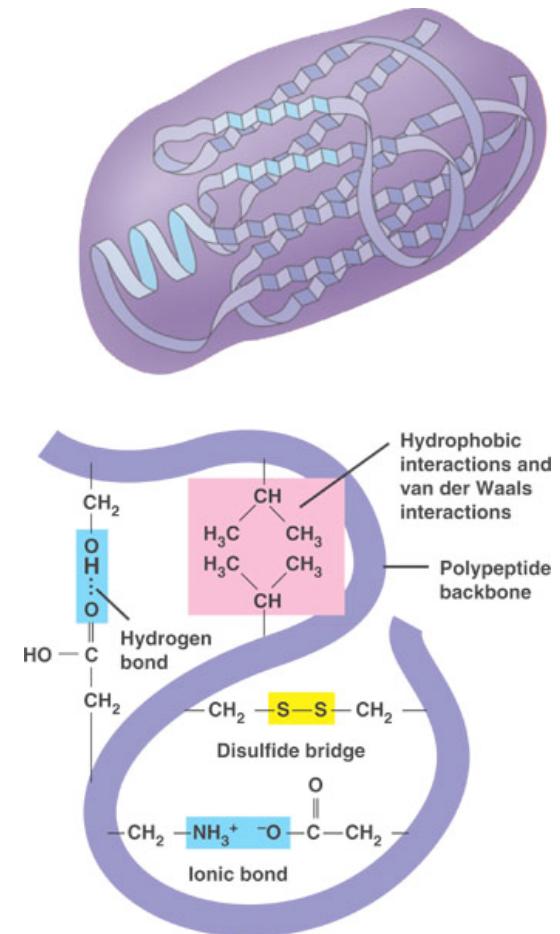
- 3 Strong Primary bonds:
  - **Ionic, Covalent and Metallic**
- Secondary bonds: Can be polar hydrogen bonds, very important raises boiling point of water  
 $H_2O$  vs  $CH_4$



• Fig 3.2 p.48

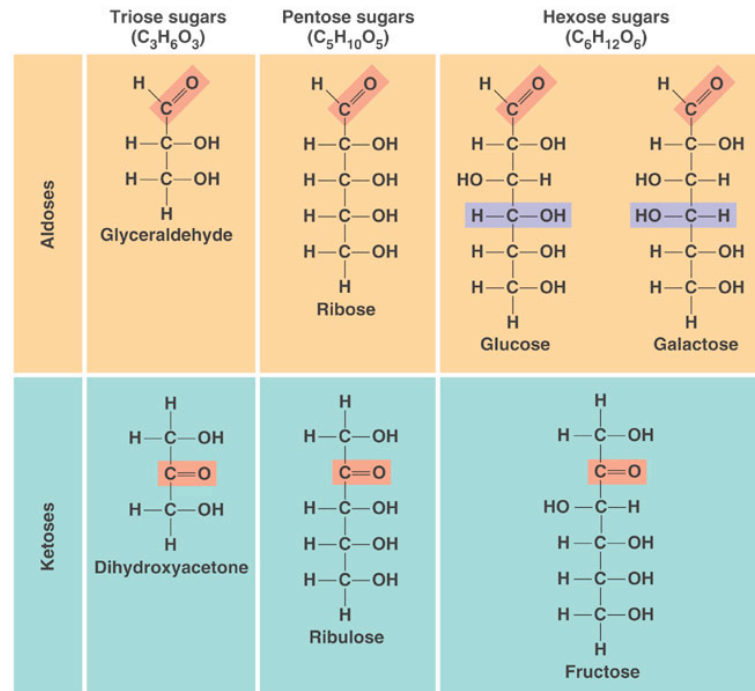
## •Other Weak Chemical Bonds

- Van der Waals, weak electronic interactions*
- Hydrophobic vs. Hydrophilic*
- Disulfide Bridges*

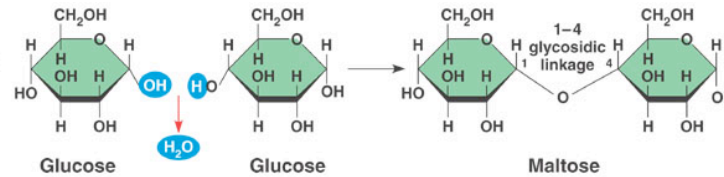


- P.70 Fig 5.3, 5.5

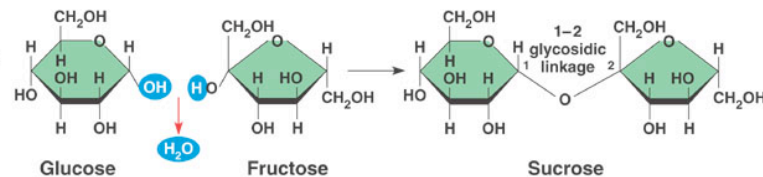
## Monosaccharides, disaccarides Polysaccarides



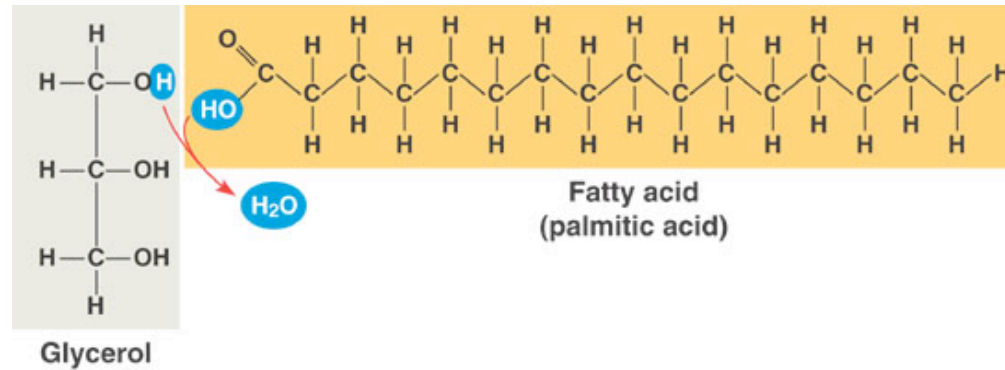
(a) Dehydration reaction in the synthesis of maltose



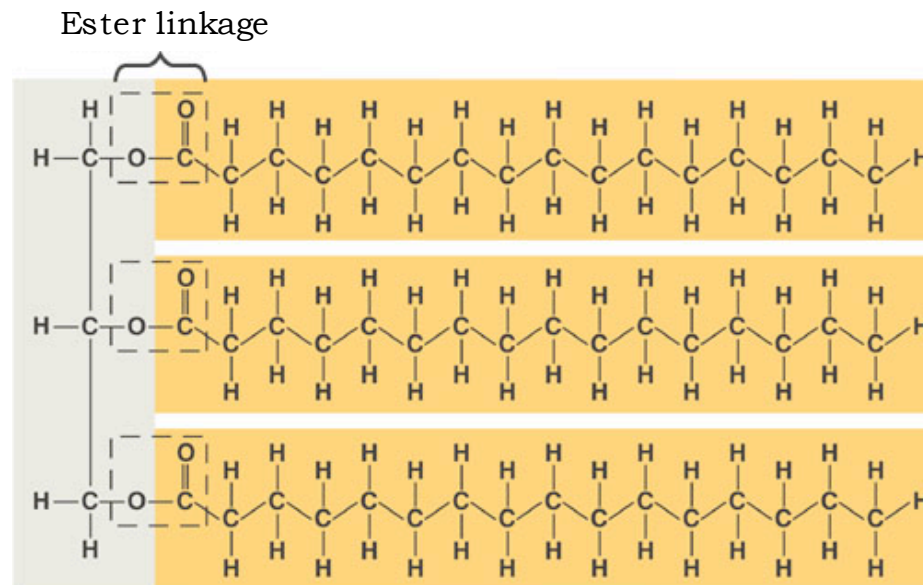
(b) Dehydration reaction in the synthesis of sucrose



## • Fatty Acids & Glycerin

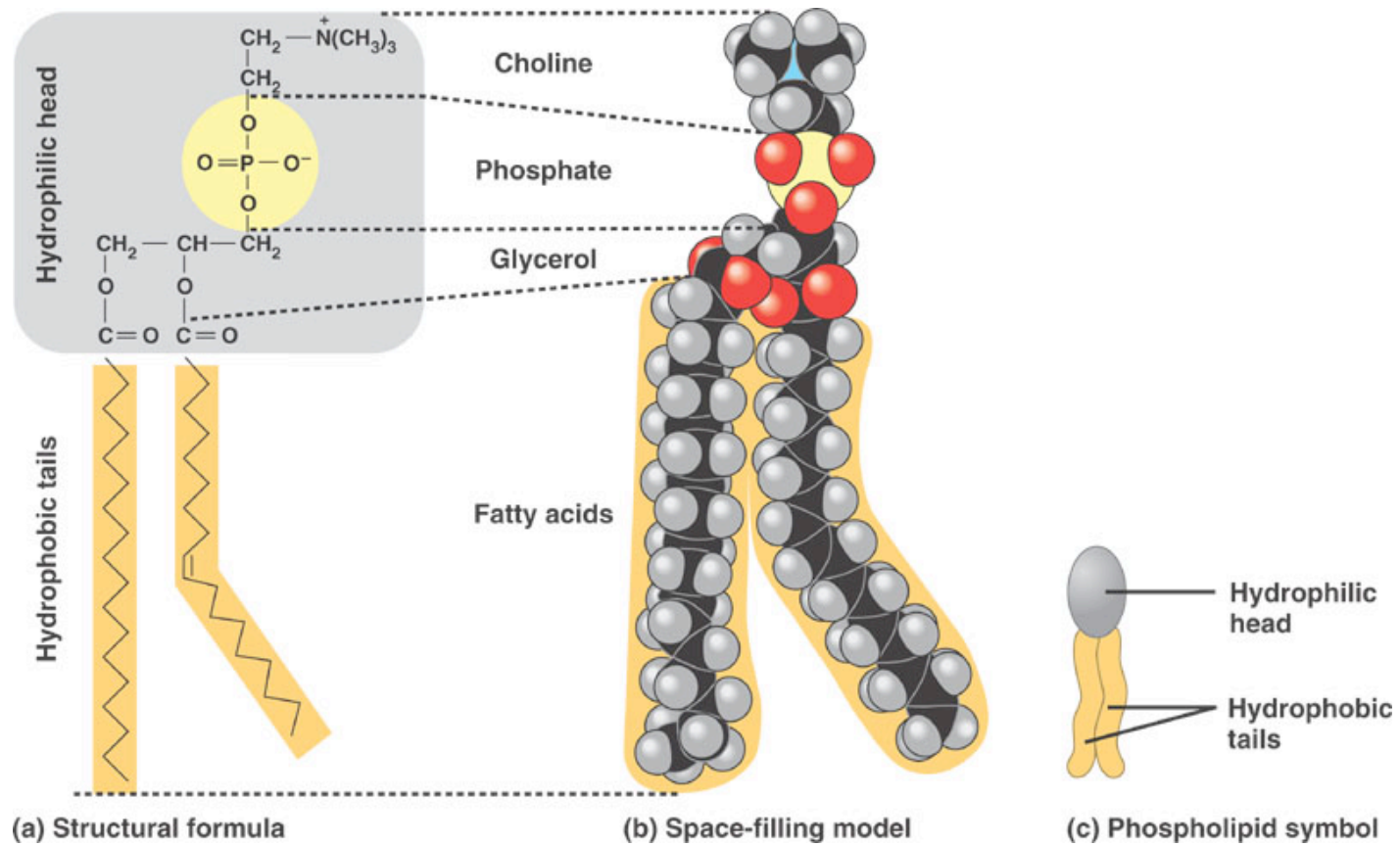


(a) Dehydration reaction in the synthesis of a fat



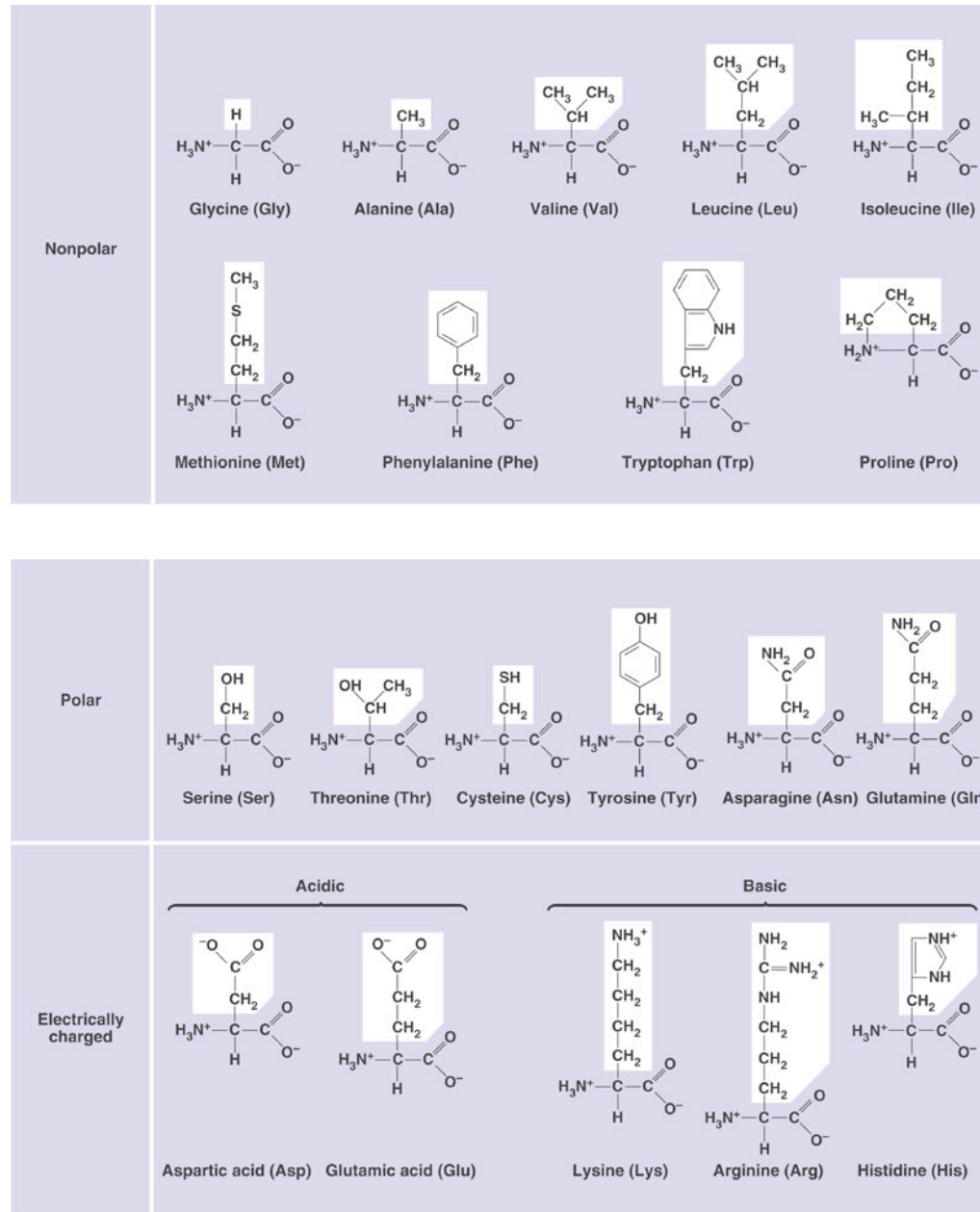
(b) Fat molecule (triacylglycerol)

## Phospho Lipids



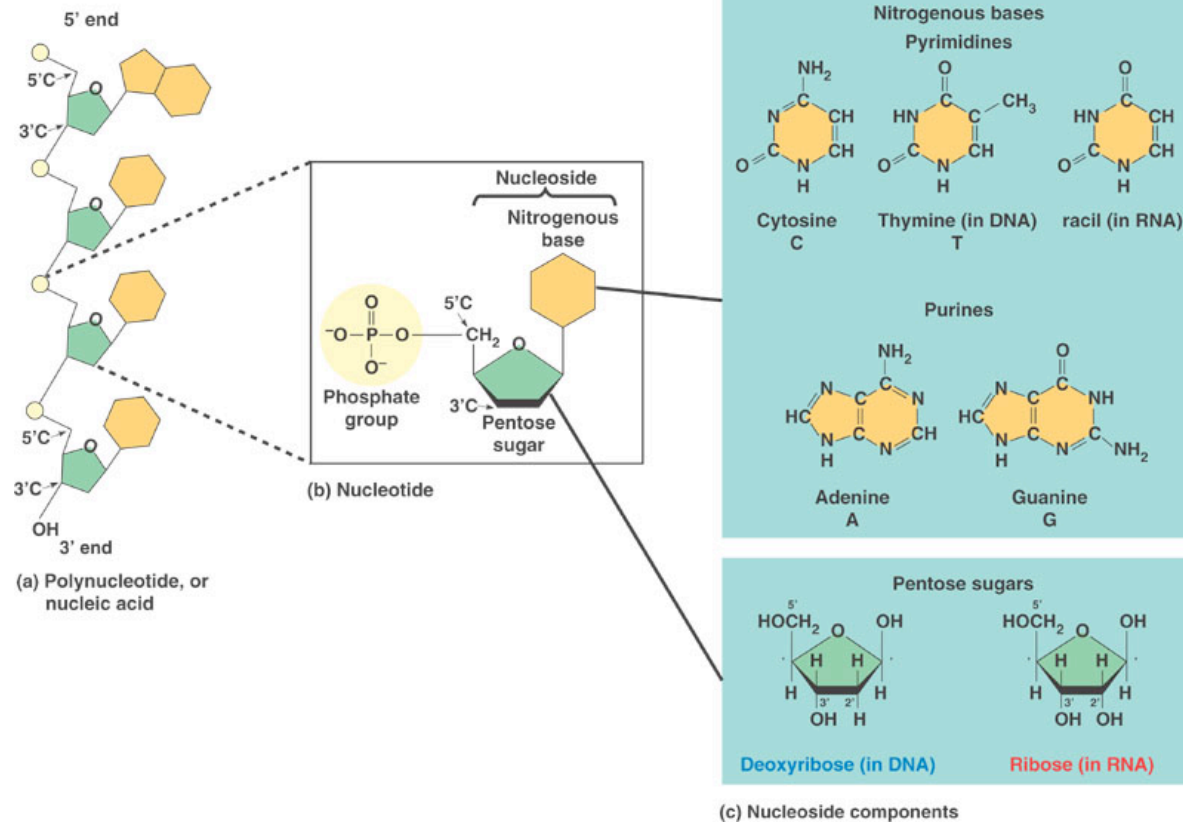
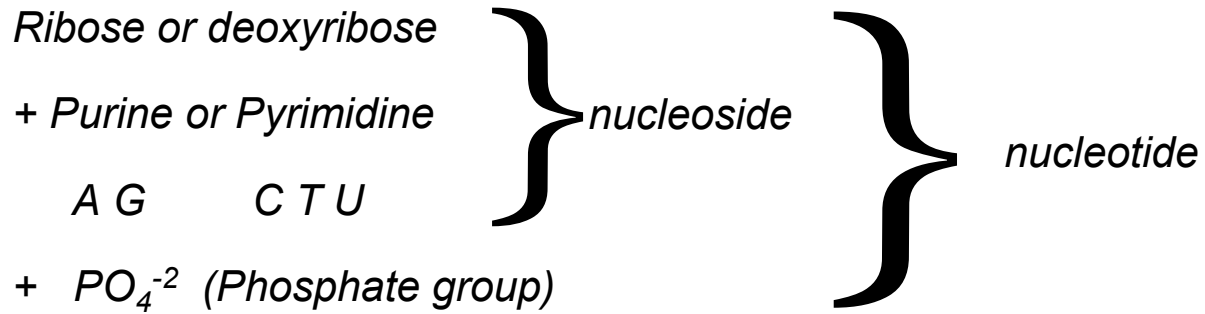


# Amino Acids



•P.79 Fig 5.17

# Nucleic Acids DNA, RNA



# DNA -> RNA -> Protein

## Information flow in a cell

