

BIO-ORGANIC CHEMISTRY

(Organic Chemistry for Biology Students)

(SQBS 1603)

Other Organic Compounds

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Other Functional Groups

- **Alkyl halides**
 - Organic molecules containing halogen atom
 - F, Cl, Br and I
- **Organic compounds that contain sulfur (S)**
 - Thiol group: Sulfhydryl group
 - Disulfide Bridge
- **Organic compounds that contain fosforus (P)**
 - Phosphate

Alkyl Halides

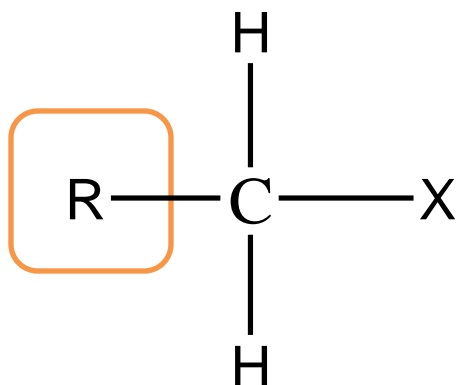
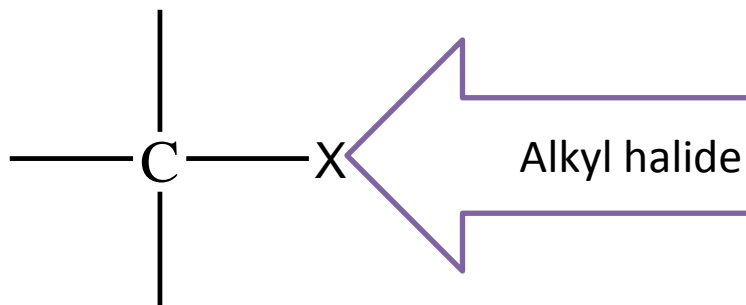
The haloalkanes: Halo-group

1 H																	2 He														
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne														
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar														
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr														
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe														
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn														
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Unn																						
																		58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
																		90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

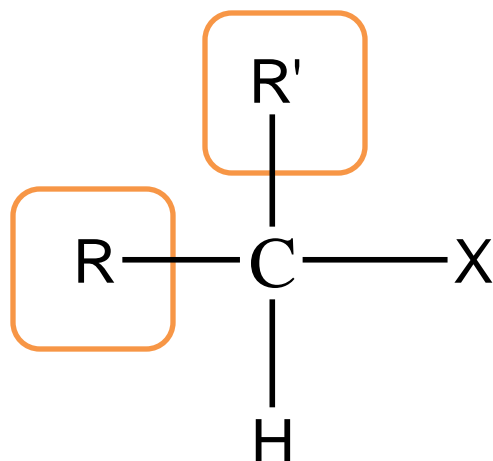
Alkyl Halides

- Classification

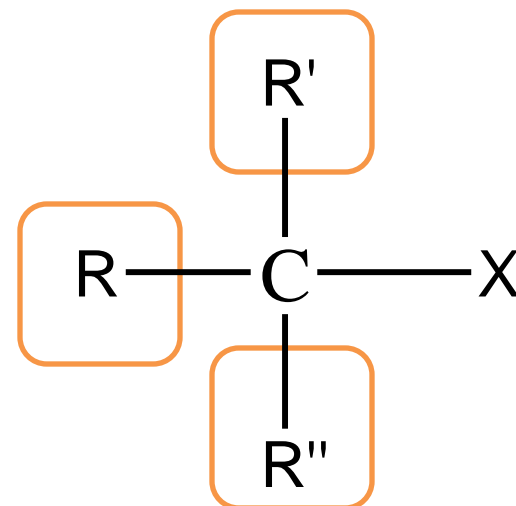
$X = \text{F, Cl, Br, I}$



Primary
(1°)



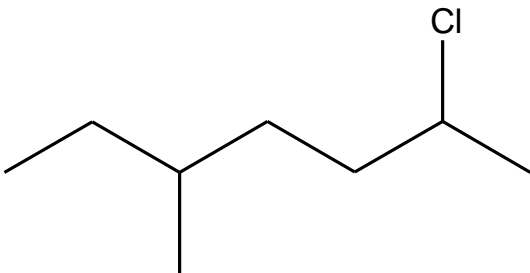
Secondary
(2°)



Tertiary
(3°)

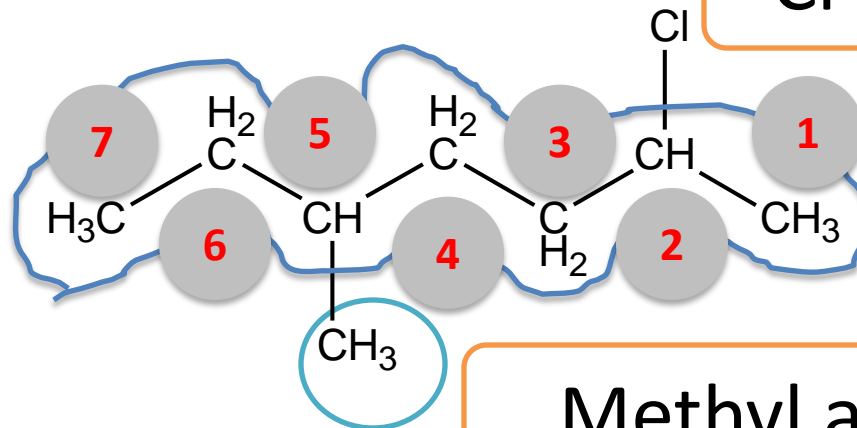
Naming Alkyl Halides

- Give the IUPAC name of the following alkyl halide



7 C's : heptane

Cl (Chloro) at C2

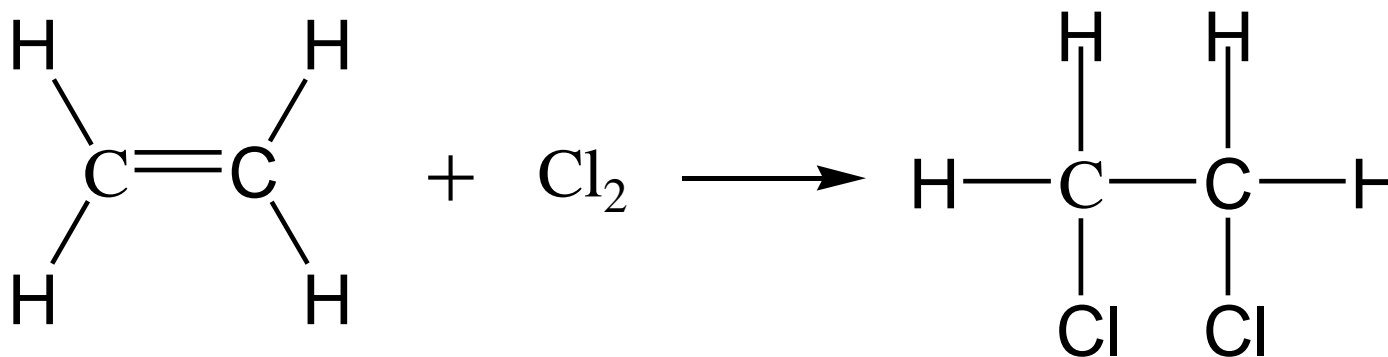
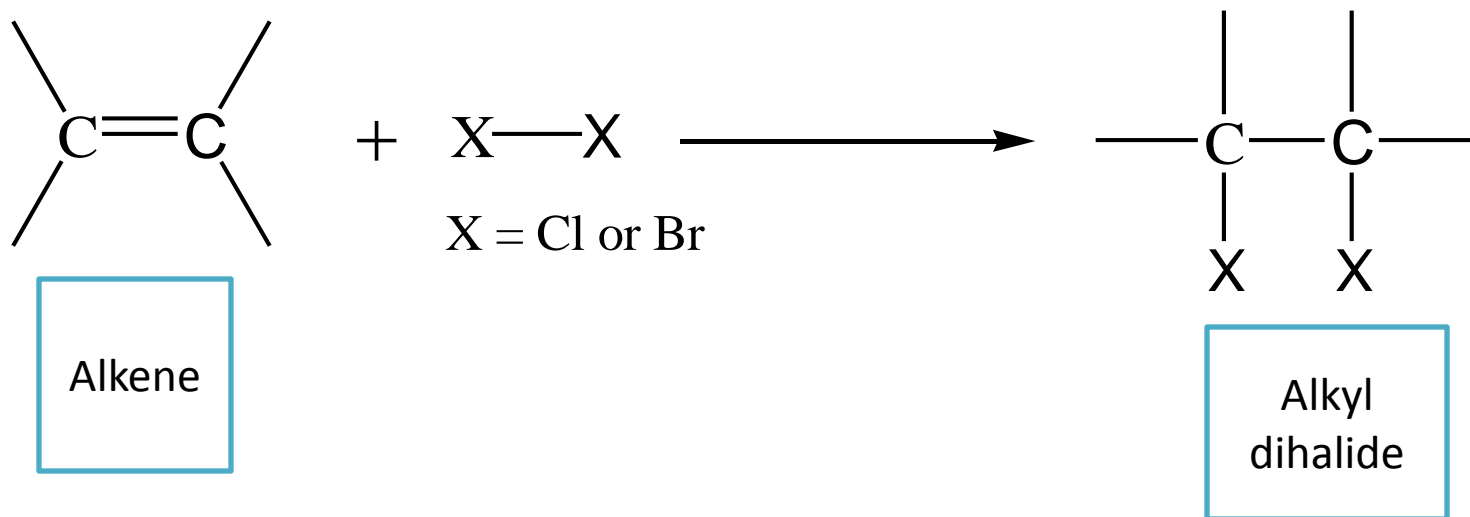


Methyl at C5

2-chloro-5-methylheptane

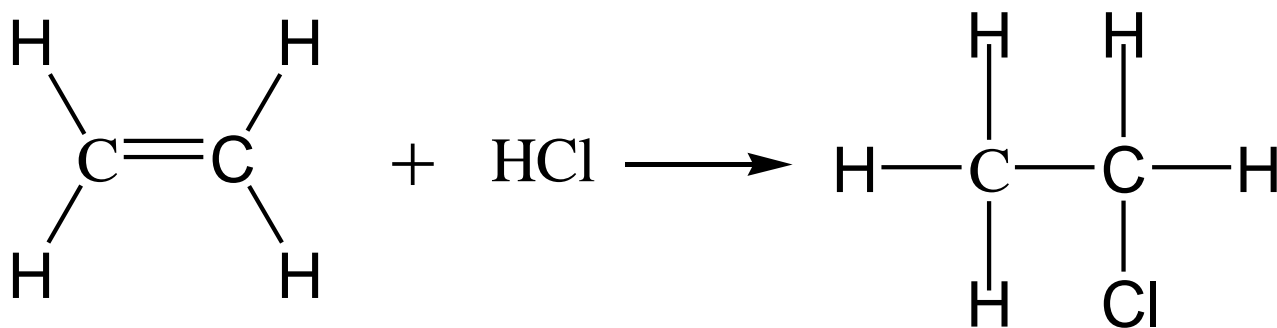
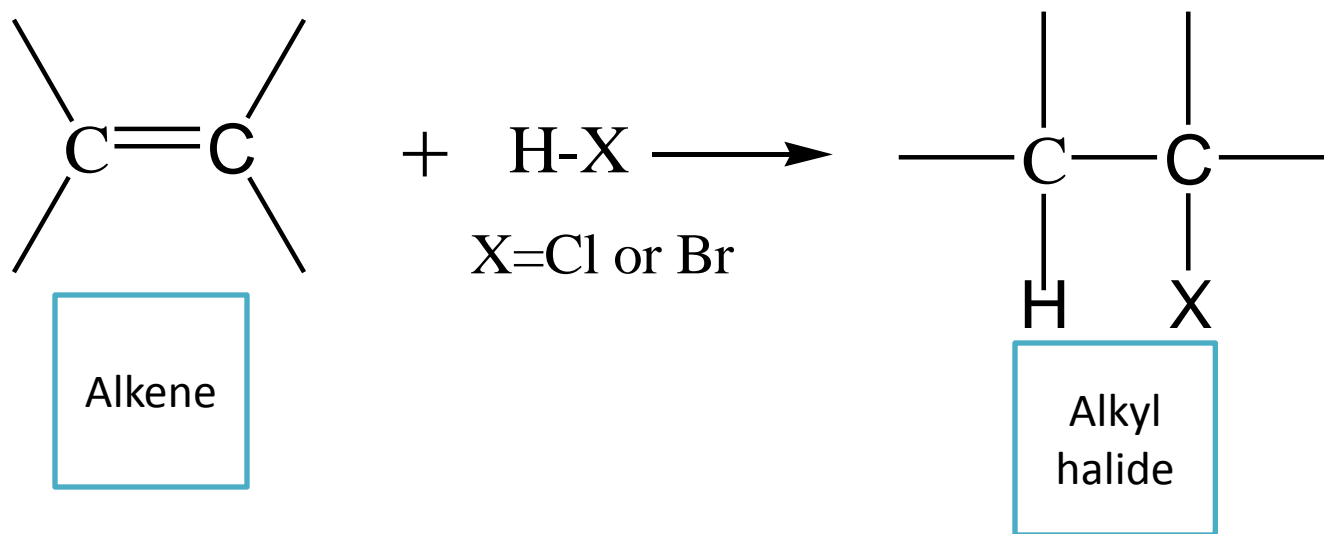
Halogenation

- The addition of halogen (X_2) to an alkene



Hydrohalogenation

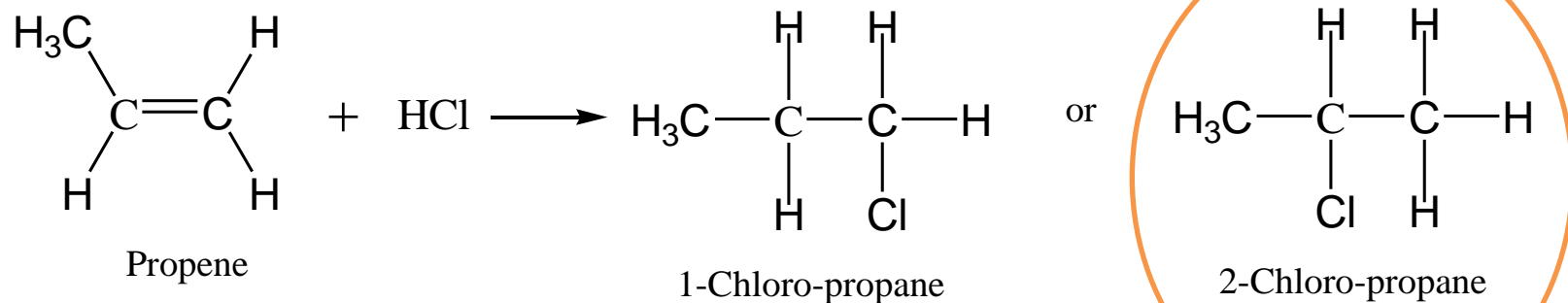
- The addition of HX (X = Cl or Br) to an alkene



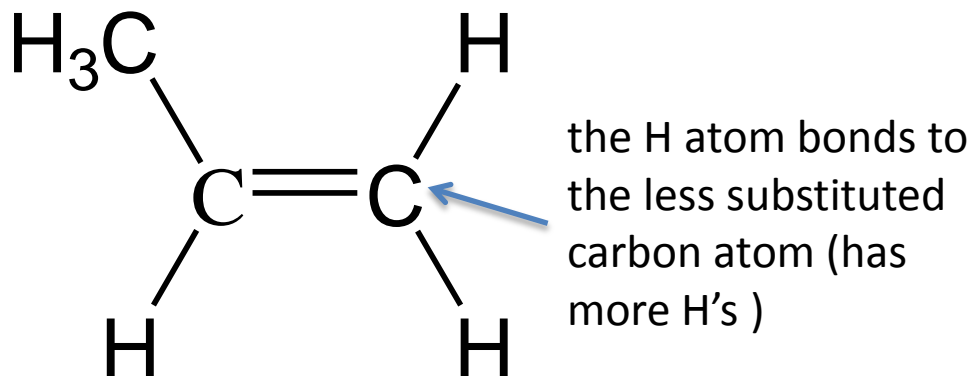
Hydrohalogenation

- Markovnikov's rule
 - In the addition of HX to an unsymmetrical alkene, the H atom bonds to the less substituted carbon atom
 - The carbon that has more H's to begin with.

Hydrohalogenation



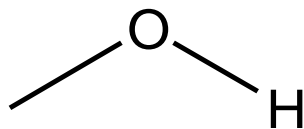
According to Markovnikov's rule



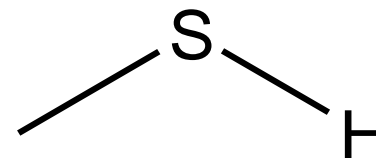
Only product

Thiols

- Thiols group: organic compounds that contain a sulfhydryl group
 - SH group
 - Similar to alcohol (OH group)



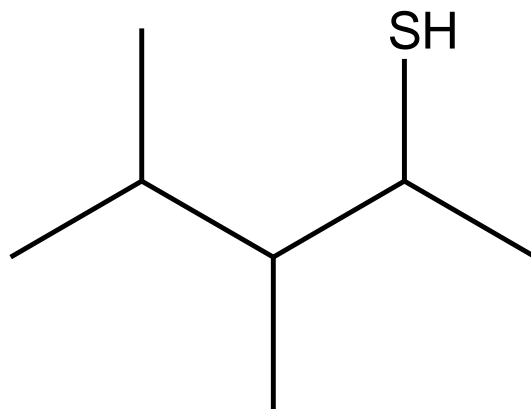
Hydroxyl



Thiol

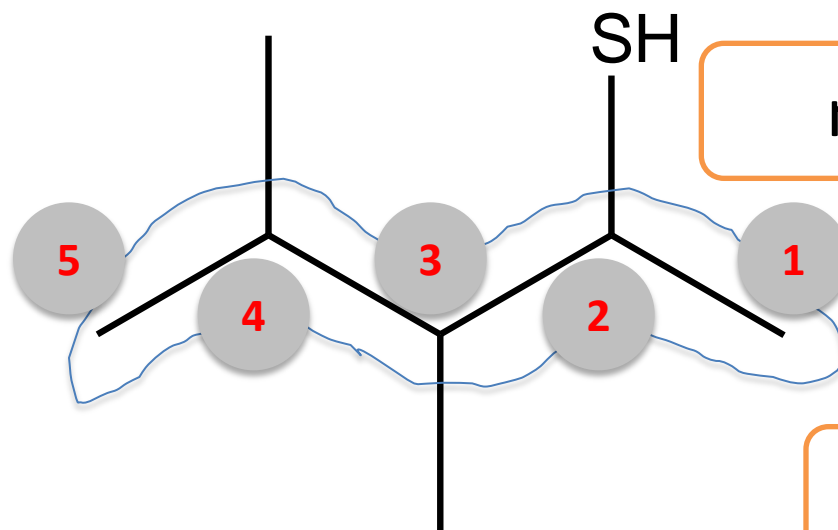
Naming Thiols

- Name the parent hydrocarbon as an alkane and add the suffix -thiol.
- Number the carbon chain to give the SH group the lower number



Naming Thiols

Thiol at C2



methyl at C3 and C4

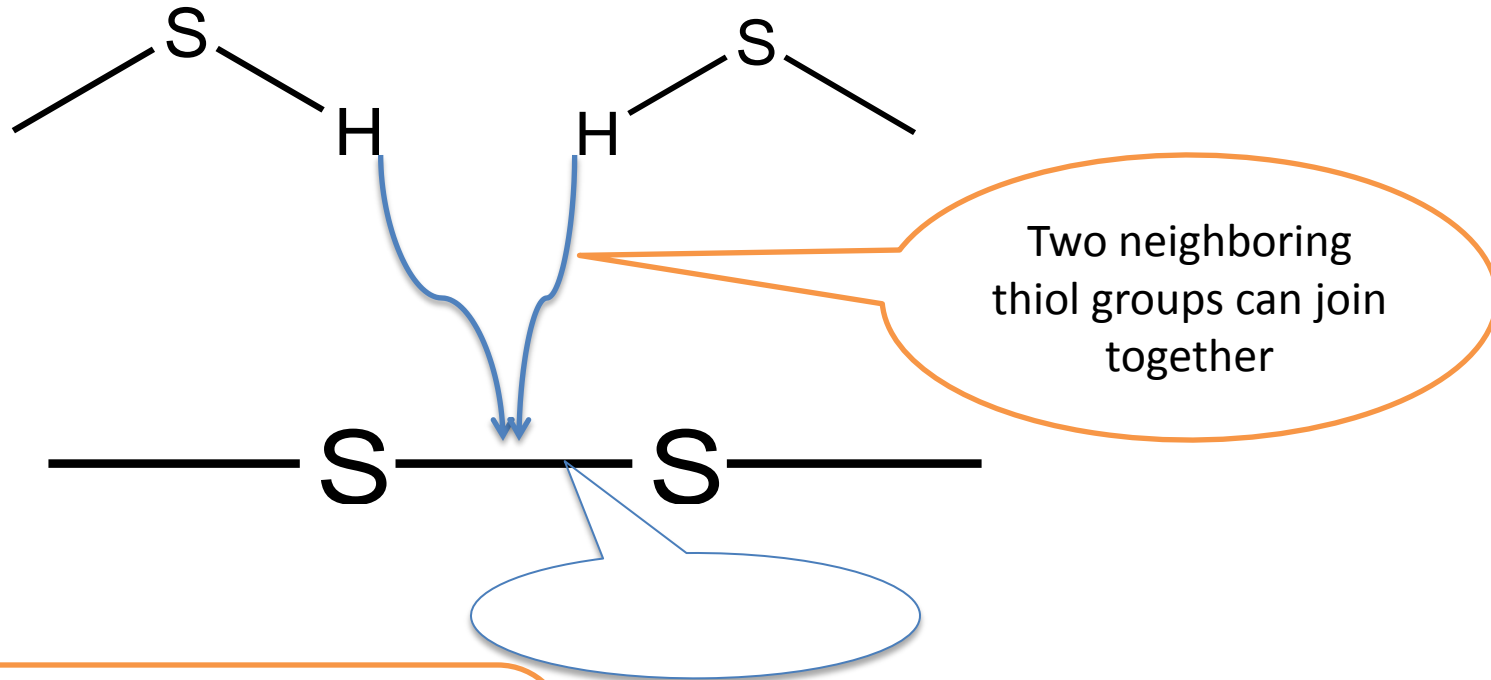
5 C's : pentane

3,4-dimethyl-2-pentanethiol

Physical properties of thiols

- Sulfur is only as electronegative as carbon
 - Thus, thiol group does not have the same functionality than molecules containing oxygen (alcohol, ether, ester etc) or nitrogen (amide and amine).
 - Non-polar molecule.
 - Hydrogen bonding is impossible.

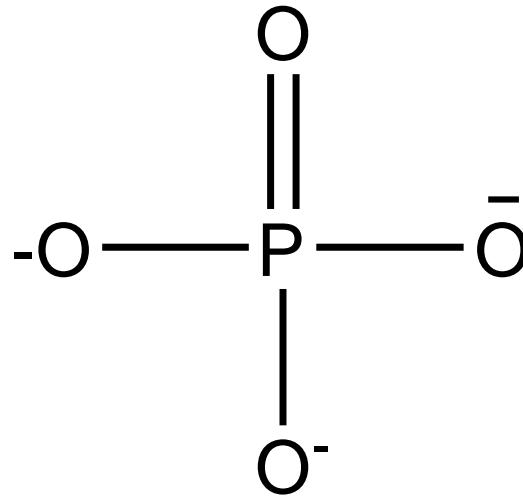
Disulfide Bridge



- ❖ disulfide bridge have a vital role in stabilizing the structure of proteins.
- ❖ It firmly linking together amino acids from different parts of the protein to help “lock” the protein in the place.

Phosphate

- phosphate (ionized form)

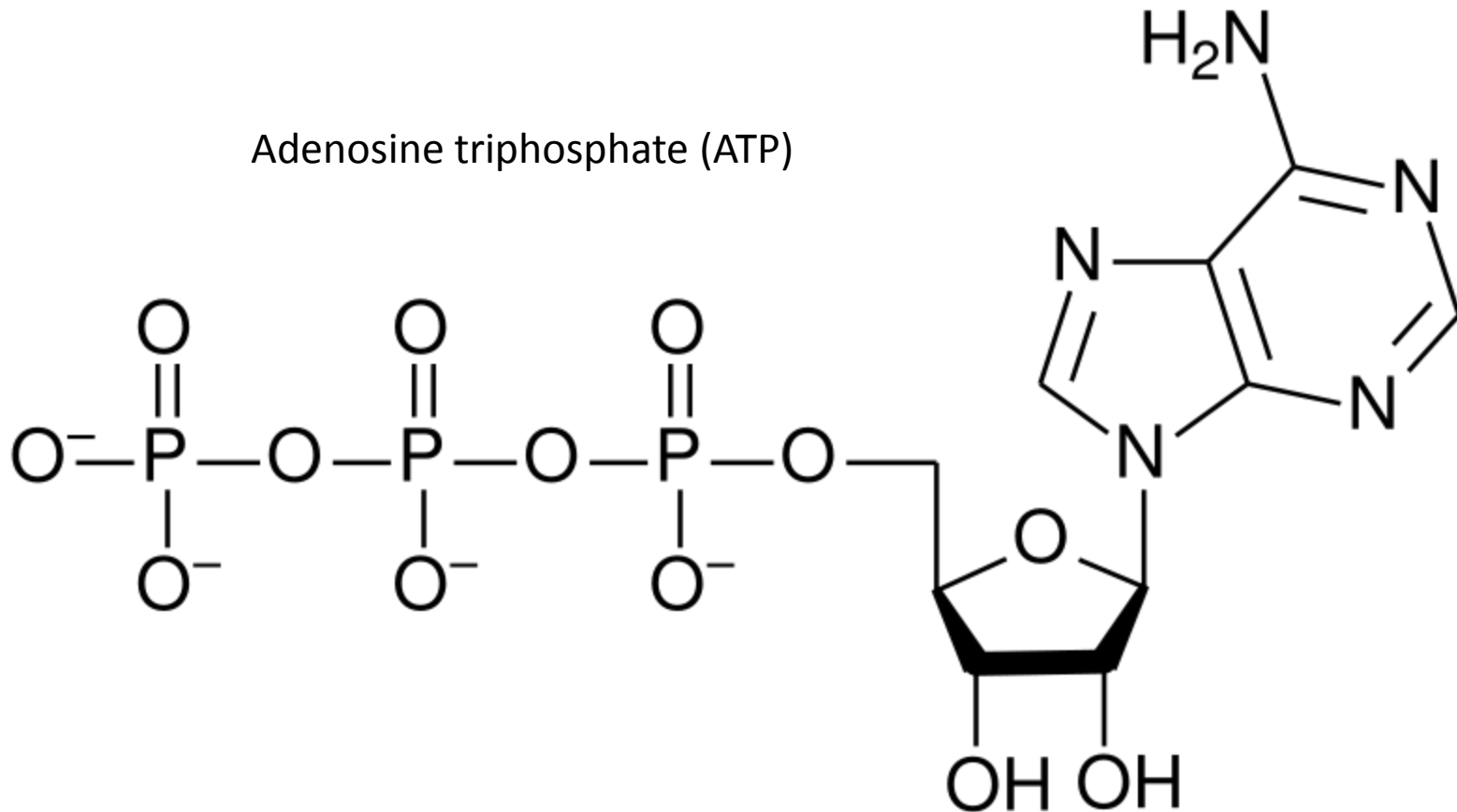


Phosphate ion

Phosphate

- Phosphate in biological compounds

Adenosine triphosphate (ATP)



REFERENCES

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- Horton, H.R., Moran, L.A., Scrimgeour, K.G., Perry, M.D. and Rawn J.D. (2006). *Principles of Biochemistry*, 4th Edition. Pearson International Edition.
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MY PROFILE



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