I. Brief Review and Recap of CHEM 261

Organic Chemistry - Study of carbon compounds

A Molecule is a set of atoms connected in a fixed and discreet arrangement.

A **Compound** is a collection of molecules of a particular type.

1 **Mole** = 6×10^{23} molecules

Molecular Weights & Atomic Weights: Example: H-O-H (water)

Atomic weights: H = 1, O = 16Water molecular weight = 18 18 g of water = 1 mole = 6.02×10^{23} molecules

*** Know about the first and second rows of the periodic table, such as:

Element symbols Atomic numbers (Atomic number vs weight) Numbers of protons and neutrons Atomic weights (integral values; e.g., O = 16, N = 14, etc.) Inert gas configuration

Know:

- Nomenclature (names of the first 20 alkanes, all functional groups)
- Properties & reactions of alkanes, alkenes, alkynes, and alkyl halides (i.e., substitution & elimination reactions)
- Stereochemistry: configurations of stereogenic centres (i.e., R or S), definitions of enantiomers and diastereomers
- Conformations of cycloalkanes
- Functional groups
- Line drawings

Example: Cholesterol is essential in every mammalian cell membrane. It is a steroid, which has three 6-member rings and one 5-member ring.



- Be able to identify **methyl, methylene, and methine groups**, in addition to primary, secondary, tertiary, and quaternary carbons.
- Be able to draw the full **structure** showing all atoms (i.e., carbons and hydrogens)



Cholesterol has 8 stereogenic centers (attached to four different groups) – be able to identify their configurations as R or S

Number of isomers $= 2^n$

 $2^8 = 256$ stereoisomers

1 is cholesterol, 1 is the enantiomer of cholesterol, 254 are diastereomers of cholesterol

Note: Enantiomers are stereoisomers that are non-superimposable mirror images, while diastereomers are stereoisomers that are not mirror images.

Determining R and S configuration



Chiral molecules Enantiomers

Priority is based on atomic number. If the lowest priority group is pointing to the back, and the other groups decrease in priority **counterclockwise**, the configuration is S. If they decrease in priority **clockwise**, the configuration is R.



Note: Nitrogen is not a stereocenter at room temperature because the lone pair rapidly inverts



Clockwise, but lowest priority group is pointing up $\rightarrow S$

Coniine conformation (chair)



Nomenclature example



(R)-2-methyl-4-propyl-1-nonene