Session 1 Worksheet

Vocab

Organic Chemistry: The study of carbon-containing molecules and their reactions

Organic Compounds: contain carbon atoms (there are exceptions)

Inorganic Compounds: lack carbon atoms (again... exceptions)

Isotopes: Same element, different mass #

Ex:

Number of Neutrons = 12 − 6 = 6	Number of Neutrons = 13 − 6 = 7	Number of Neutrons = 14 − 6 = 8
$^{12}_{6}C$	$^{13}_{6}C$	$^{14}_{6}C$

Valence Electrons:
Electrons located in the outermost shell of an atom

The group number tells you how many valence electrons the element has in the valence shell

Ionic Bonding:
Resulting from attraction of two oppositely charged ions

Covalent Bonding:

bond of 2 atoms sharing a pair of electrons

Polar Covalent:

A bond formed from differences in electronegativity

In the chart below, write down whether the bonding is ionic, covalent, or polar covalent

Br_2	NaOH	H_2O	CH_3	NaBr	$C(CH_3)_3$
Covalent	Ionic	Polar Covalent	Covalent	Ionic	Covalent

Electronegativity Trend:

Tournament of the Elements

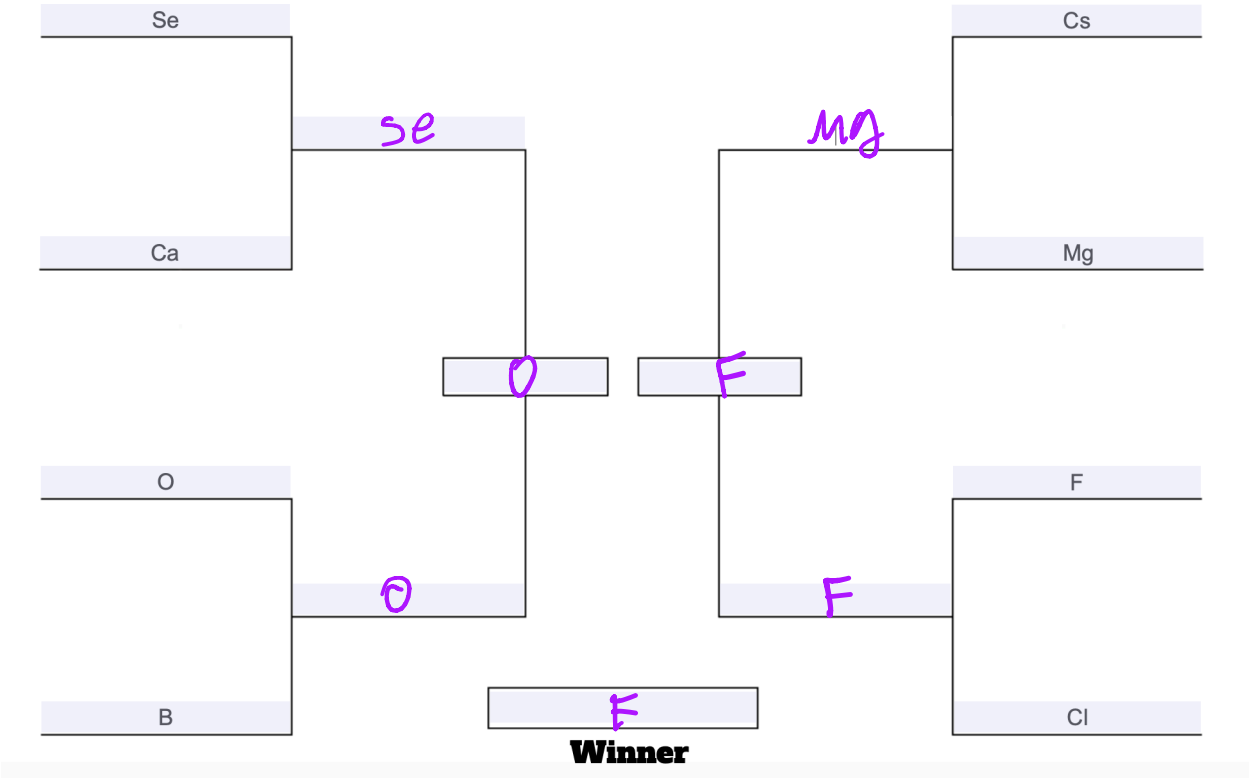
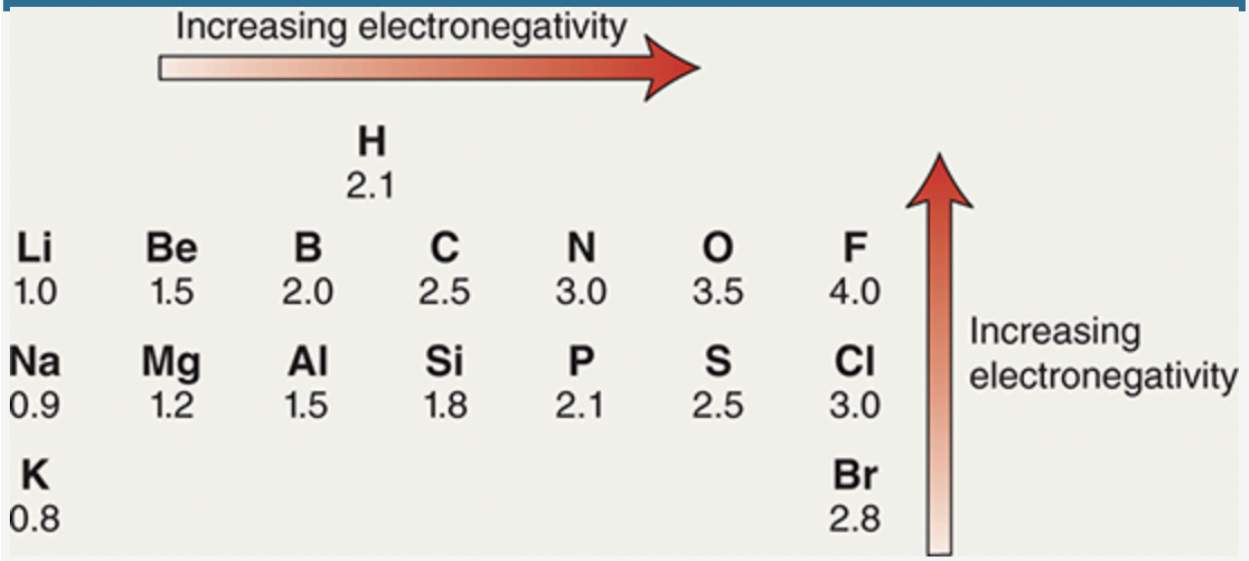


TABLE 1.1

ELECTRONEGATIVITY VALUES OF SOME COMMON ELEMENTS



Heterolysis:

- The movement of electrons to the more electronegative atom
- forms ions

$Na-Cl \rightarrow Na^+ + Cl^-$

Homolysis:

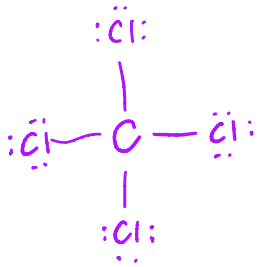
- Ions are equally strong, so the bond (electrons) is split evenly
- Forms super reactive compounds called radicals

$Cl-Cl \rightarrow Cl^\cdot + Cl^\cdot$

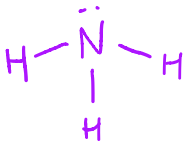
Tetravalent	*Trivalent*	*Divalent*	*Monovalent*
—C—	—N—	—O—	H— X— (where X = F, Cl, Br, or I)
Carbon generally forms ***four*** bonds.	Nitrogen generally forms ***three*** bonds.	Oxygen generally forms ***two*** bonds.	Hydrogen and halogens generally form ***one*** bond.

Draw the Lewis structures of:

CCl_4



NH_3

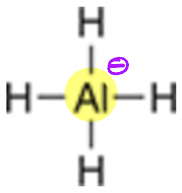


Dihydrogen Monoxide

Calculating Formal Charge

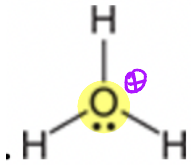
Formal Charge = # valence e^- - $\frac{1}{2}$ bond e^- - non-bonded valence e^-

Find the formal charge of the central atom:



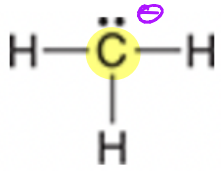
$FC = 3 - 8(\frac{1}{2}) - 0$

$FC = -1$



$FC = 6 - 6(\frac{1}{2}) - 2$

$FC = 1$



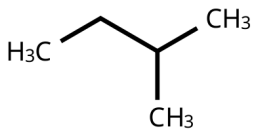
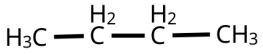
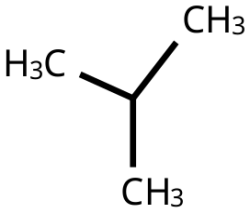
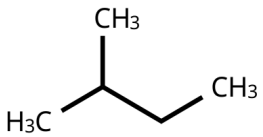
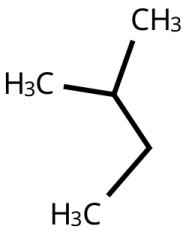
$FC = 4 - 6(\frac{1}{2}) - 2$

$FC = -1$

Constitutional Isomers:

Same molecular formula, different connectivity

What is the relationship of these molecules? Different, Same, or Constitutional Isomers?

C_4H_{10}	
	
	

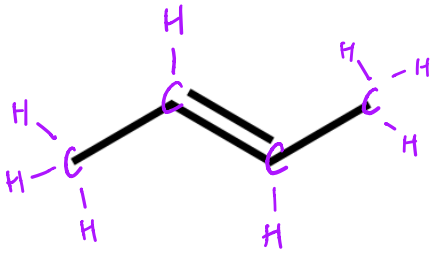
Different

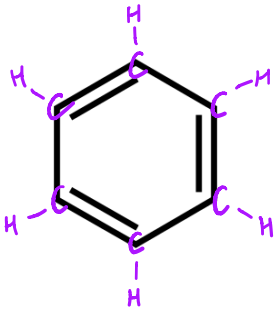
Constitutional Isomers

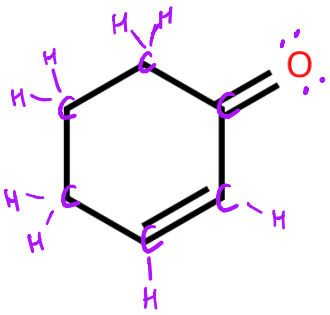
Same compound

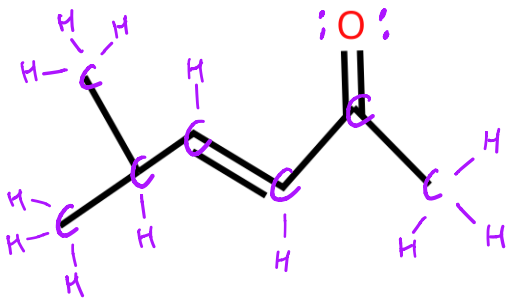
In organic chemistry, we mainly use bond line structure to represent compounds, however, converting bond line to condensed formula (and vice versa) is important to understand and know how to do.

First, start with labelling all carbons, hydrogens, and possible lone pairs on the given structures:

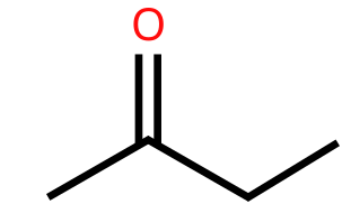
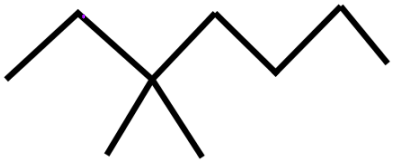
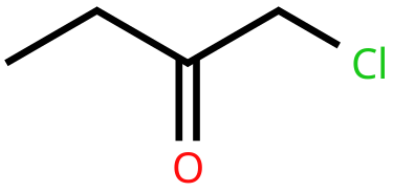
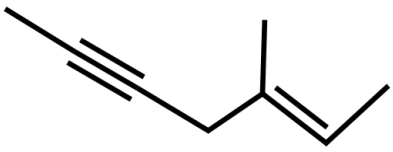




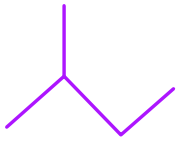
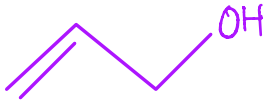




Write the condensed formula given the structure:

	$CH_3COCH_2CH_3$
	$CH_3CH_2C(CH_3)_2(CH_2)_3CH_3$
	$CH_3CH_2COCH_2Cl$
	$CH_3CCCH_2C(CH_3)CHCH_3$

Write the structure given the condensed formula:

$CH_3CH_2CH_2CH_2Br$	
$CH_3CH(CH_3)CH_2CH_3$	
CH_2CHCH_2OH	

Wedges and Dashes:

When thinking about molecules in a 3D plane, we use _dashes_ to represent the substituent going behind the page, and _wedges_ to represent the substituent coming out of the page