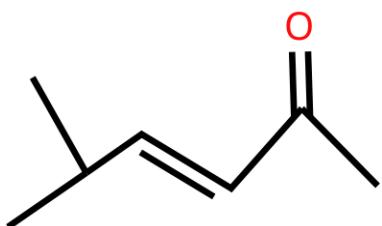
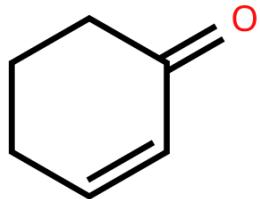
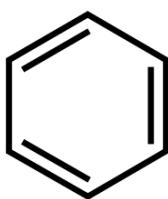
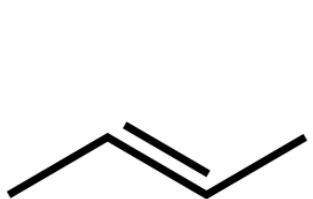


Session 2 Worksheet

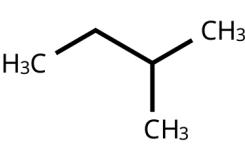
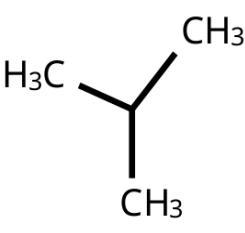
In organic chemistry, we mainly use bond line structure to represent compounds, however, converting bond line to condensed formula (and vice versa) is important to understand and know how to do.

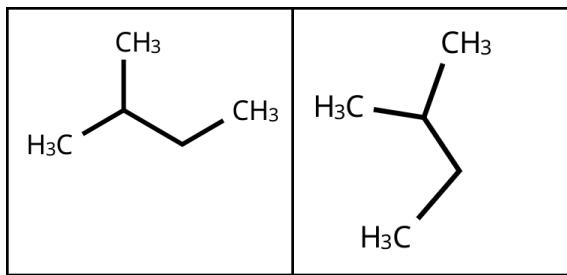
First, start with labelling all carbons, hydrogens, and possible lone pairs on the given structures:



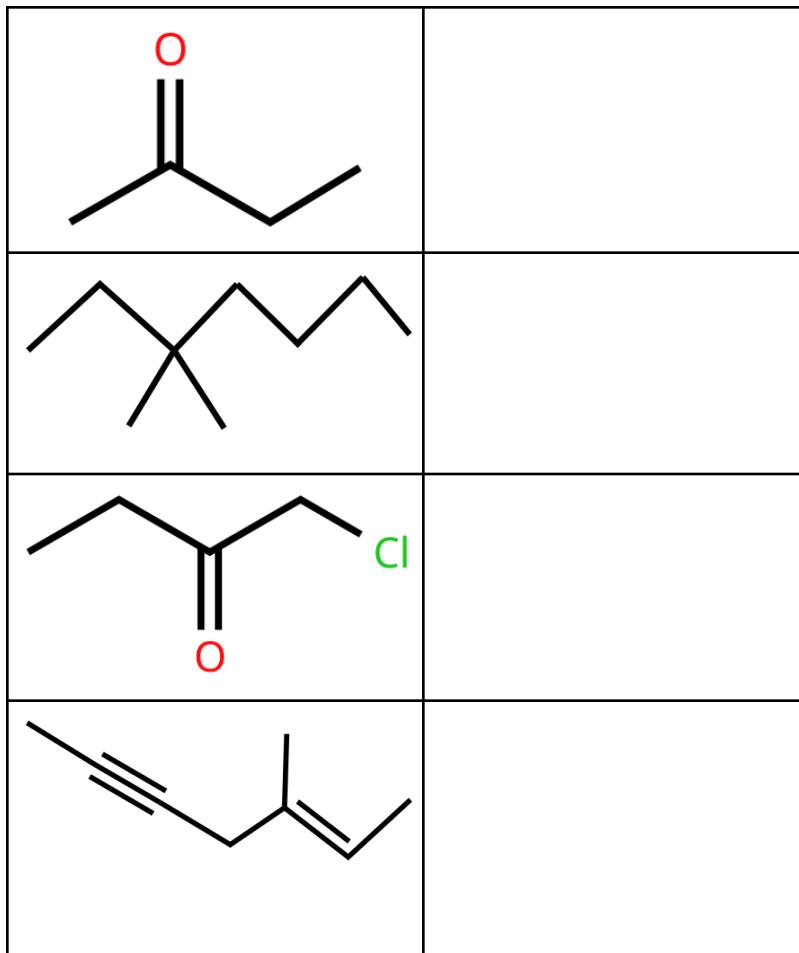
Constitutional Isomers

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

C_4H_{10}	 <p>Structural formula of 2-methylbutane, showing a four-carbon chain with a methyl group (CH₃) attached to the second carbon.</p>
$H_3C - \overset{H_2}{C} - \overset{H_2}{C} - CH_3$	 <p>Structural formula of 2-methylbutane, showing a four-carbon chain with a methyl group (CH₃) attached to the second carbon.</p>



Write the condensed formula given the structure:



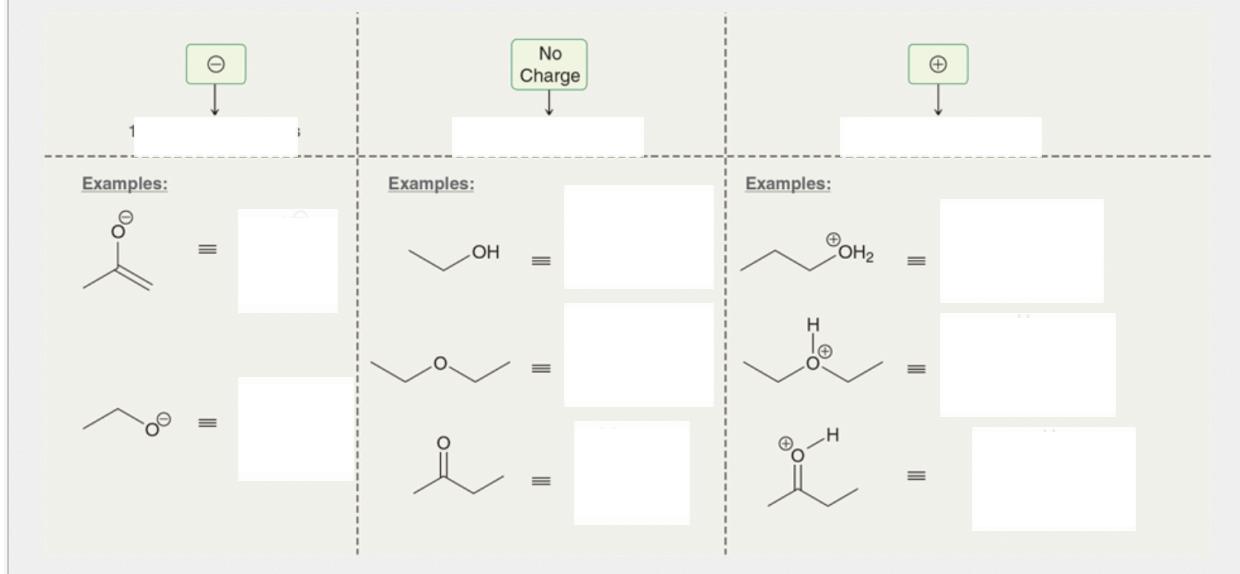
Write the structure given the condensed formula:

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$	
$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$	
$\text{CH}_2\text{CHCH}_2\text{OH}$	

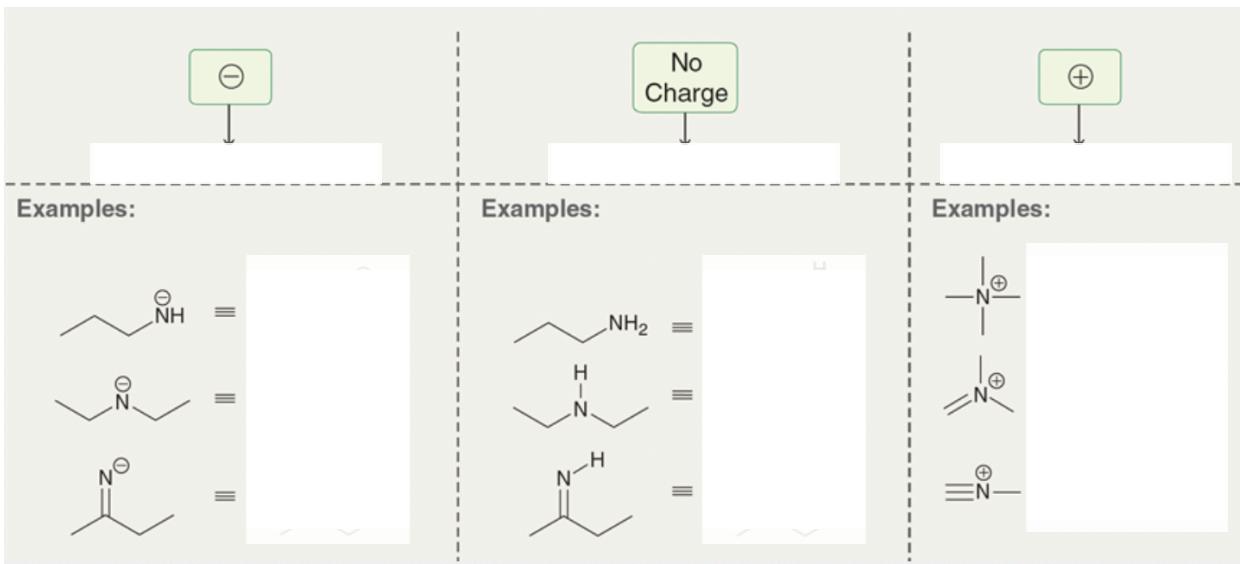
Summary of formal charges:

Oxygen Summary:

FORMAL CHARGE ON AN OXYGEN ATOM ASSOCIATED WITH A PARTICULAR NUMBER OF BONDS AND LONE PAIRS



Nitrogen Summary:



Introducing Carbocations:

Recall: carbon is tetravalent

Carbocation:



Carbocation

Carbanion:



Carbanion

You do not have to write lone pairs if you don't want to, however, you **MUST** include a formal charge (if applicable)



Resonance:

Resonance structures:

We represent resonance structures with _____

Note: the resonance structures are not switching back and forth! The hybrid is a mixture of both structures



Delocalization:

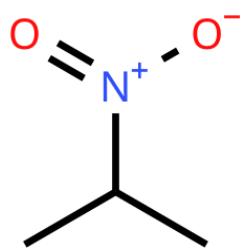
Resonance Stabilization:

Curved Arrows:

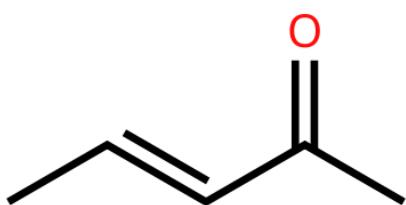
Use a double-barbed arrow, single-barbed arrows show the movement of radicals (single e-)

Resonance Demonstration:

1.

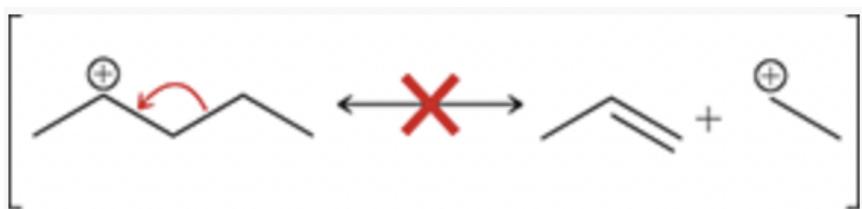


2.

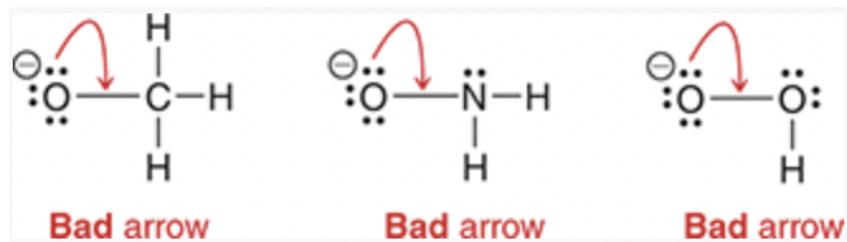


NEVER DO THIS IN RESONANCE:

1.



2.



More than 1 resonance structure:

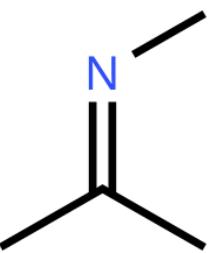
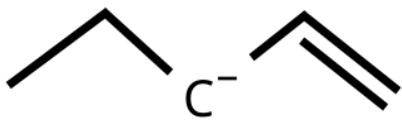
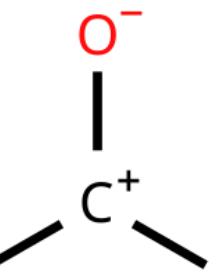


Conjugated pi bonds in a ring:



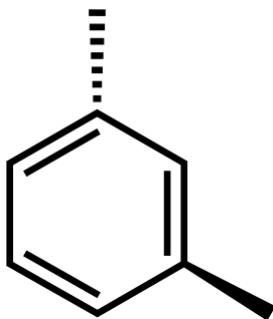
Practice :)





Wedges and Dashes:

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



Quantum Mechanics

Molecular Orbital (MO):

- Represents the _____ where one or two electrons of a molecule are likely to be found
- Have a _____ behavior with _____ and _____ lobes

Remember

Bonding MO:

Anti-bonding MO:

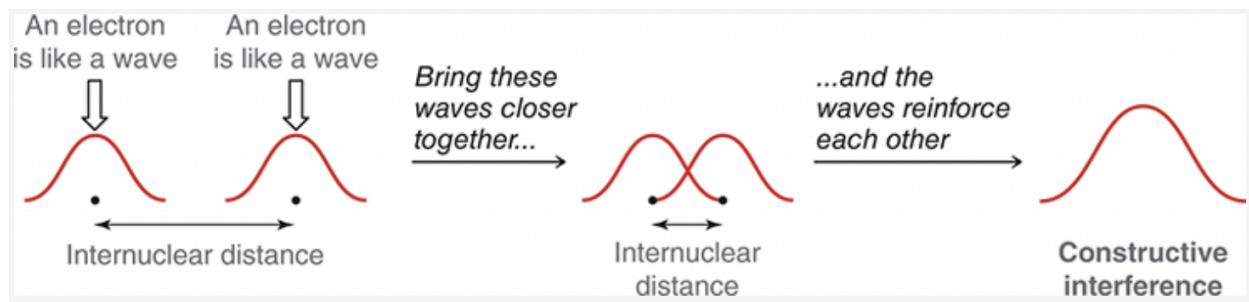
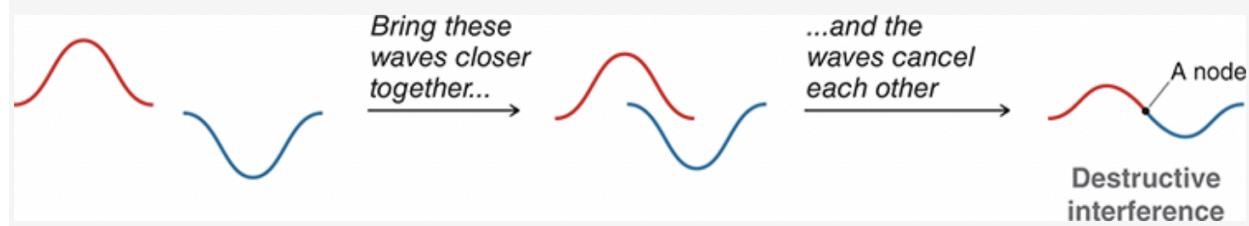
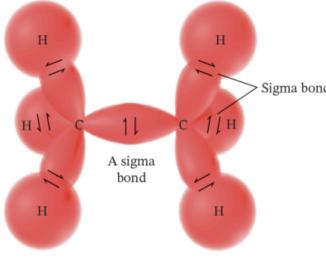
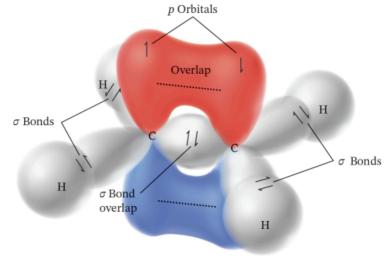
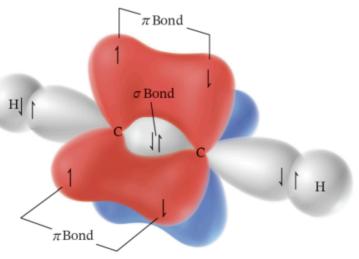


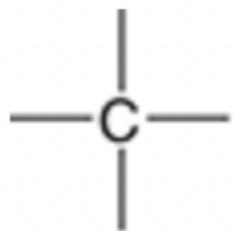
FIGURE 1.11 Constructive interference resulting from the interaction of two electrons.



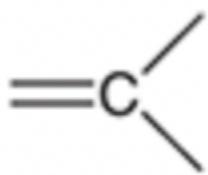
Hybridized Orbitals:

	Sp ₃	Sp ₂	Sp
Diagram	 <p>Diagram illustrating the bonding in a molecule using sp^3 hybridized orbitals. The molecule consists of two carbon atoms bonded together, each bonded to four hydrogen atoms. Red spheres represent sp^3 hybrid orbitals, and grey spheres represent p orbitals. A sigma bond is labeled between the two carbons, and other sigma bonds are shown between each carbon and its four hydrogens. The p orbitals are shown as red clouds above and below the plane of the molecule.</p>	 <p>Diagram illustrating the bonding in a molecule using sp^2 hybridized orbitals. The molecule consists of two carbon atoms bonded together, each bonded to two hydrogen atoms. Red spheres represent sp^2 hybrid orbitals, and grey spheres represent p orbitals. The p orbitals are shown as red clouds above and below the plane of the molecule. The diagram illustrates sigma bond overlap between the carbons and the p orbitals forming pi bonds.</p>	 <p>Diagram illustrating the bonding in a molecule using sp hybridized orbitals. The molecule consists of two carbon atoms bonded together, each bonded to one hydrogen atom. Red spheres represent sp hybrid orbitals, and grey spheres represent p orbitals. The p orbitals are shown as red clouds above and below the plane of the molecule. The diagram illustrates sigma bond overlap between the carbons and the p orbitals forming pi bonds.</p>
What's Happening			
Bond-line			
Geometry			
Angles			

Hybridization life hack!!!



sp^3

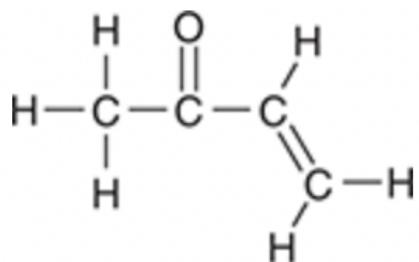


sp^2



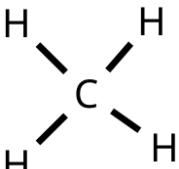
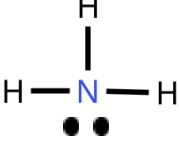
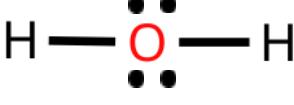
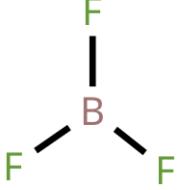
sp

Determine the hybridization state of each carbon:



VSEPR Theory:

Common Molecular Shapes:

Compound	Bonding e- pairs	Lone e- pairs	Steric number	Arrangement of e- pairs	Molecular Geometry
					
					
					
					
					

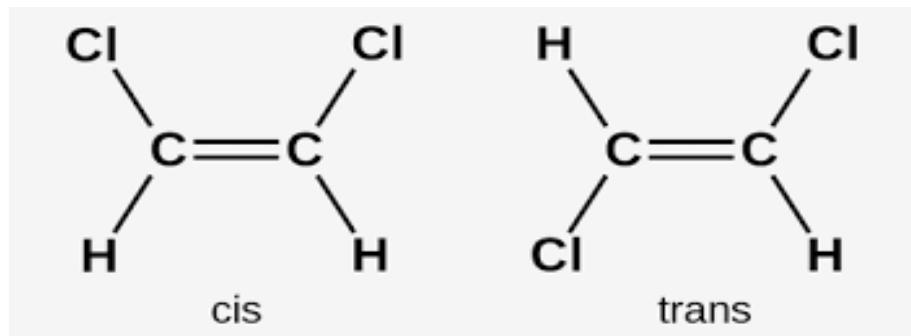
Cis/trans Stereoisomerism:

Cis:

Trans:

We can think of the molecule as being on a plane and separating this plane evenly either through the molecule itself or through a double/triple bond

Ex:



Restricted Rotation:

AKA, the properties of a single, double, and triple bond

Order the bonds:

Length

Energy

Strength