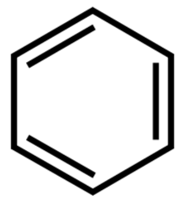
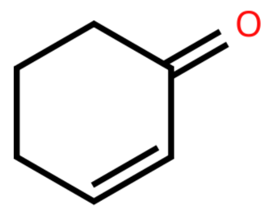
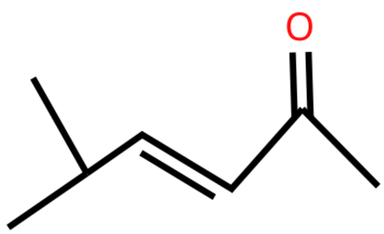
**<u>Session 2 Worksheet</u>**

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:

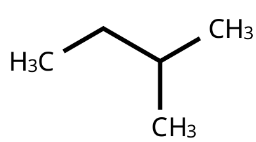
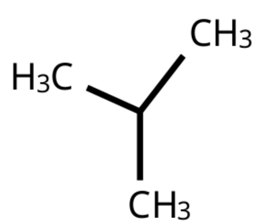


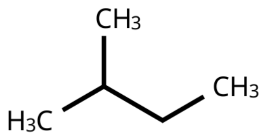
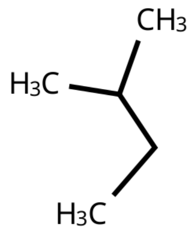


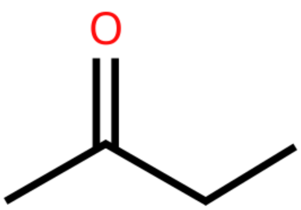
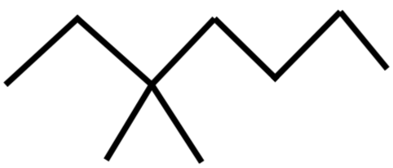
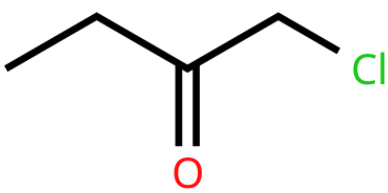
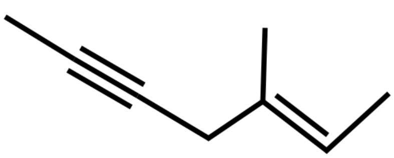

**Constitutional Isomers**

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

| | |
|---|---|
| $C_4H_{10}$ |   |
| $H_3C-\overset{H_2}{C}-\overset{H_2}{C}-CH_3$ |   |

| | |
|---|---|
|   |   |

Write the condensed formula given the structure:

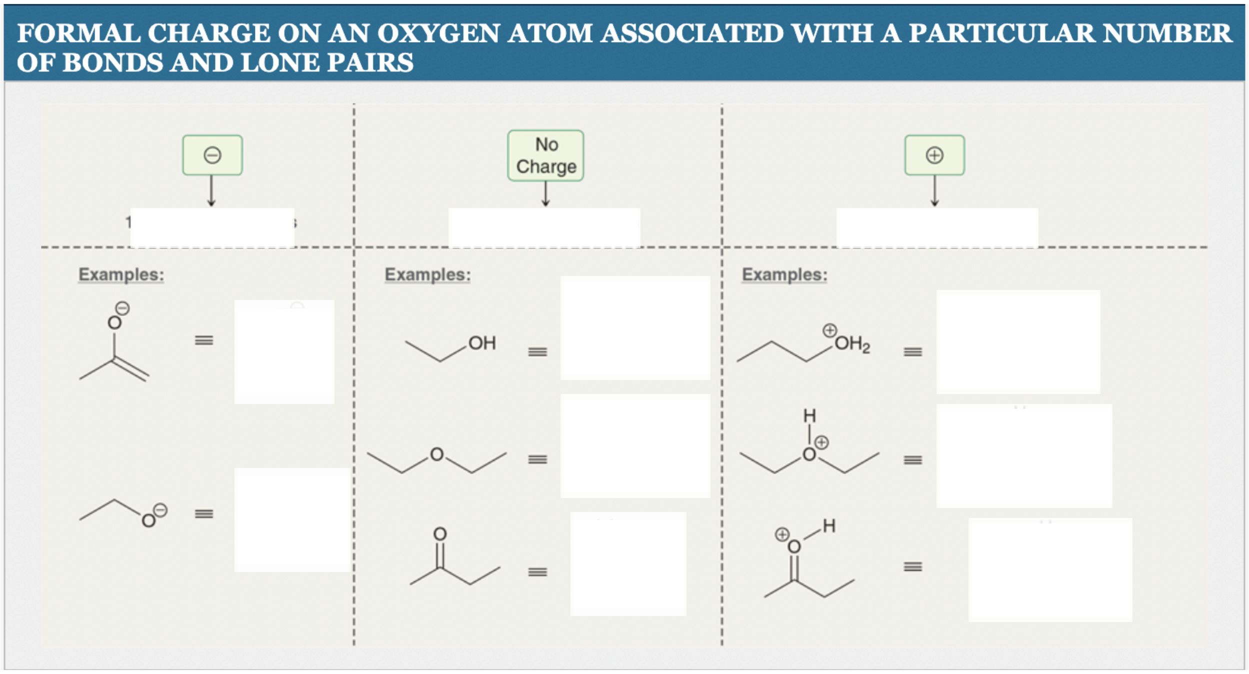
| | |
|---|---|
|   | |
|  | |
|   | |
|  | |

Write the structure given the condensed formula:

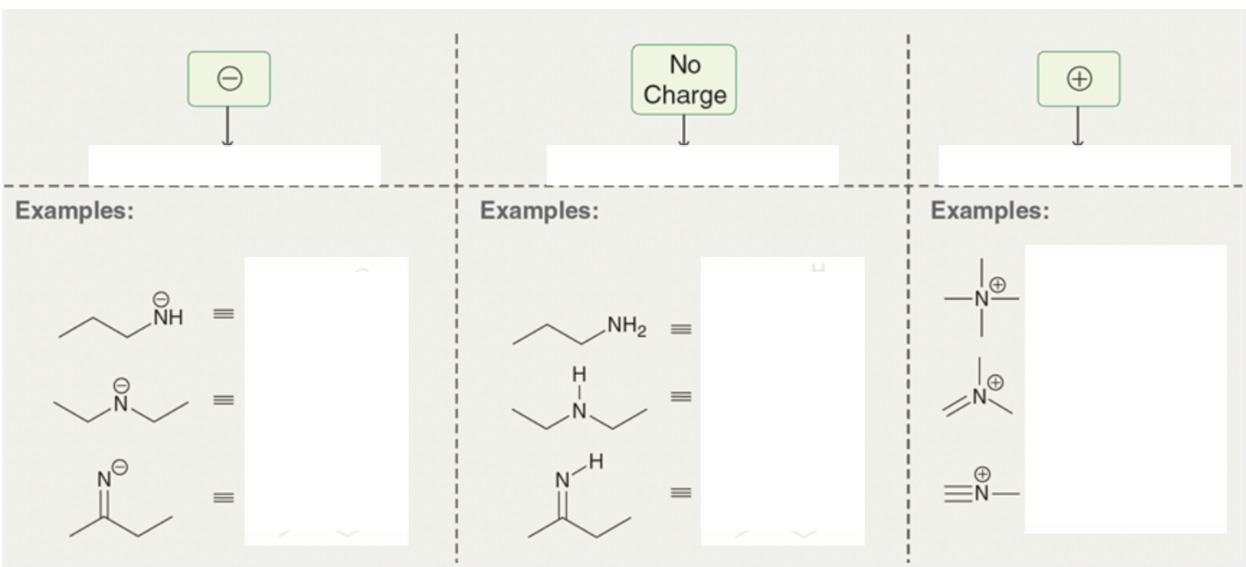
| | |
|---|---|
| $CH_3CH_2CH_2CH_2Br$ | |
| $CH_3CH(CH_3)CH_2CH_3$ | |
| $CH_2CHCH_2OH$ | |

Summary of formal charges:

Oxygen Summary:



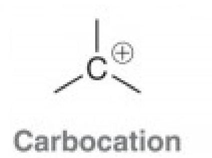

Nitrogen Summary:




Introducing Carbocations:

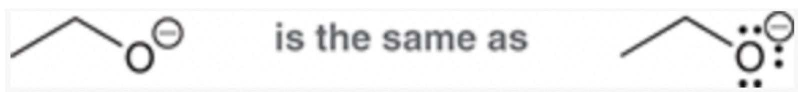
Recall: carbon is tetravalent

Carbocation:




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:

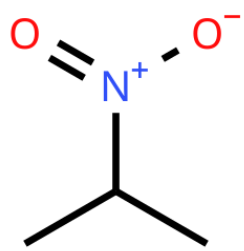
Resonance Stabilization:

Curved Arrows:

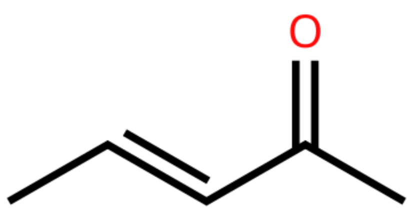
Use a double-barbed arrow, single-barbed arrows show the movement of radicals (single e-)

Resonance Demonstration:

1.



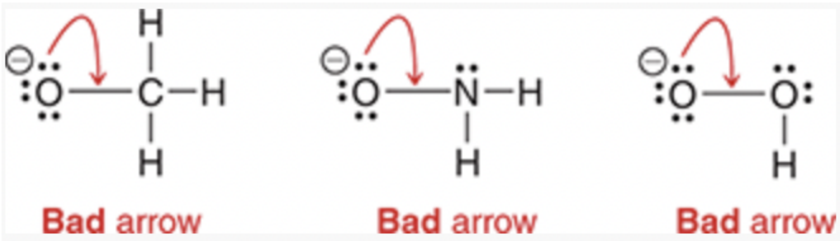

2.



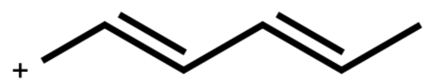

NEVER DO THIS IN RESONANCE:

1.

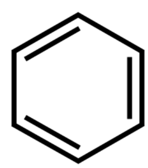
2.



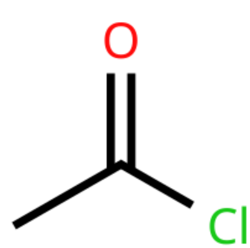

More than 1 resonance structure:

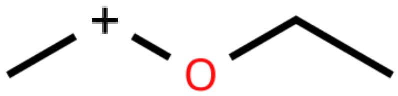
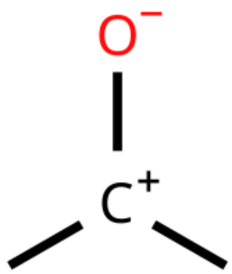
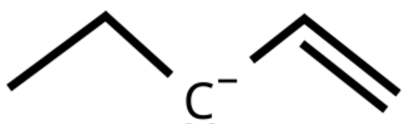
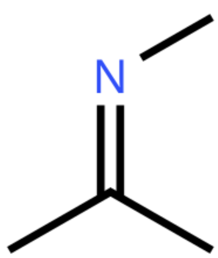


Conjugated pi bonds in a ring:



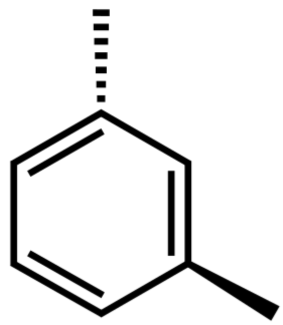
Practice :)



| |
|---|
|  |
|  |
|  |
|  |

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:

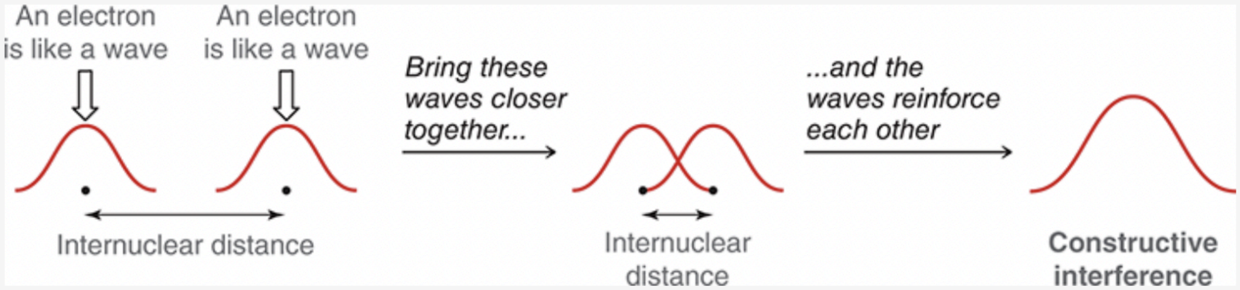
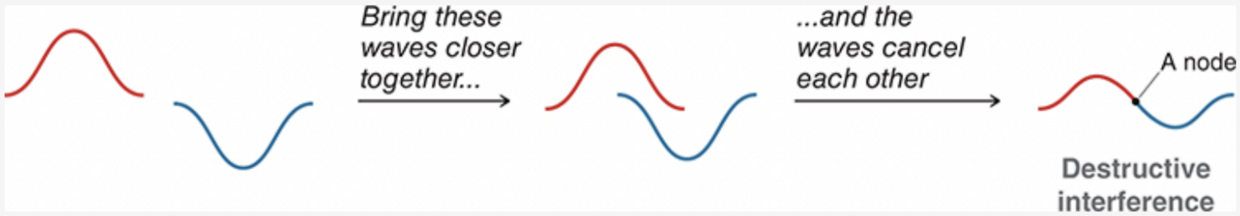
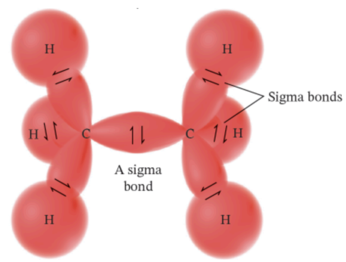
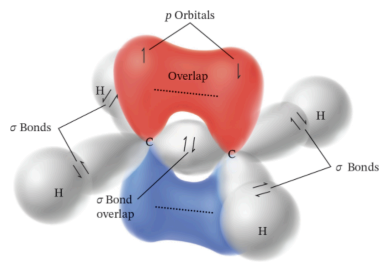
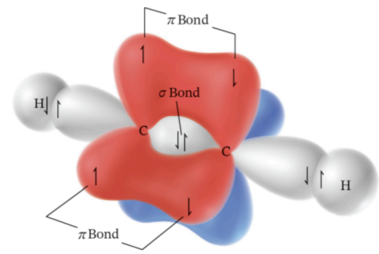


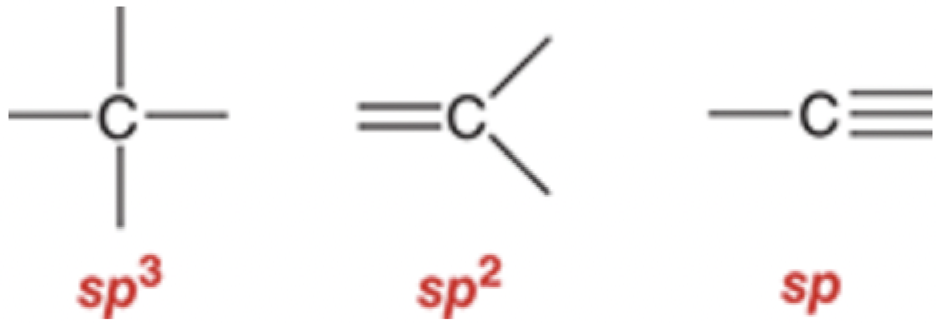

**FIGURE 1.11 Constructive interference resulting from the interaction of two electrons.**



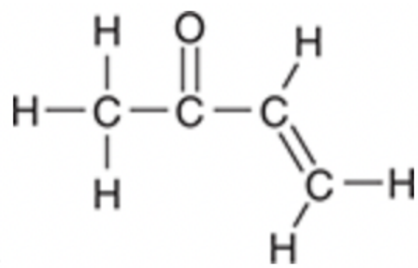
Hybridized Orbitals:

| | **Sp3** | **Sp2** | **Sp** |
|---|---|---|---|
| **Diagram** |  |  |  |
| **What's Happening** | | | |
| **Bond-line** | | | |
| **Geometry** | | | |
| **Angles** | | | |

**Hybridization life hack!!!**




Determine the hybridization state of each carbon:

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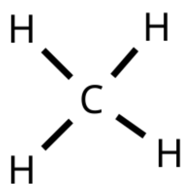
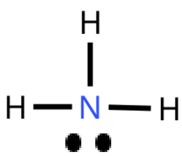
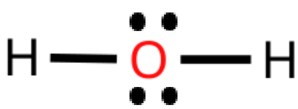
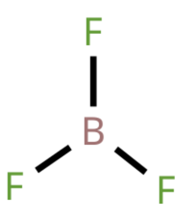
VSEPR Theory:

Common Molecular Shapes:

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

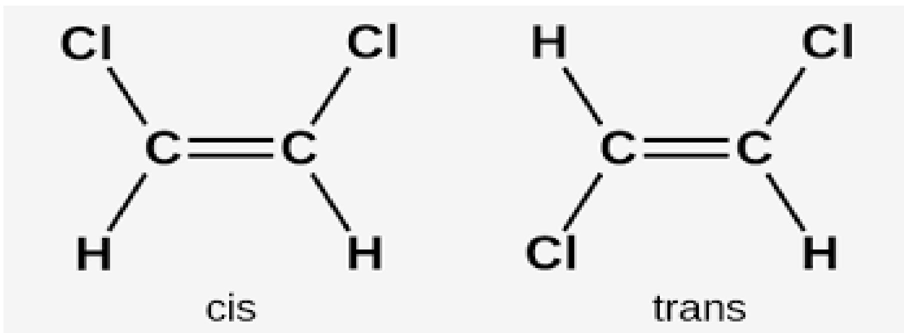
Cis/trans Steroisomerism:

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**