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HEY HEY 📣📣 LISTEN UP ❗ LISTEN UP ‼️

The CK-5K is back up and running!!! 🏃‍♂️🏃‍♀️🏃

Sign up NOW to support kids impacted by a parent's/guardian's cancer 🐛💙💚 If you previously registered for the original date, please be sure to re-register for this new date. Scan the QR code for the registration link or find it on the Linktree in our bio!

🔥Friday 3/27 is the last day to receive a T-Shirt with registration
🔥Registration for the event is available up until race day, Saturday, April 4th

A HUGE thank you to all of our sponsors for your contributions to making this event possible 🫶

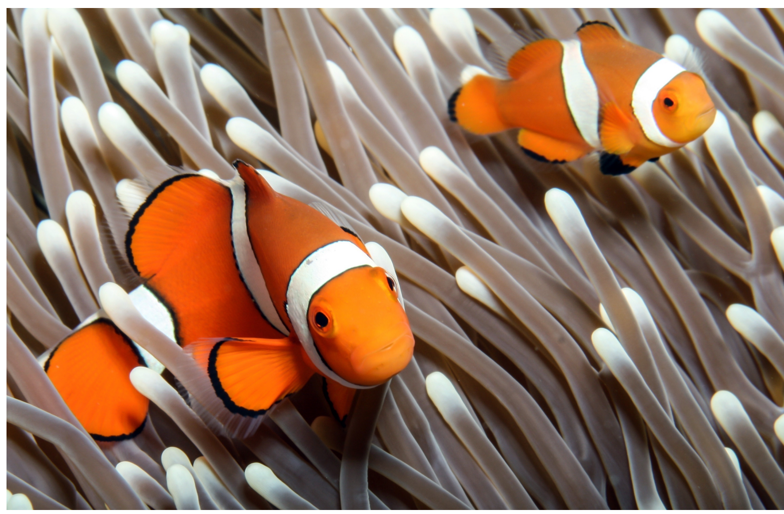
55 2

March 16

Log in to like or comment.

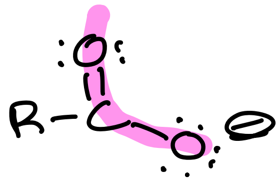


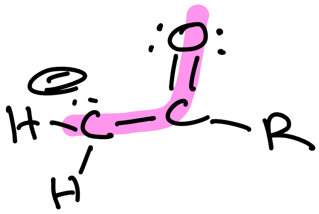


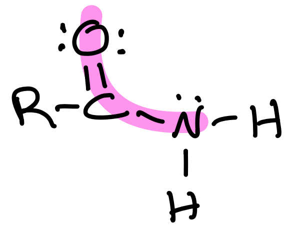



π-Way Recap

3 atom "π-ways" we have seen

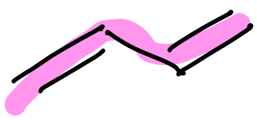


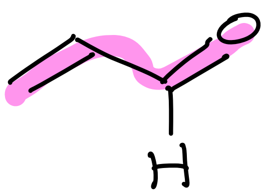


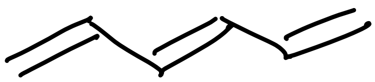


Conjugation → "π way" → 4 atoms or more

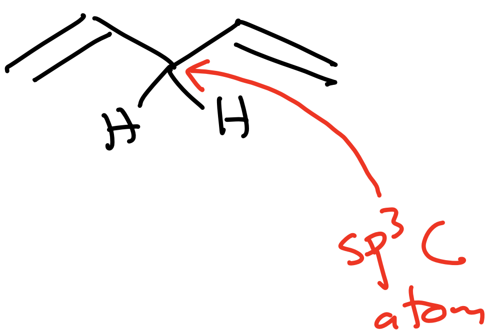
↳ More than one π bond that overlaps



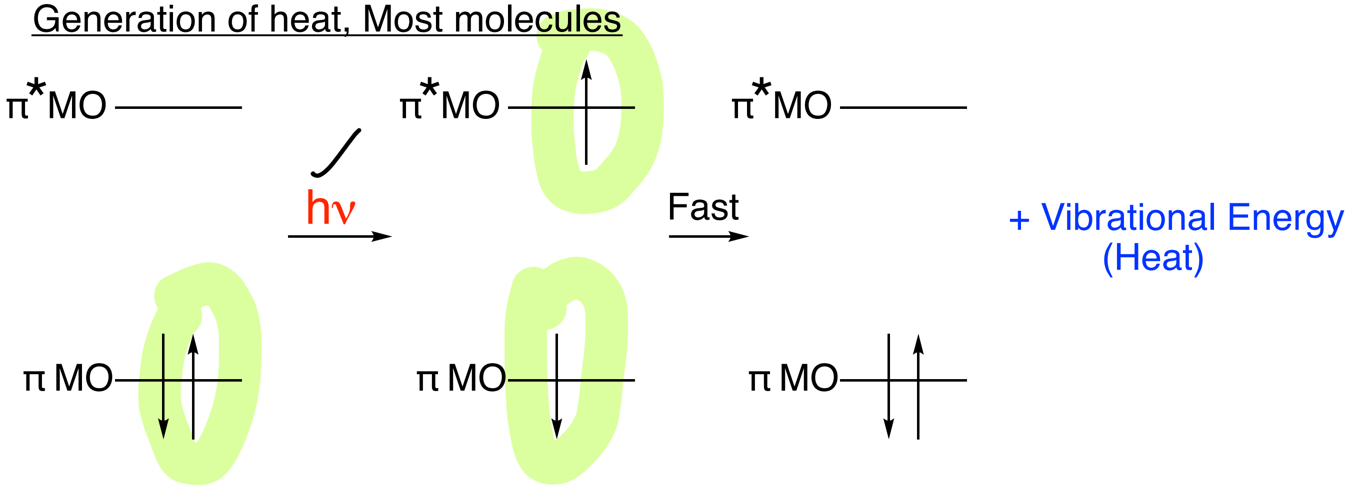




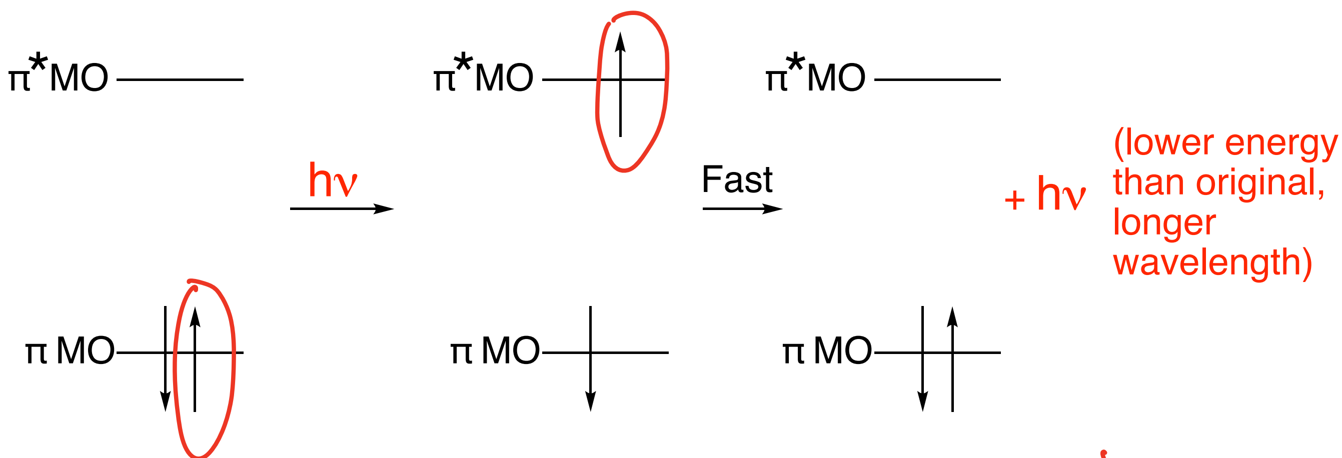
Not conjugated:



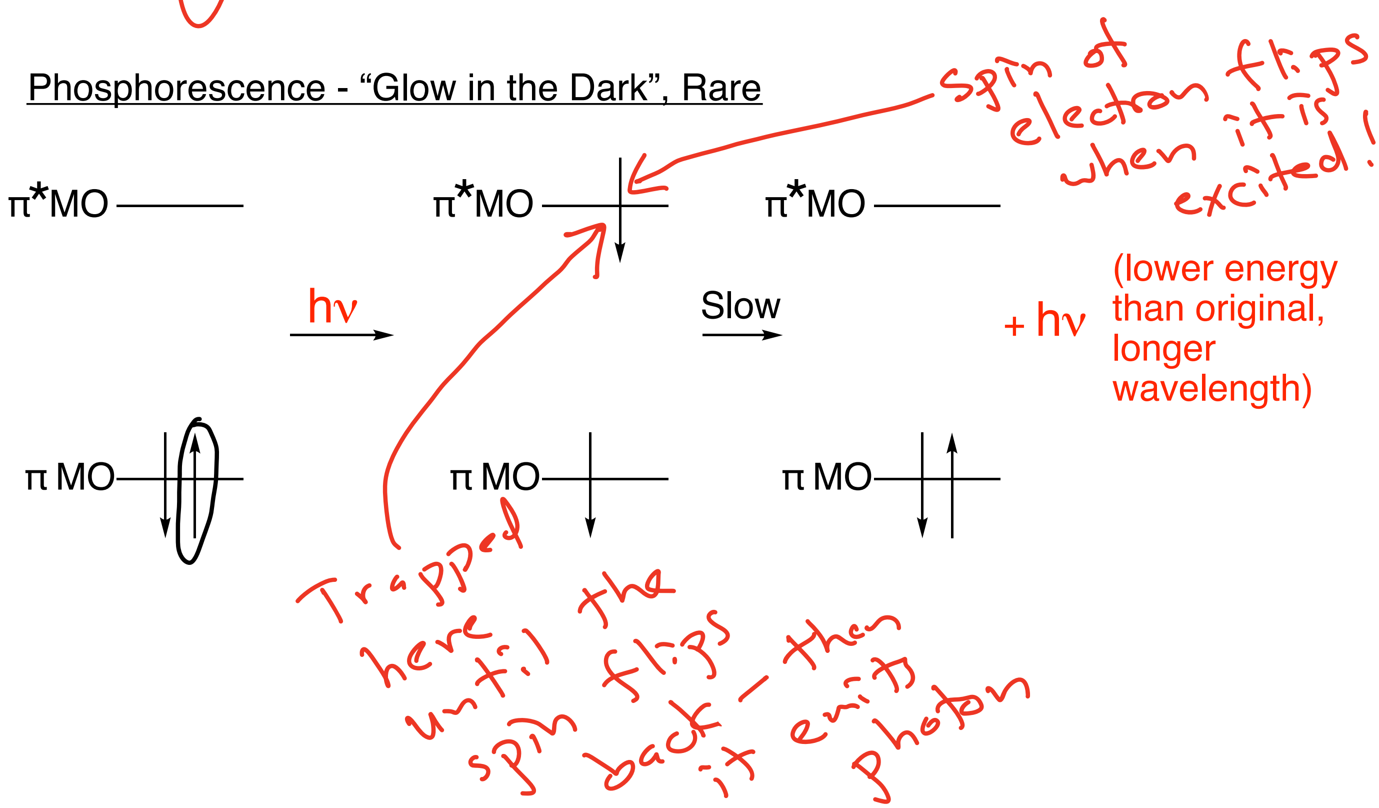
Generation of heat, Most molecules



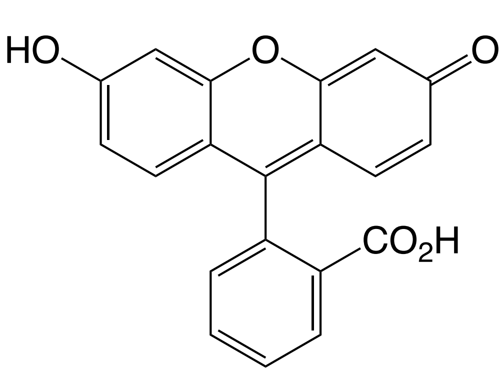
Flourescence - Rigid Molecules, Not uncommon



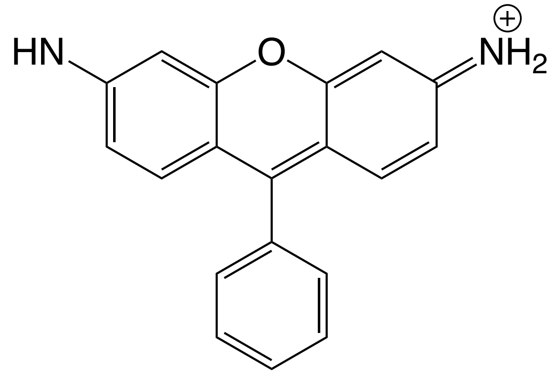
Phosphorescence - “Glow in the Dark”, Rare



Flourescence - Rigid Molecules, Not uncommon

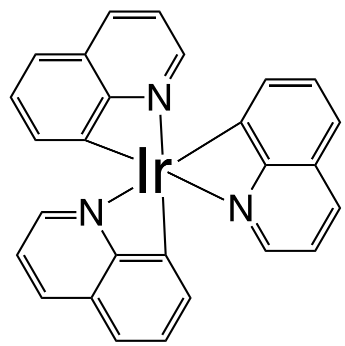


Fluorescein

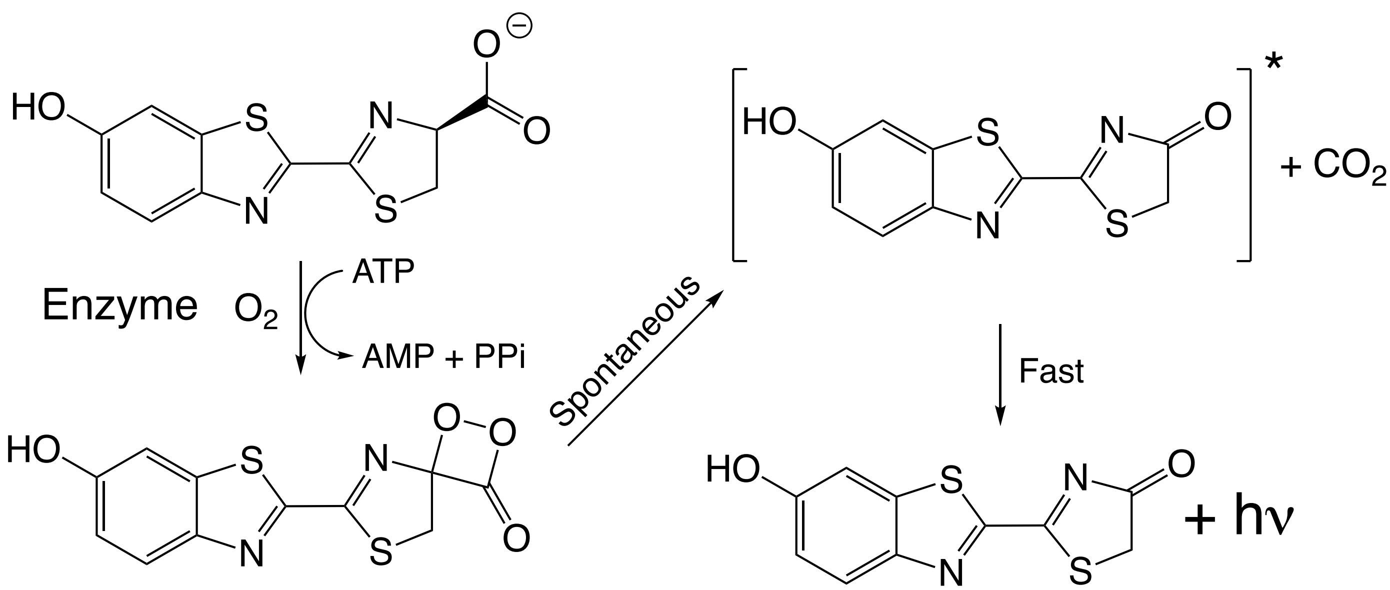


Rhodamine

Phosphorescence - “Glow in the Dark”, Rare



Bioluminescence - Fireflies, Deep Sea Creatures - Chemical Reactions



http://photobiology.info/Branchini2.html

← Energy

Light source

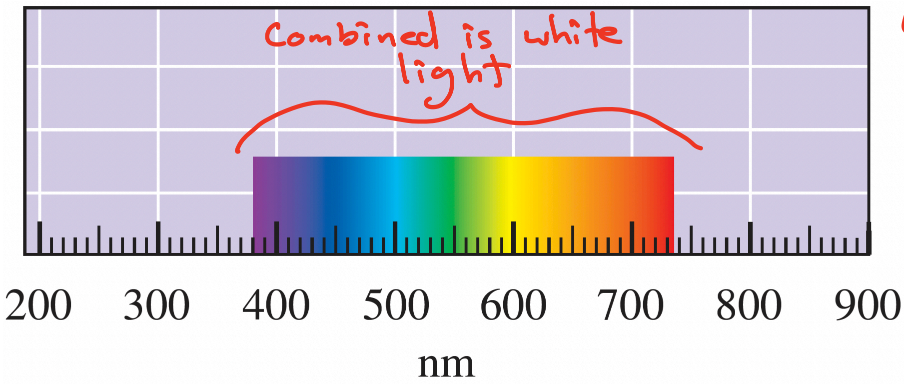
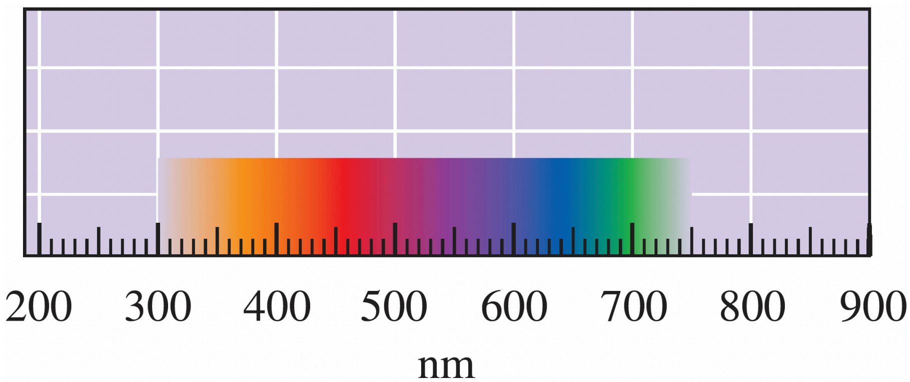
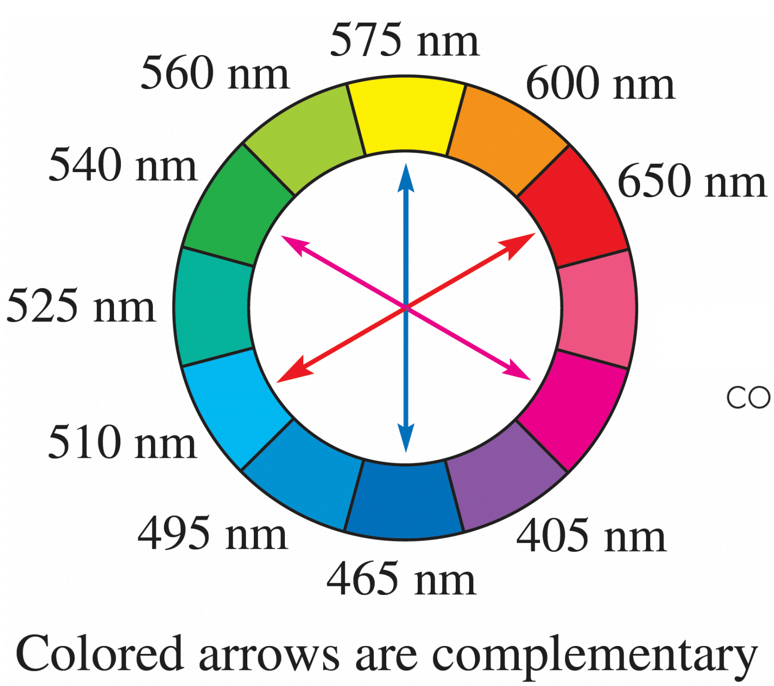


FIGURE 20.5 (a) Visible light color-wavelength correlation.

*** We "see" the wavelengths reflected minus the wavelengths absorbed ***

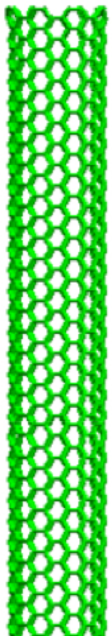


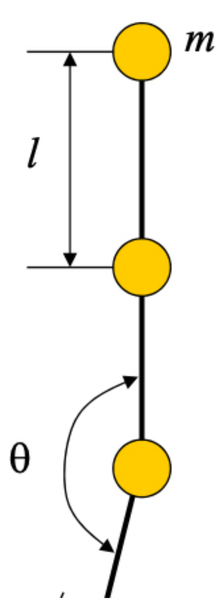
(b) Approximate color of substance (reflected light) if a single wavelength (i.e., the wavelength listed on the numerical scale of the *x*-axis) is absorbed.

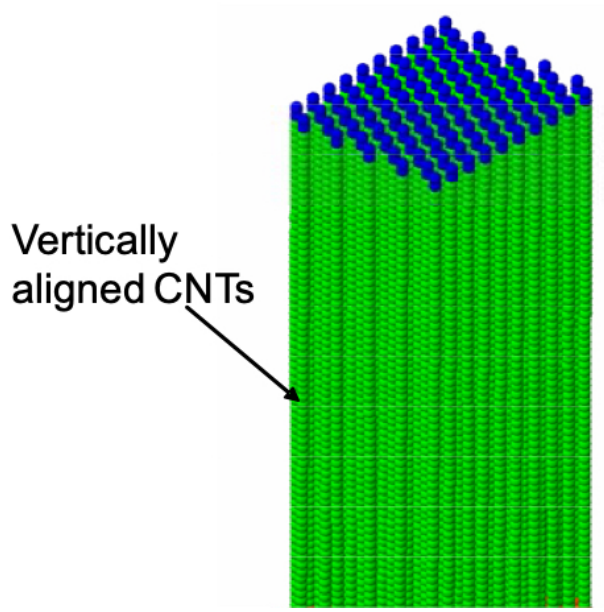


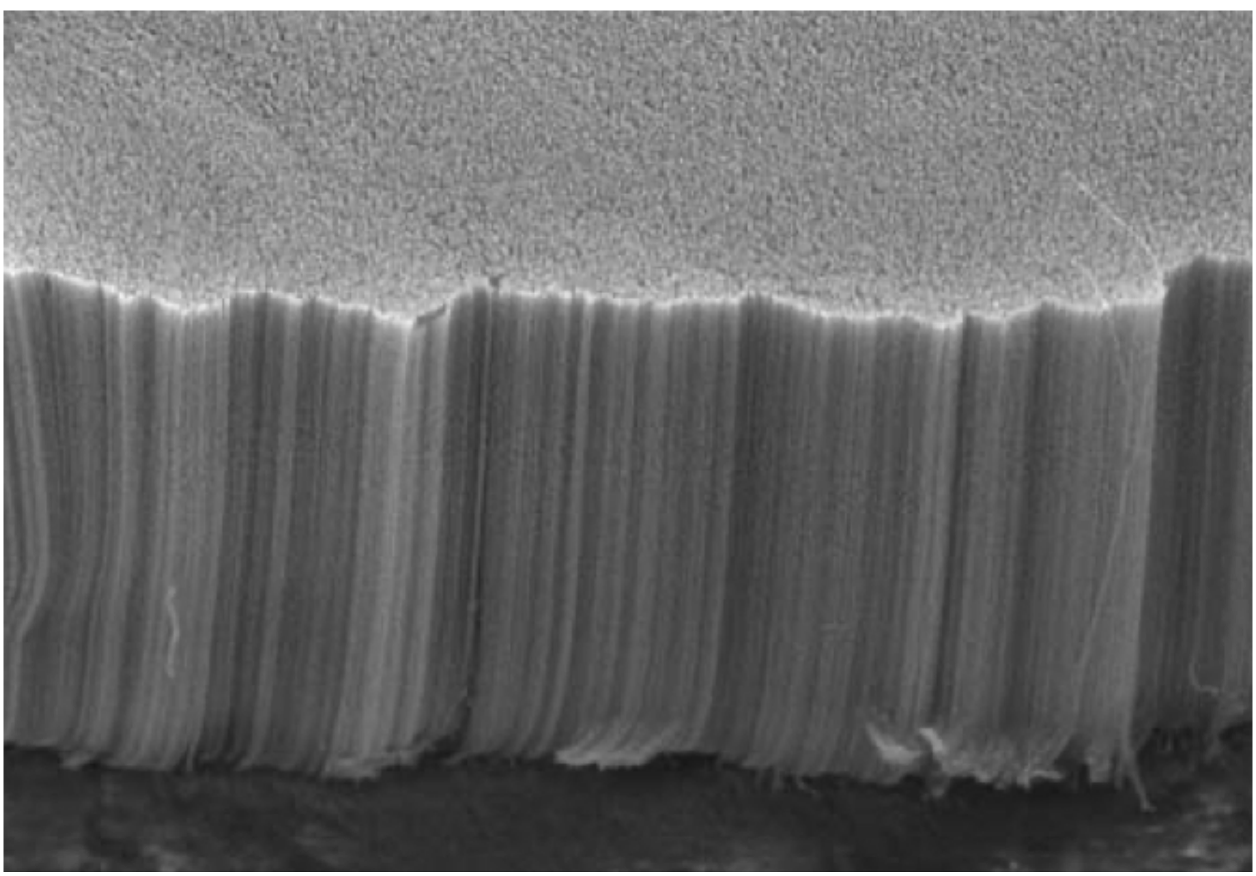
(c) Complementary colors on a color wheel.

Vanta Black → The "blackest" material









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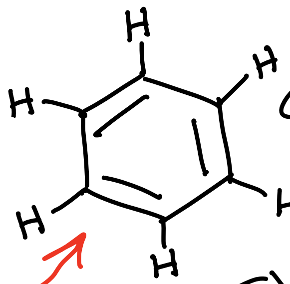
Preview

Called "aromatcity"



Benzene

Extraordinarily Stable!

This is A LOT

~36 kcal/mol more stable than expected

"aromatic" molecule

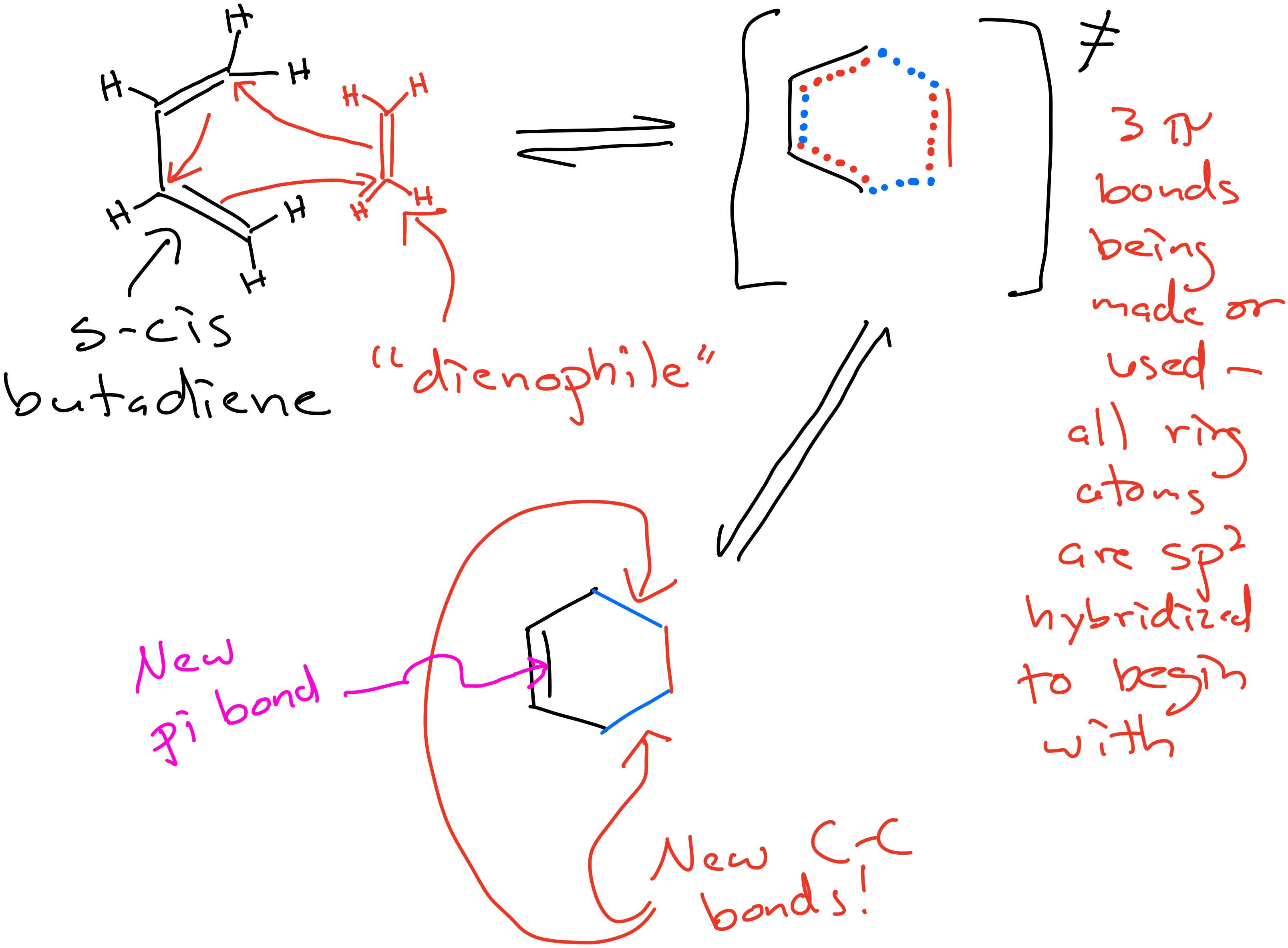
Pericyclic Reactions → π bonds and σ bonds interchange

→ Happens because the transition state is super stable

"aromatic" character of transition state

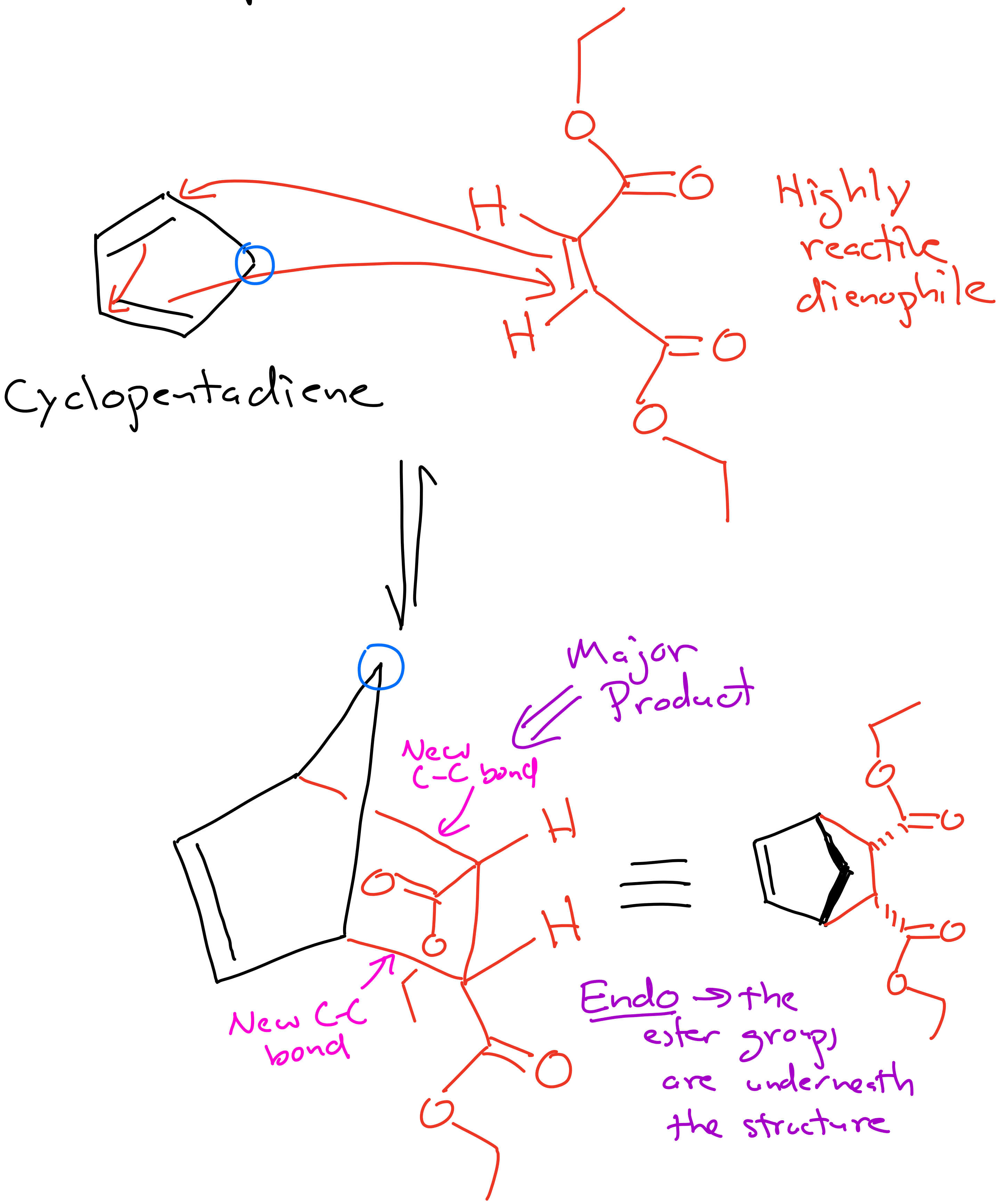
Otto!
↓
Diels-Alder Reaction

..... bonds being broken
..... bonds forming

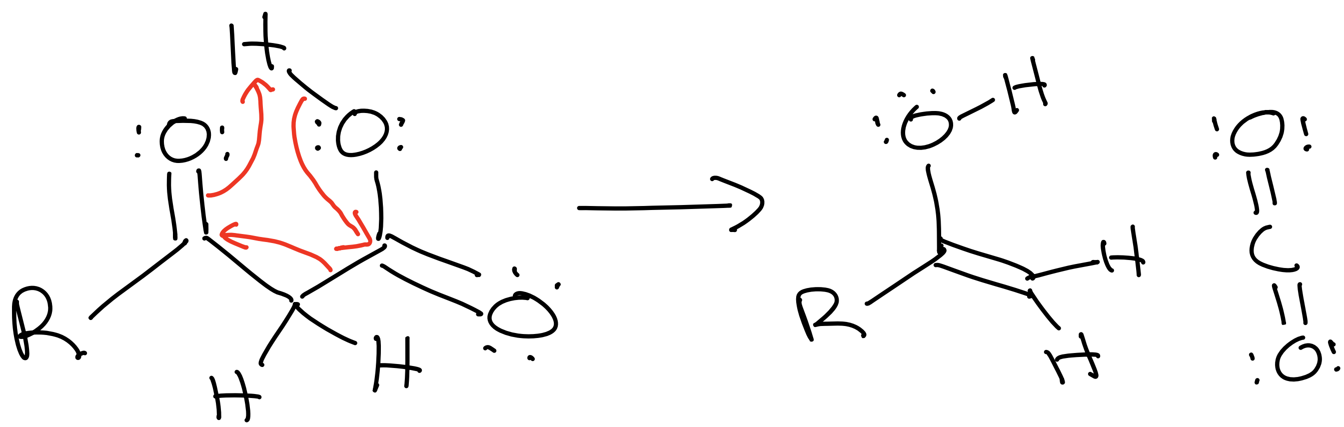


The above reaction gives a poor yield and was used only to illustrate the process → there are many, many known examples of Diels-Alder reactions

The following is the only Diels-Alder reaction you are responsible for in this class



You have seen one other example of this type of reaction:



3 π bonds being broken or formed in the transition state → very stable transition state!

Transition state has aromatic character!

That is why β-keto acids and β-diacids decarboxylate when you heat them!

The Golden Rules of Organic Chemistry

Your goal should be to understand, not memorize, the material presented in your organic chemistry course. The following principles should be learned as you begin your study of organic chemistry, then used as a solid foundation for building your understanding throughout the course. These simple ideas explain a great deal about the structures and properties of organic molecules, as well as the characteristic ways in which they react. Thoroughly understanding the following three key principles and related ideas will allow you to develop an intuitive feel for organic chemistry that avoids the necessity of resorting to the far less effective use of extensive memorization.

A. Predicting Structure and Bonding

1. In most stable molecules, all the atoms will have filled valence shells.

2. Five- and six-membered rings are the most stable.

3. There are two possible arrangements of four different groups around a tetrahedral atom.

B. Predicting Stability and Properties

4. The most important question in organic chemistry is "Where are the electrons?"

5. Delocalization of charge over a larger area is stabilizing.

6. Delocalization of unpaired electron density over a larger area is stabilizing.

7. Delocalization of pi electron density over a larger area is stabilizing.

C. Predicting Reactions

8. Reactions will occur if the products are more stable than the reactants and the energy barrier is low enough.

9. Functional groups react the same in different molecules.

10. A reaction mechanism describes the sequence of steps occurring during a reaction.

11. Most bond-making steps in reaction mechanisms involve nucleophiles reacting with electrophiles.

All conjugated systems are extra stable, but there is a certain class that is particularly stable:

Aromatic Rings ⟹ Hückels Rules (definition)

1) All ring atoms are sp^2 hybridized (have a 2p orbital)

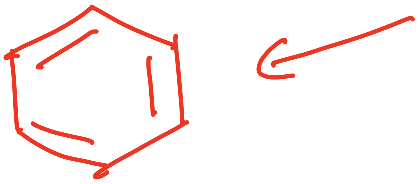
2) Ring is flat

3) Monocyclic

4) 2, 6, 10, 14, 18, 22.... π electrons

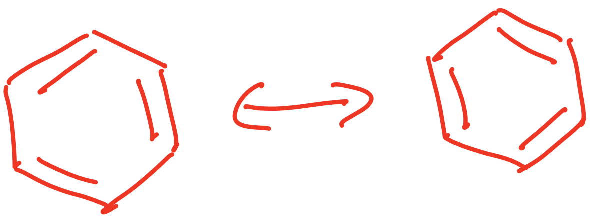
$4n+2$ π electrons

$n = 0, 1, 2, 3, 4, 5.....$



Benzene

The π electrons of benzene are much less reactive than normal alkenes → benzene only reacts under harsh conditions



All bonds are the same length!

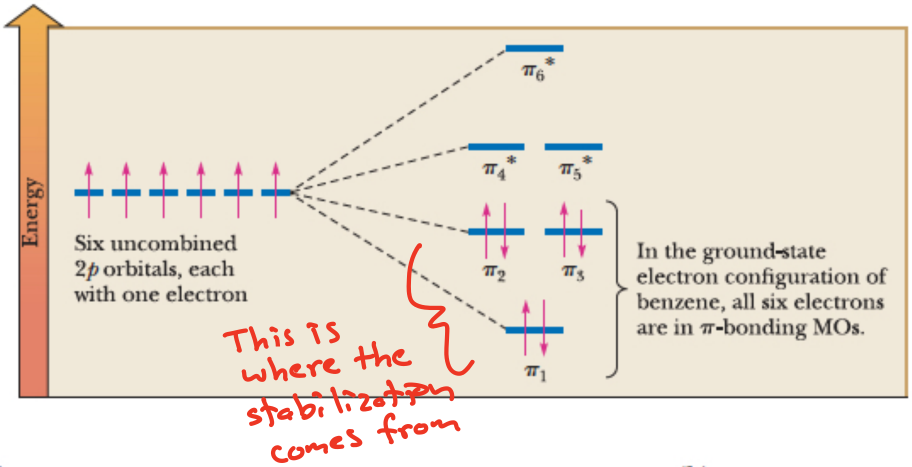


FIGURE 21.2 The molecular orbital representation of the π bonding in benzene.

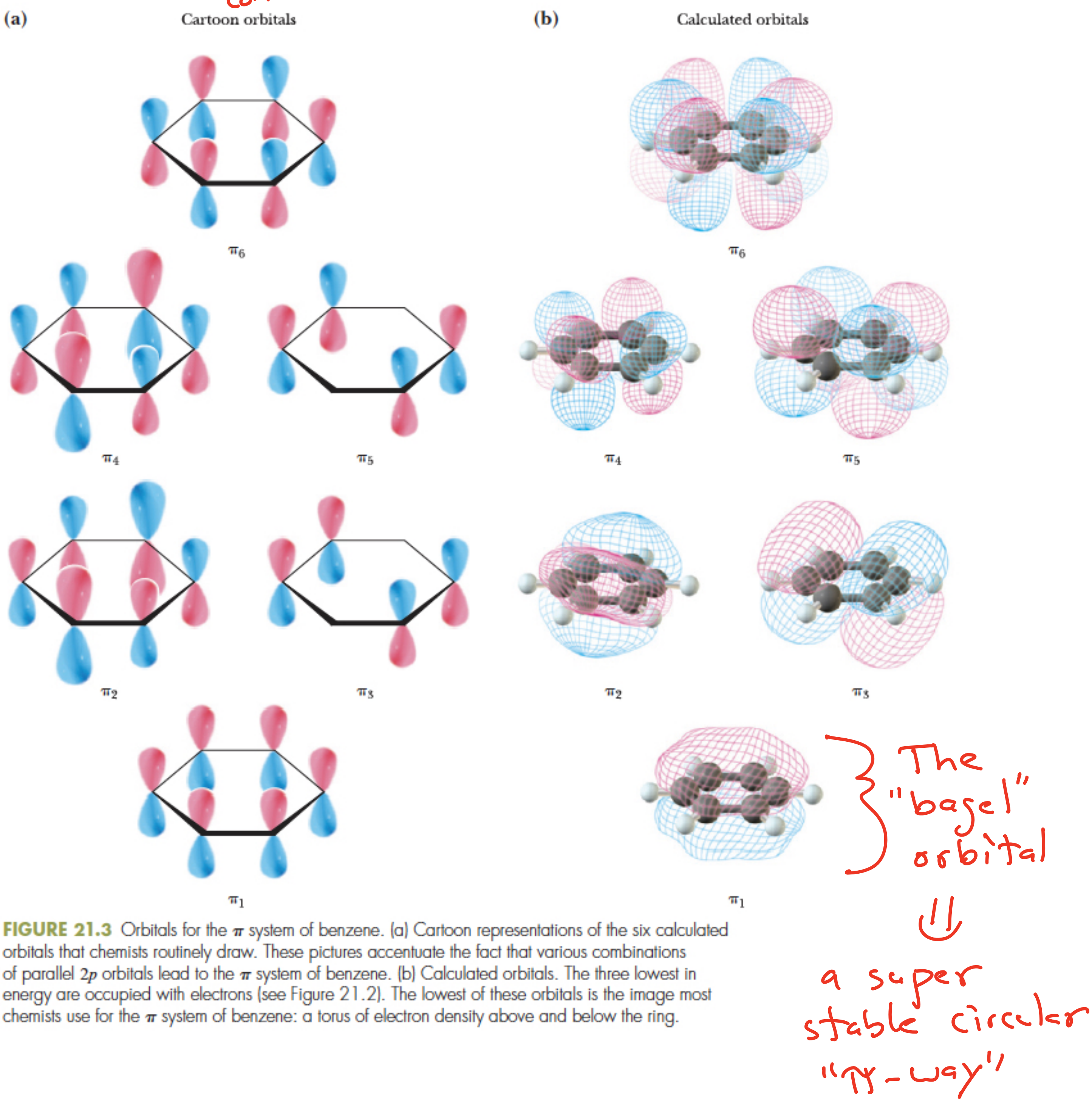


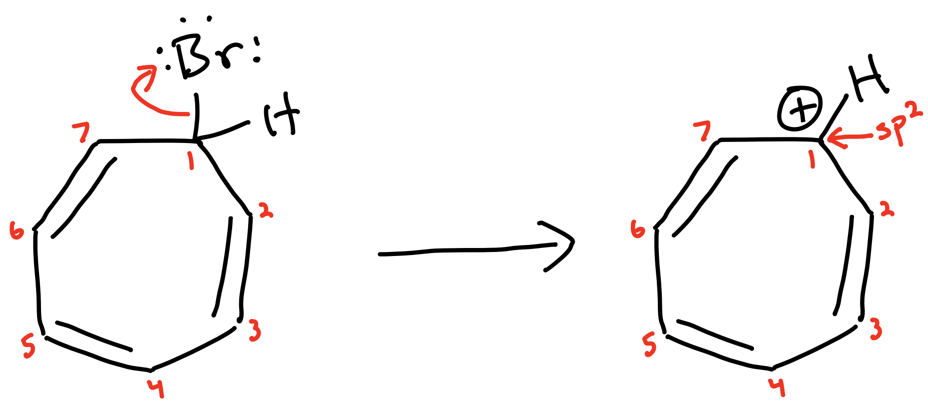
FIGURE 21.3 Orbitals for the π system of benzene. (a) Cartoon representations of the six calculated orbitals that chemists routinely draw. These pictures accentuate the fact that various combinations of parallel 2*p* orbitals lead to the π system of benzene. (b) Calculated orbitals. The three lowest in energy are occupied with electrons (see Figure 21.2). The lowest of these orbitals is the image most chemists use for the π system of benzene: a torus of electron density above and below the ring.

Two Important Consequences of Aromaticity

1) Aromaticity stabilizes ions → anions and cations

2) Atoms in molecules will be sp^2 if that produces aromaticity

Tropylium Ion



all ring atoms sp^2

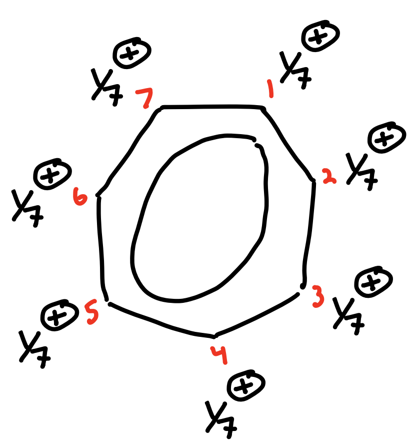
flat

monocyclic

6 π electrons

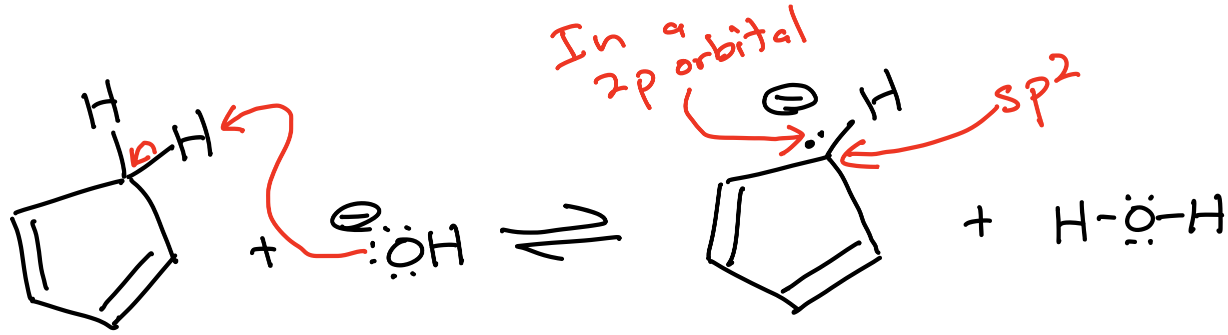
Aromatic!

Super stable cation



All atoms are equivalent → 7 equal contributing structures!

Cyclopentadienyl Anion

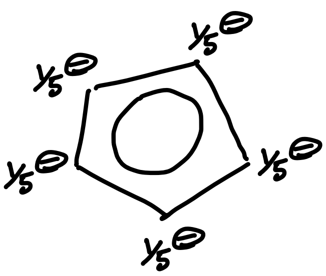


$pK_a = 16$

Aromatic!

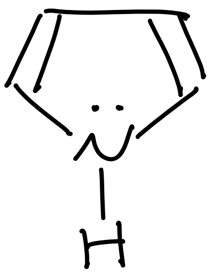
Super stable anion

- all ring atoms sp^2
- flat
- monocyclic
- 6 π electrons
  - → 2 electrons of lone pair
  - → 4 electrons in the 2 π bonds

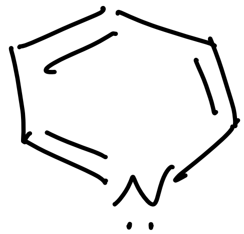


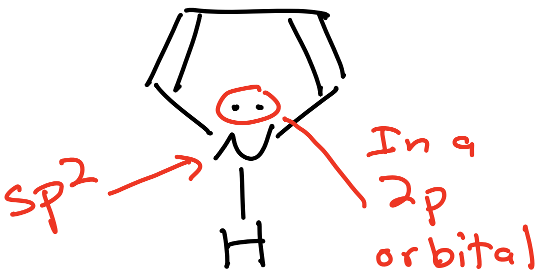
All atoms are equivalent → 5 equal contributing structures!

Pyrrole

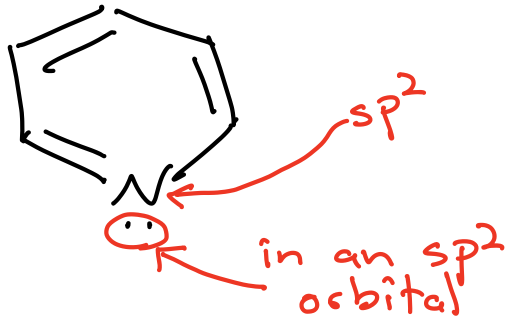


Pyridine





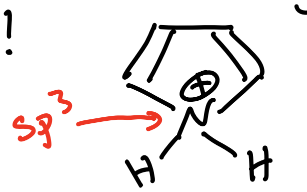
The "lone pair" on N is actually part of the 6 π electrons so they are delocalized and <u>not</u> able to bond to a proton



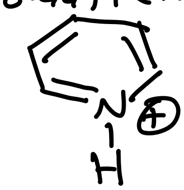
The lone pair on N is available to bond to a proton

This is the base!

Another way to look at it: Upon protonation, the pyrrole would be forced to lose aromaticity because the N atom would be forced to be sp^3 and only 4 π electrons would remain. Losing aromaticity costs far too much energy! Protonated pyridine is still aromatic!



Not aromatic



Aromatic