

KE-YUAN HSIN, ZONGHENG ZHANG, &
GABRIELA MORA FALLAS, CONDUCTORS

UT
University
Orchestra

Johannes Brahms - Variations on a Theme
by Haydn, Op. 56

Bedřich Smetana - Vltava (The Moldau)

Nikolai Rimsky-Korsakov - Capriccio espagnol, Op. 34

18 APRIL 2023 | 7:30PM

BATES RECITAL HALL

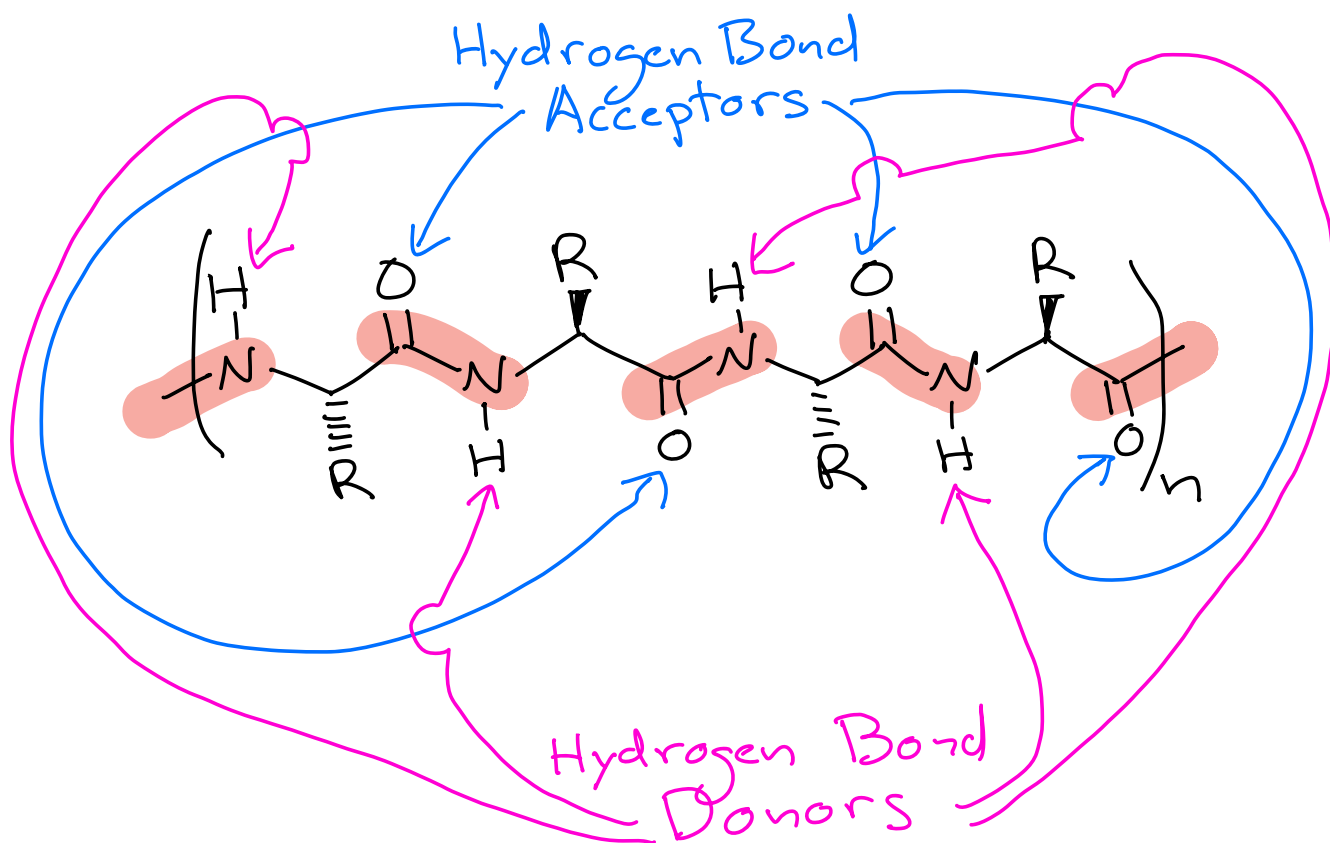
FREE ADMISSION

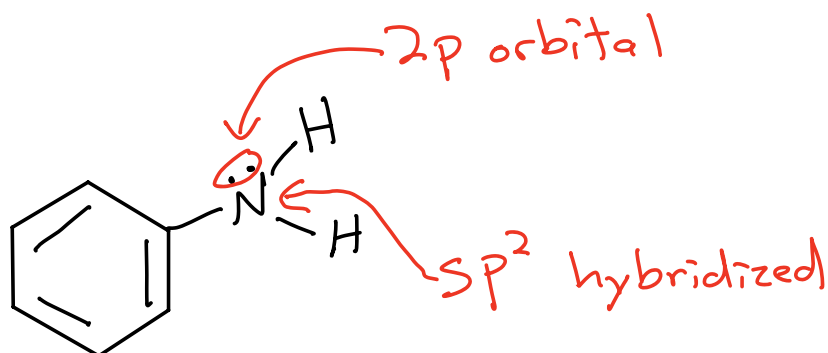
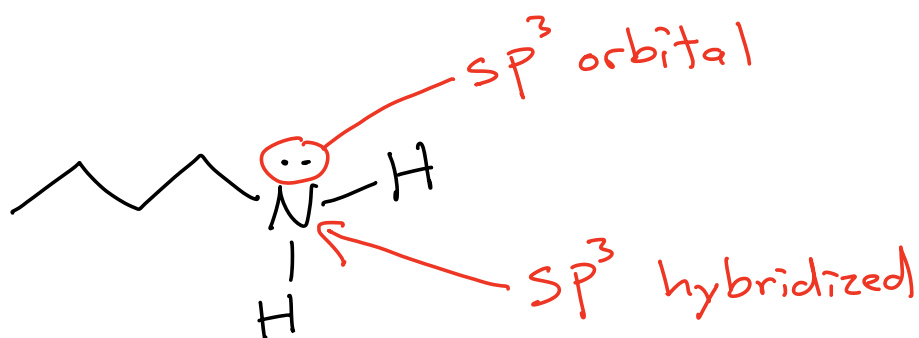




What does this mean for amides:

- 1) The amide group can make strong hydrogen bonds
- 2) The C-N bond **does not rotate** at room temperature

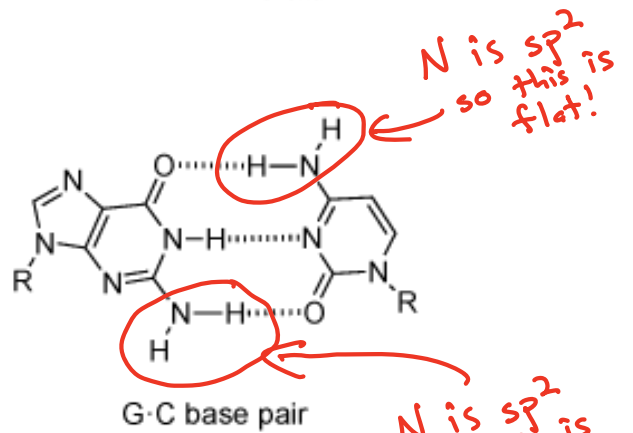
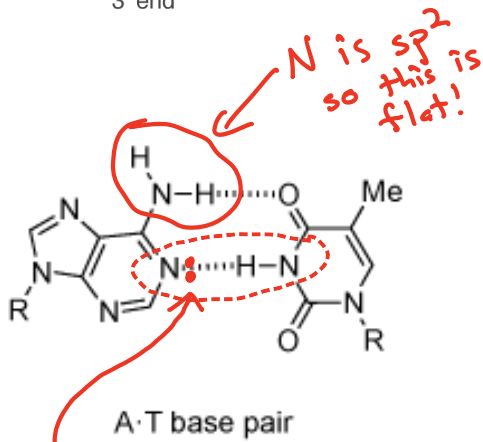
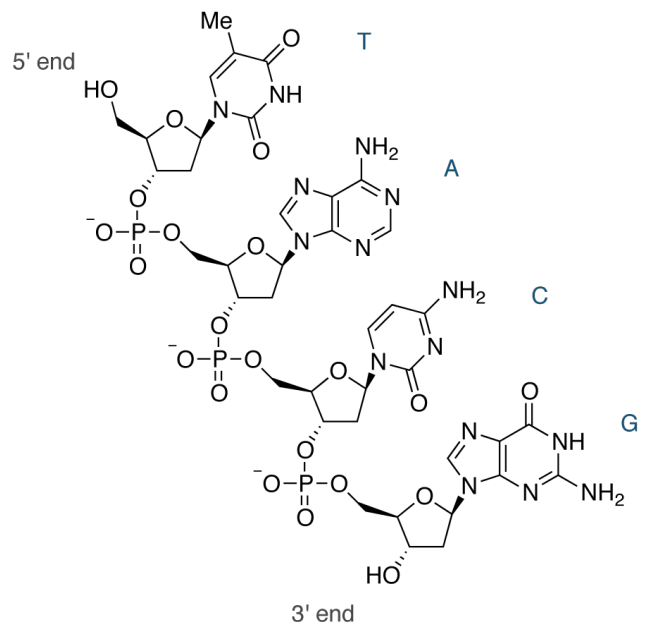
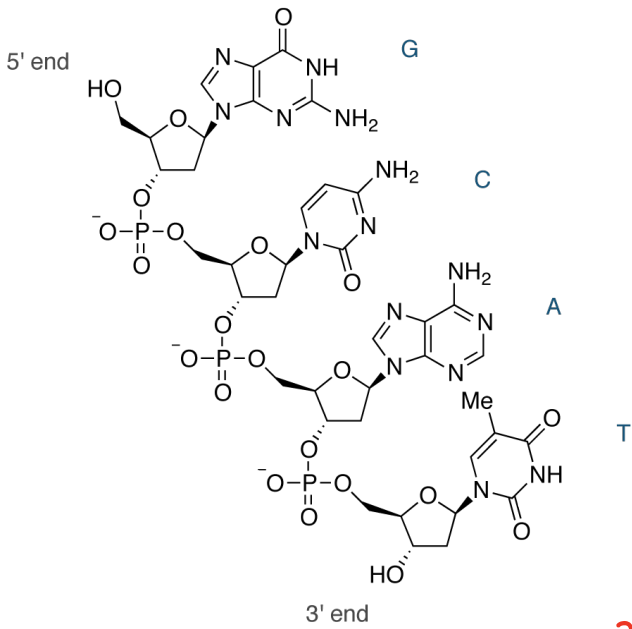




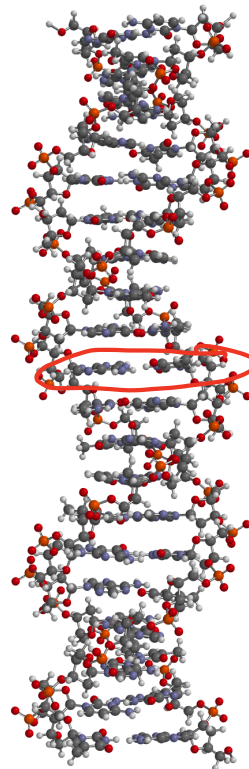
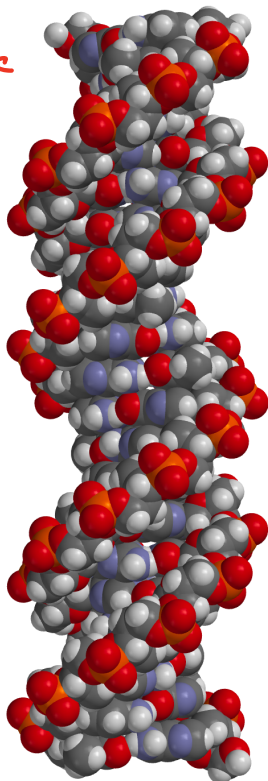
Golden rule: π electrons are more stable when delocalized

The lone pair is delocalized into the aromatic π system! The lone pair needs to be in a $2p$ orbital so N must be sp^2 hybridized

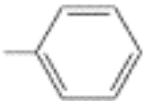
This is critical to DNA and RNA structure: DNA bases are aromatic and the $-\text{NH}_2$ groups on the bases are sp^2 and flat



Lone pair is in an sp^2 orbital and available to make a strong hydrogen bond

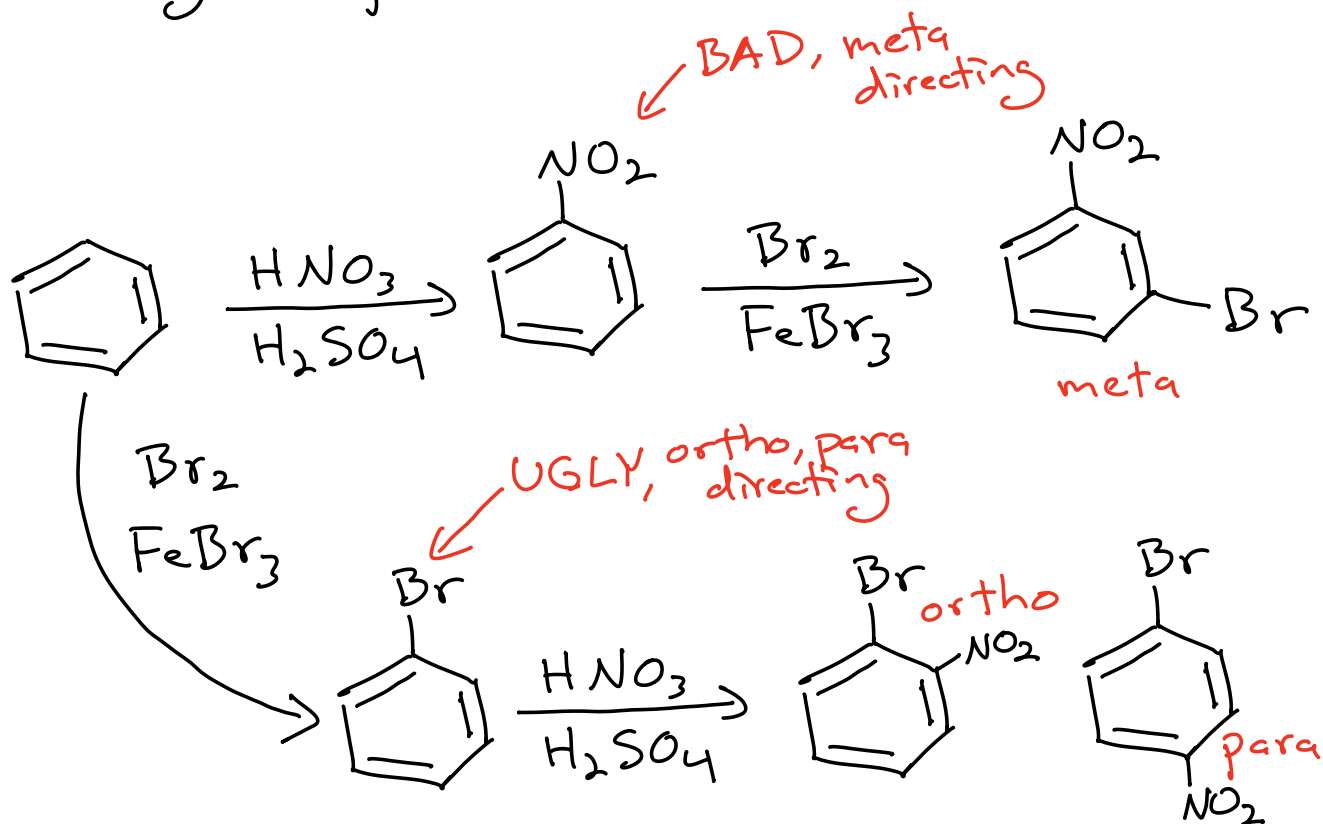


base pairs are flat because N atoms are sp^2

Ortho-Para Directing	Strongly activating	$-\ddot{\text{N}}\text{H}_2$	$-\ddot{\text{N}}\text{HR}$	$-\ddot{\text{N}}\text{R}_2$	$-\ddot{\text{O}}\text{H}$	$-\ddot{\text{O}}\text{R}$		
	Moderately activating	$-\ddot{\text{N}}\text{H}\overset{\text{O}}{\parallel}\text{CR}$	$-\ddot{\text{N}}\text{H}\overset{\text{O}}{\parallel}\text{CAr}$	$-\ddot{\text{O}}\overset{\text{O}}{\parallel}\text{CR}$	$-\ddot{\text{O}}\overset{\text{O}}{\parallel}\text{CAr}$		GOOD	
	Weakly activating	$-\text{R}$					<i>ortho, para directing activating</i>	
	Weakly deactivating	$-\ddot{\text{F}}:$	$-\ddot{\text{Cl}}:$	$-\ddot{\text{Br}}:$	$-\ddot{\text{I}}:$		<i>ortho, para directing deactivating</i>	UGLY
Meta Directing	Moderately deactivating	$-\overset{\text{O}}{\parallel}\text{CH}$	$-\overset{\text{O}}{\parallel}\text{CR}$	$-\overset{\text{O}}{\parallel}\text{COH}$	$-\overset{\text{O}}{\parallel}\text{COR}$	$-\overset{\text{O}}{\parallel}\text{CNH}_2$	$-\overset{\text{O}}{\parallel}\text{SOH}$	$-\text{C}\equiv\text{N}$
	Strongly deactivating	$-\text{NO}_2$	$-\text{NH}_3^+$	$-\text{CF}_3$	$-\text{CCl}_3$		<i>meta directing deactivating</i>	BAD

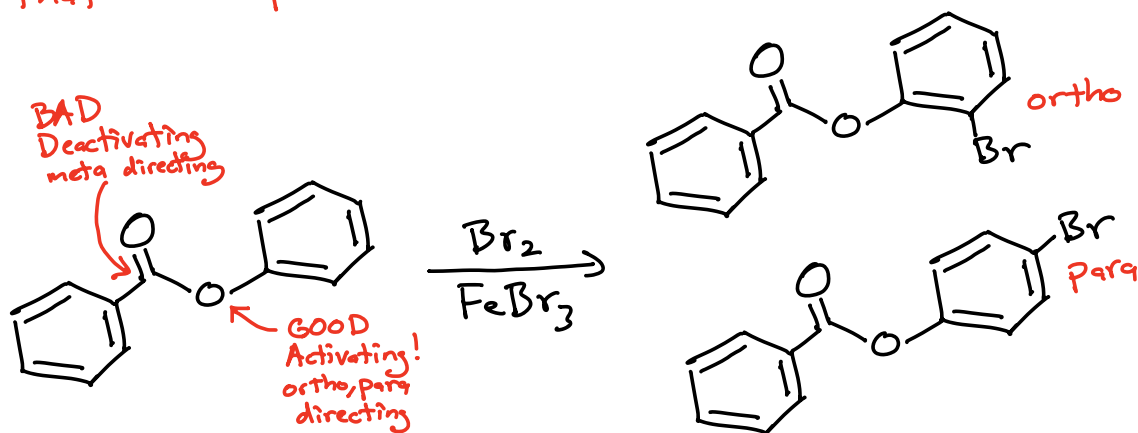
Relative importance in directing further substitution ↑

The order in which you add groups matters!

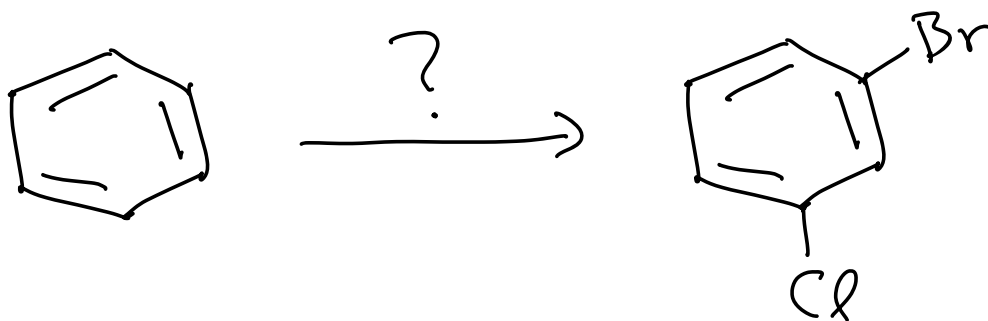


Classic Question → As you can see in

the energy diagrams, the ring with the GOOD group has a lower energy barrier so that is the product we see → ortho, para



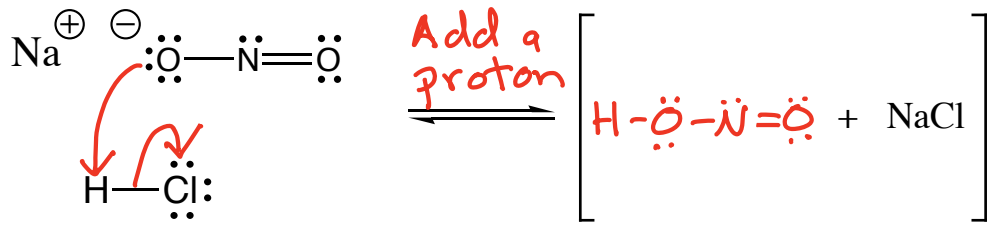
How do we carry out the following synthesis?



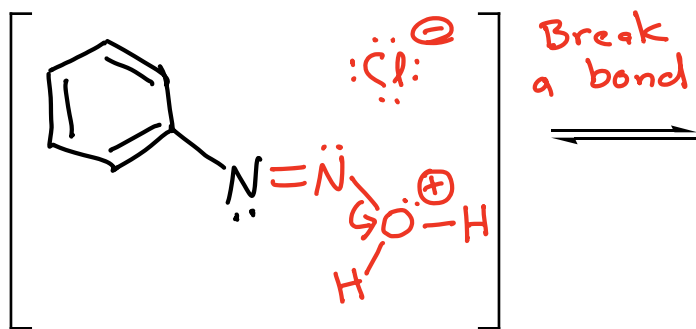
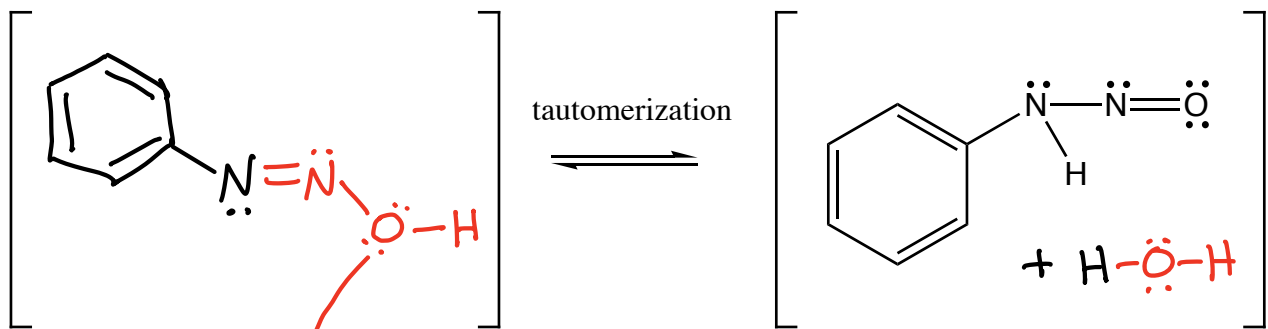
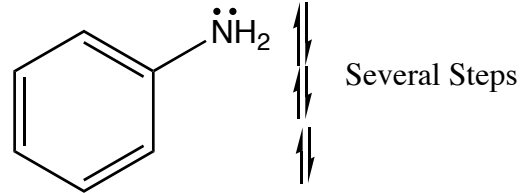
Time to call "Mr. Bill"

Both of these are UGLY so they are ortho,para directing. How do we introduce both of them meta to each other?

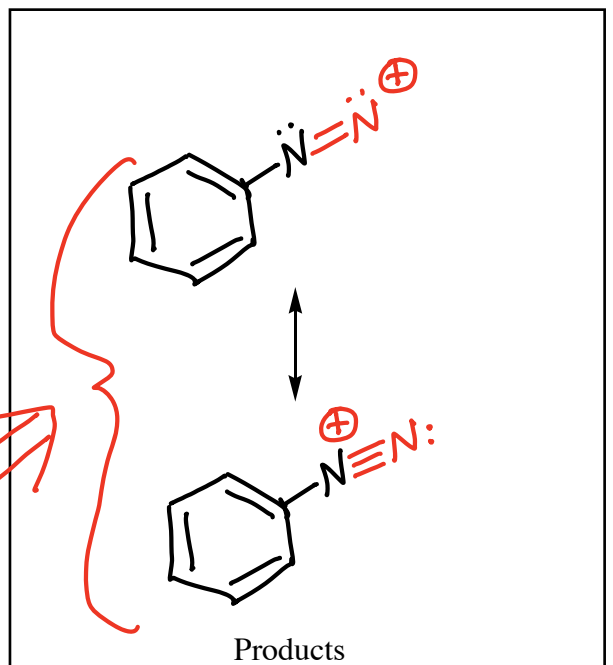
Preparation of Diazoniums, The "Mr. Bill" Reaction



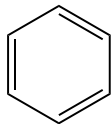
The Mr. Bill reagent



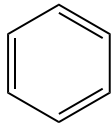
Aryl Diazonium also known as a Diazonium Salt



N_2 leaves and is replaced by a variety of reagents \rightarrow Not responsible for mechanisms



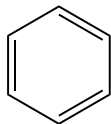
HNO_3
 H_2SO_4



BAD \rightarrow NO_2
meta directing

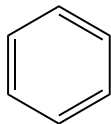
H_2
 Ni^0

New Reaction \leftarrow



GOOD \rightarrow NH_2
ortho, para directing

NaNO_2
 HCl



Diazonium Salt

N_2^+

H_2O

HBF_4

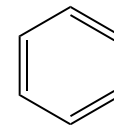
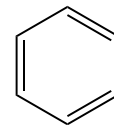
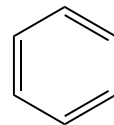
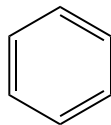
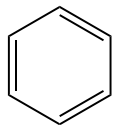
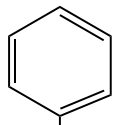
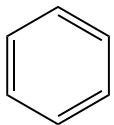
HCl
 CuCl

HBr
 CuBr

KCN
 CuCN

KI

H_3PO_2



OH

F

Cl

Br

CN

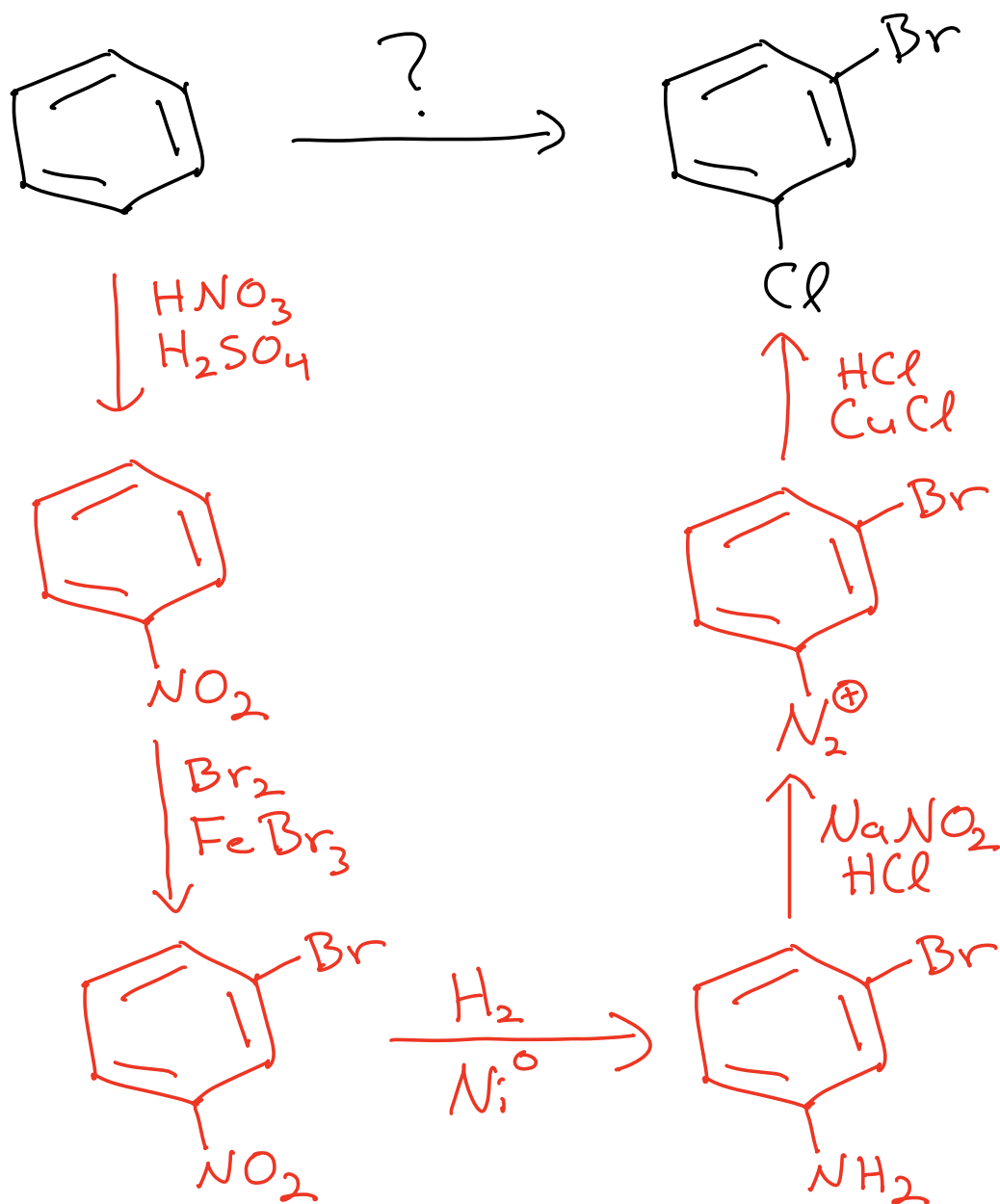
I

H

Sandmeyer Reaction

$+ \text{N}_2$

How do we carry out the following synthesis?



Carbohydrates

pentose

hexose

Monosaccharides → 5 or 6 carbons

and are aldehydes and ketones

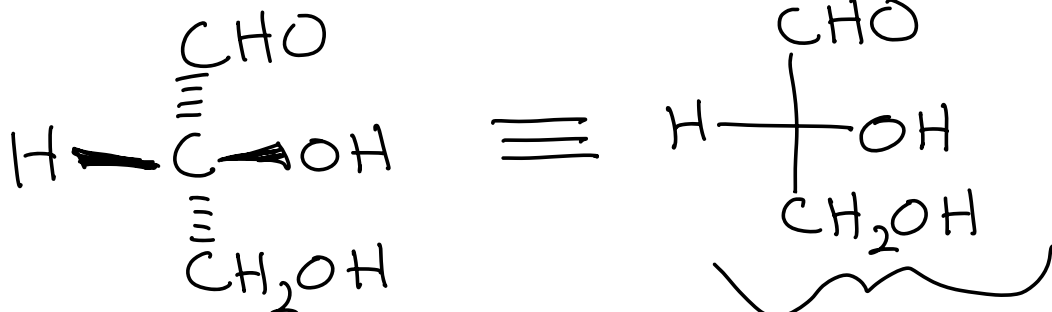
aldose

ketose

Ex.

Glucose is an aldohexose

Stereochemistry



(R)-D-Glyceraldehyde

↗
dextrorotatory
(+)

Called a
Fischer
projection

"Like a Teddy Bear
giving you a hug"

Stereochemistry defines the different carbohydrates

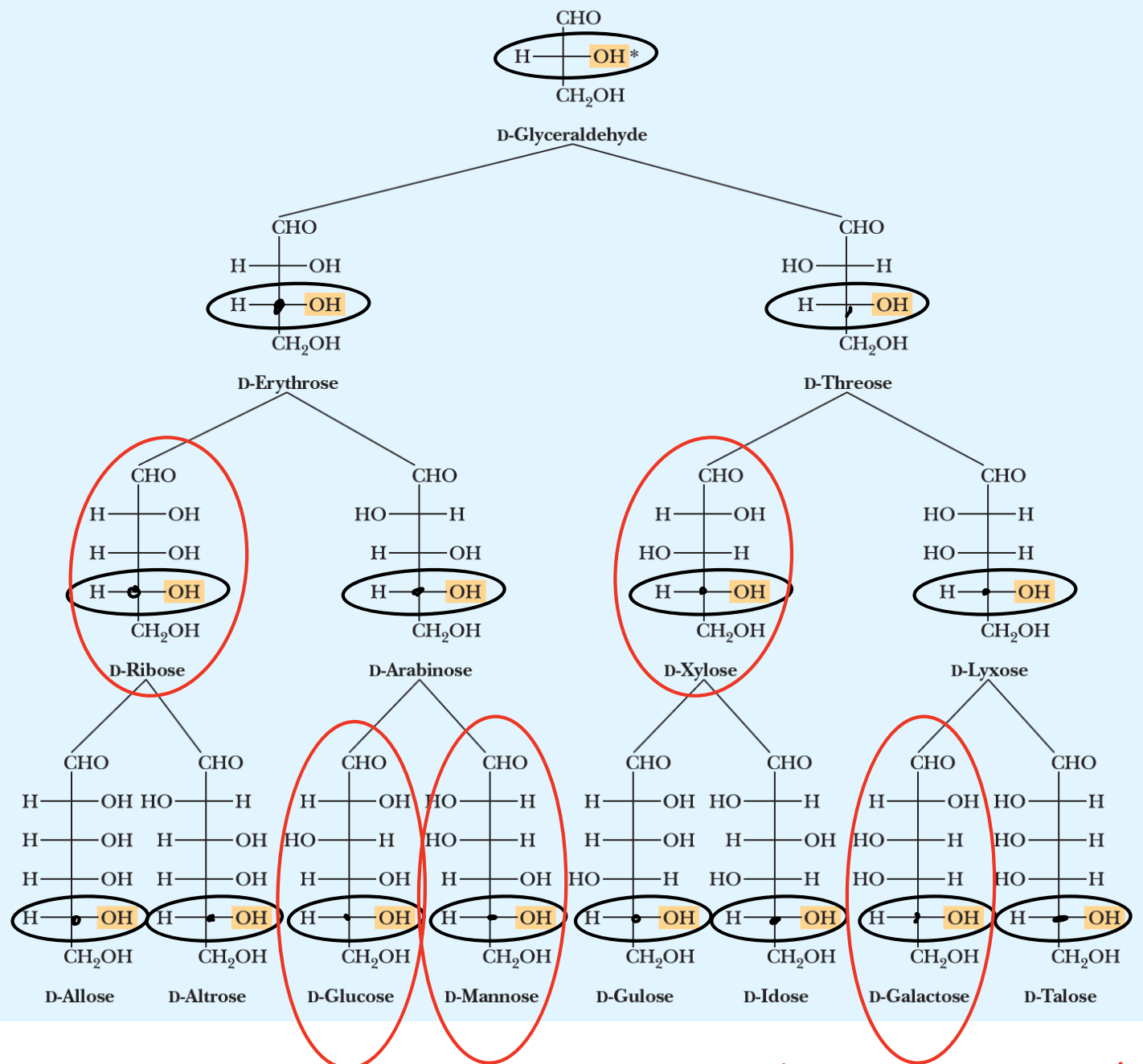
→ Due to the way carbohydrates are synthesized in cells → the common carbohydrates all have the same stereochemistry as D-glyceraldehyde at the carbon farthest from the carbonyl (aldehyde or ketone)

That is why they are called "D" carbohydrates

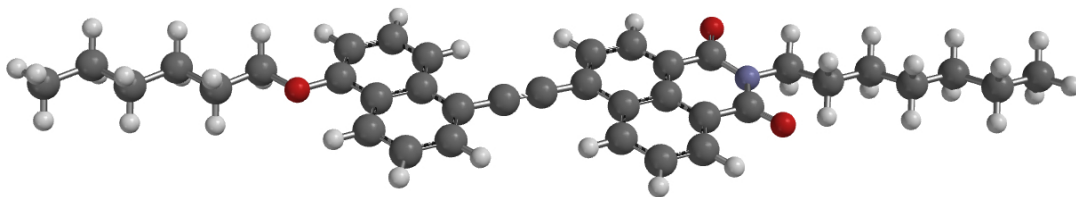
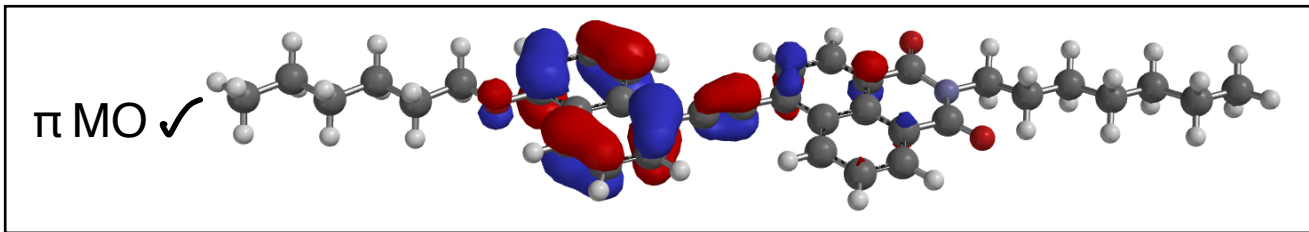
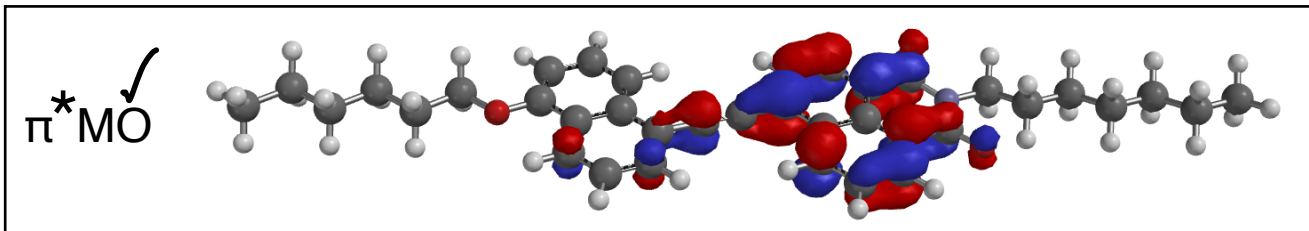
Can I please
have a hug?



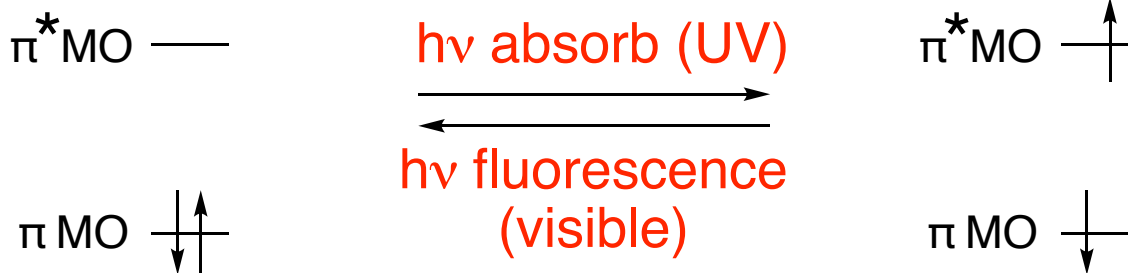
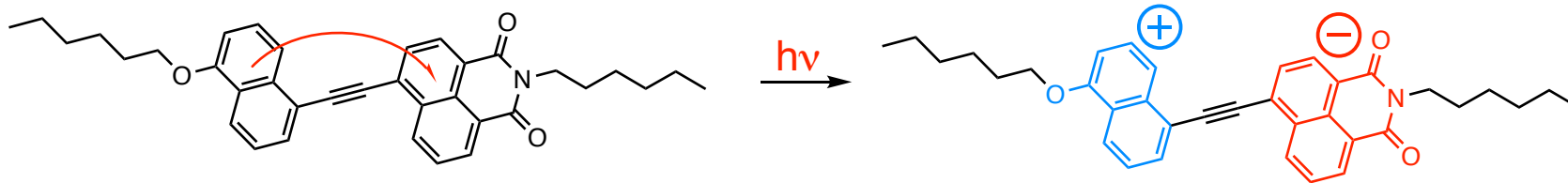
Table 25.1 Configurational Relationships Among the Isomeric D-Aldotetroses, D-Aldopentoses, and D-Aldohexoses

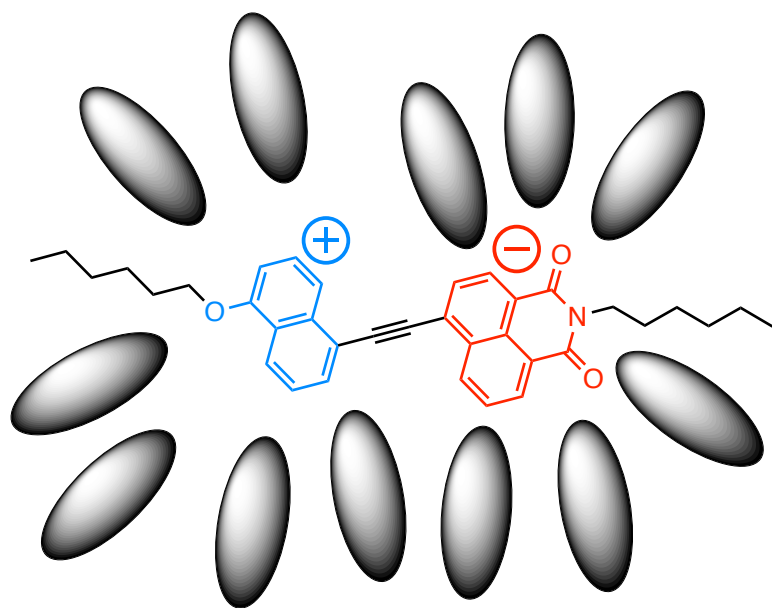


The carbohydrates circled in red are the most common.



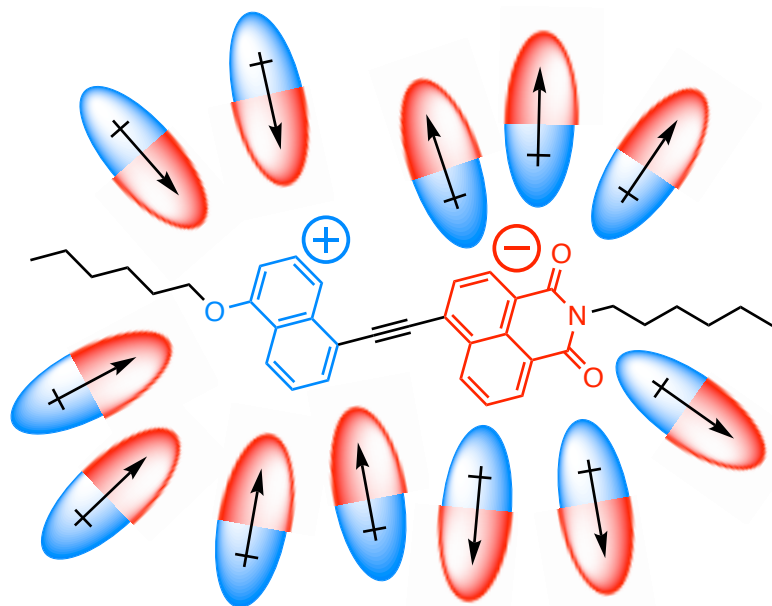
Blue Light = higher energy
Orange light = lower energy





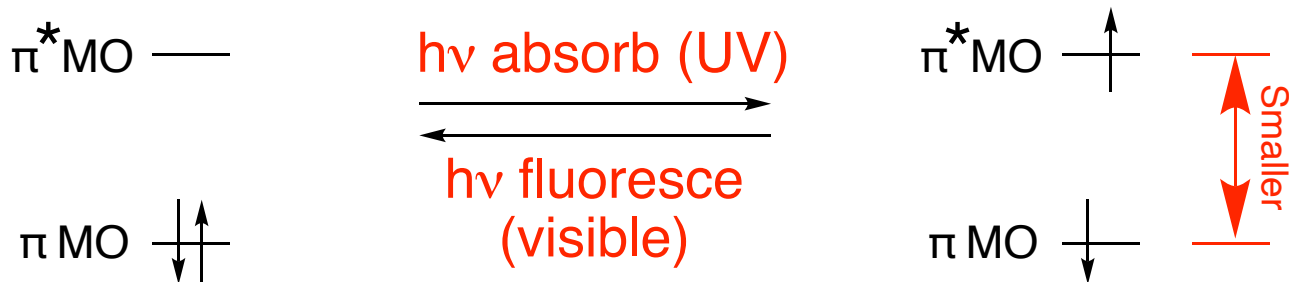
Non-polar Solvent Molecule

No stabilization of the
charged excited state

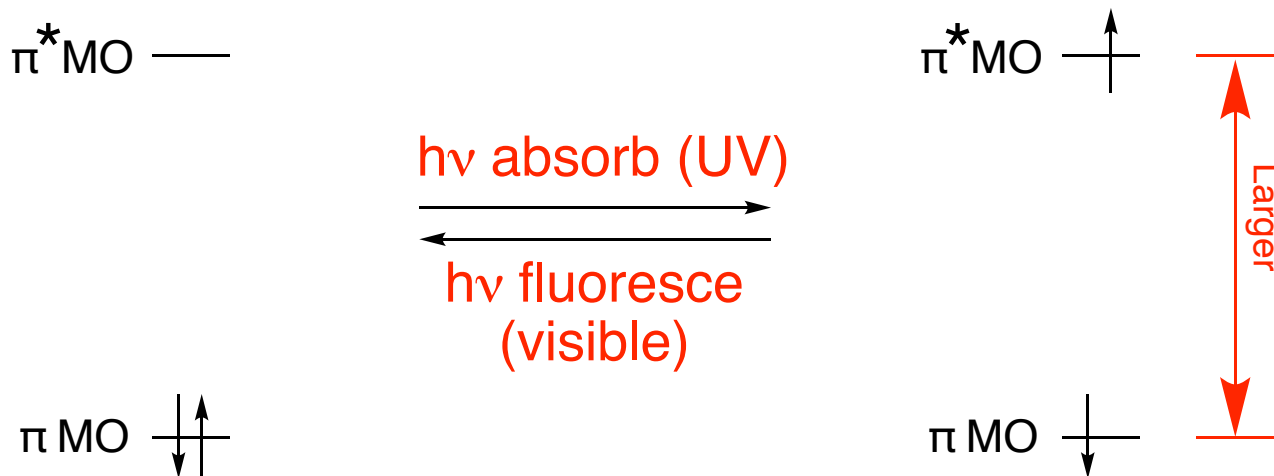


Polar Solvent Molecule

Stabilization of the
charged excited state



Polar Solvent - the charged excited state is well solvated because the solvent molecules have a relatively large molecular dipole that interacts favorably with the charges. There is a smaller energy difference between the ground state and excited state, corresponding to **orange light**



Non-polar Solvent - the charged excited state is disfavored because it is not well-solvated. There is no molecular dipole in the solvent to interact favorably with the charges. This makes the charged excited state higher in energy. There is a larger energy difference between the ground state and excited state, corresponding to **blue light**

Answer
to the
quiz
question



Solvent polarity →

