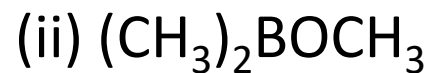
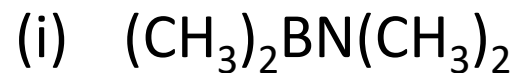


*Q. Two resonance forms can be written for each of the following structures:*



(A) Write the resonance structures

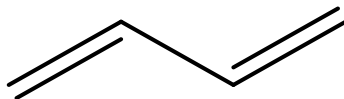
(B) Which forms in each pair of resonance forms is more important?

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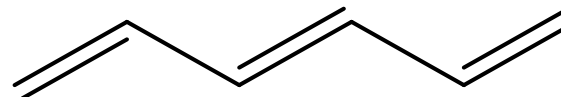
## Effect of Conjugation on the $\pi$ -MOs



**Ethylene**

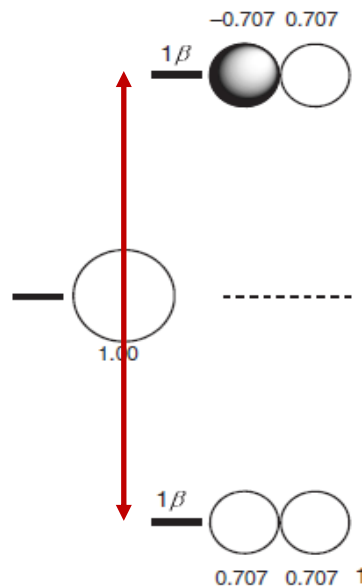


**Butadiene**



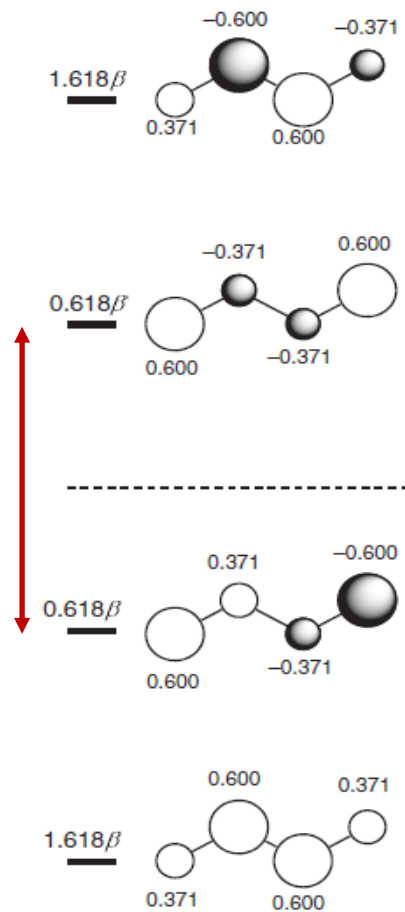
**Hexatriene**

- ✓ We have discussed the bonding in ethylene and butadiene
- ✓ As we keep on increasing the number of double bonds in conjugation, what kind of changes do we observe on the  $\pi$ -MOs (especially HOMO and LUMO)?



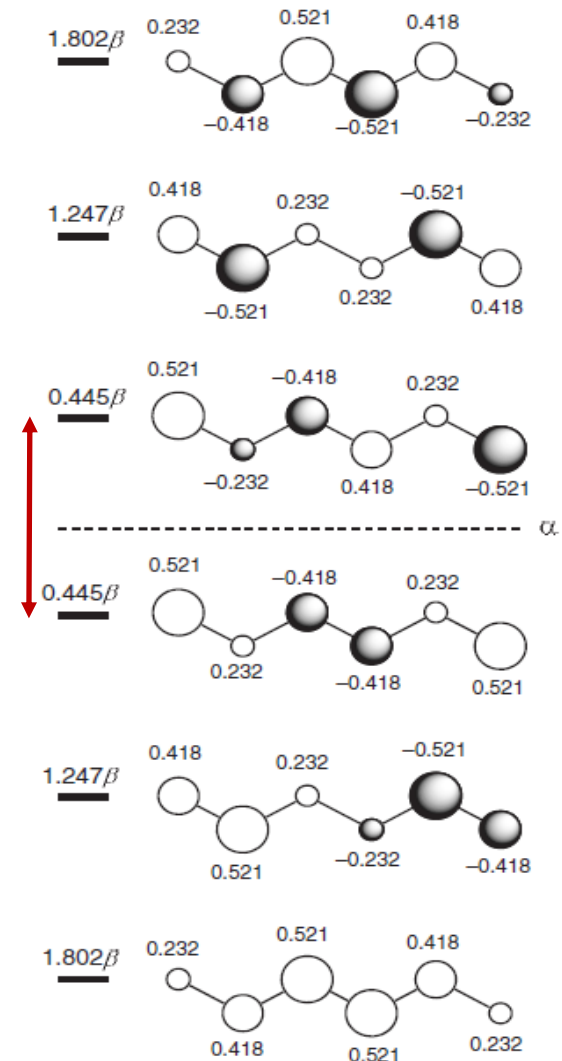
Ethylene

HOMO-LUMO gap:  $2\beta$



Butadiene

$1.236\beta$



Hexatriene

$0.89\beta$

✓ In which case the  $\pi$ -electrons are more stabilized: ethylene or butadiene?

✓ Ans. Butadiene

Stabilization energy (per  $\pi$  electron): ethylene  $1\beta$ ; butadiene:  $1.118\beta$

✓ Who is more electrophilic? ethylene or butadiene?

✓ Ans. Butadiene

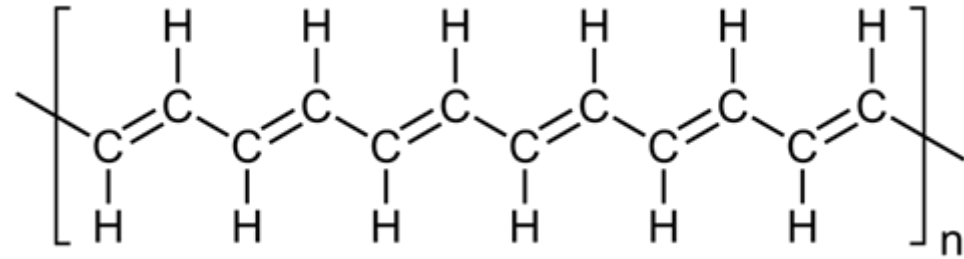
Butadiene LUMO is lower in energy than the ethylene LUMO

✓ Who is more nucleophilic? ethylene or butadiene?

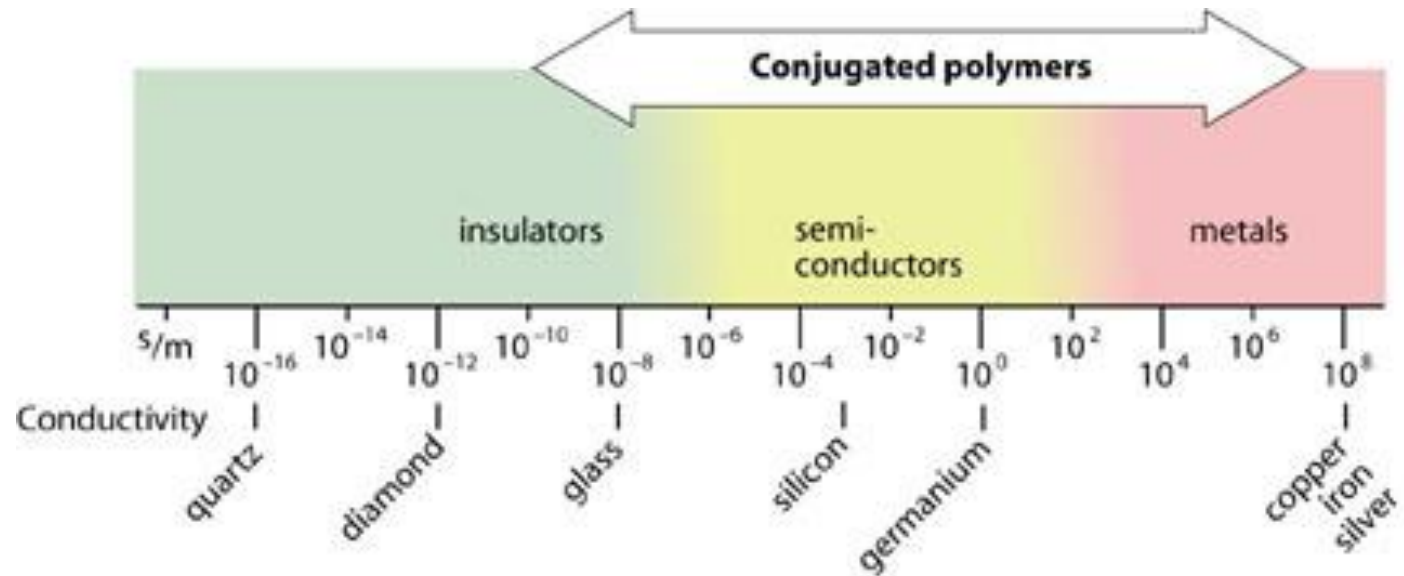
✓ Ans. Butadiene

Butadiene HOMO is higher in energy than the ethylene HOMO

# Conducting Polymers



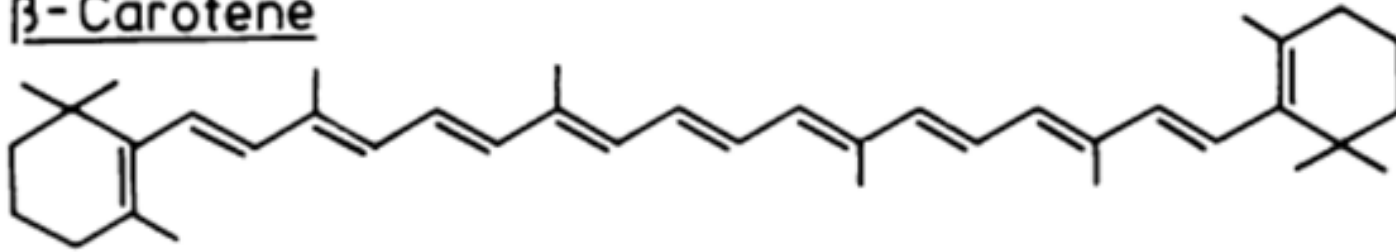
## Polyacetylene



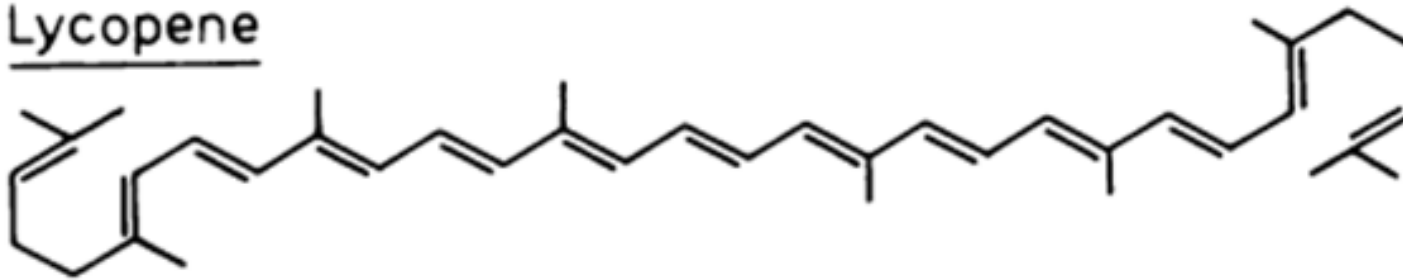
## *Delocalization and Conjugation*

- An increase in the number of double bonds in conjugation leads to decrease in HOMO-LUMO gap

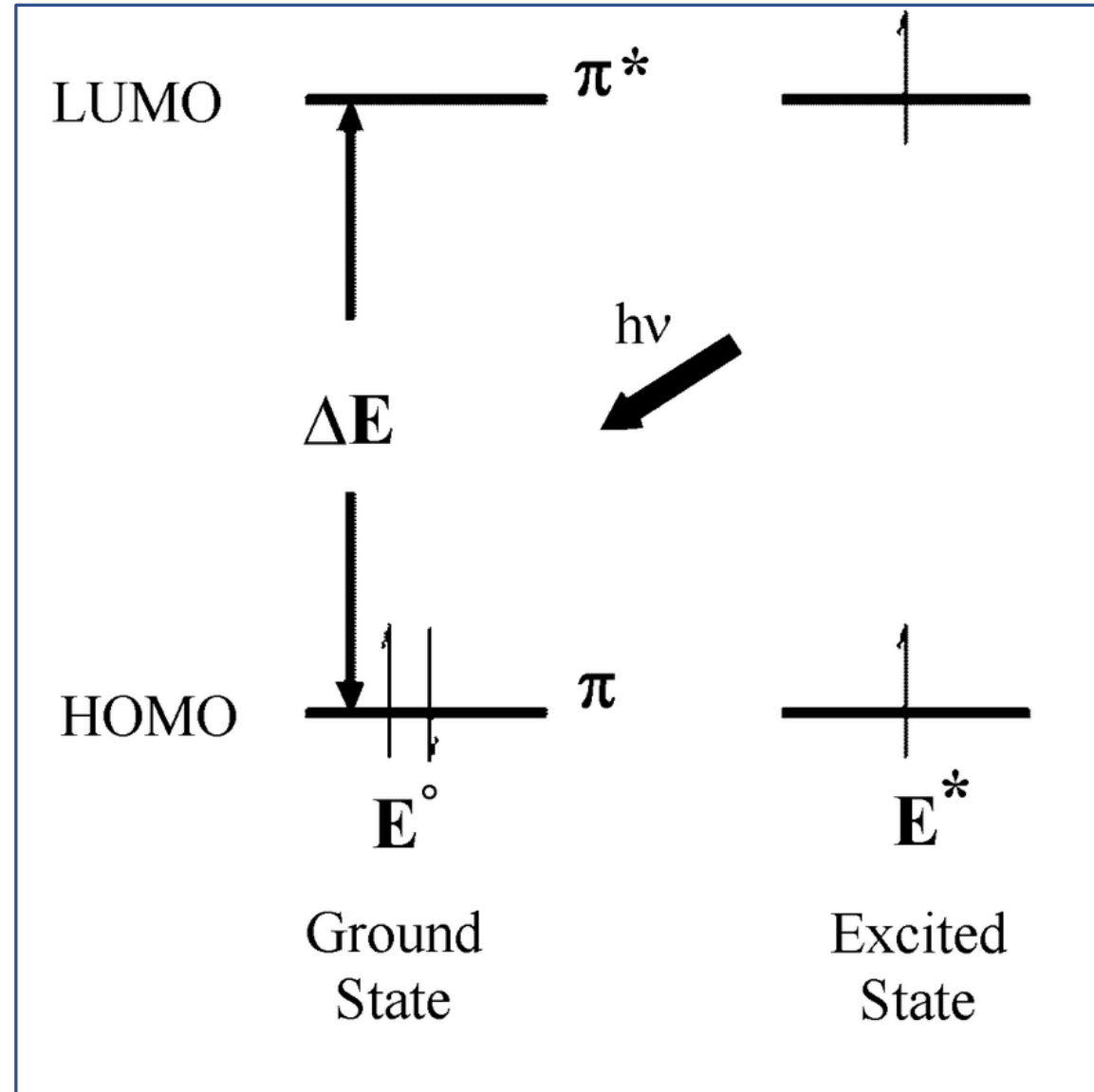
$\beta$ -Carotene



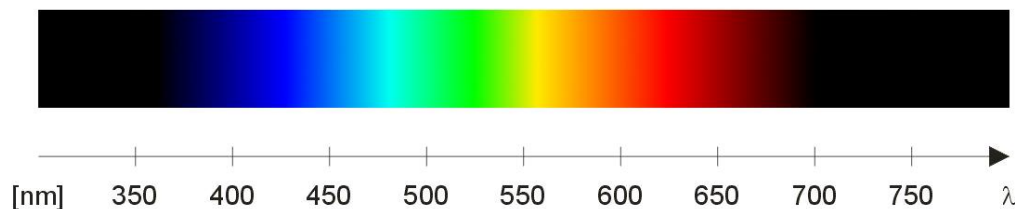
Lycopene



✓ Irradiation of light results in the excitation of an electron from HOMO to LUMO

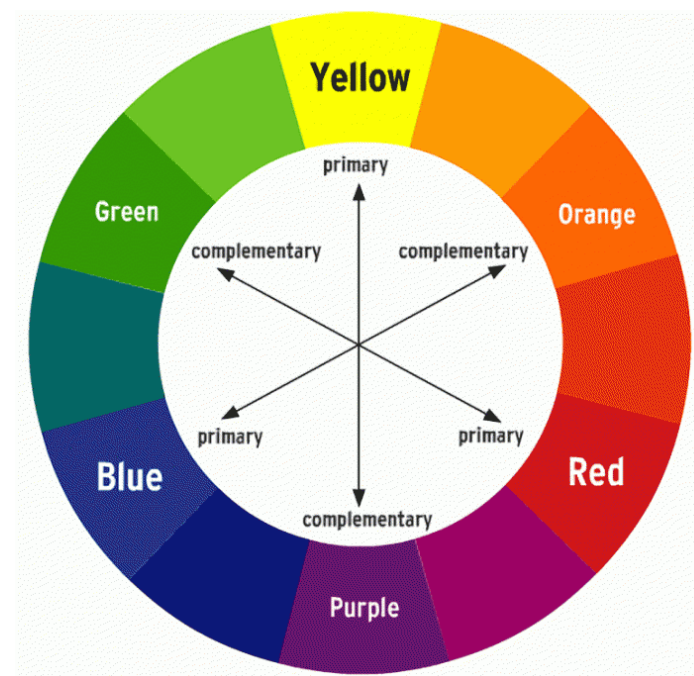


✓ The color is originated only when the number of double bonds in conjugation is 8 or more



### Approximate wavelengths for different colours

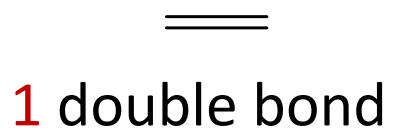
Absorbed frequency, nm	Colour absorbed	Colour transmitted	$R(\text{CH}=\text{CH})_n\text{R}, n =$
200–400	ultraviolet	—	< 8
400	violet	yellow-green	8
425	indigo-blue	yellow	9
450	blue	orange	10
490	blue-green	red	11
510	green	purple	
530	yellow-green	violet	
550	yellow	indigo-blue	
590	orange	blue	
640	red	blue-green	



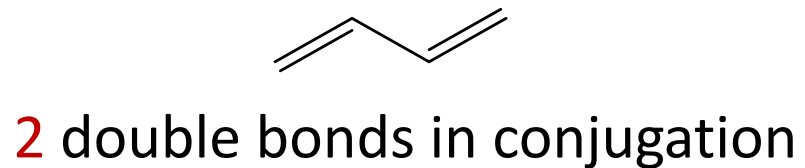
Color Wheel



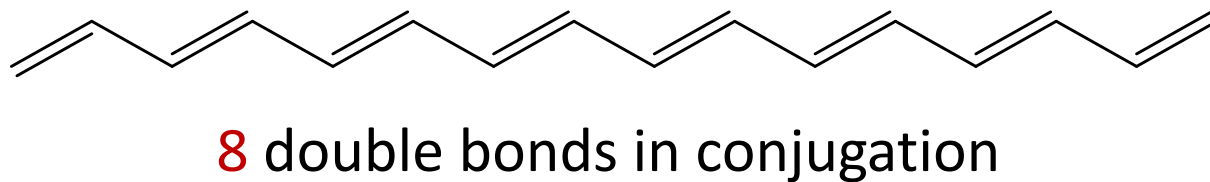
## Absorption



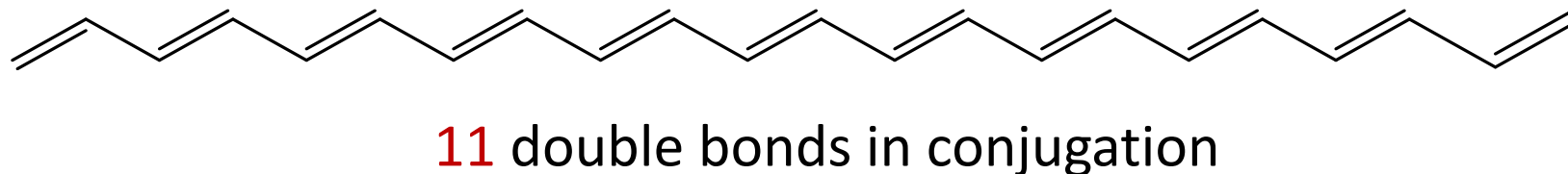
185 nm



215 nm



400 nm



490 nm