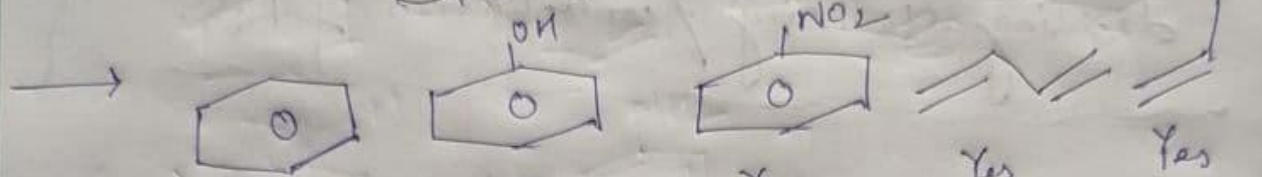


Lecture → 9

Resonance Effect  
or

Date → 24/08/2011

Mesomeric Effect



Resonance

Yes

Yes

Yes

Yes

Yes

Resonance effect

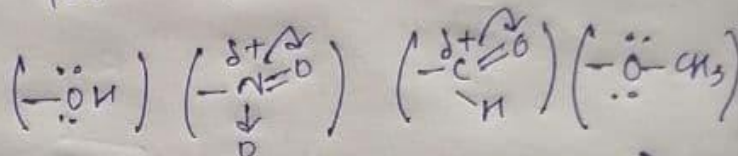
No

Yes

Yes

Yes

Yes



Donating      Withdrawing      Withdrawing      Donating

(+R effect)      (-R effect)      (-R effect)      (+R effect)

(+m effect)      (-m effect)      (-m effect)      (+m effect)

Note: (i) Permanent effect.

(ii) Strong Effect.

(iii) Distance independent effect. of a conjugated system

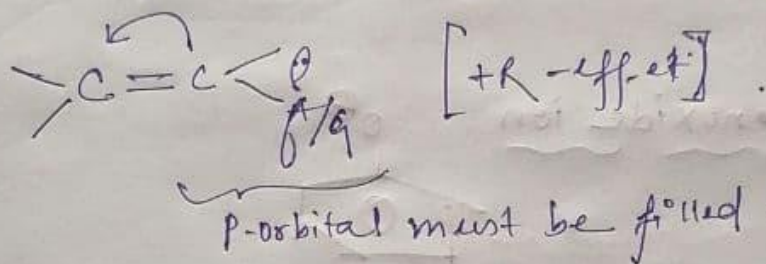
(iv) (Polarisation in  $\pi$ -e density due to p-orbital of attached group.)

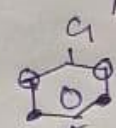
↑  
Definition of Resonance effect / mesomeric effect.

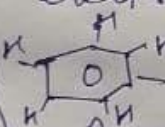


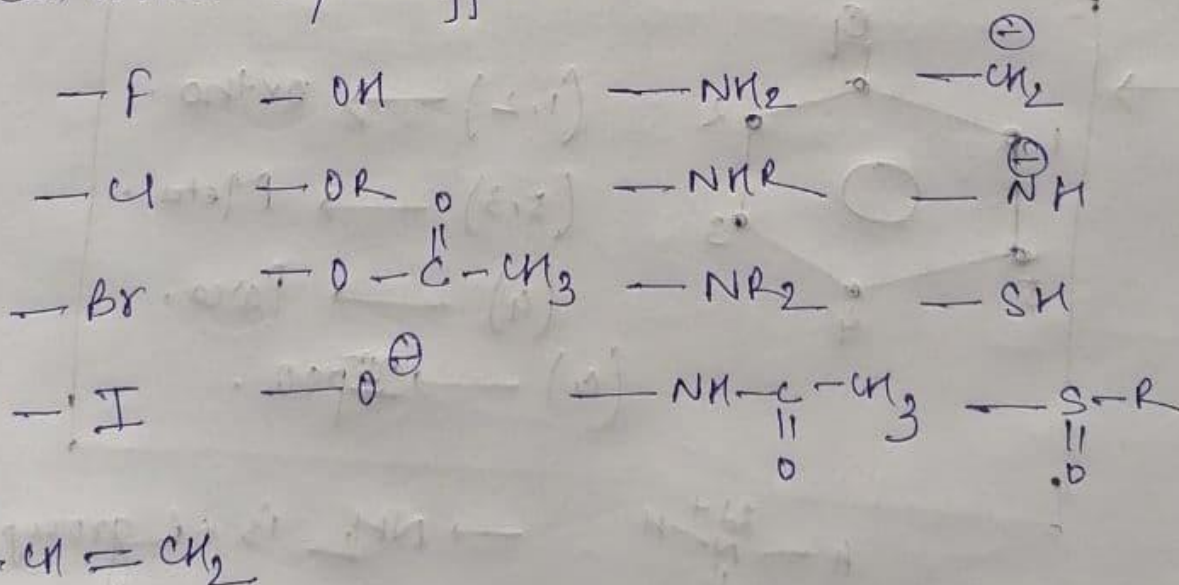
(iv) There are two types of R effect:-

(a) +R-effect:- Permanent polarisation in  $\pi$  e- density of a conjugated system away to attached atom/group due to its p-orbital is known as +R/+m effect of that atom/group.



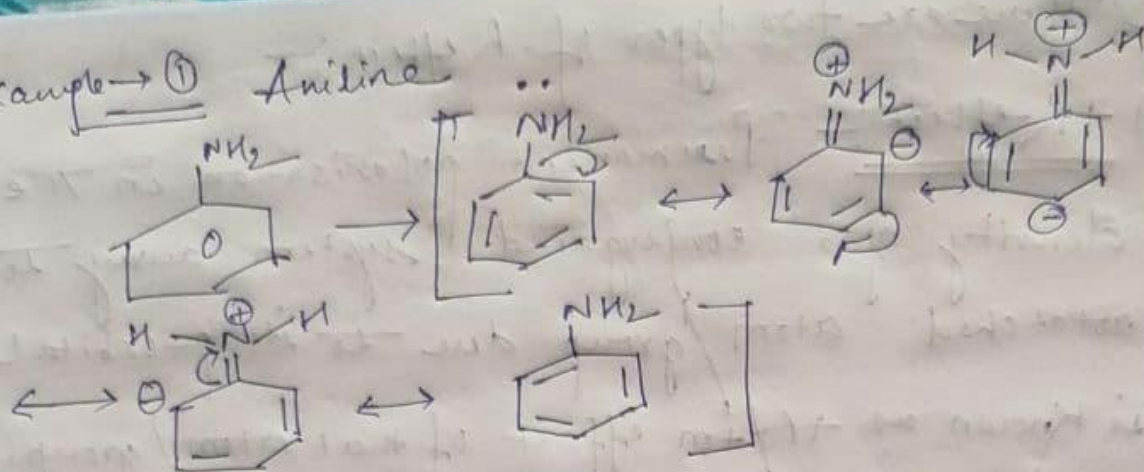
Note (i) for +R/+m effect A/G must have electron density. (ii)  all are diff. positions

(ii)  all sides are identical. (iii) atoms/groups which can show +R/+m effect.

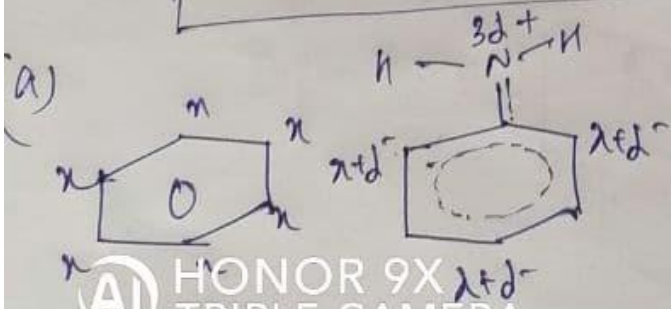
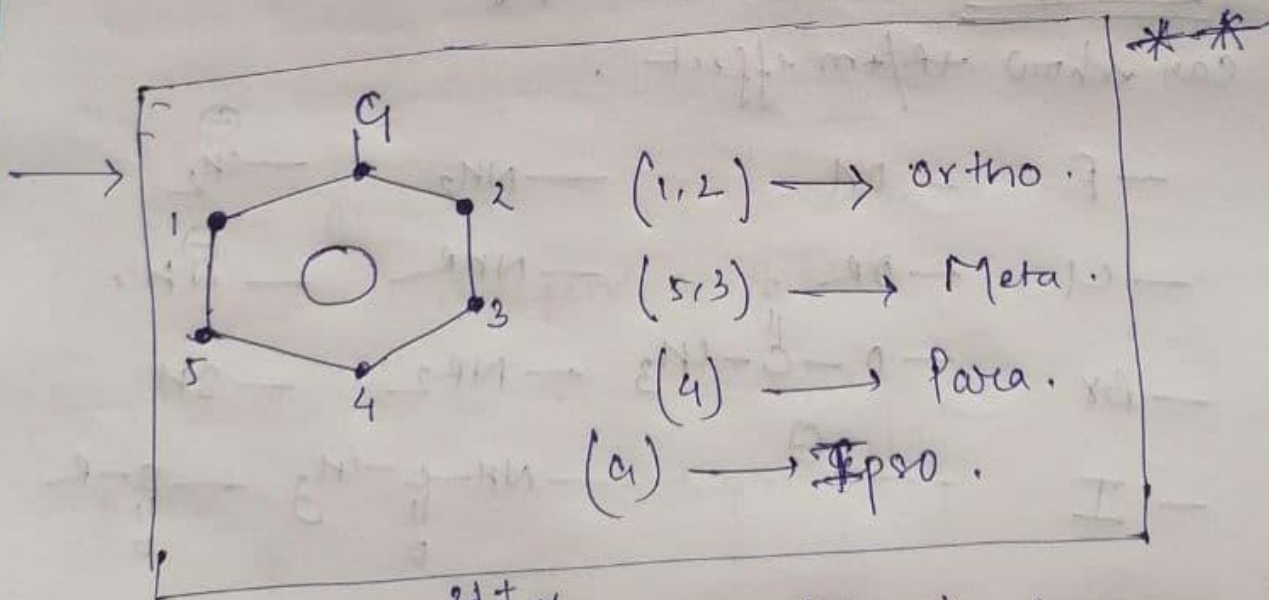
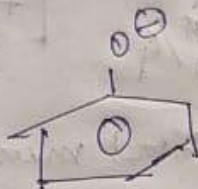




Example  $\rightarrow$  ① Aniline

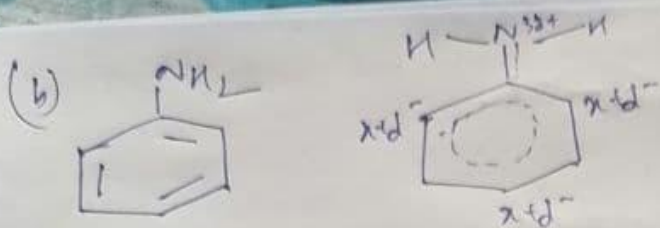


~~Ex~~  $\rightarrow$  Phenoxide ion



$\rightarrow \text{NH}_2$  is +R group  
Electron donating. We  
can consider Benzene as  
Reference.



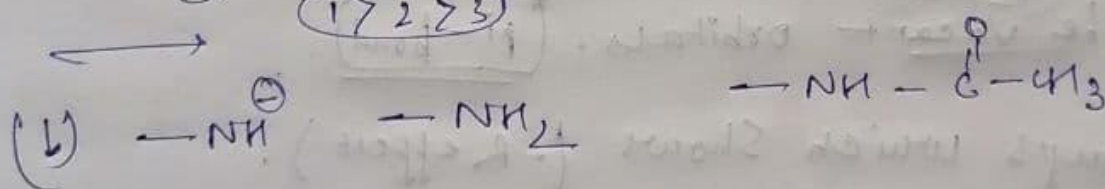
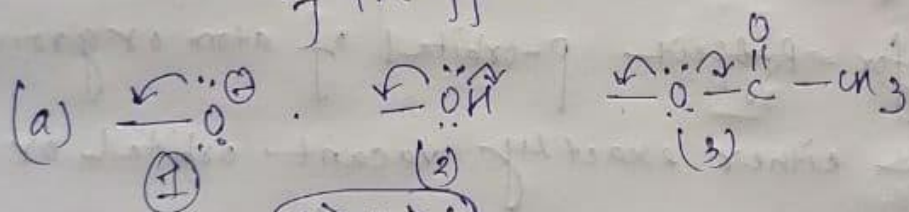


[most contributing RS]

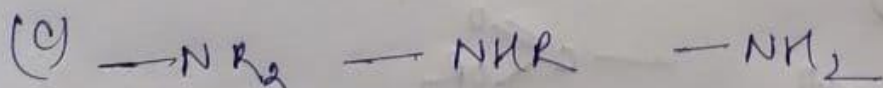
→ +R effect is a electron donating effect.

→ +R effect increases  $\pi e^-$  density at its Ortho and Para positions and hence +R groups/atoms

Ex-3 :- Arrange following in decreasing order of +R effect.

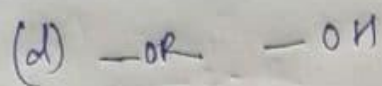


→



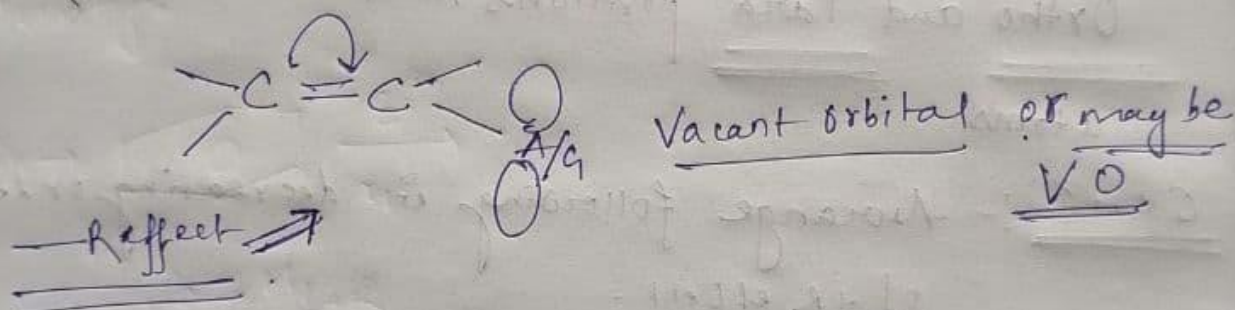
→





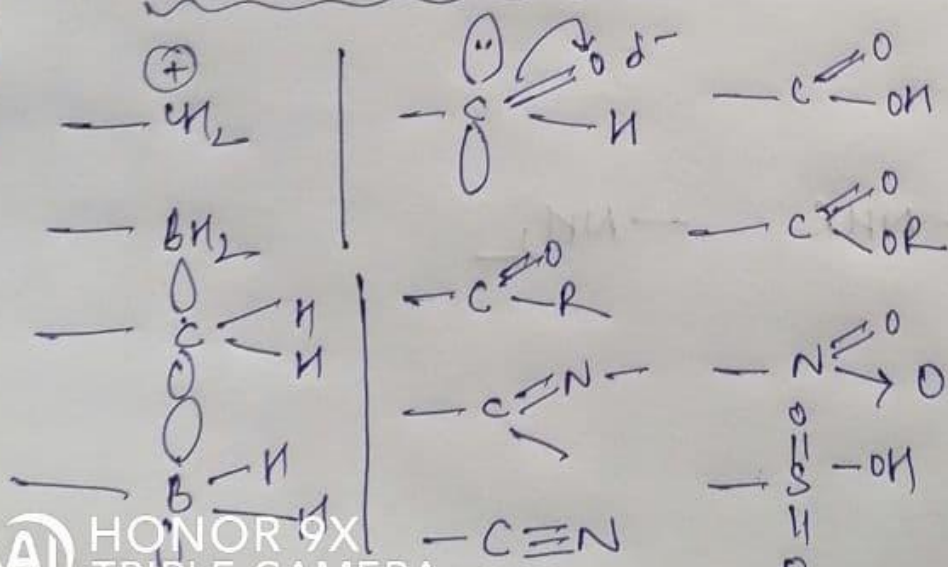
$\rightarrow$

# -R-effect: Permanent polarisation of  $\pi$  electrons of a conjugated system towards the attached atom/group due to its p-orbital is known as -R effect / m effect of that atom/group.



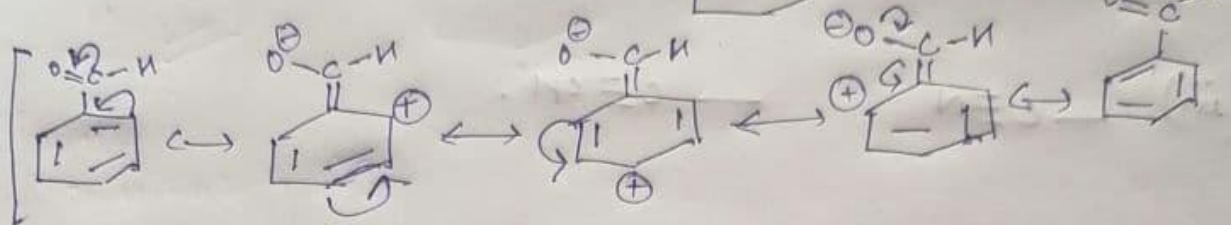
Note: (i) for -R effect p-orbital of atom or group must have either exactly vacant orbital or may be vacant orbitals. ( $\pi$ -bond)

(ii) Groups which Show (-R effect).

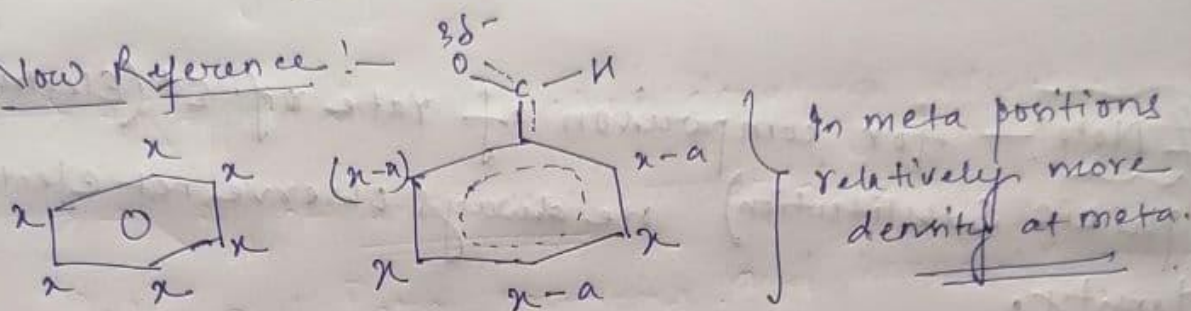




Ex → 1! - Benzaldehyde! -



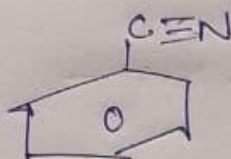
Now Reference! -



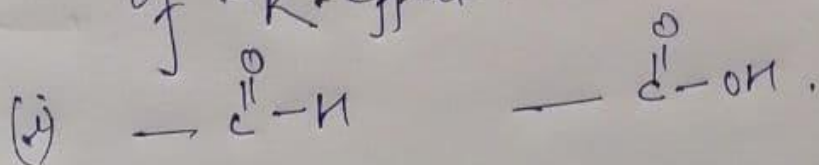
Note! - (i) -R-effect is electron withdrawing effect.

(ii) -R effect mainly withdraw electrons from ortho and para position and hence meta directing for  $E^+$  (Electrophile).  
Electron loving

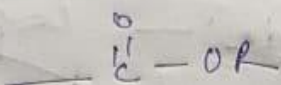
Example! - Benzonitrile



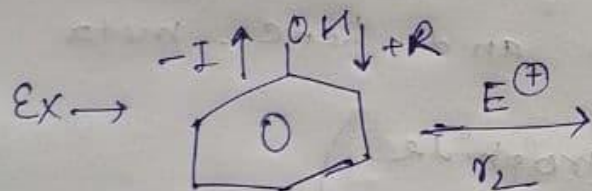
Ex → Arrange following in decreasing order of -R-effect.







#Note:— for comparison of rate of  $E^+$  (Electrophilic Substitution) we always observe net electron density.



$\therefore \underline{\underline{r_2 > r_1}}$