Today

The affect of substituents on EAS
Activators, deactivators and o,p vs m Directors
Section 18.12, 18.13

Next Class

The affect of substituents on EAS
Activators, deactivators and *o*,*p* vs *m* Directors
Section 18.12, 18.13

Second Class from Today

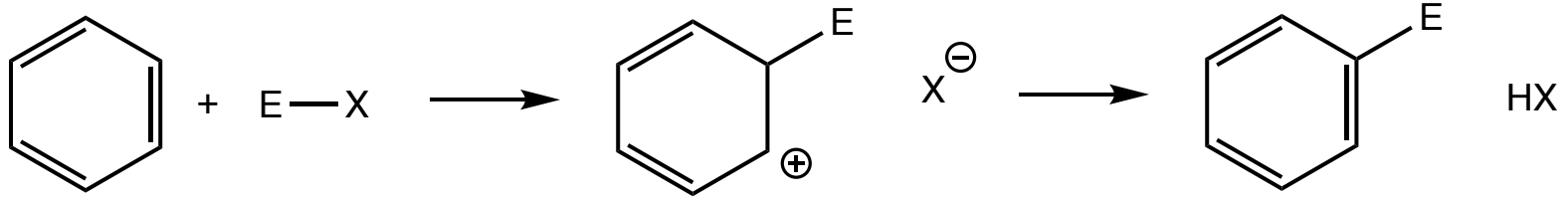
The affect of substituents on EAS:
Activators, deactivators and *o*,*p* vs *m*
Directors
Section 18.12, 18.13

Please hand in reworked test 3 at the final on May 5

Reminder: final is on May 5 from 8:00 to 10:00

Activating and Deactivating a Benzene Ring toward EAS

Section 18.12



Increase election density to make the benzene ring more reactive toward electrophiles

Stabilize the intermediate to make the reaction go faster

Move Electron Density Around Using....

electronegativity ... electropositivity and the inductive effect

(attract e^- density in a bond to themselves

withdraw e^- density

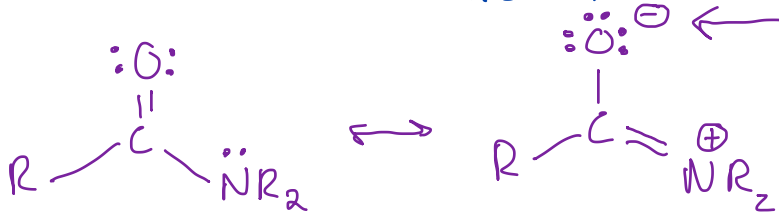
lose e^- density to other atom in bond

donate e^- density

σ e^- withdrawing

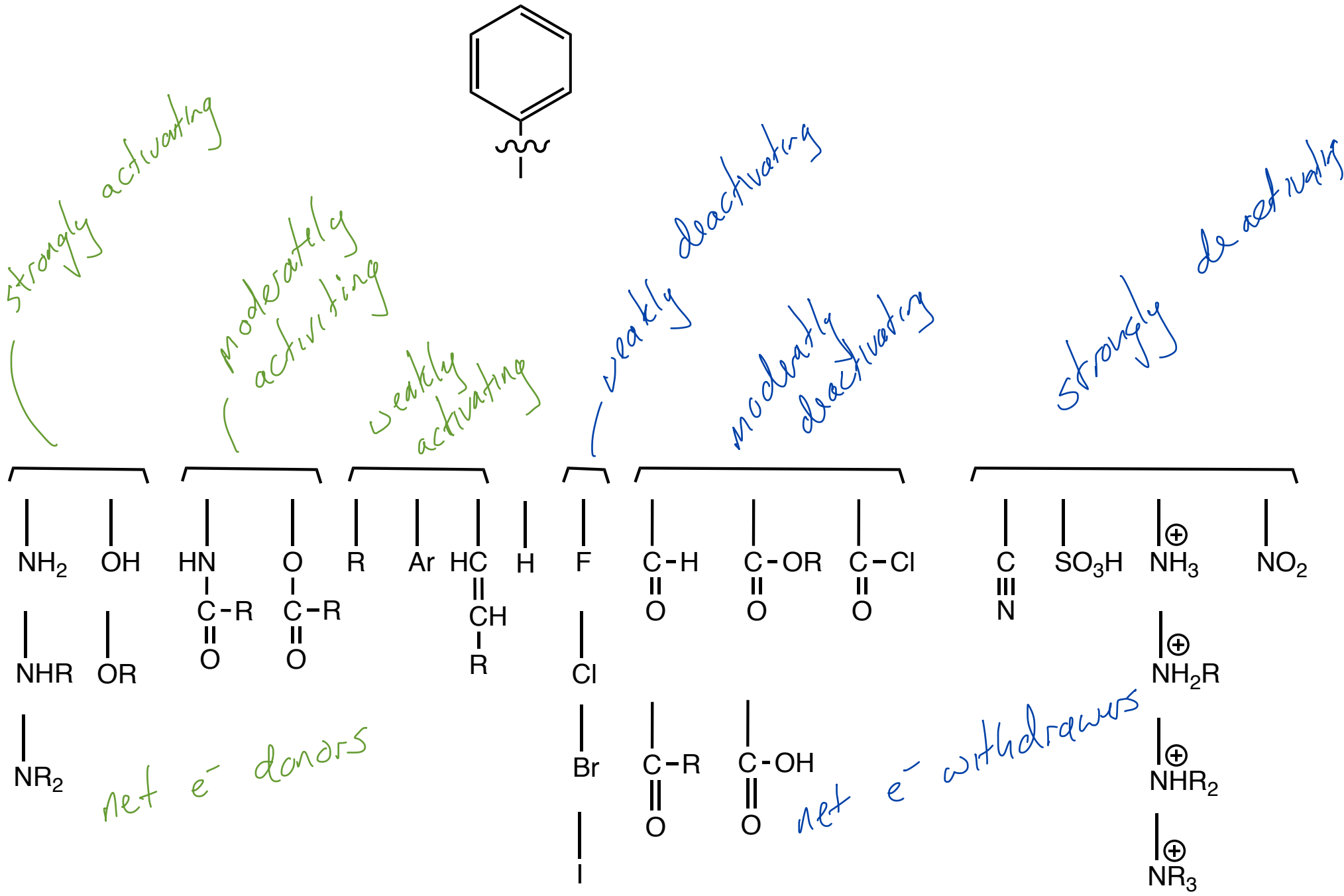
σ e^- donation

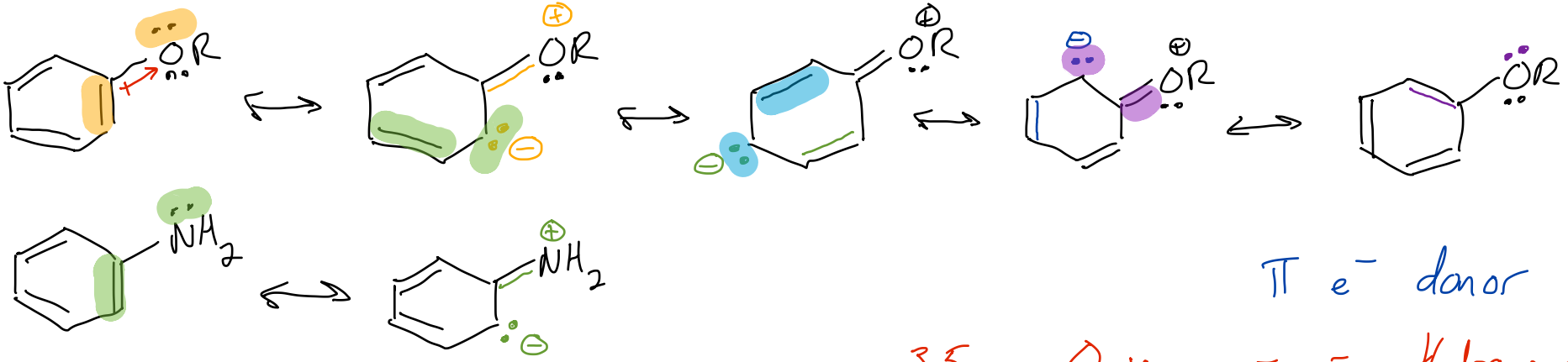
electron delocalization ... resonance contributors



π e^- donation made the O more e^- rich

π e^- withdrawal made the N less e^- rich


strongly activating
moderately activating
weakly activating
weakly deactivating
moderately deactivating
strongly deactivating
NH2
OH
NHR
OR
NR2
HN
C-R
O
O
C-R
O
R
Ar
HC
CH
R
H
F
Cl
Br
I
C-H
O
C-OR
O
C-Cl
O
C-R
O
C-OH
O
C
N
SO3H
NH3
NO2
NH2R
NHR2
NR3
net e- donors
net e- withdrawers

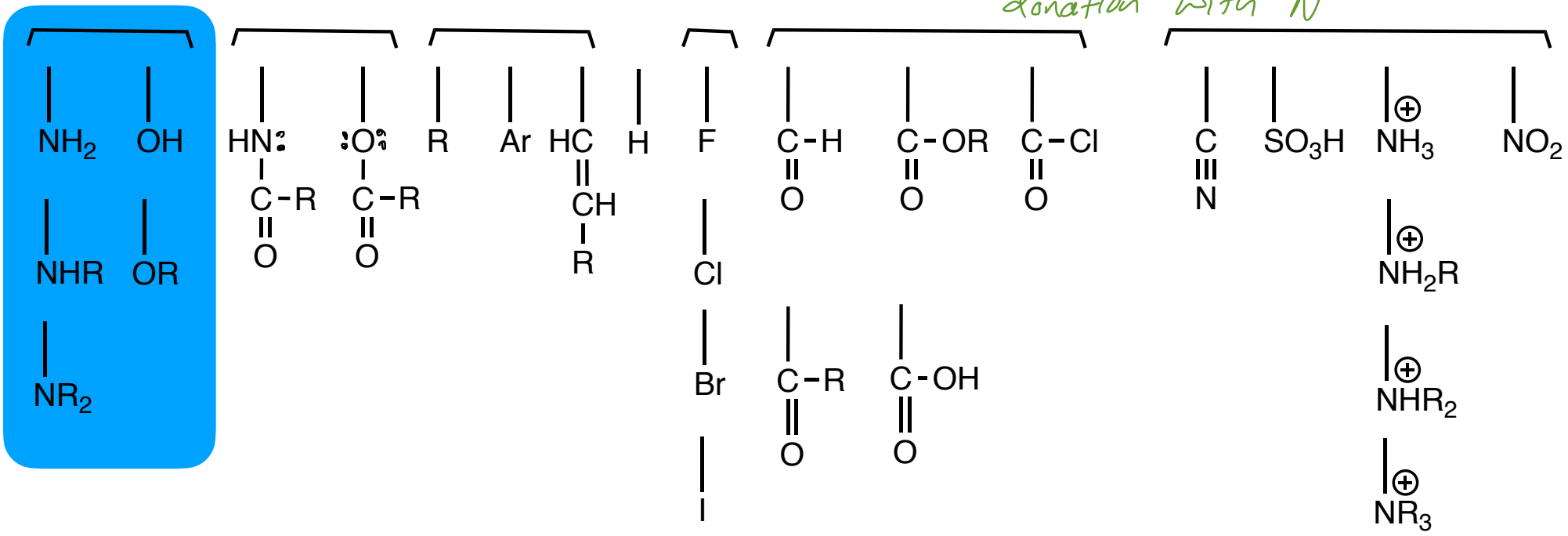


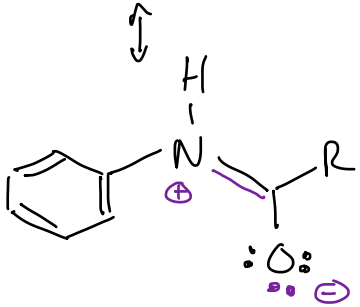
π e⁻ donor

3.5 O is a σ e⁻ withdrawer

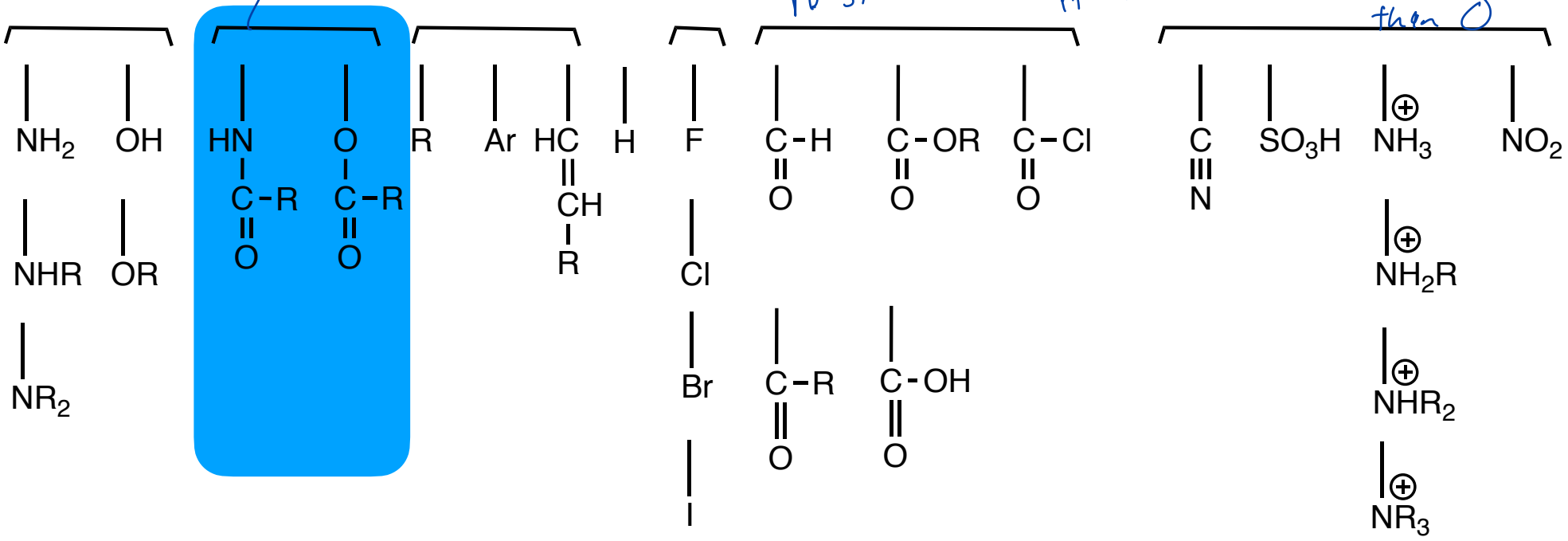
3.0 N is a weaker σ e⁻ withdrawer

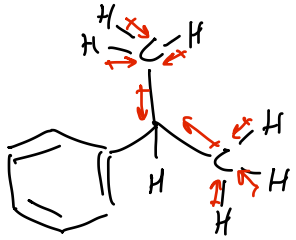
so net there is more e⁻ donation with N





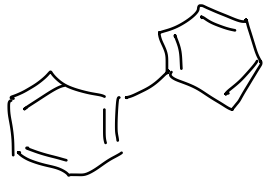
still the same trend...
N + O are π donors but not quite as good as before because the C=O is withdrawing some e⁻ density from N+O.
N still a better net donor because it is less eneg (less σ e⁻ withdrawing) than O





σ e⁻ donor

we will also see that they can stabilize the intermediate



σ⁻ e⁻ donor

π e⁻ donation + withdrawing ability cancels out

can stabilize the intermediate