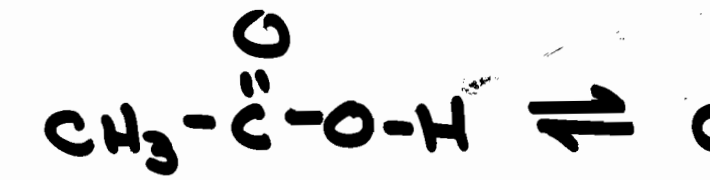
ELECTRONIC EFFECTS.

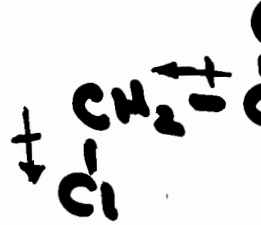
- EFFECT OF GROUPS ON STABILITY, OF ANIONS, CATIONS, RADICALS.

FOR EXAMPLE



$pK_a \approx 4.8$

IF WE REPLACED ONE H BY AN ELECTRONEGATIVE GROUP.

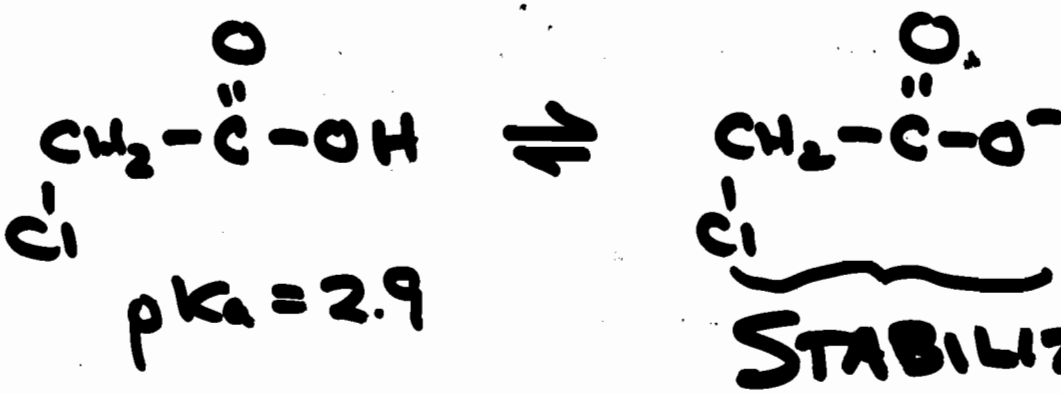


- ELECTRONEG. GROUP IS PULLING ELECTRON DENSITY FROM THE ADJACENT CARBON

- THAT CARBON IS ∴ A BIT e^- DEFICIENT, SO IT PULLS e^- DENSITY FROM CARBON ATTACHED

ULTIMATELY, THAT O^- IS HAVING ITS "−" CHARGE RELIEVED A BIT

- THAT IS STABILIZING



OCCURS THROUGH σ BONDS

CALLED INDUCTIVE (THROUGH BOND) EFFECT -I

↑ WITHDRAWING e^- DENSITY INDUCTIVELY

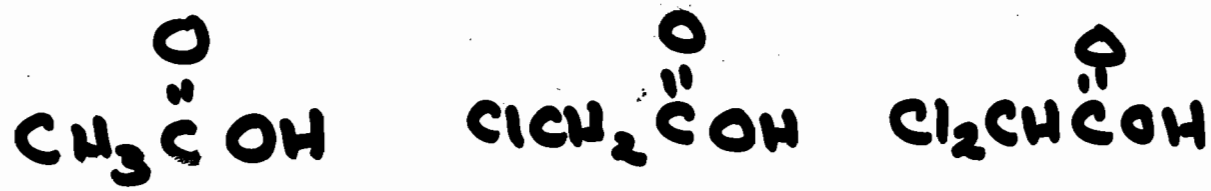
-I GROUPS F, Cl, OH, NH_2

STABILIZE ANIONS.

DESTABILIZE CATIONS.

(+I GROUPS ALKYL GROUPS $-CH_3$; CH_2CH_3)

↳ DONATING INDUCTIVELY.

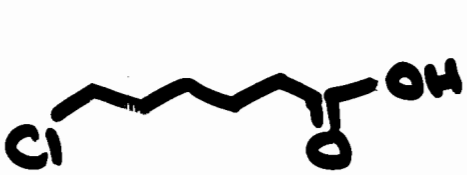


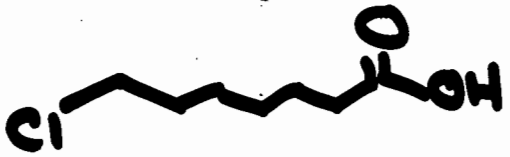
pKa 4.8 2.9 1.3

0.5

0.2

EFFECT DOES DROP OFF RAPIDLY THROUGH 4 σ BONDS MAXIMUM.





NOT MUCH CHANGE IN THESE

- ALSO CALLED FIELD EFFECTS.

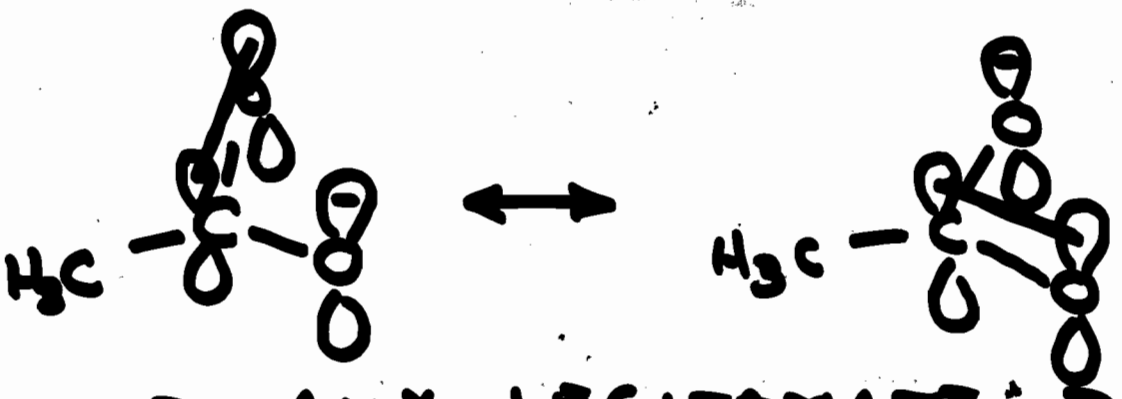
RESONANCE EFFECTS.

pK ≈ 4.8

pKa ≈ 16.5

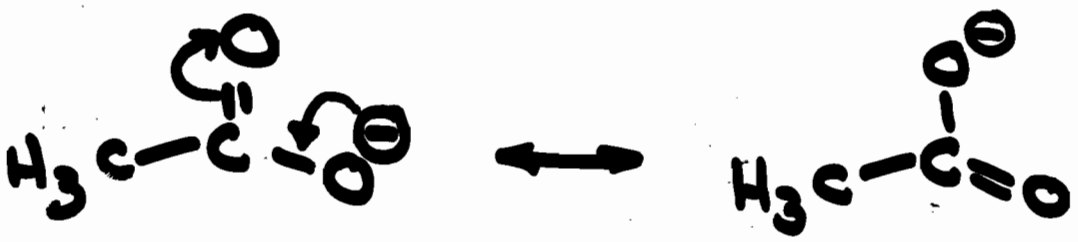
HUGE DIFFERENCE

- DUE TO π SYSTEM OF CARBONYL.



EQUALLY LEGITAMATE DESCRIPTIONS OF ELECTRONIC DISTRIBUTION

p- ORBITAL OVERLAP PERFECTLY



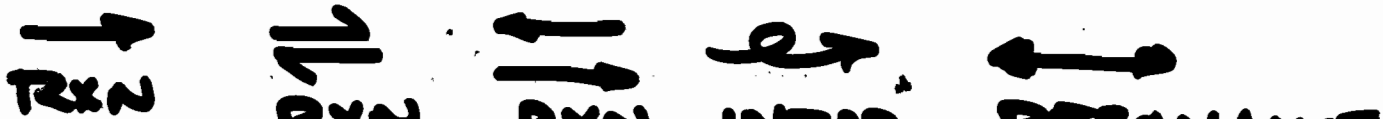
EACH O ATOM IS $-\frac{1}{2}$ CHARGED

- TREMENDOUSLY STABILIZING
- OFTEN MUCH MORE POWERFUL THAN INDUCTNE EFFECT

POINTS.

1) THESE ARE NOT TWO RAPIDLY EQUILIBRATING SPECIES, IT'S ONE SPECIES WHOSE ELECTRONIC DESCRIPTION IS A WEIGHTED AVERAGE

2) ⟷ ARROW IS RESERVED FOR RESONANCE FORMS.



ULTIMATE CASE

REALLY

BENZENE

36 kcal/mol STABILIZATION.

RULES:

1) INVOLVES π- SYSTEM.

2) - IF YOU CAN PUT A "−" CHARGE ON AN ELECTRONEGATIVE ATOM, THAT'S ESPECIALLY GOOD.

3) - IF YOU PUT A "+" CHARGE ON AN ELECTRONEGATIVE ATOM

- IF 8 VALENCE e^-'S ⇒ OK

-IF 6 VALENCE e^-S ⇒ NO WAY