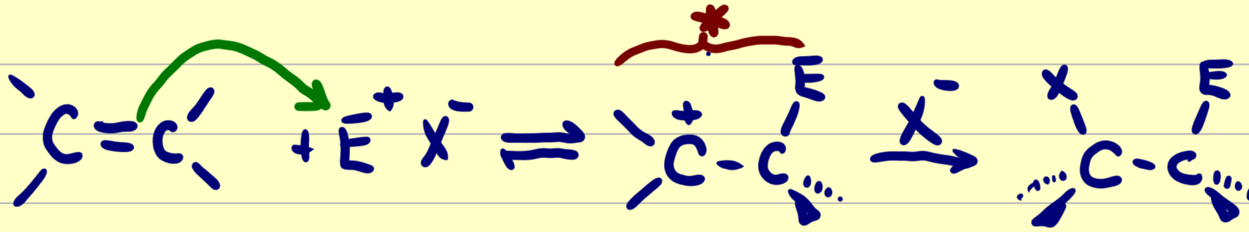
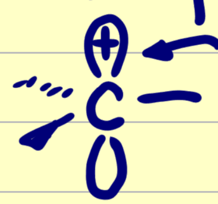



# ELECTROPHILIC ADDITION

* - CALLED A CARBOCATION
(CARBENIUM ION)
(~~CARBONIUM ION~~) - OUTDATED

there is another species that is now properly called a carbonium ion

- 6 VALENCE $e^-$, $C^+$, $sp^2$ HYBRIDIZED

∴ PLANAR  EMPTY p ORBITAL

$E^+X^-$ $\overset{+}{H}\overset{-}{Cl}$, HBr, $Br_2$, $Cl_2$, ICl, $H_2O^*$

WHY NOT $\overset{+}{Na}\overset{-}{Cl}$ - TOTALLY UNREACTIVE

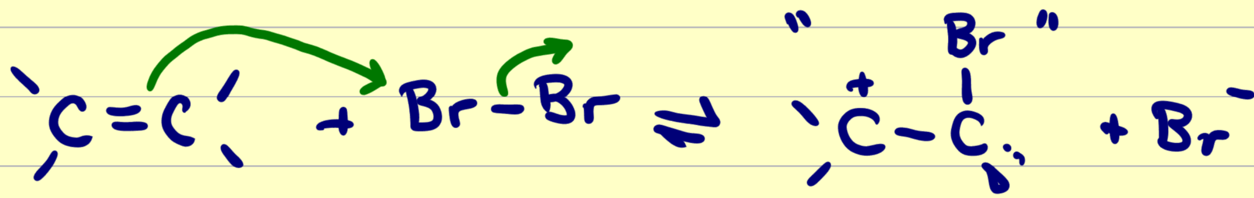
$Na^+$ - SIMPLY TOO STABLE AS THE CATION

WHY NOT $CH_3$-Cl ON ITS OWN?
- $\overset{+}{C}H_3$ NOT STABLE ENOUGH,

NO AMOUNT OF IT IN SOLUTION

$H^+$ - VERY GOOD - BOTH REASONABLE CONCENTRATION AND REACTIVE ENOUGH TO DO SOMETHING.

$Br_2$ AND $Cl_2$ REAL ANSWER FOR HOW THESE ARE $E^+$



OK TO WRITE

$$Br-Br \longleftrightarrow Br^+ \; Br^-$$

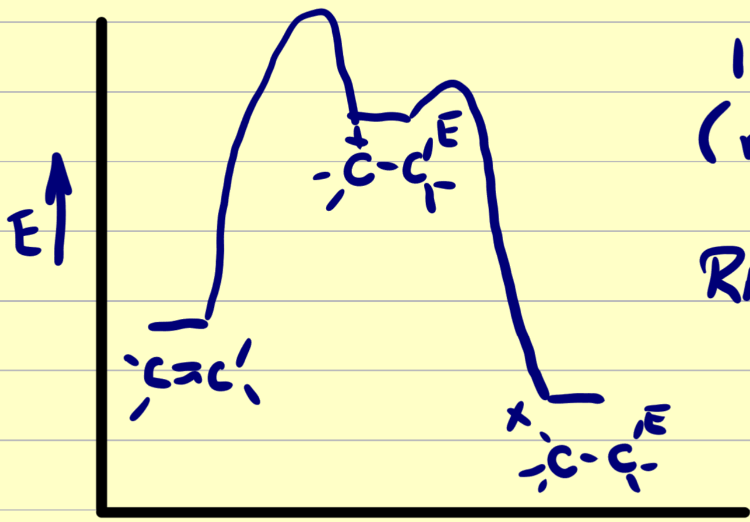
TWO STEPS - WHICH IS RATE DETERMINING (?)

$1^{ST}$ - STEP - DOING THE TOUGH THING - MAKING A PRETTY HIGH ENERGY CARBOCATION - SLOW STEP.

$2^{ND}$ STEP - $-C^+ + X^- \longrightarrow -C-X$

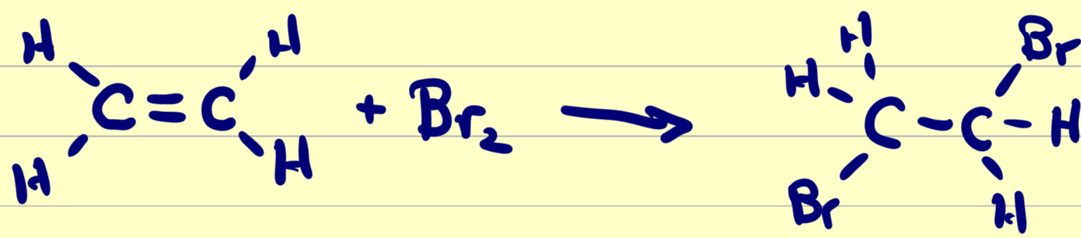
- OPPOSITELY CHARGED SPECIES

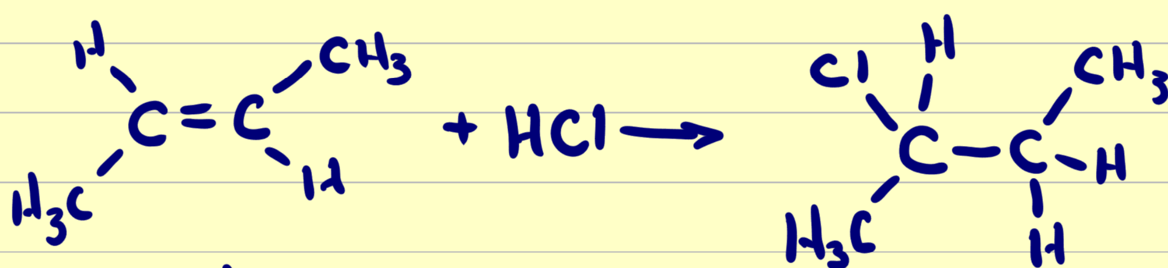
# COMBINING TO GET A NEUTRAL - SHOULD BE REALLY FAST

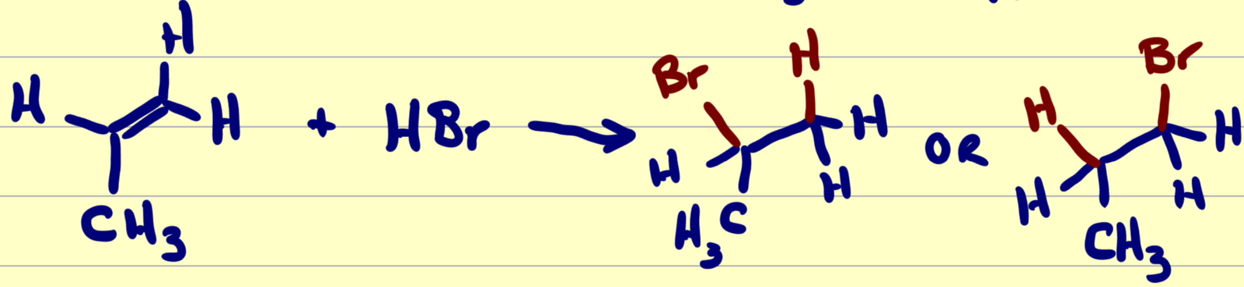


1ST STEP IS SLOW (rds)

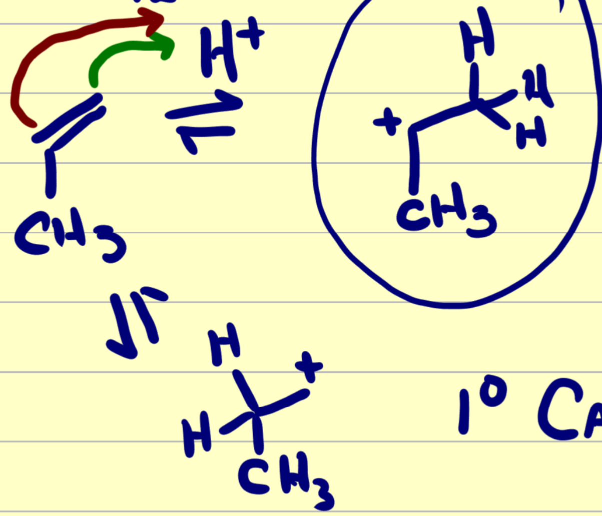
RATE $v = k[E^+][C{=}C]$







1$^{st}$ STEP




2° CARBOCATION

1° CARBOCATION

- WHICH IS MORE STABLE?

1) ALKYL GROUPS ARE +I
   ∴ STABILIZE CATION.

2)


- THIS σ BOND IS ALIGNED TO DONATE $e^-$ DENSITY TO THE CATION ∴ STABILIZATION

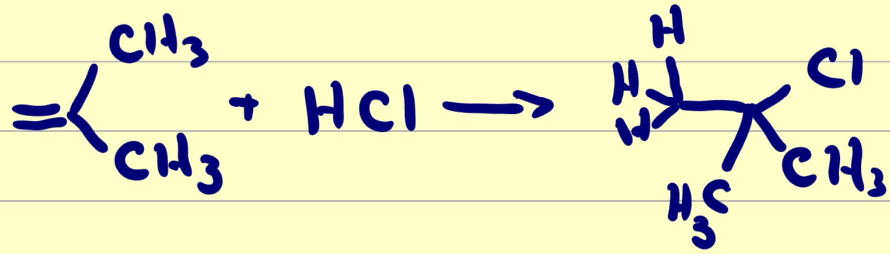
CALLED HYPERCONJUGATION.

$$\underset{\text{HAS NONE}}{\overset{+}{C}H_3} < \underset{\text{ONE}}{\overset{1^\circ}{H_3C-\overset{+}{C}H_2}} < \underset{\text{TWO}}{\overset{2^\circ}{H_3C-\overset{+}{C}H-CH_3}} < \underset{\text{THREE}}{\overset{3^\circ}{H_3C-\overset{+}{C}(CH_3)-CH_3}}$$

WE MUST ADD THIS TO HAMMOND POSTULATE

- TRANSITION STATE MOST CLOSELY RESEMBLES THE SPECIES IT'S CLOSEST TO IN ENERGY

∴ RATE OF FORMATION $3^\circ > 2^\circ > 1^\circ$




MARKOVNIKOV'S RULE