

### Terms to know

#### Markovnikov's rule

in **addition reactions**, the proton is added to the carbon atom with the **greatest** number of hydrogen atoms attached to it

#### anti-Markovnikov's rule

in **addition reactions**, the proton is added to the carbon atom with the **lowest** number of hydrogen atoms attached to it

#### zaitsev's rule

in **elimination reactions**, the major product is the **more stable** alkene with the **highly substituted** double bond

### M, Anti-M and V

[link text](#)

### Elimination Reactions

#### E1

multistep,

#### E2

single step,

### Terms

#### Protic

Solvents with O-H or N-H bonds and the ability to hydrogen bond

#### Aprotic

Solvents that don't

#### Nucleophile

A simple metal and salt, nucleus "loving", usually anions

#### Electrophile

Must contain a C-LG bond, electron "loving", usually cations

#### Solvolysis Reaction

the nucleophile is also the solvent

### Terms (cont)

#### E/Z System

1. Prioritize the 2 groups attached to each carbon relative to one another. If the higher priority groups are **cis**, its **Z**, if their **trans**, its **E**

### Terms

#### Vicinal

2 atoms or groups bonded to same carbon

#### Geminal

2 atoms or groups bonded to the same side of the carbon

#### syn-addition

added to same plane or same side of compound

#### anti-addition

added to different sides of compounds

### Geminal vs Vicinal

[link text](#)

### Anti vs Syn

[link text](#)

### Substitution Reactions

#### SN1

2 step, RR possible, tertiary reacts fastest

#### SN2

1 step, no RR, Primary reacts fastest

### Elimination and Substitution Flowchart

[link text](#)

### Addition Reactions

| Names of Reaction | Kind of Reactant | Whats on Arrow | Product structure |
|-------------------|------------------|----------------|-------------------|
|-------------------|------------------|----------------|-------------------|

### Addition Reactions (cont)

| Catalytic Hydrogenation | Alkene | H <sub>2</sub> , Ni, Pt or Pd | alkane, M not applicable, syn, No RR |
|-------------------------|--------|-------------------------------|--------------------------------------|
|-------------------------|--------|-------------------------------|--------------------------------------|

| Addition of hydrogen halides | Alkene | H-X | M, No syn/anti, possible |
|------------------------------|--------|-----|--------------------------|
|------------------------------|--------|-----|--------------------------|

| Acid Catalyzed hydration | Alkene | H <sub>2</sub> SO <sub>4</sub> or H <sup>+</sup> , H <sub>2</sub> O | New H added, M, no syn/anti, possible |
|--------------------------|--------|---------------------------------------------------------------------|---------------------------------------|
|--------------------------|--------|---------------------------------------------------------------------|---------------------------------------|

| Hydroboration-Oxidation | Alkene | 1. B <sub>3</sub> H <sub>6</sub> , 2. H <sub>2</sub> O, -OH | New H added, Anti-M, S, no RR |
|-------------------------|--------|-------------------------------------------------------------|-------------------------------|
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| Addition of Halogens/halogenation | Alkene | X <sub>2</sub> , CH <sub>3</sub> Cl | new vicinal halogens, not applicable, Anti, No RR |
|-----------------------------------|--------|-------------------------------------|---------------------------------------------------|
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| Cohalogenation | Alkene | Br <sub>2</sub> , H <sub>2</sub> O | new halogen added, OH, M of OH and Anti-M for halogen, Anti, No F |
|----------------|--------|------------------------------------|-------------------------------------------------------------------|
|----------------|--------|------------------------------------|-------------------------------------------------------------------|

| Expoxidation | Alkene | RCOOH (peroxide) | Expoxide formed, M not applicable, Syn, No RR |
|--------------|--------|------------------|-----------------------------------------------|
|--------------|--------|------------------|-----------------------------------------------|

| Ozonolysis | Alkene | 1. O <sub>3</sub> , 2. H <sub>2</sub> O | 2 carbonyl compounds, nothing else applicable |
|------------|--------|-----------------------------------------|-----------------------------------------------|
|------------|--------|-----------------------------------------|-----------------------------------------------|

M=Markovnikov's Rule

Anti-M= Anti-Markovnikov's Rule

RR=Rearrangement