guidelines for drawing an E2 mechanism

<table>
<tr><td colspan="2">Label the α carbon and the β carbon(s) you will use in the mechanism.</td></tr>
<tr><td colspan="2">Only a β carbon attached to one or more hydrogens can be used for E2.</td></tr>
<tr><td colspan="2">If two β carbons have different “connectivity”, they result in different E2 products.
If two β carbons have the same “connectivity”, they result in the same E2 product.
Exception: If the E2 product has one or more stereocenters, then two β carbons with the same connectivity may result in different E2 products.</td></tr>
<tr><th>Straight chain</th><th>Ring</th></tr>
<tr><td>Rule: The major product for E2 and E1 uses the more substituted β carbon (“Zaitsev rule”). The minor product uses the less substituted β carbon.
Exception: The major product for E2 with tert-butyl-oxide uses the less substituted β carbon (“Hofmann rule”). The minor product uses the more substituted β carbon.</td><td>For an E2 mechanism in which the α carbon and the β carbon are both in a ring, the β hydrogen must be trans to the leaving group.</td></tr>
<tr><td>If both the α carbon and the β carbon are stereocenters, then, to determine the stereochemistry of the E2 product: (1) Draw a Newman projection (looking down the bond between the α and β carbon). (2) Rotate the Newman projection to the conformation in which the leaving group and the β hydrogen are located “anti” to each other. (3) The substituents which are now on the same side of the Newman projection will also be on the same side of the double bond in the E2 alkene product.
If either the α carbon or the β carbon is not a stereocenter, then you don’t need to draw a Newman projection.</td><td>Rule: The major product for E2 on a ring uses the more substituted β carbon with a hydrogen that is trans to the leaving group (“Zaitsev rule”). The minor product uses the less substituted β carbon with a hydrogen that is trans to the leaving group.
Exception: When using tert-butyl-oxide, the major product for E2 on a ring uses the less substituted β carbon with a hydrogen that is trans to the leaving group (“Hofmann rule”). The minor product uses the more substituted β carbon with a hydrogen that is trans to the leaving group.</td></tr>
<tr><td></td><td>When a cyclohexane ring bears a large substituent (such as a tert-butyl group), draw the chair conformation. The more stable chair conformation puts the large substituent in the equatorial position.
When the α and β carbons are both in a cyclohexane ring, E2 is possible only during a chair flip in which the leaving group and β hydrogen are both axial.
If E2 is possible only during the less stable chair flip, E2 will proceed slowly. If E2 is possible during the more stable chair flip, E2 will proceed relatively quickly.</td></tr>
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