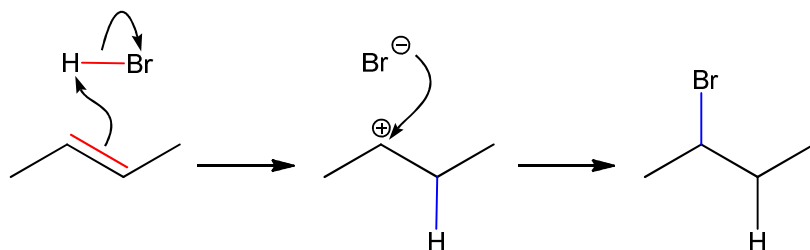


CHEM1102 Worksheet 3 – Answers to Critical Thinking Questions

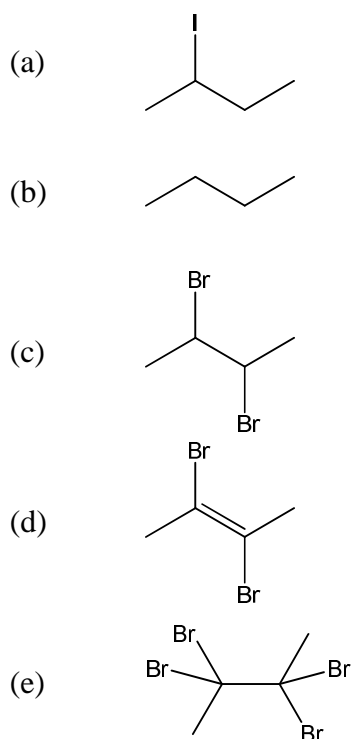
The worksheets are available in the tutorials and form an integral part of the learning outcomes and experience for this unit.

Model 1: Addition to Symmetrical Alkenes and Alkynes

1. Nucleophile
2. Broken = red. Formed = blue.

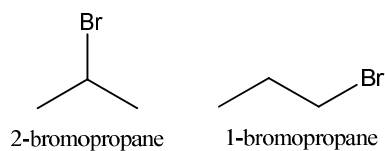


3.

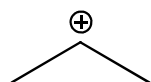


Model 2: Addition to Unsymmetrical Alkenes and Alkynes

1.



2.



3. 2-bromopropane.

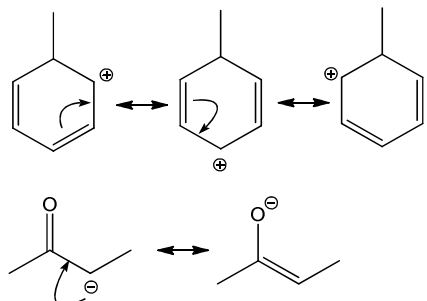
4. H₂O

5. Catalyst. First step of the reaction involves protonation of π bond.

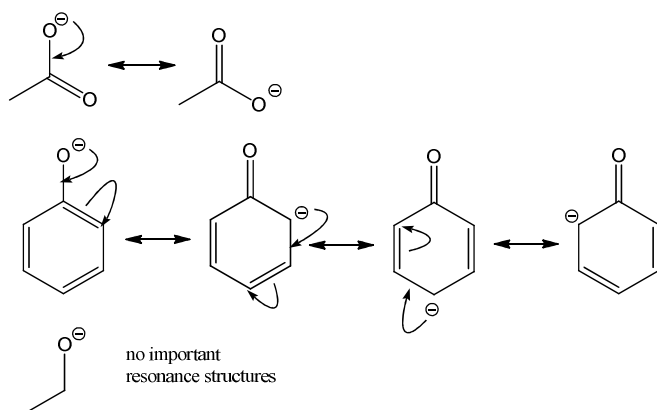
Model 3: Resonance and Electrophilic Aromatic Substitution

1. No.
2. Much less than structure with 2 π bonds as it involves charges.

3.

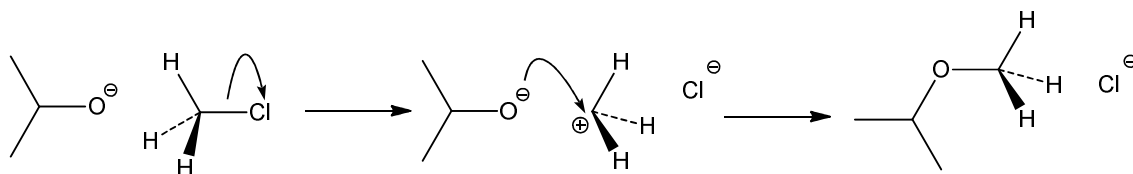


4. Both are more stable. The positive charge is spread over the whole ring so the π electrons experience attraction to all of the nuclei. The negative charge is spread over more atoms including the oxygen atom which is more electronegative.
5. The carboxylate anion has the negative charge stabilized by spreading it over 2 electronegative O atoms. The phenoxide anion has the negative charge stabilized by spreading it over the ring. The ethoxide anion is not stabilized in this way.



Model 4: Nucleophilic Substitution

1. See below.

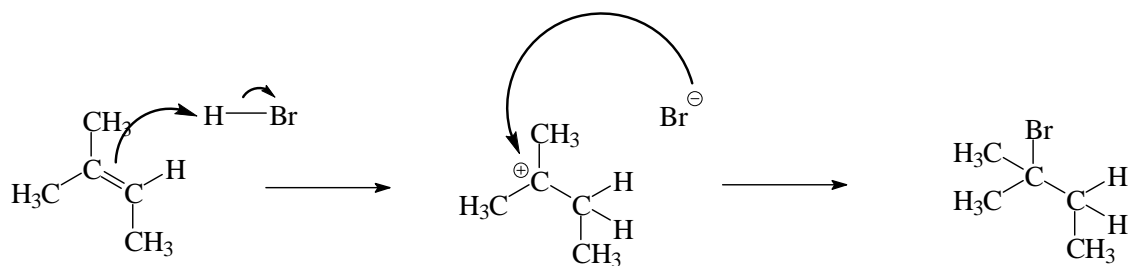


2. S = substitution, N = nucleophilic, "1" = unimolecular (key or *rate determining* step involves 1 molecule) and "2" = bimolecular (key or *rate determining* step involves 2 molecules).

Exercises

2008-J-13

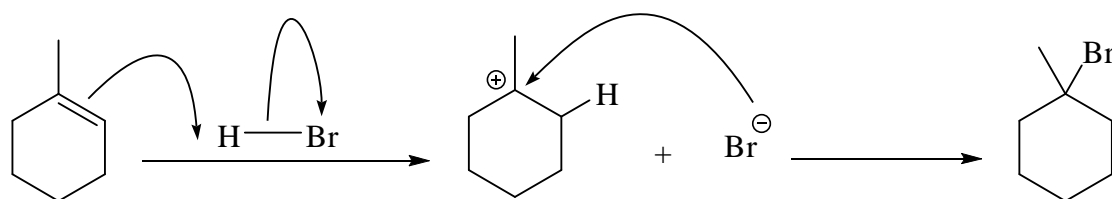
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• HBr

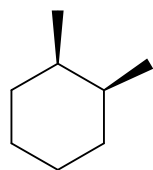
2009-J-12

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2009-J-8

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