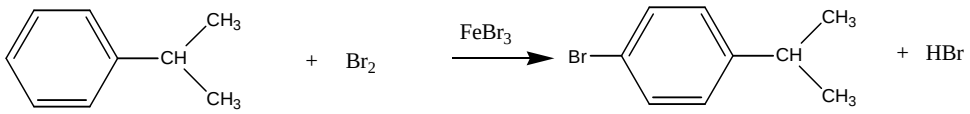
CH1012 Tutorial 8 Answers

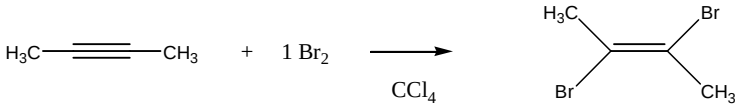
1. Identify each of the following reactions as addition, elimination or substitution reactions.

(i)



electrophilic aromatic substitution (of H for Br)

(ii)

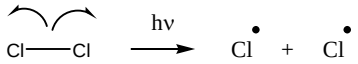


electrophilic addition of Br_2 across the triple bond

2. Define each of the following, illustrate with an example of each:

(i) Homolytic bond cleavage: cleavage of a two electron bond with a single electron going to each of the previously bonded atoms to give 2 radicals. This is a radical mechanism.

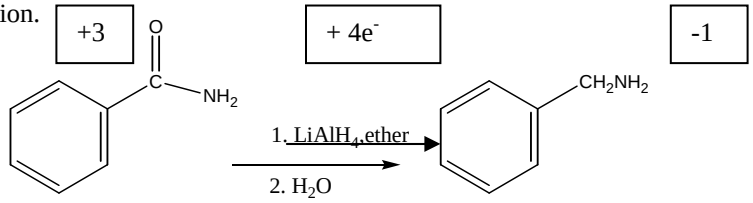
eg.



(ii) Nucleophile: a reactant molecule which is nucleus seeking - it is electron rich
eg. OH^-, Cl^-, $:NH_3$

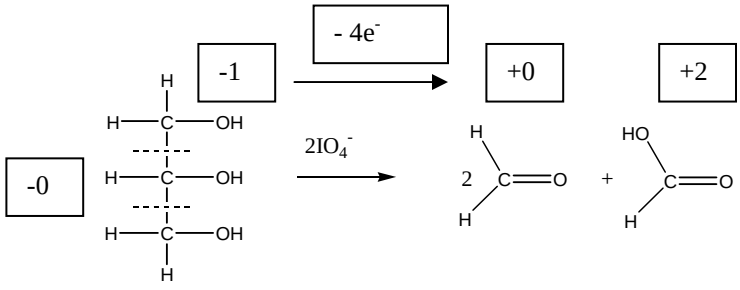
3. For the following half reactions work out if the organic transformation is a redox process and if it is state if it is a reduction or a oxidation.

(i)



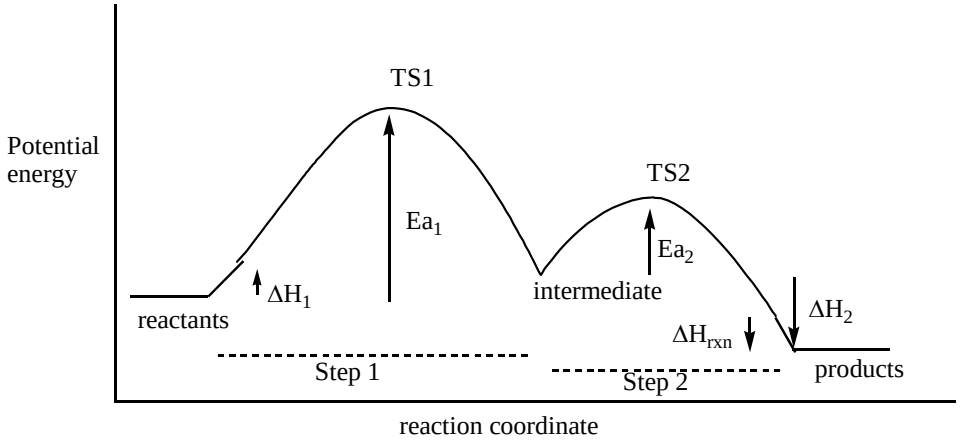
reduction benzamide benzylamine

(ii)



Oxidation Glycerol formaldehyde formic acid

4. Using a **reaction coordinate diagram** illustrate the variation in energy associated with a two step reaction where the first step is endothermic and the second step is exothermic, the overall reaction is exothermic. Illustrate the position of transition state(s) and intermediate(s) on the diagram.

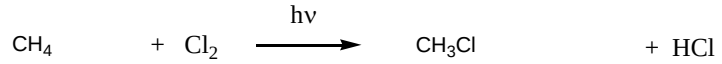


5. Describe in detail the mechanism of the following reactions, give an example of each:

(i) radical substitution

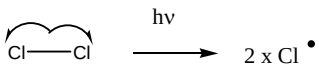
$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ when irradiated with UV light chloromethane is formed

Mechanism

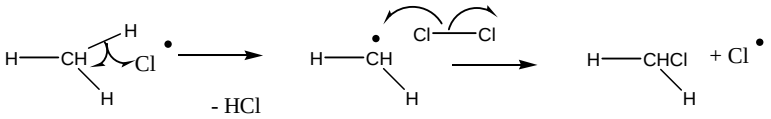


homolytic cleavage of the sigma bond to give Cl radicals

Initiation

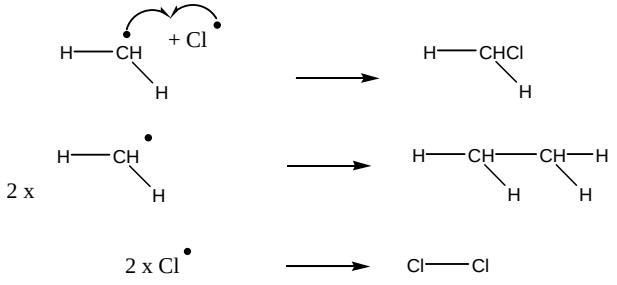


Propagation



abstraction of a hydrogen from methane gives the methyl radical

Termination

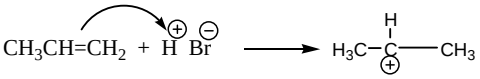


(ii) Markovnikov electrophilic addition to alkenes .

$CH_3CH=CH_2 + HBr \rightarrow CH_3CH(Br)CH_3$

Mechanism

Step 1



Step 2