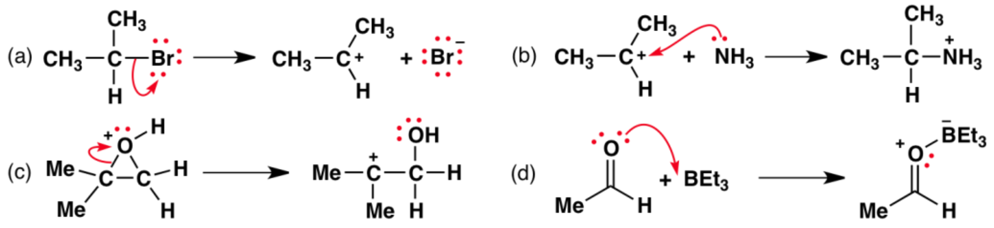
Solutions to Exercises, Chapter 7

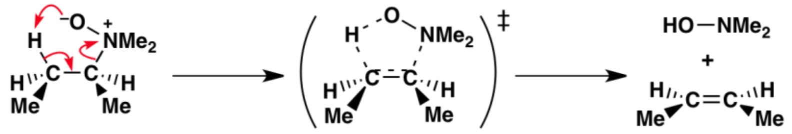
7.1 (a) substitution (b) addition (c) substitution (d) elimination
(e) substitution (f) rearrangement

7.2



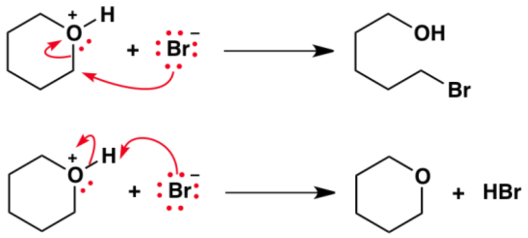
7.3 (a) nucleophile: $C_2H_5O^-$, electrophile: CH_3Cl, nucleofuge: Cl^-
(b) nucleofuge: Br^- (c) nucleophile: NH_3, electrophile: CH_3CO_2Et
(d) nucleofuge: EtO^-

7.4 A lone pair of the O and the two bonding pairs of the C–H and C–N bonds are involved in the formation of the cyclic transition structure with the redistribution of 6 valence electrons.

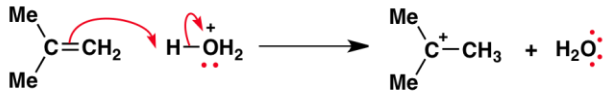


7.5

7.6



7.7

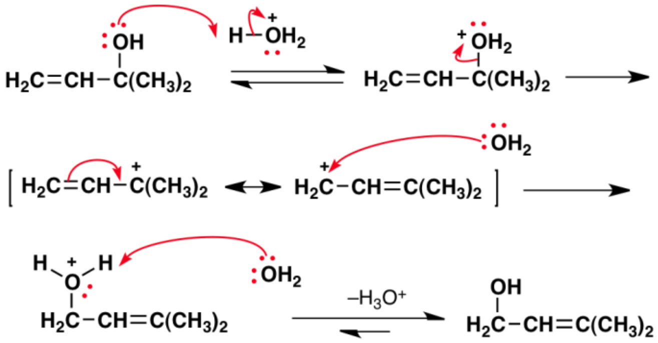


7.8 The first step is given in eqn 7.12, and the second step is:

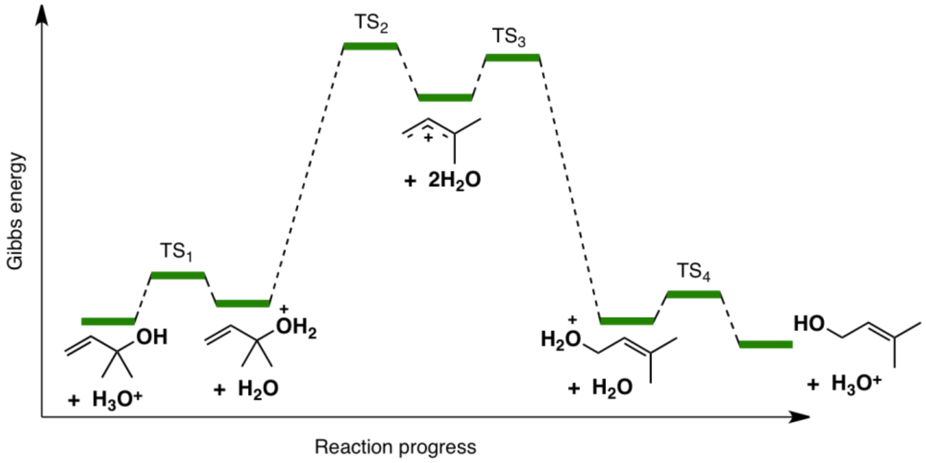
7.9 When the cyclic bromonium ion is trapped by a nucleophile, rear-side capture results exclusively in the *trans* product. If the open carbenium ion were involved as an intermediate, its nucleophilic capture would give some *cis* product as well.

7.10

(a)



(b) The reaction is a four-step process with the first and the last steps being low-barrier proton transfers between oxygen atoms. The rate-determining step involves heterolysis of the C-O bond of the protonated reactant. The product with a tri-substituted double bond is lower in energy than the reactant with a mono-substituted double bond.



7.11 The carbenium ion with the Ph substituent is stabilised by resonance as shown below.