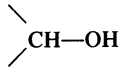
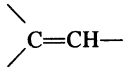
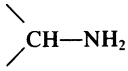
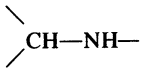
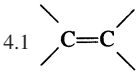
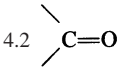
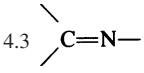
TABLE 3.1 International Classification of Enzymes: Class Names, Code Numbers, and Types of Reactions Catalyzed

1. Oxidoreductases (oxidation-reduction reactions)
   - 1.1 Acting on 
   - 1.2 Acting on 
   - 1.3 Acting on 
   - 1.4 Acting on 
   - 1.5 Acting on 
   - 1.6 Acting on NADH; NADPH
2. Transferases (transfer of functional groups)
   - 2.1 One-carbon groups
   - 2.2 Aldehydic or ketonic groups
   - 2.3 Acyl groups
   - 2.4 Glycosyl groups
   - 2.7 Phosphate groups
   - 2.8 S-containing groups
3. Hydrolases (hydrolysis reactions)
   - 3.1 Esters
   - 3.2 Glycosidic bonds
   - 3.4 Peptide bonds
   - 3.5 Other C—N bonds
   - 3.6 Acid anhydrides
4. Lyases (addition to double bonds)
   - 4.1 
   - 4.2 
   - 4.3 
5. Isomerases (isomerization reactions)
   - 5.1 Racemases
6. Ligases (formation of bonds with ATP cleavage)
   - 6.1 C—O
   - 6.2 C—S
   - 6.3 C—N
   - 6.4 C—C

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3.2. HOW ENZYMES WORK

Enzymes lower the activation energy of the reaction catalyzed by binding the substrate and forming an enzyme–substrate complex. Enzymes do not affect the free-energy change or the equilibrium constant. Figure 3.1 illustrates the action of an enzyme from the activation-energy point of view. For example, the activation energy for the decomposition of hydrogen peroxide varies depending on the type of catalysis. The activation energy of the uncatalyzed reaction at 20°C is 18 kilocalories per mole (kcal/mol), whereas the ΔE values for chemically catalyzed (by colloidal platinum) and enzymatically catalyzed (catalase) decomposition are 13 and 7 kcal/mol, respectively. That is, catalase accelerates the rate of reaction by a factor of about 10^8. The reader should note that this large change in rate for a relatively small change in activation energy is due to the exponential dependence of rate on activation energy. In this case, the ratio of the rates is $\exp(-7000/2 \cdot 293) \div \exp(-18{,}000/2 \cdot 293)$.