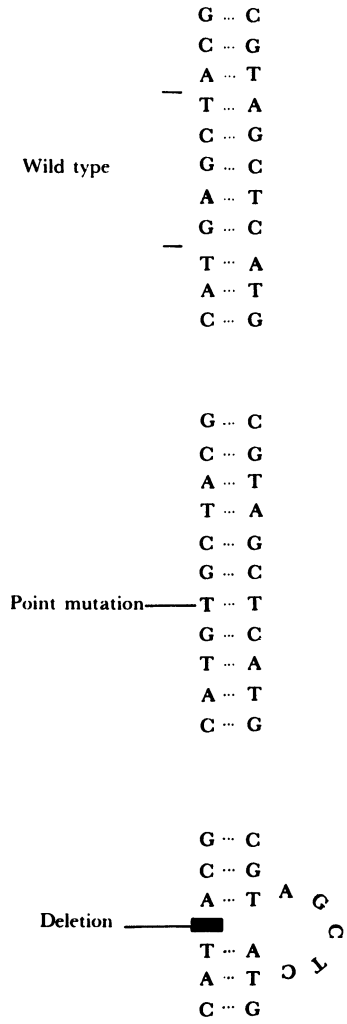

Figure 8.1. DNA base changes from wild type, involving point mutation and deletion. (With permission, from T. D. Brock, D. W. Smith, and M. T. Madigan, *Biology of Microorganisms*, 4th ed., Pearson Education, Upper Saddle River, NJ, 1984, p. 307.)

8.2.2. Selecting for Desirable Mutants

Mutants can serve as powerful tools to better understand cell physiology; they are also valuable as industrial organisms, because mutation can be used to alter metabolic regulation and to cause overproduction of a desired compound. Methods to induce mutations and then select for mutants are important tools for catalyst development in bioprocessing.

Natural (*spontaneous*) rates of mutation vary greatly from gene to gene (10^{-3} to 10^{-9} per cell division), with 10^{-6} mutations in a gene per cell division being typical. Chemical agents (*mutagens*) or radiation are often used in the laboratory to increase mutation rates. Mutagens are nonspecific and may affect any gene.