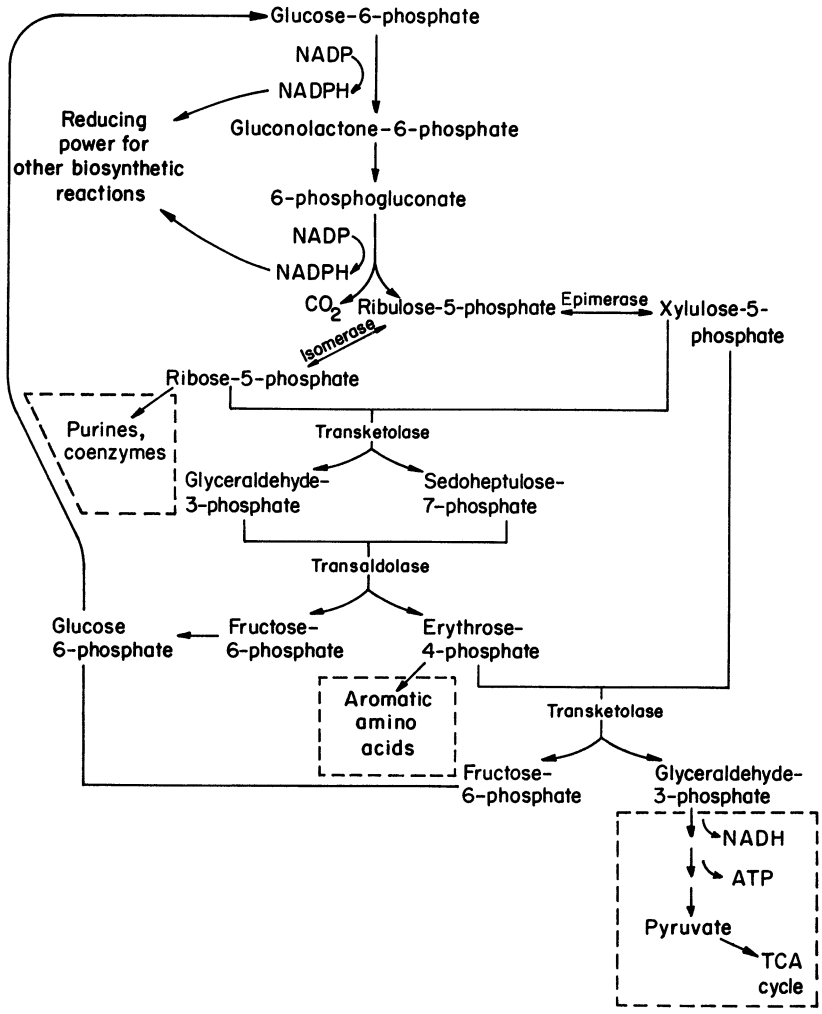

Figure 5.7. Pentose-phosphate pathway (hexose-monophosphate) with relations to other cellular processes. Compounds and reactions in the dashed boxes are not part of the pathway but rather represent connections to other metabolic activities. (With permission, from T. D. Brock, D. W. Smith, and M. T. Madigan, *Biology of Microorganisms*, 4th ed., Pearson Education, Upper Saddle River, NJ, 1984, p. 792.)

mercial fermentations if the system is not operated carefully. The requirement for CO_2 can be eliminated if the medium is formulated to supply key lipids, such as oleic acid.

The synthesis of most of the polysaccharides from glucose or other hexoses is readily accomplished in most organisms. However, if the carbon energy source has less than six carbons, special reactions need to be used. Essentially, the EMP pathway needs to be operated in reverse to produce glucose. The production of glucose is called *gluconeogenesis*. Since several of the key steps in the EMP pathway are irreversible, the cell must cir-