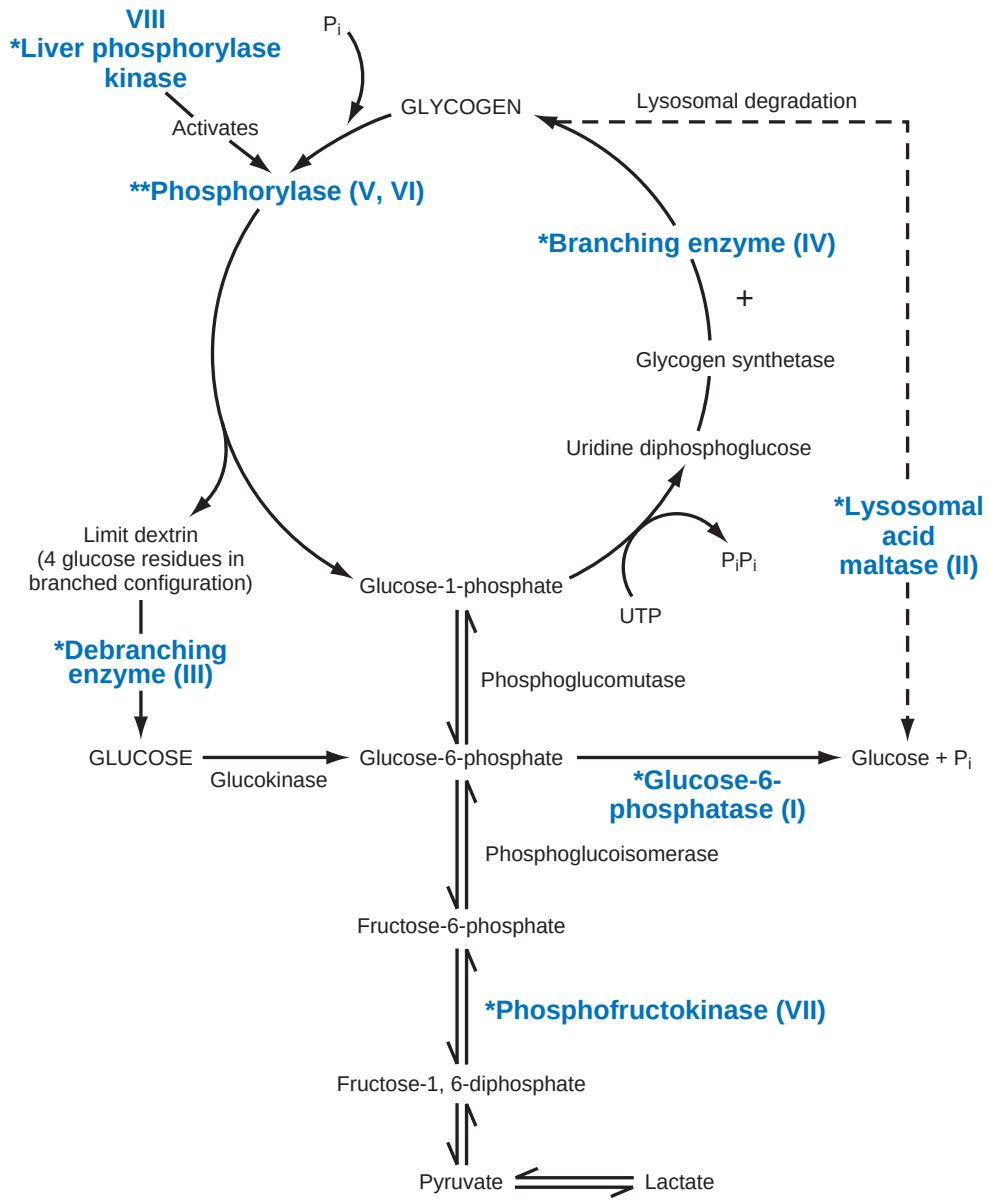

Figure 5-14 Pathways of glycogen metabolism. Asterisks mark the enzyme deficiencies associated with glycogen storage diseases. Roman numerals indicate the type of glycogen storage disease associated with the given enzyme deficiency. Types V and VI result from deficiencies of muscle and liver phosphorylases, respectively. (Modified from Hers H, et al: Glycogen storage diseases. In Scriver CR, et al [eds]: The Metabolic Basis of Inherited Disease, 6th ed. New York, McGraw-Hill, 1989, p 425.)

(von Gierke disease, or type I glycogenosis) is a prime example of the hepatic-hypoglycemic form of glycogen storage disease (Table 5-7). Other examples include deficiencies of liver phosphorylase and debranching enzyme, both involved in the breakdown of glycogen (Fig. 5-15). In all these disorders glycogen is stored in many organs, but *hepatic enlargement and hypoglycemia dominate the clinical picture.*

- *Myopathic forms.* In the skeletal muscles, as opposed to the liver, glycogen is used predominantly as a source of energy during physical activity. ATP is generated by glycolysis, which leads ultimately to the formation of lactate (Fig. 5-16). If the enzymes that fuel the glycolytic pathway are deficient, glycogen storage occurs in the muscles and is associated with muscular weakness due to impaired energy production. Examples in this category include deficiencies of muscle phosphorylase (McArdle disease, or type V glycogenosis), muscle phosphofructokinase (type VII glycogen storage disease), and several others. *Typically, individuals with the myopathic forms present with muscle cramps after exercise and lactate levels in the blood fail to rise after exercise due to a block in glycolysis.*
- *Glycogen storage diseases associated with (1) deficiency of α-glucosidase (acid maltase) and (2) lack of branching enzyme* do not fit into the hepatic or myopathic categories. They are associated with glycogen storage in many organs and death early in life. Acid maltase is a lysosomal enzyme, and hence its deficiency leads to lysosomal storage of glycogen (type II glycogenosis, or *Pompe disease*) in all organs, but *cardiomegaly is the most prominent feature* (Fig. 5-16).