

**Glucose Absorption
And
Glycogen Metabolism**

Starch Digestion

Starch (1000's of residues)

**α -amylase
in saliva**



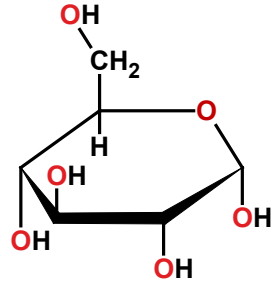
Starch (average of 8 residues)

**α -amylase
inactivated
in stomach**



Starch (in Small Intestine)

**pancreatic
 α -amylase**



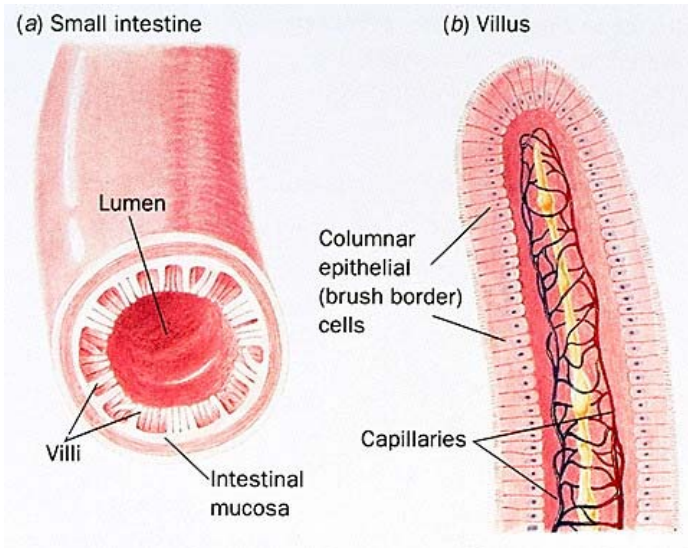
Glucose

Specific enzymes



dextrins
maltose

Glucose Absorption from Small Intestine



(c) Glucose transport

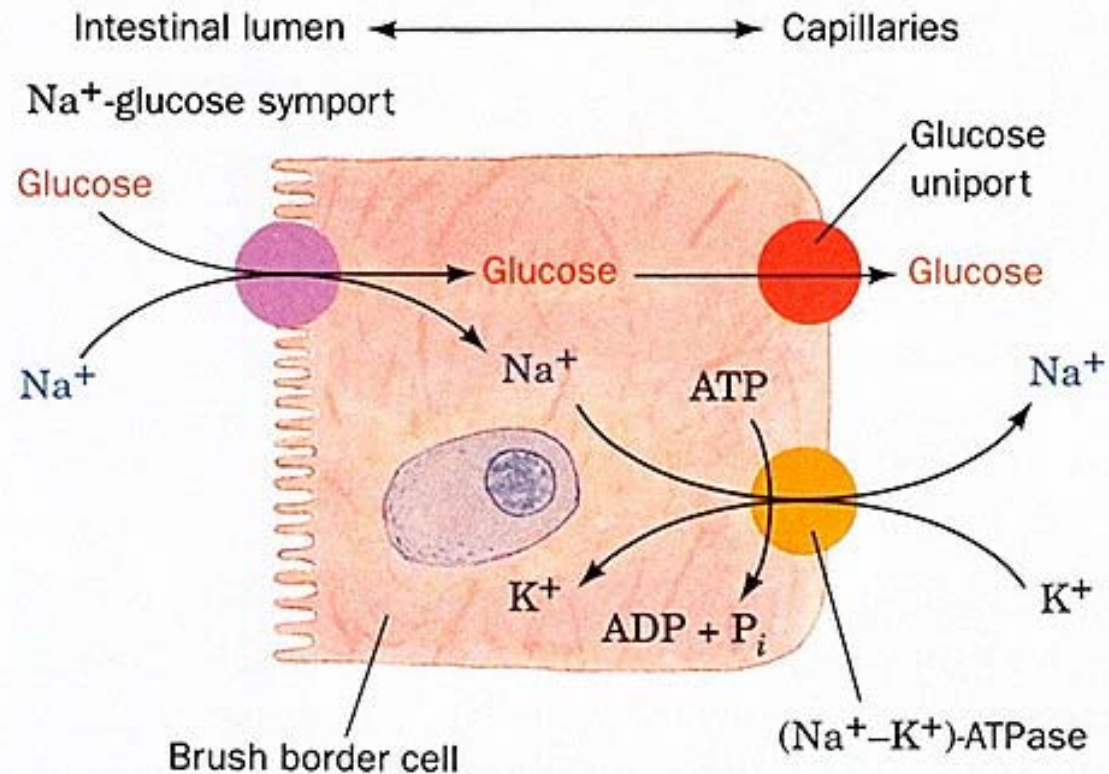


Fig 18.25

Exocytosis of Glucose Receptors in Response to Insulin

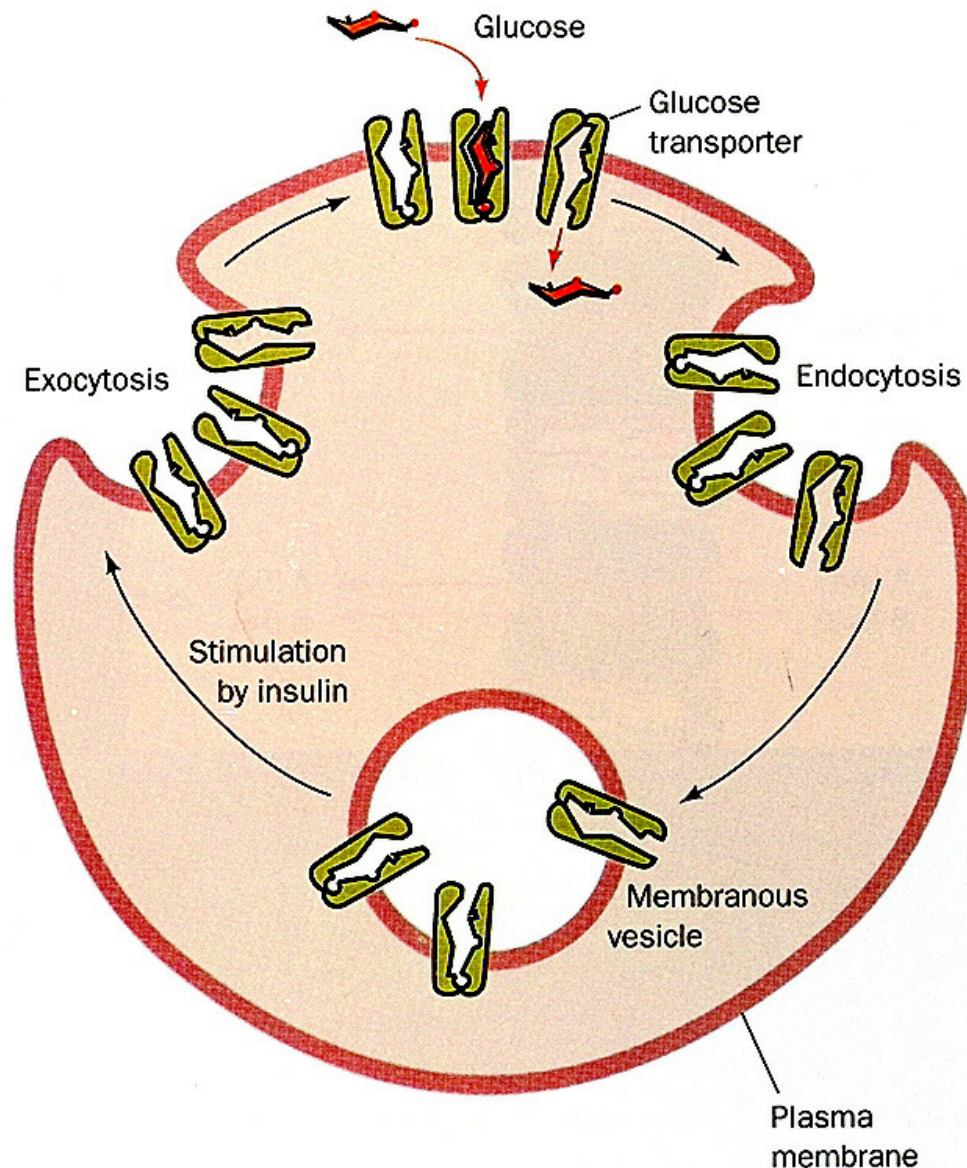


Fig 18.16

Glucose Transporter

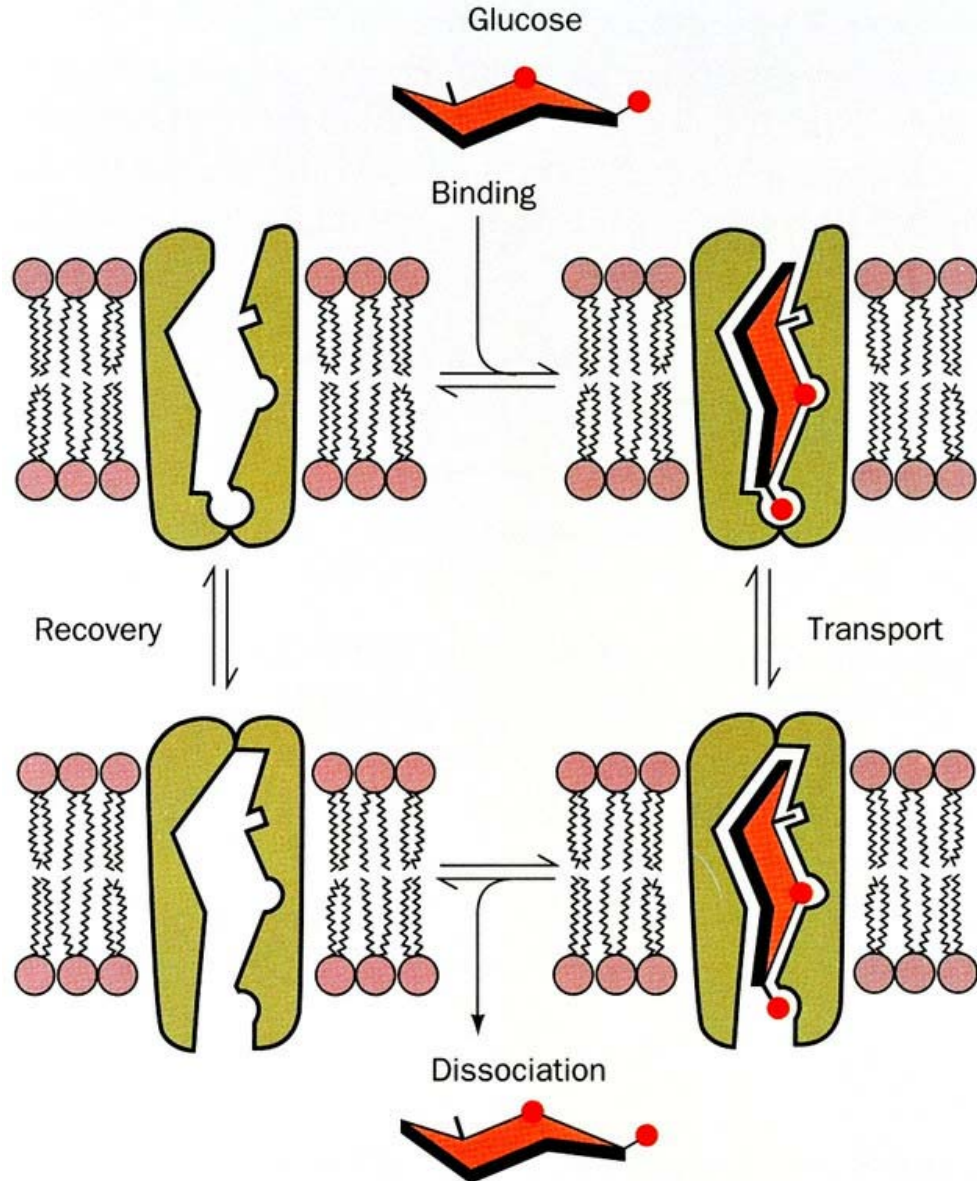


Fig 18.15

Glycogen Structure

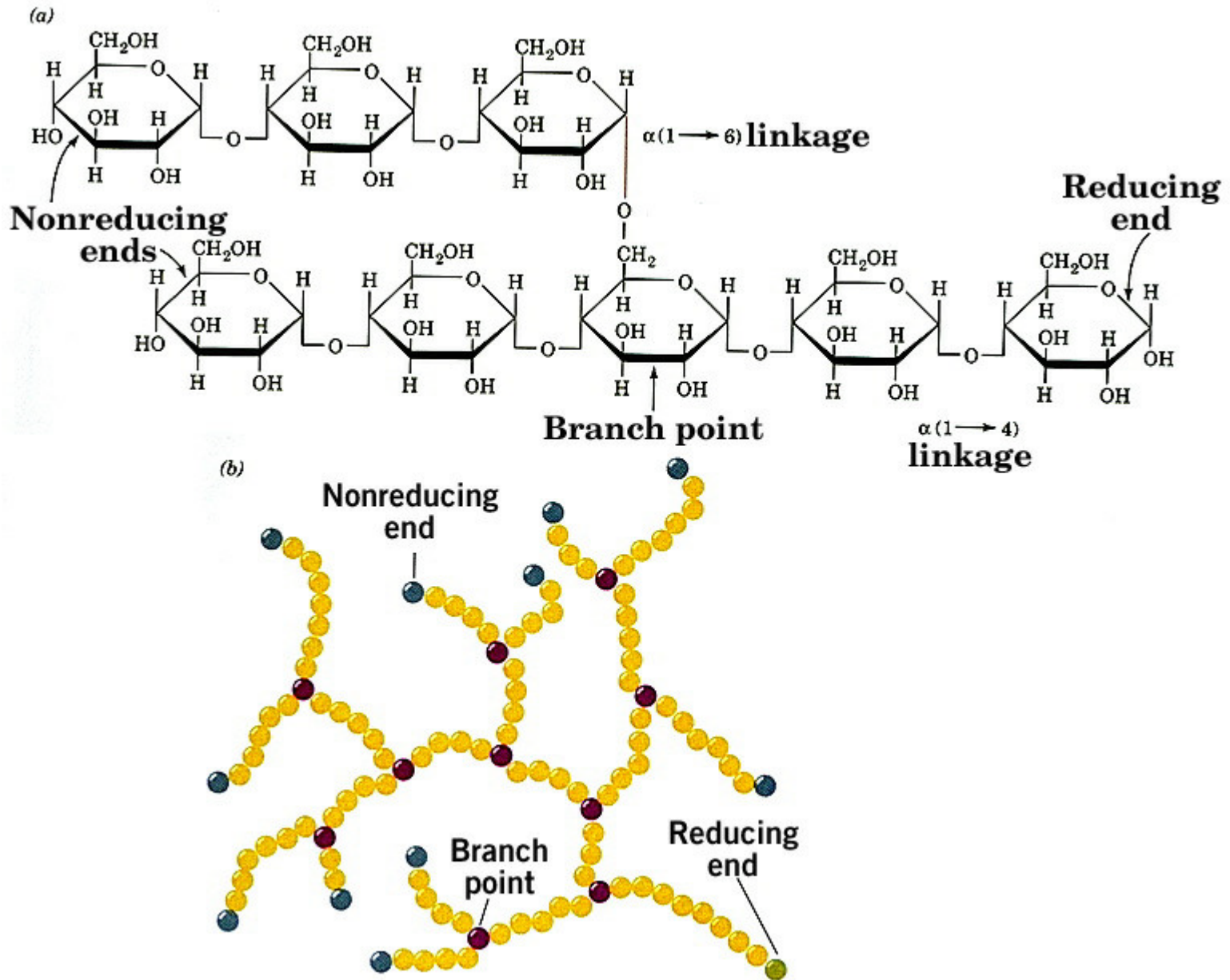


Fig 17.1

Glycogenesis

(Glycogen Synthesis)

Five steps:

1) Hexokinase ($G \longrightarrow G6P$)

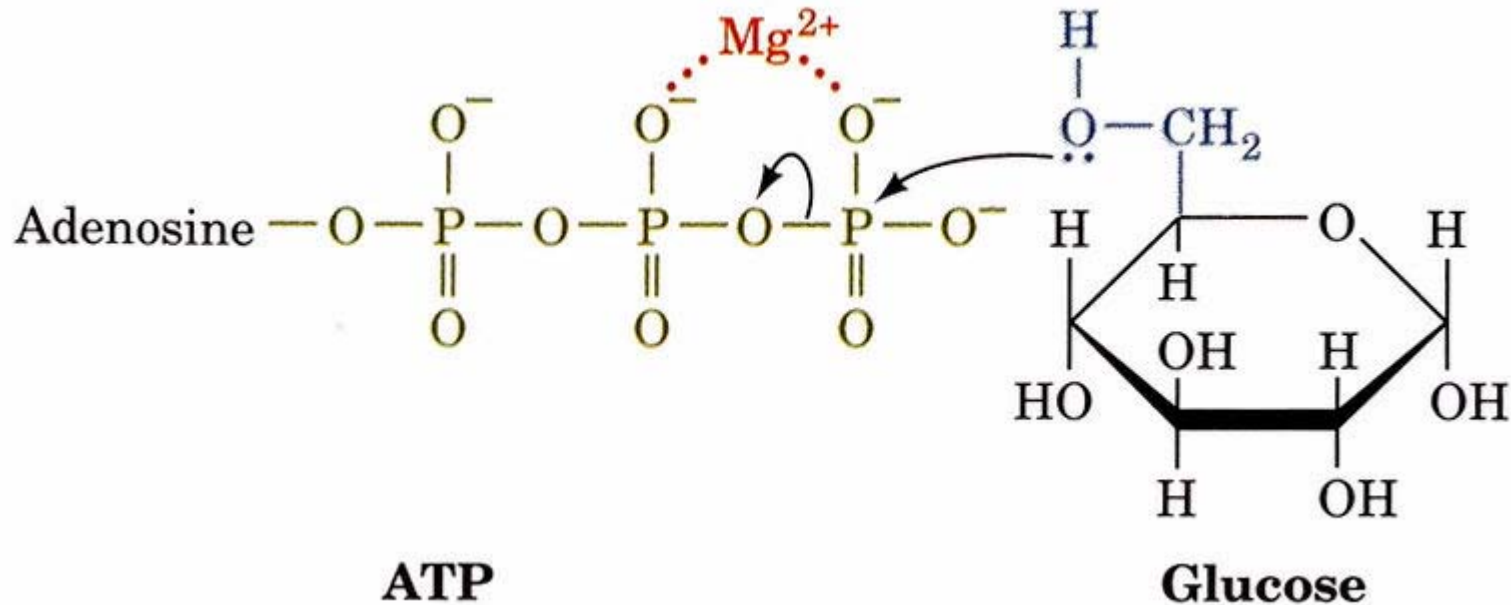
2) Phosphoglucomutase ($G6P \rightleftharpoons G1P$)

3) UDP-glucose Pyrophosphorylase
($G1P + UDP \longrightarrow UDP\text{-Glucose}$)

4) Glycogen Synthase* (regulated step)

5) Branching Enzyme

Step 1: Hexokinase and Hexokinase D

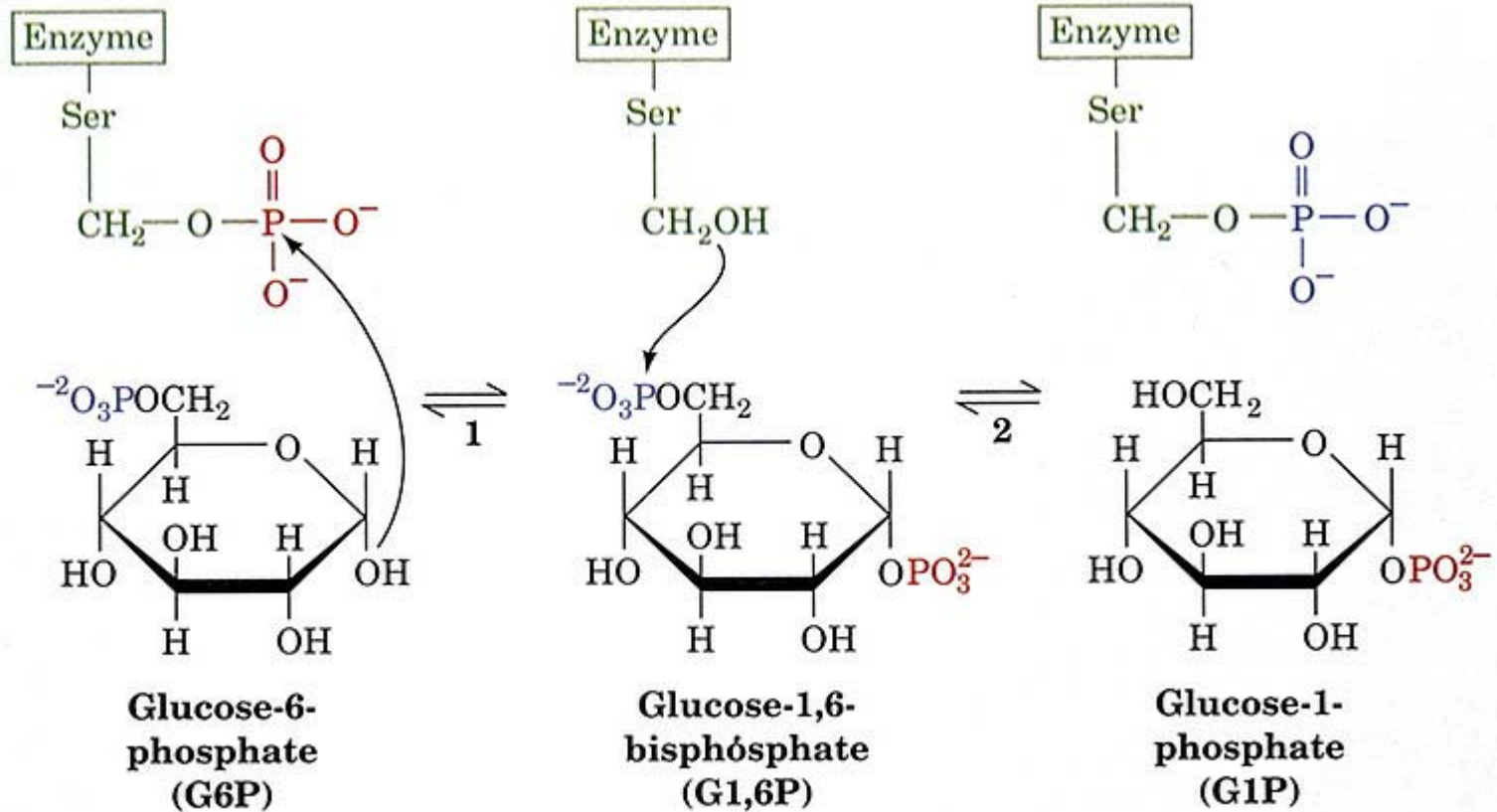


Hexokinase is in all cells except liver
inhibited by G6P

Hexokinase D is in liver
not inhibited by G6P



Step 2: Phosphoglucomutase (PGM)



Reversible

Used in both glycogen synthesis and breakdown

Step 3: UDP-Glucose Pyrophosphorylase

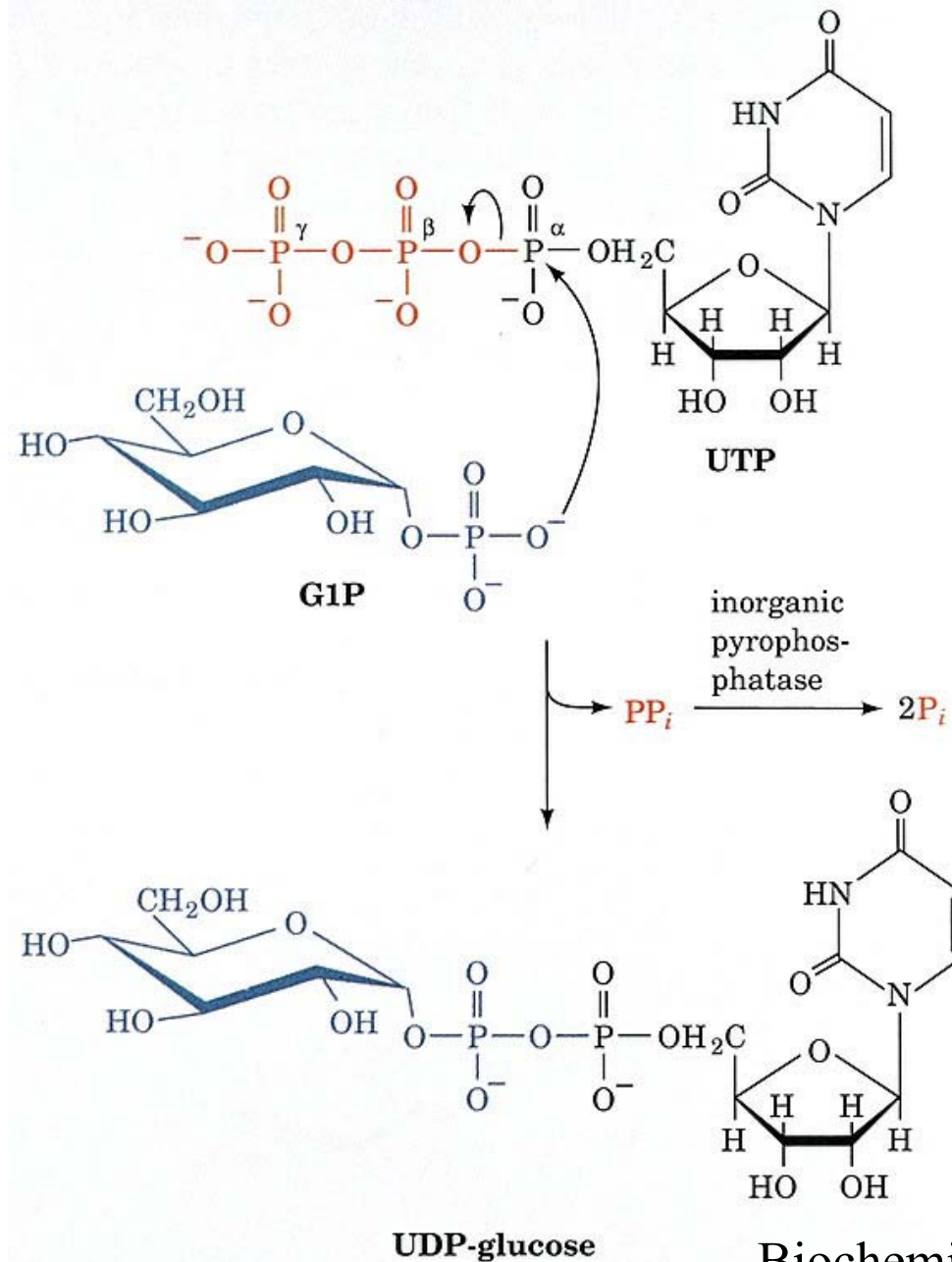


Fig 17.6

Step 4: Glycogen Synthase

Transition State

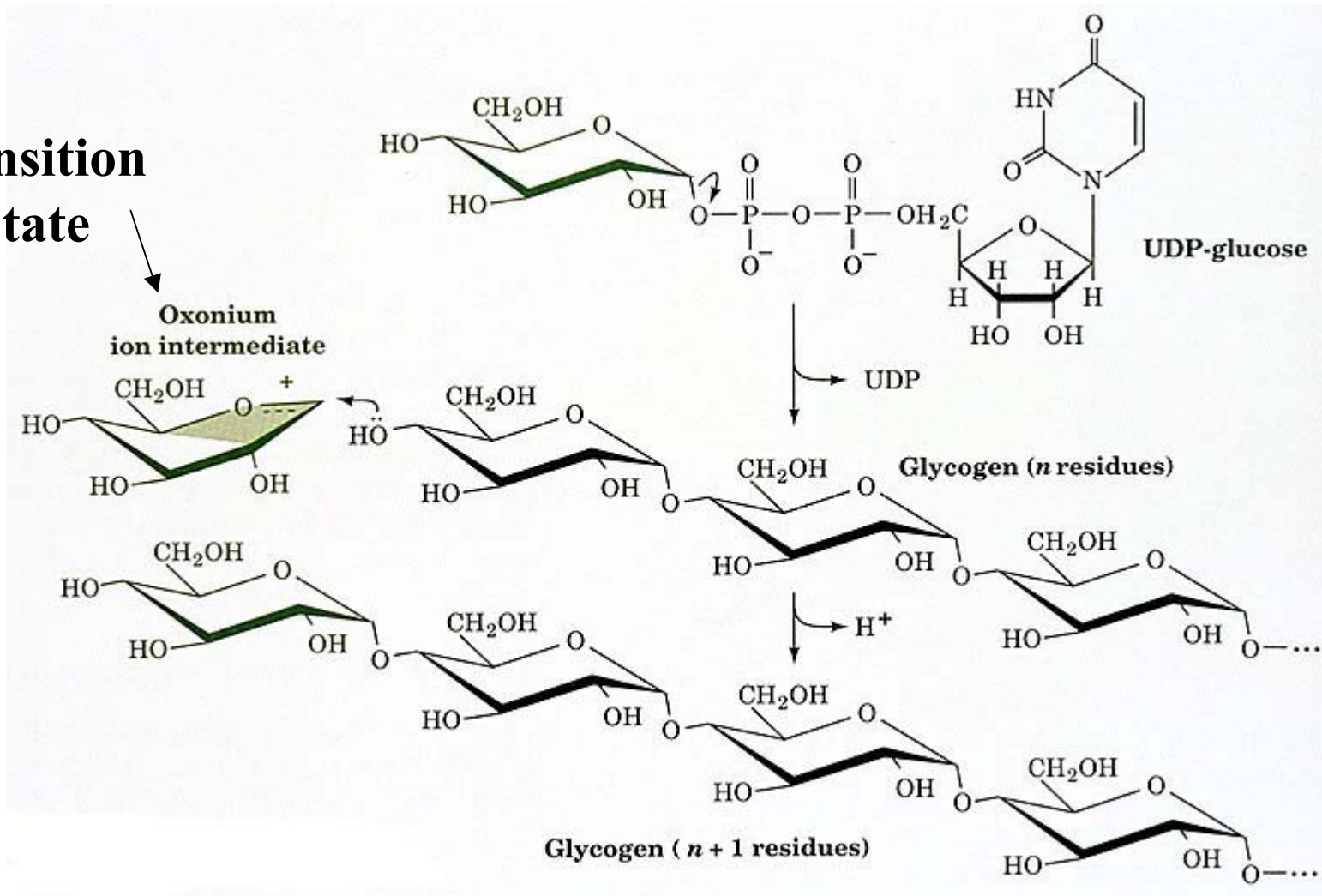


Fig 17.7

Step 5: Branching Enzyme

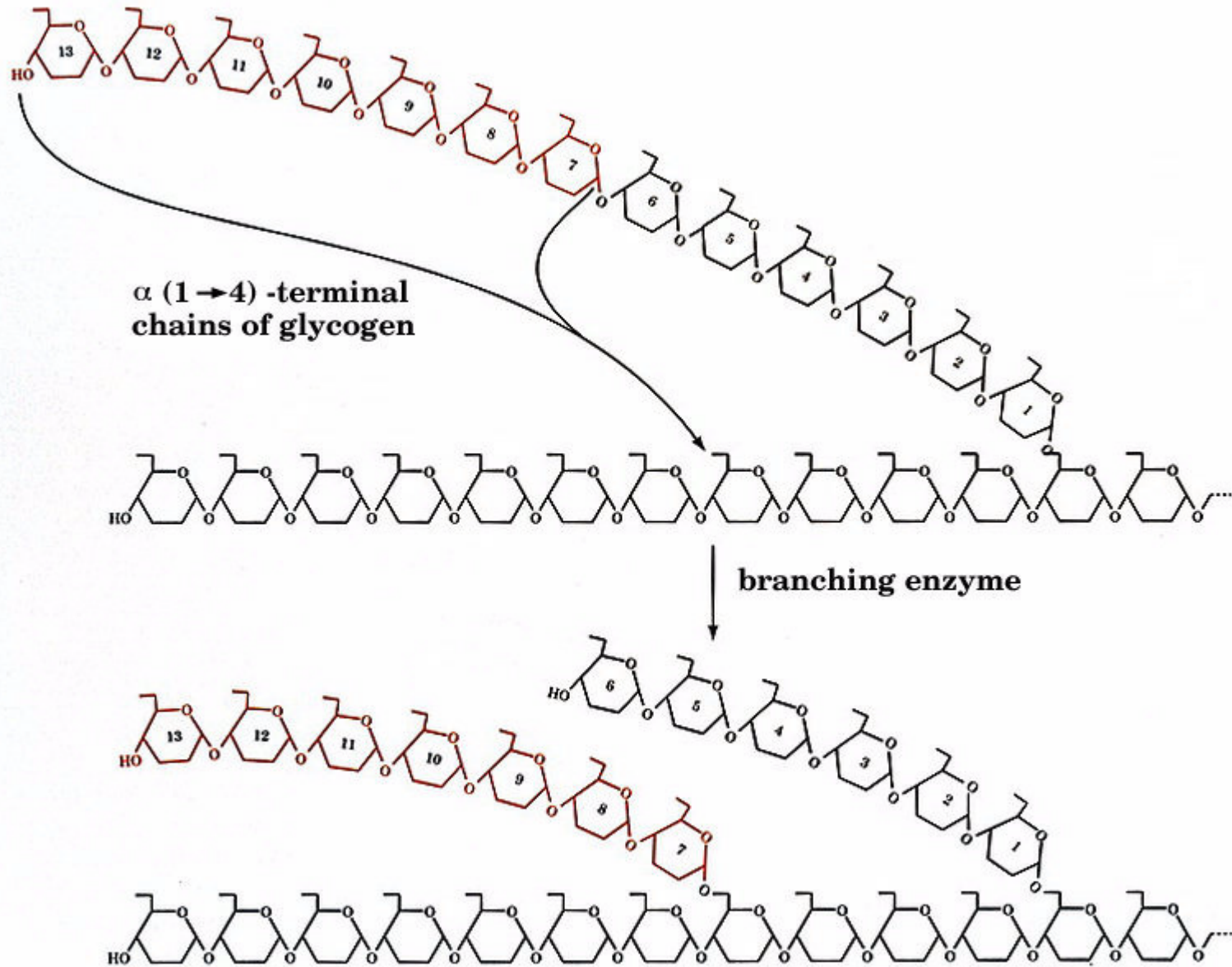


Fig 17.8

Glycogenolysis (Glycogen Breakdown)

4 Steps:

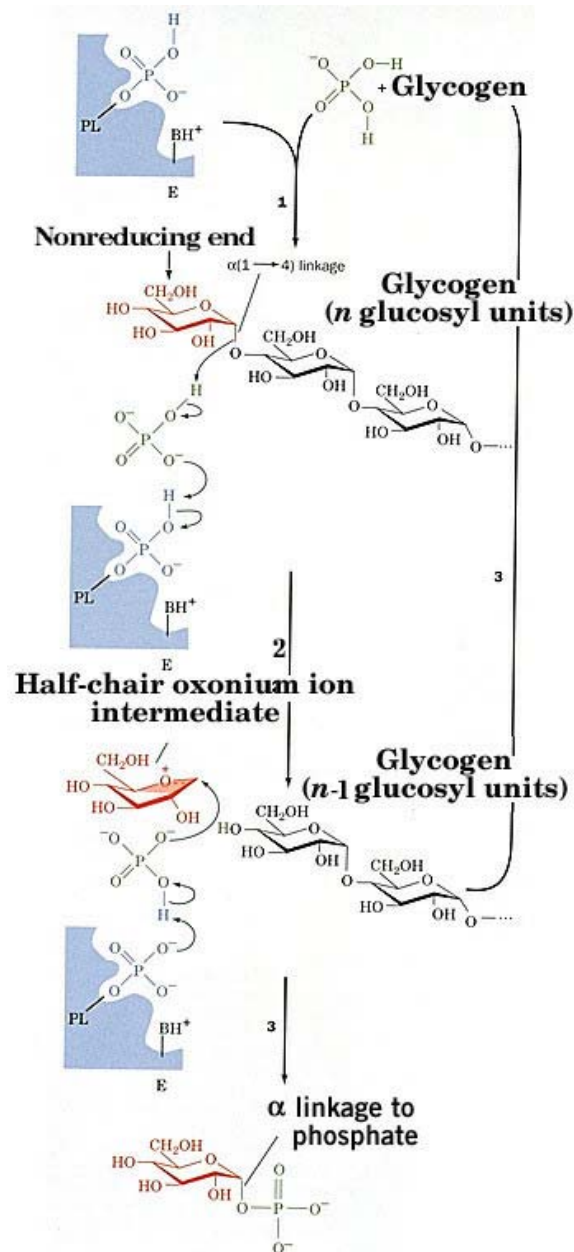
1) Glycogen Phosphorylase* (regulated step)

2) Phosphoglucomutase ($G1P \rightleftharpoons G6P$)

3) Debranching Enzyme

4) Glucose-6-phosphatase ($G6P \longrightarrow G$)
(only in liver)

Step 1: Glycogen Phosphorylase



PLP is a cofactor

Fig 17.3

Step 2: Phosphoglucomutase (PGM)

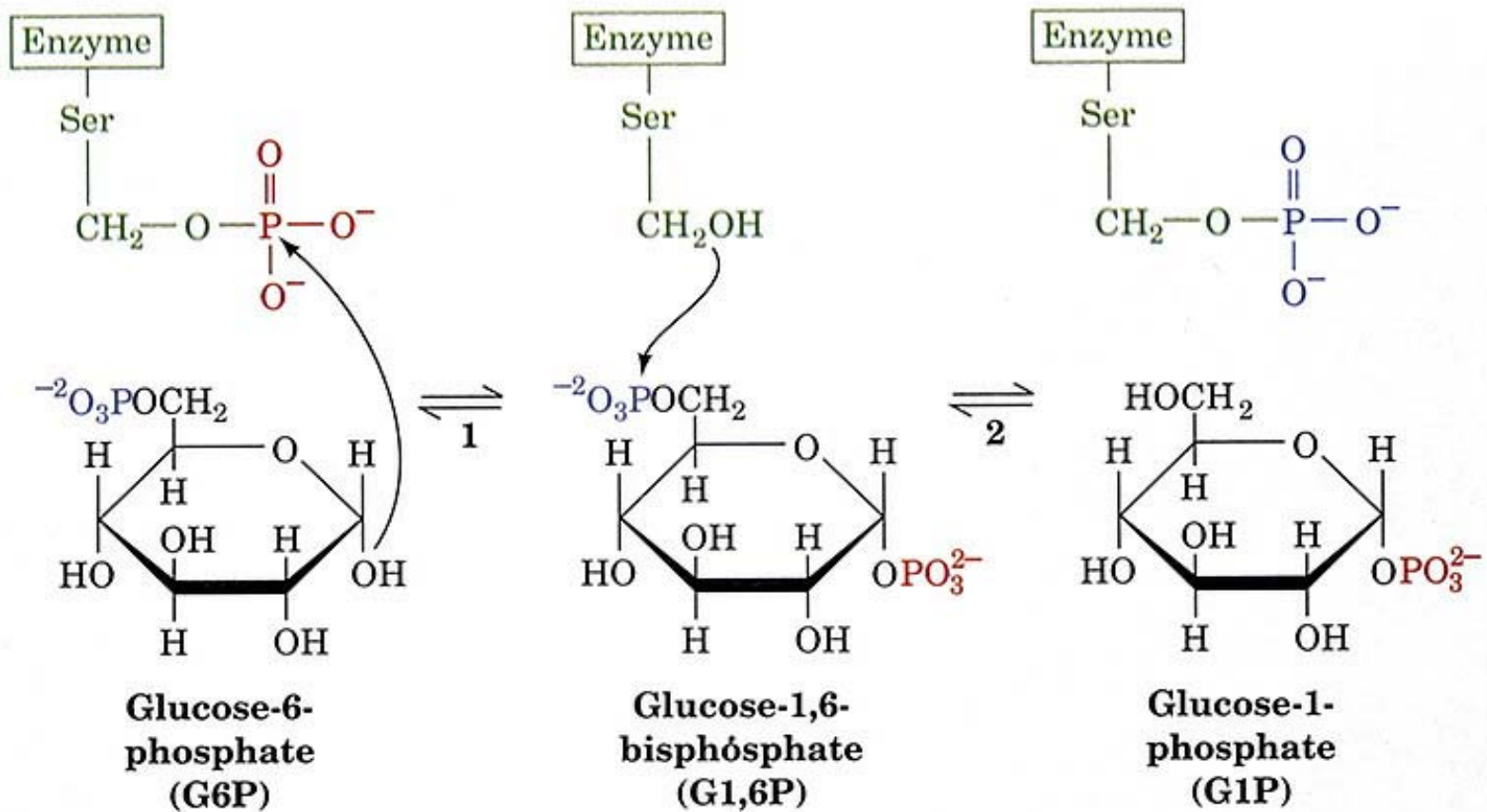


Fig 17.4

Step 3: Debranching Enzyme

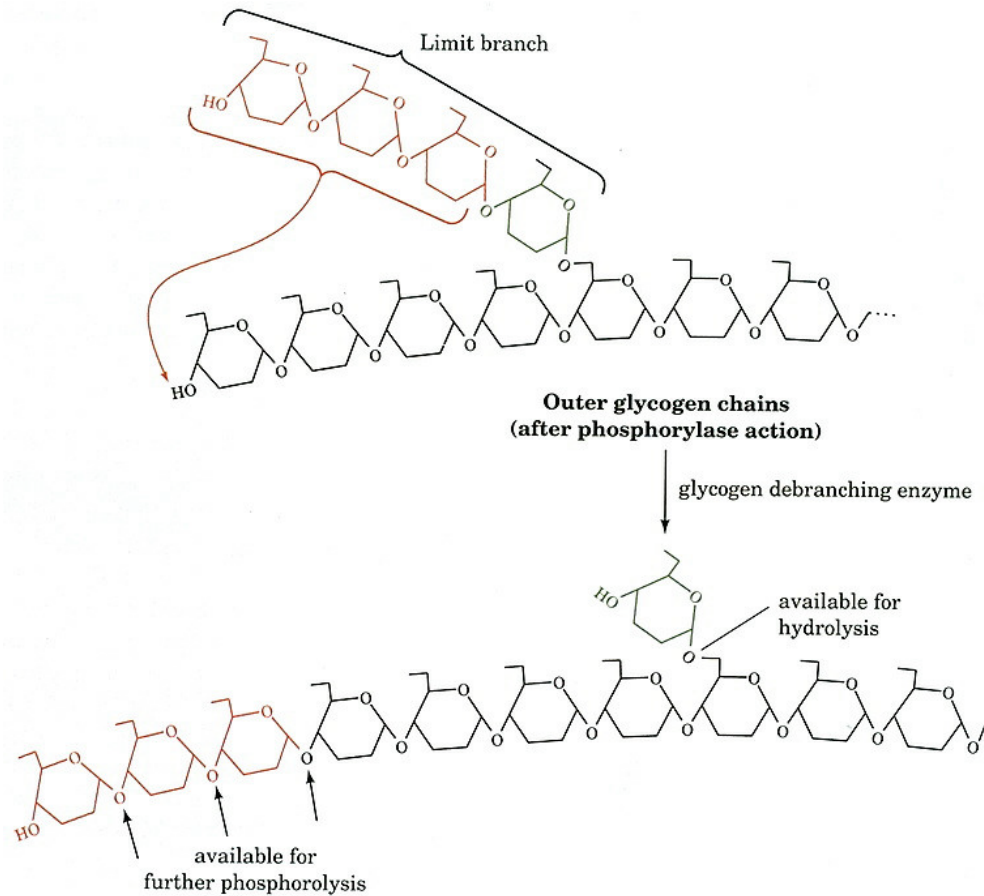


Fig 17.5

Step 4: Glucose-6-phosphatase

Glucose-6-phosphate \longrightarrow Glucose

Only happens in Liver

Biochemistry 2nd ed, Voet/Voet

Glycogen Phosphorylase Regulation

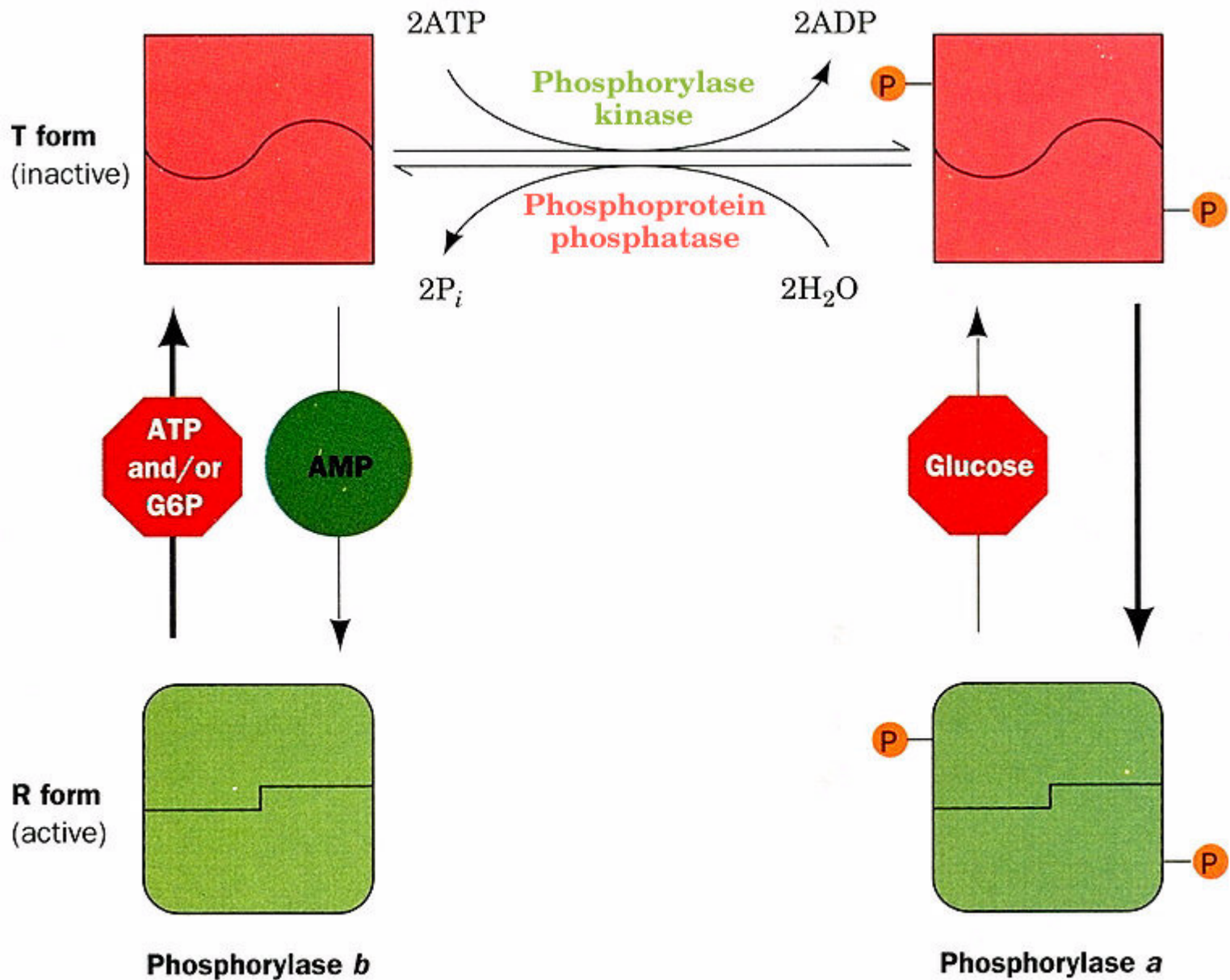


Fig 17.9