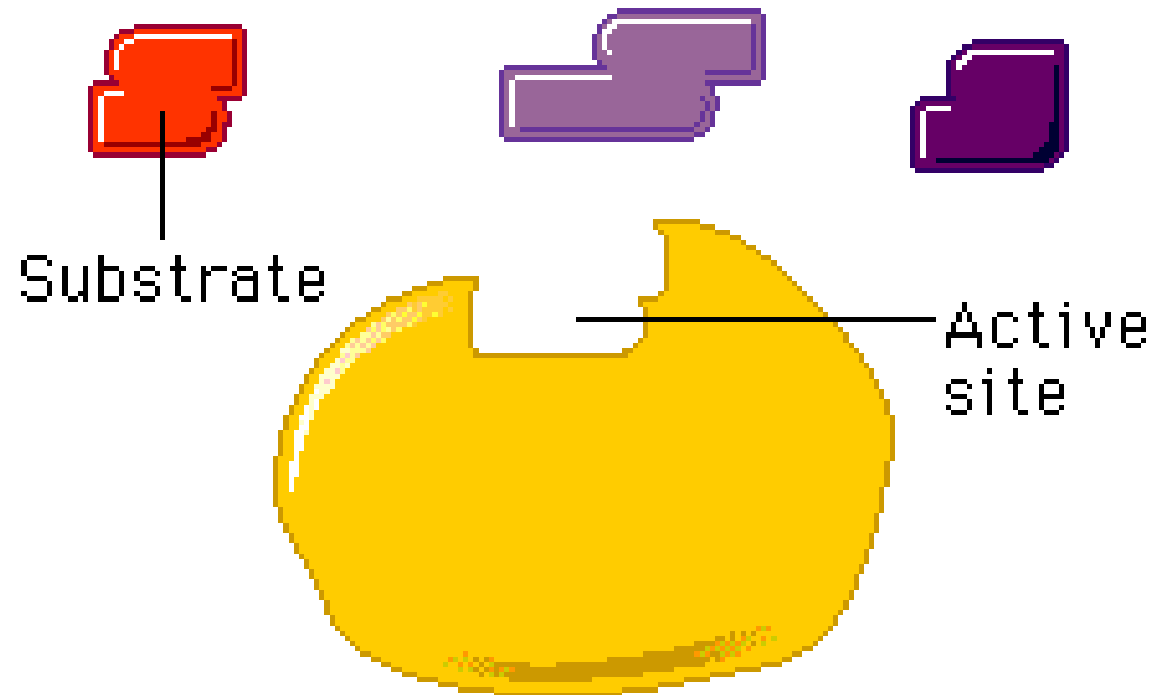


En-zymes



✓ A **catalyst** is a substance, which increases the rate of a chemical reaction,
but **do not alter** the **chemical equilibrium**

✓ Molecules of enzymes leave reaction unchanged and are **not consumed**.

{Build-up of new tissue, replacement of old tissue, conversion of food to energy,
disposal of waste materials, reproduction - all the activities that we characterize as
"life."}

❖ Understanding more about enzyme catalysts :

- what they are,
- what they do, and
- how they do it

✓ **Enzyme** is a specific **organic molecule** speeding the reaction in biological systems

- ✓ The vast majority of **enzymes** are proteins
 - ✓ enzymes can also contain **non-protein part**.
 - ✓ Based on non-protein content can classify as **simple** and **complex**
 - Edward Buchner (Noble prize:1907) showed fermentation can also be done using yeast fluid rather than yeast itself
- the word **Enzyme** came from latin word "**Zyma**" means yeast

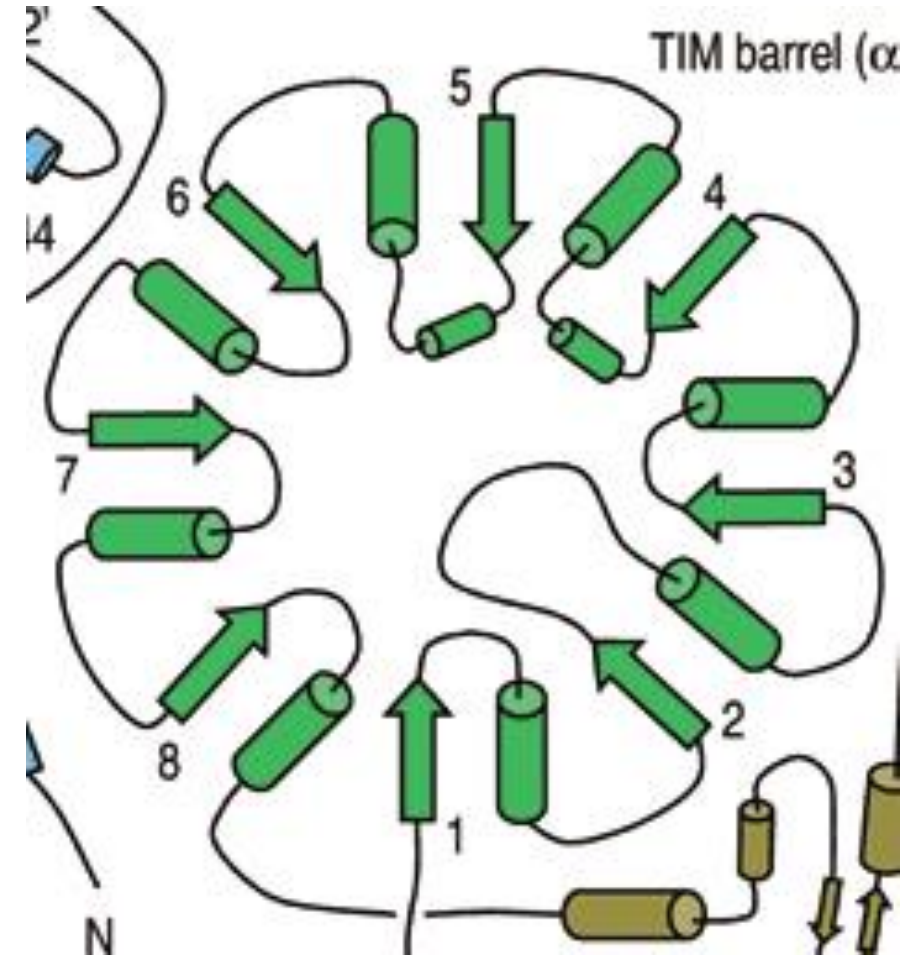
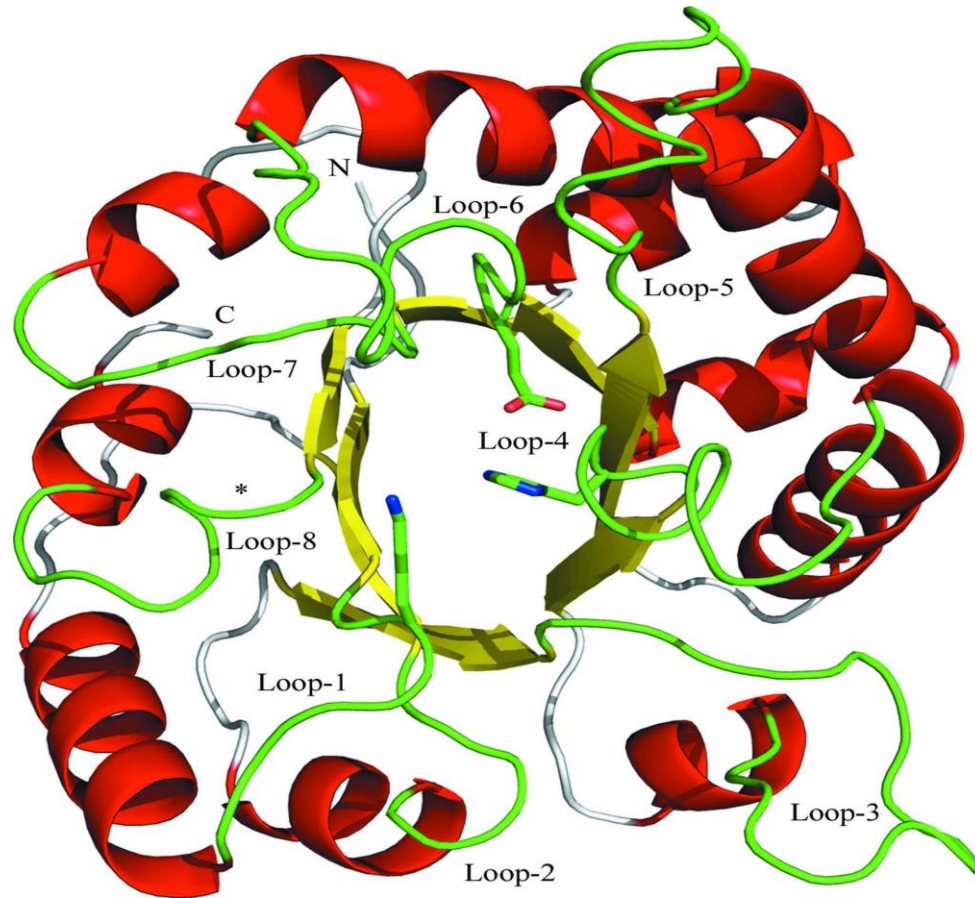
➤ Understanding about Enzyme with an example (triose phosphate isomerase)

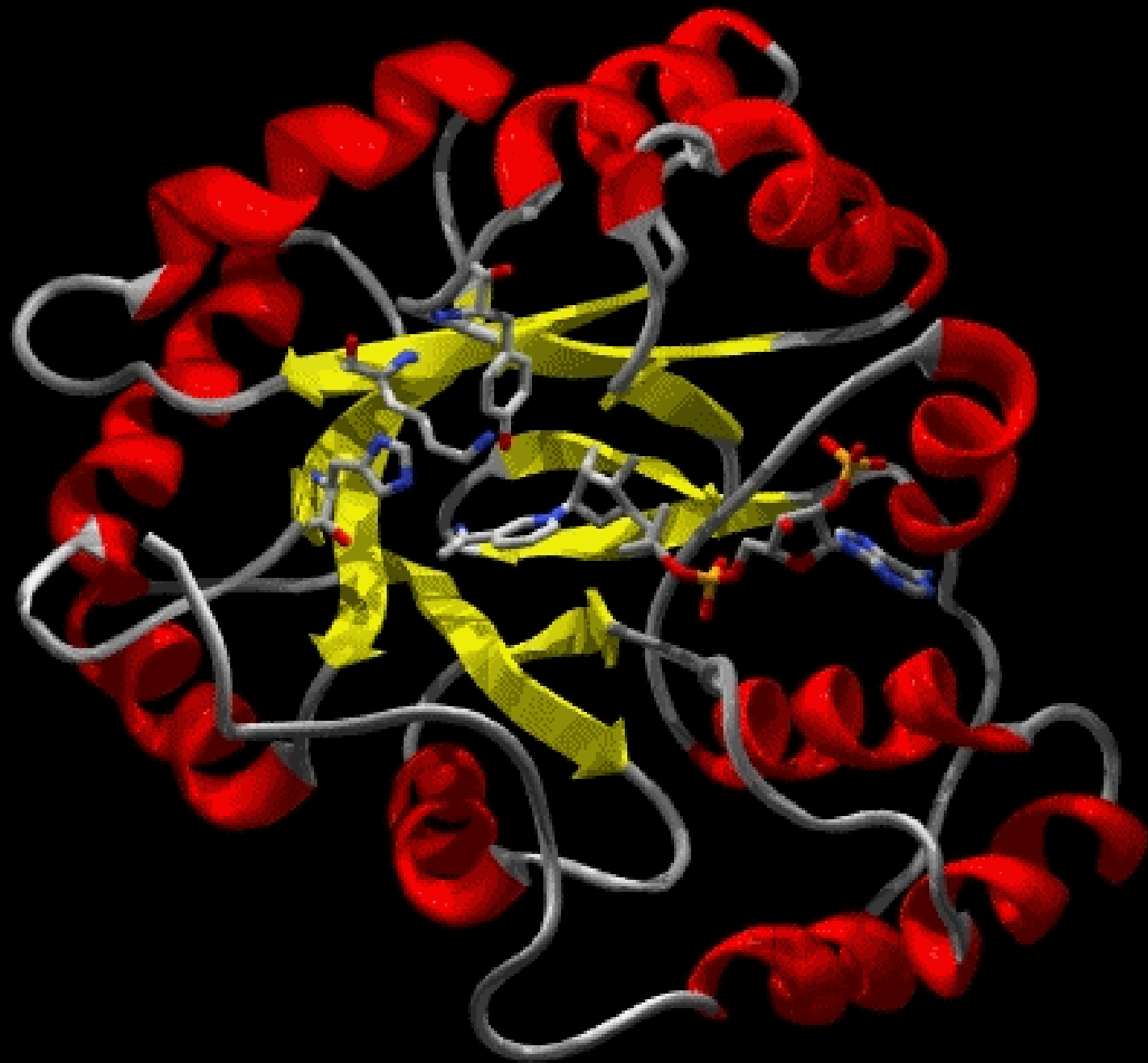
➤ TIM is a crucial enzyme in the glycolytic pathway

Structure comprises:

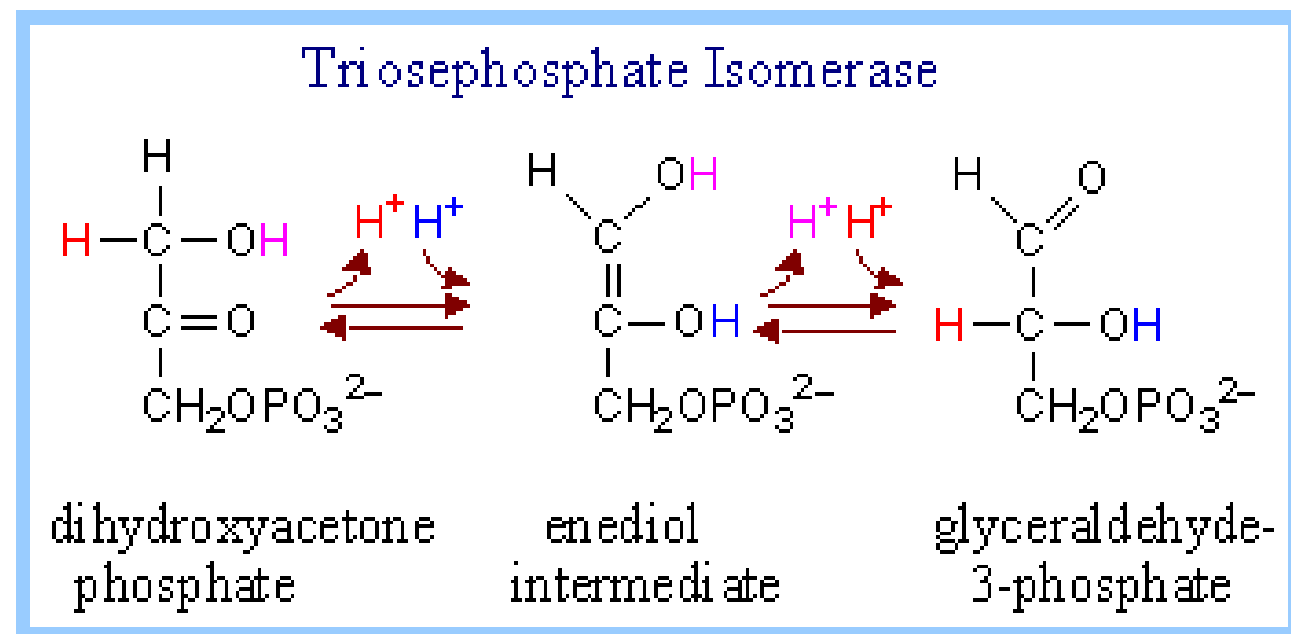
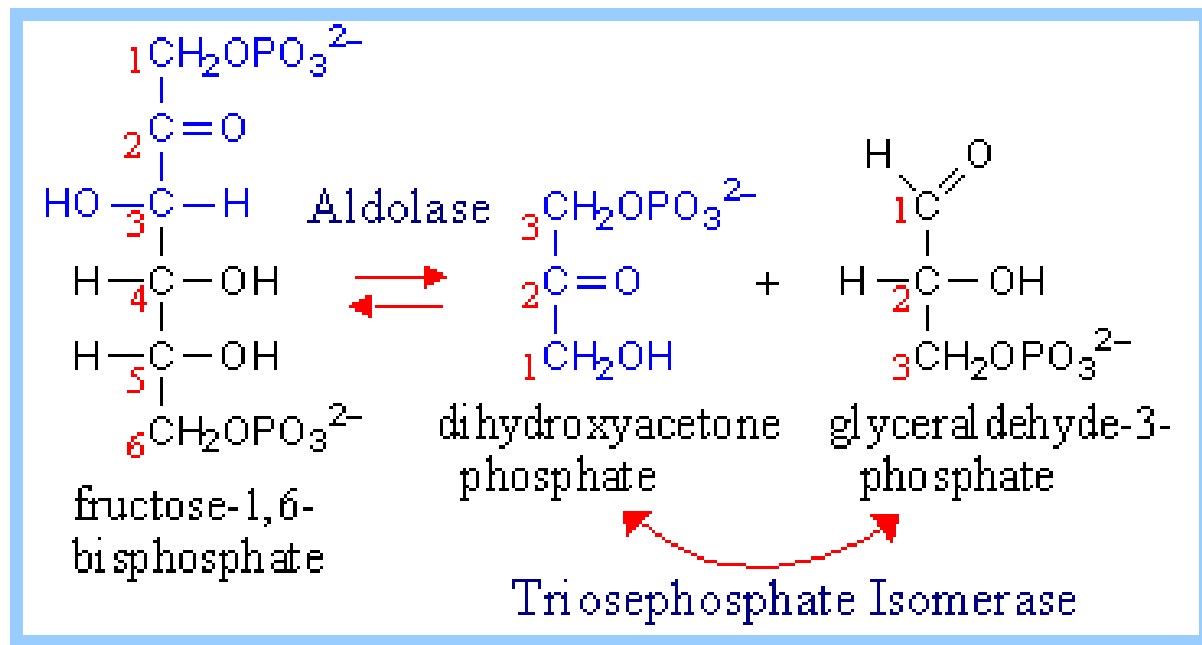
14 helices

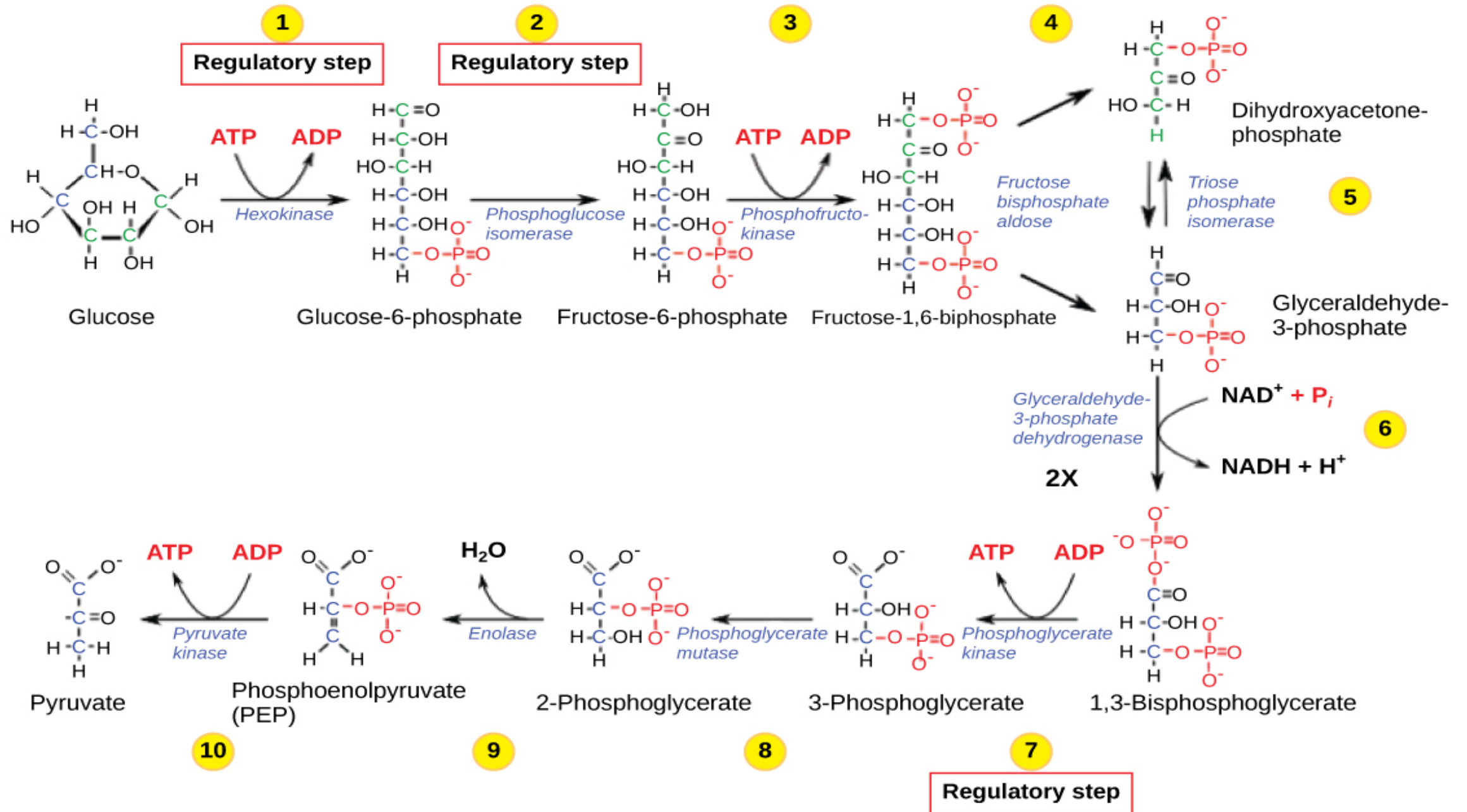
8 beta strands



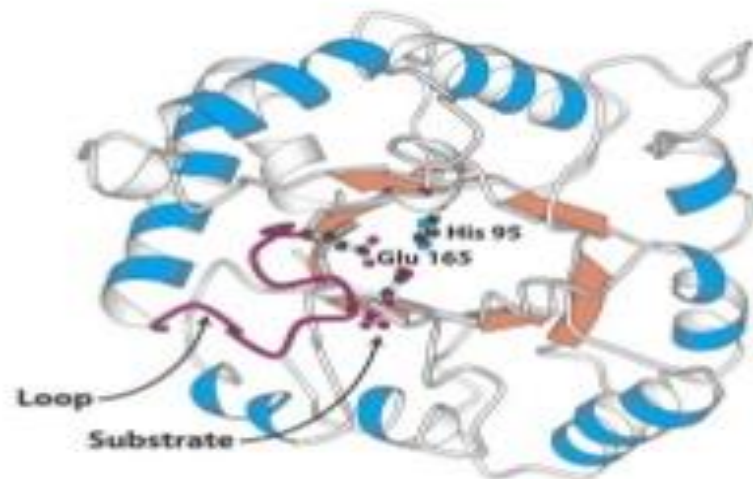


- ✓ It converts aldose Glyceraldehyde-3-phosphate (G3P) to another form of sugar ketose Dihydroxyacetone phosphate (DHAP)
- ✓ Interconversion from G3P to DHAP it has to go through cis-enediol intermediate molecule (transition molecule)
- ✓ An energetically favorable reaction
- ✓ Unstable cis-enediol makes the phosphate group come out of molecule in presence of water
- ✓ Enzyme helps to stabilize the reaction by 100 times in forming the product





Triose Phosphate Isomerase (TPI)

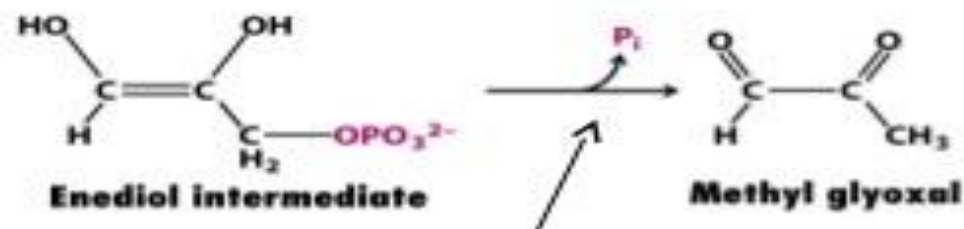


Triose phosphate isomerase (TPI)

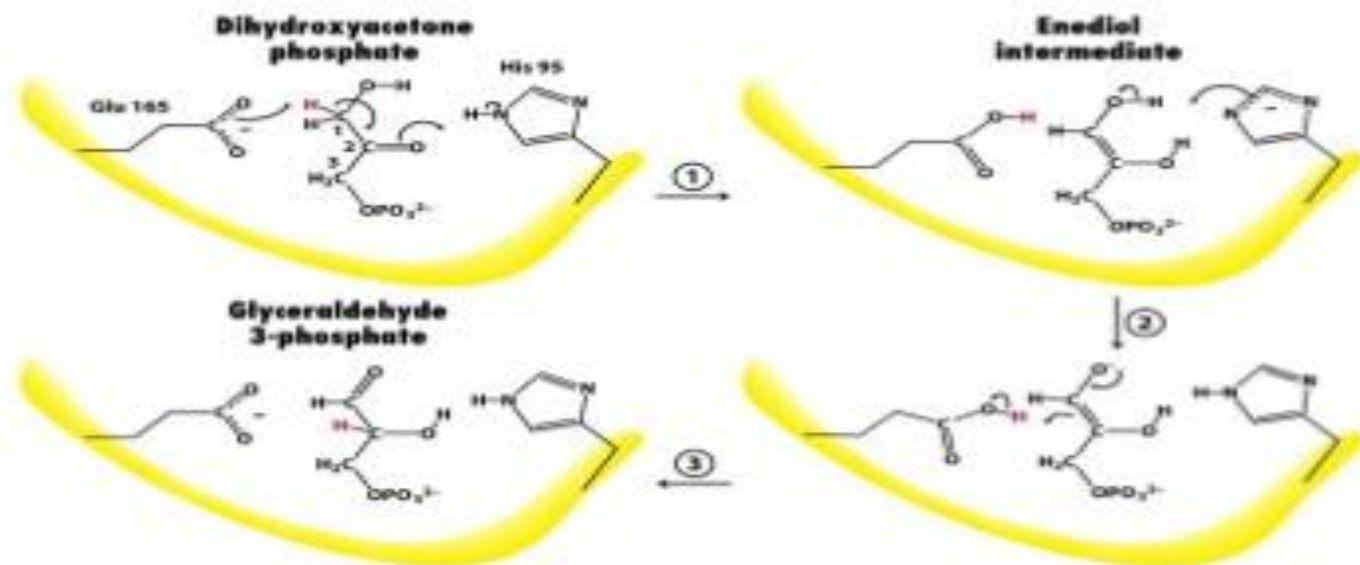
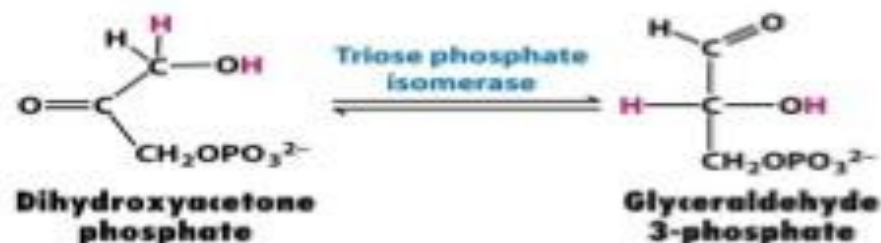
-> Isomerisation accelerated 10^{10} -fold

-;

-> suppresses an undesired side reaction



Reaction 100 times faster



TPI traps enediol intermediate -> prevents side reaction -> opens again when GAP formed

- **Glu 165 acts as the base and grabs the C2 proton on glyceraldehyde-3-phosphate**
- **while His 95 is H-bonded to the carbonyl oxygen and acts as the acid by protonating carbonyl oxygen**
- **stabilized by the positively charged side chain of Lys 12**

Imp points about Enzyme:

- ☐ It doesn't change energetic favorability
- ☐ It doesn't change activation barrier
- ☐ It stabilizes the transition state
- ☐ It prevents side reaction to occur
- ☐ It speeds up the reaction

Once the substrate is in its active site, the product is formed