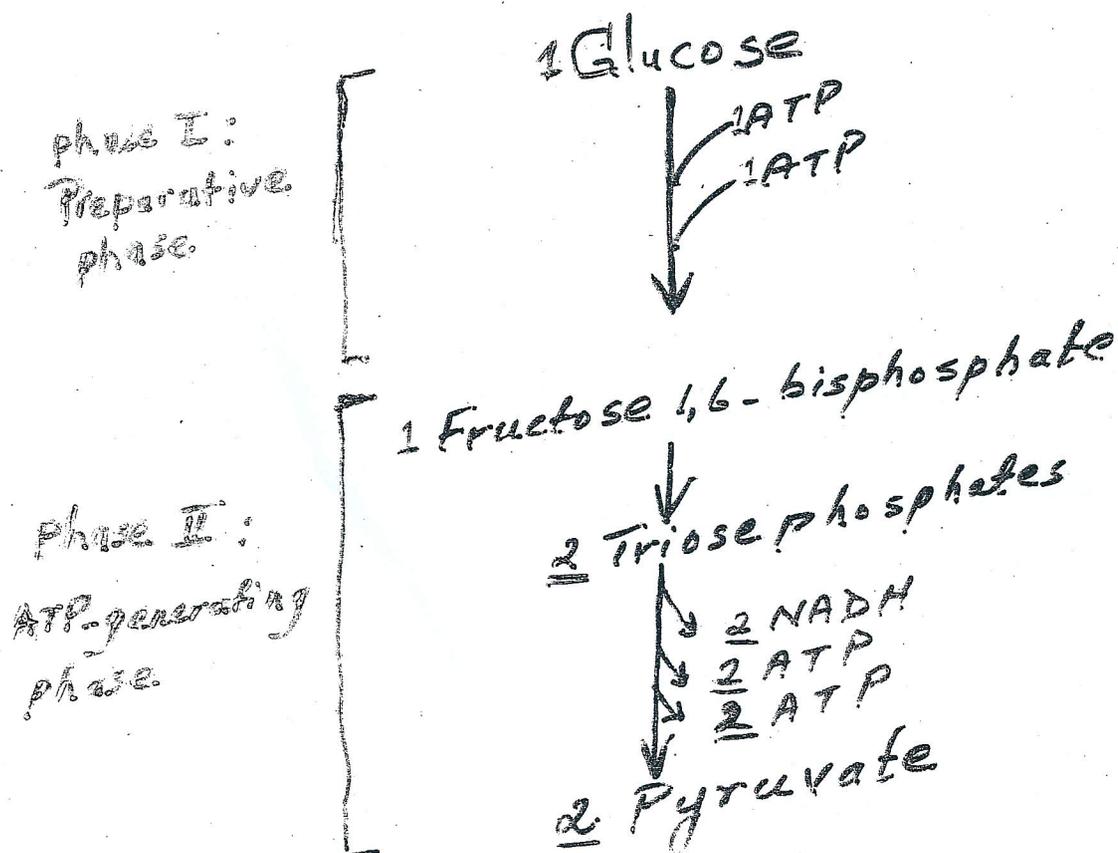


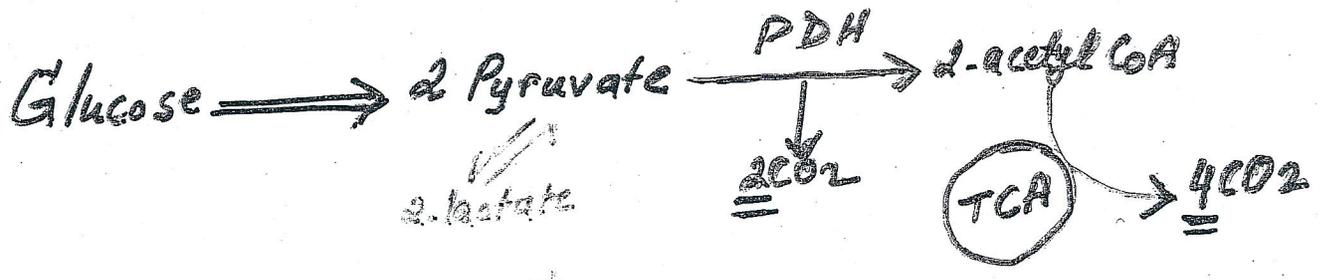
GLYCOLYSIS

- Universal Pathway in all cell types
- Generation of ATP with, and without, O_2
- Anabolic Pathway
→ biosynthetic precursors
- Phases of the glycolytic Pathway



GLYCOLYSIS :-

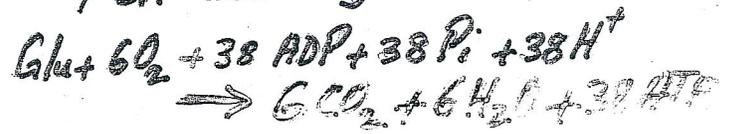
• Occurs in all Human Cells



No O₂-requirement for glycolysis - anaerobic fermentation



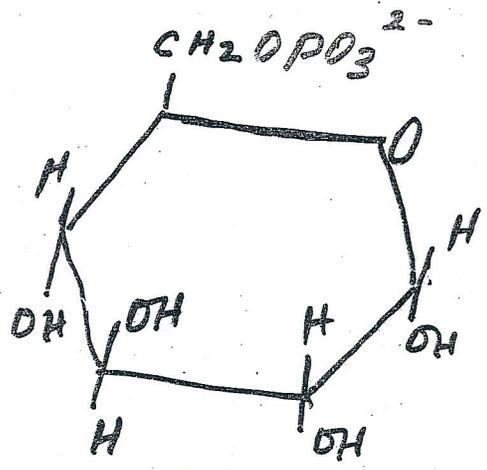
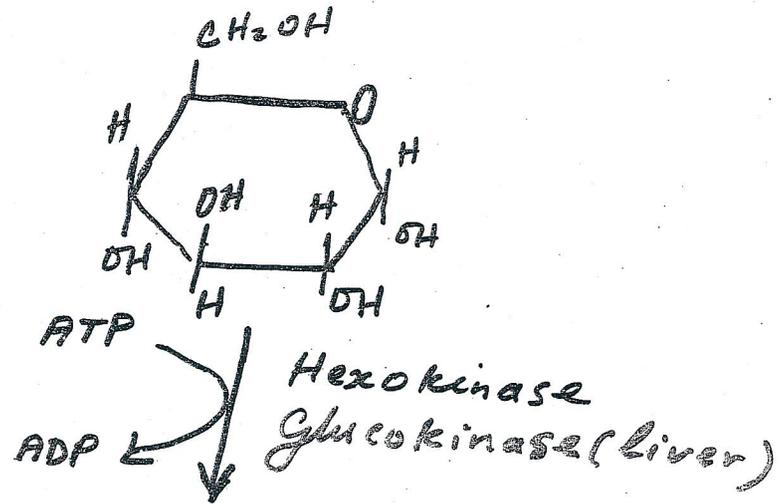
O₂-requirement for PDH & TCA activity



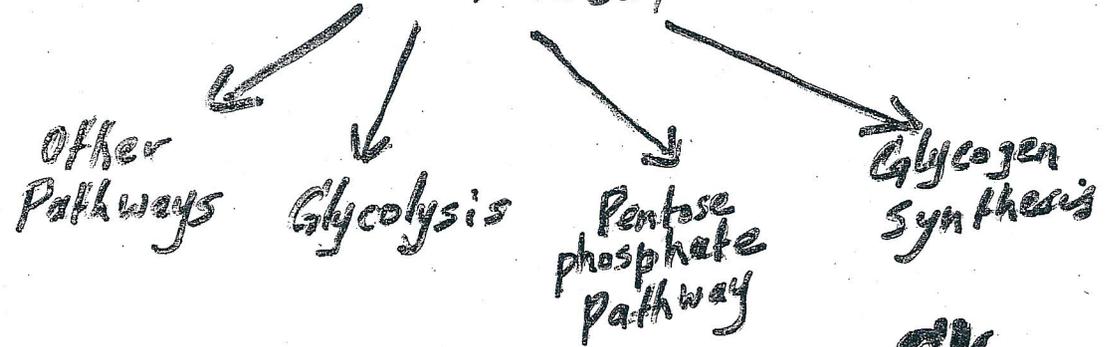
• Tissues that have an Absolute Requirement for Glucose

- Brain
- Red Blood cells
- Cornea, lens and retina
- Kidney Medulla, testis, Leukocyte and white muscle fibers

Glucose-6-phosphate Metabolism



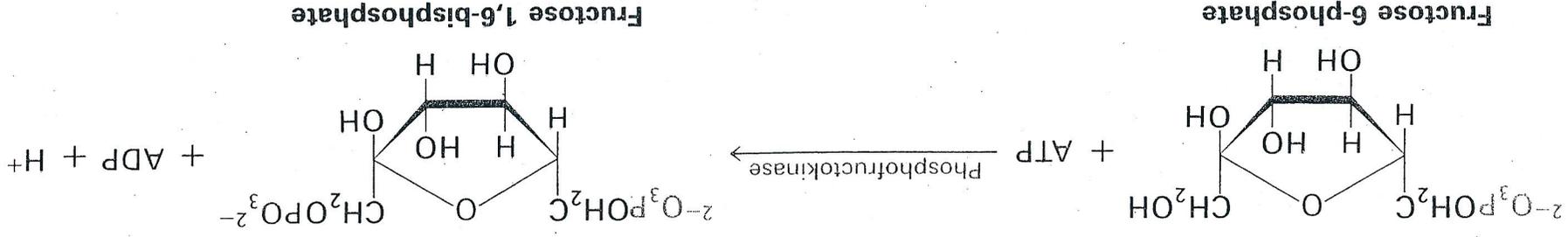
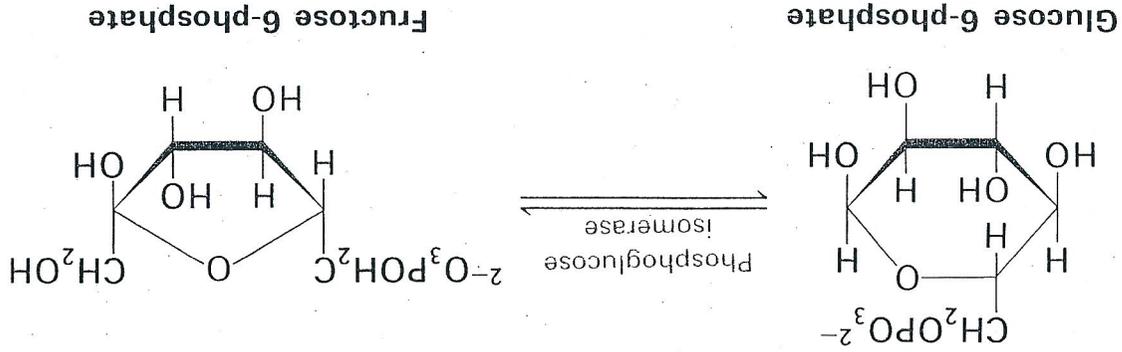
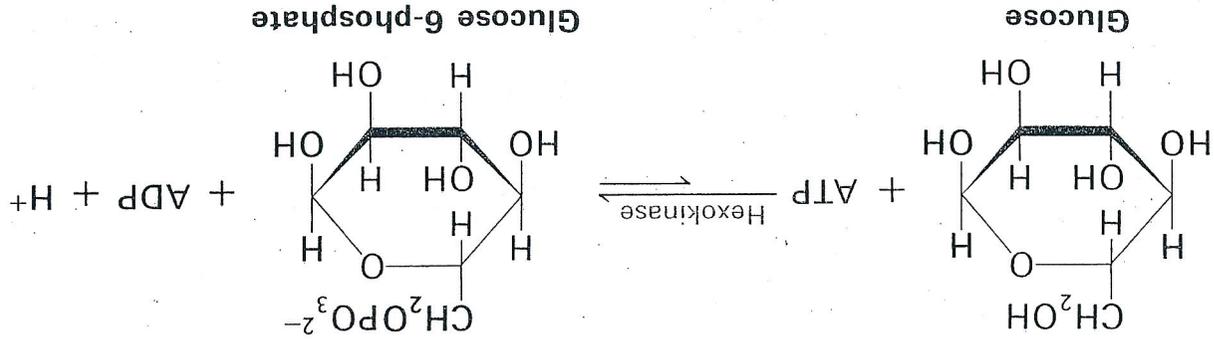
Glu-6-P



HK
clearance in all tissues
K_m 0.02 mM
S_P Glu, Fru, Man, Gal
induction Not induced
Function Even low blood

GK
 in Liver
 10 - 20 mM
 Glu + others
 ↑ insulin, Glu
 only > 100 mg/dl

Reactions of GLYCOLYSIS



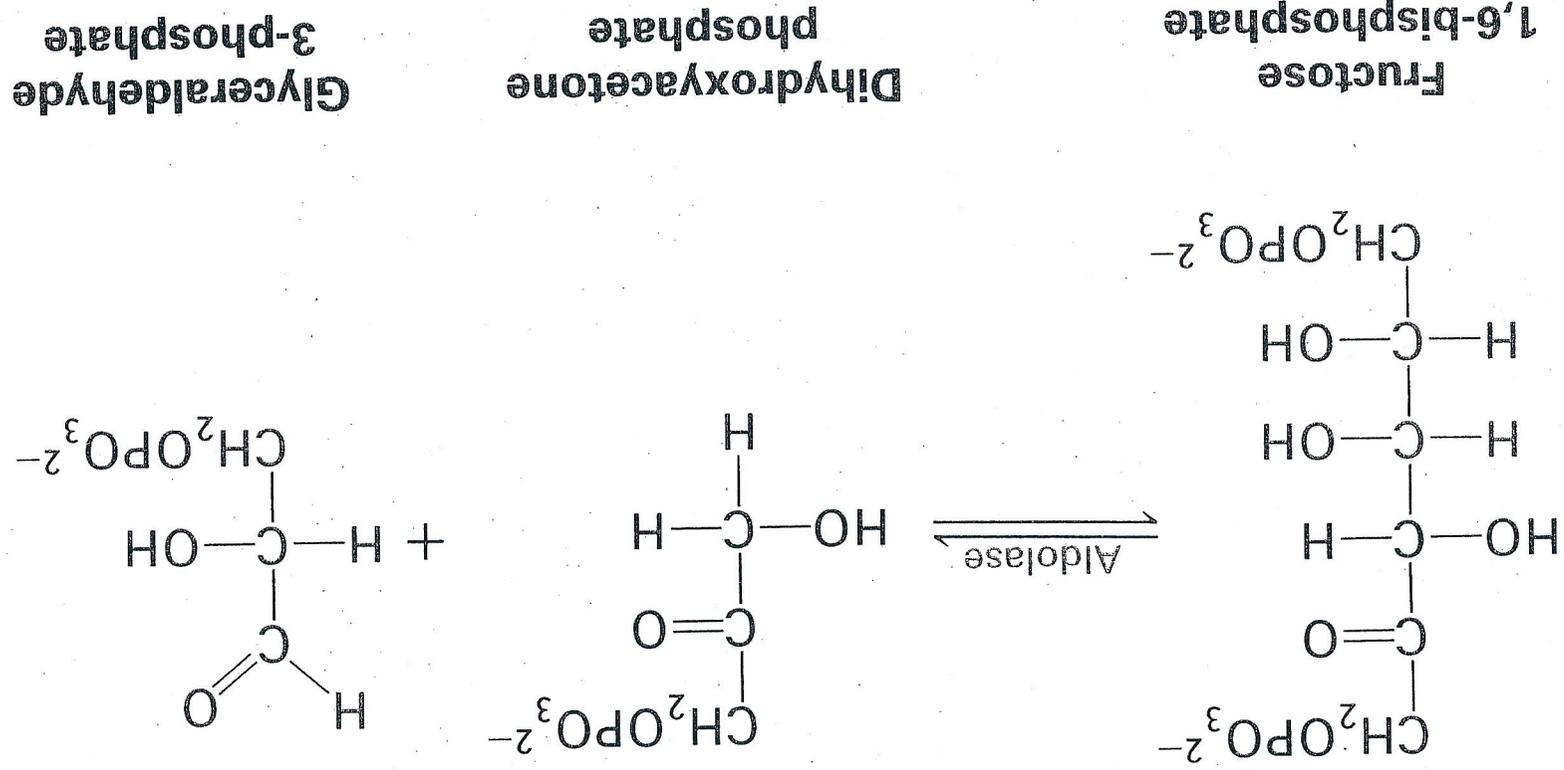
Assorted figures from pages 486 and 487

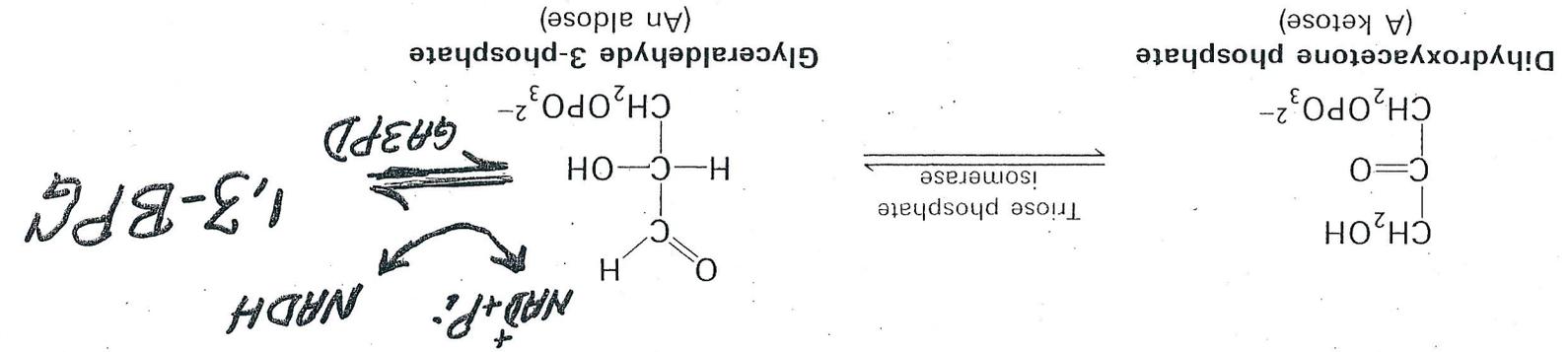
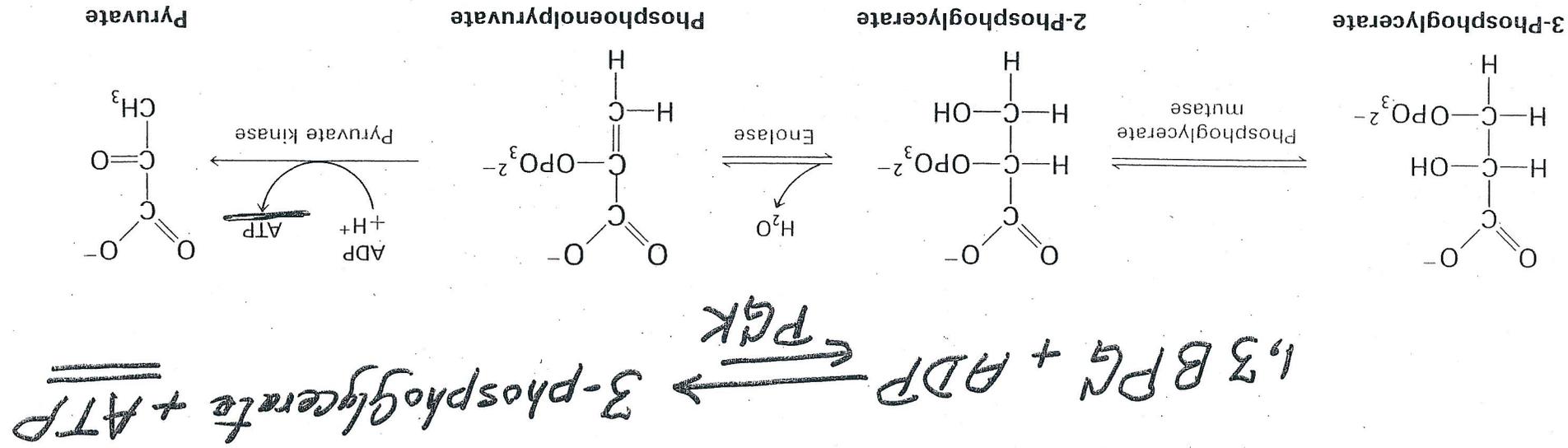
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T-53

Set I

(7)





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(M)

Glyceraldehyde 3-P dehydrogenase

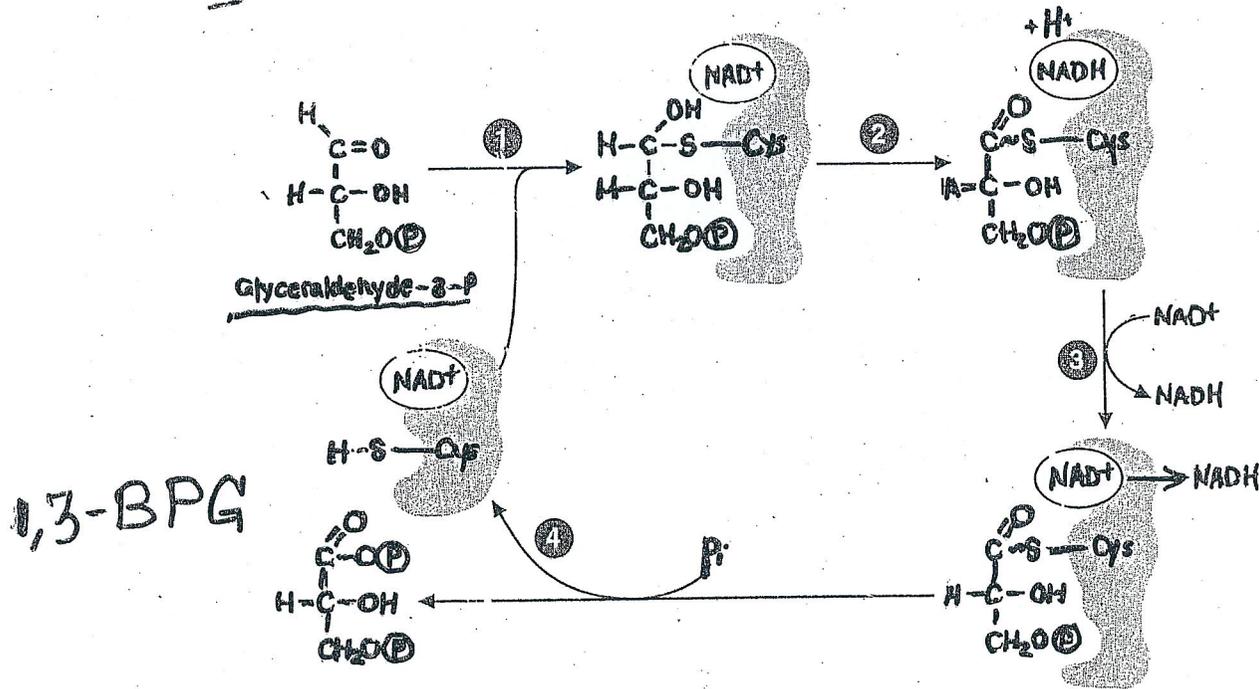


Fig. 22.17. Mechanism of the glyceraldehyde 3-phosphate dehydrogenase reaction. 1. The enzyme forms a covalent linkage with the substrate, using a cysteine group at the active site. The enzyme also contains bound NAD^+ close to the active site. 2. The substrate is oxidized, forming a high-energy thioester linkage (in blue), and NADH . 3. NADH has a low affinity for the enzyme and is replaced by a new molecule of NAD^+ . 4. Inorganic phosphate attacks the thioester linkage, releasing the product 1,3 bisphosphoglycerate, and regenerating the active enzyme in a form ready to initiate another reaction.

The Glycolytic Pathway

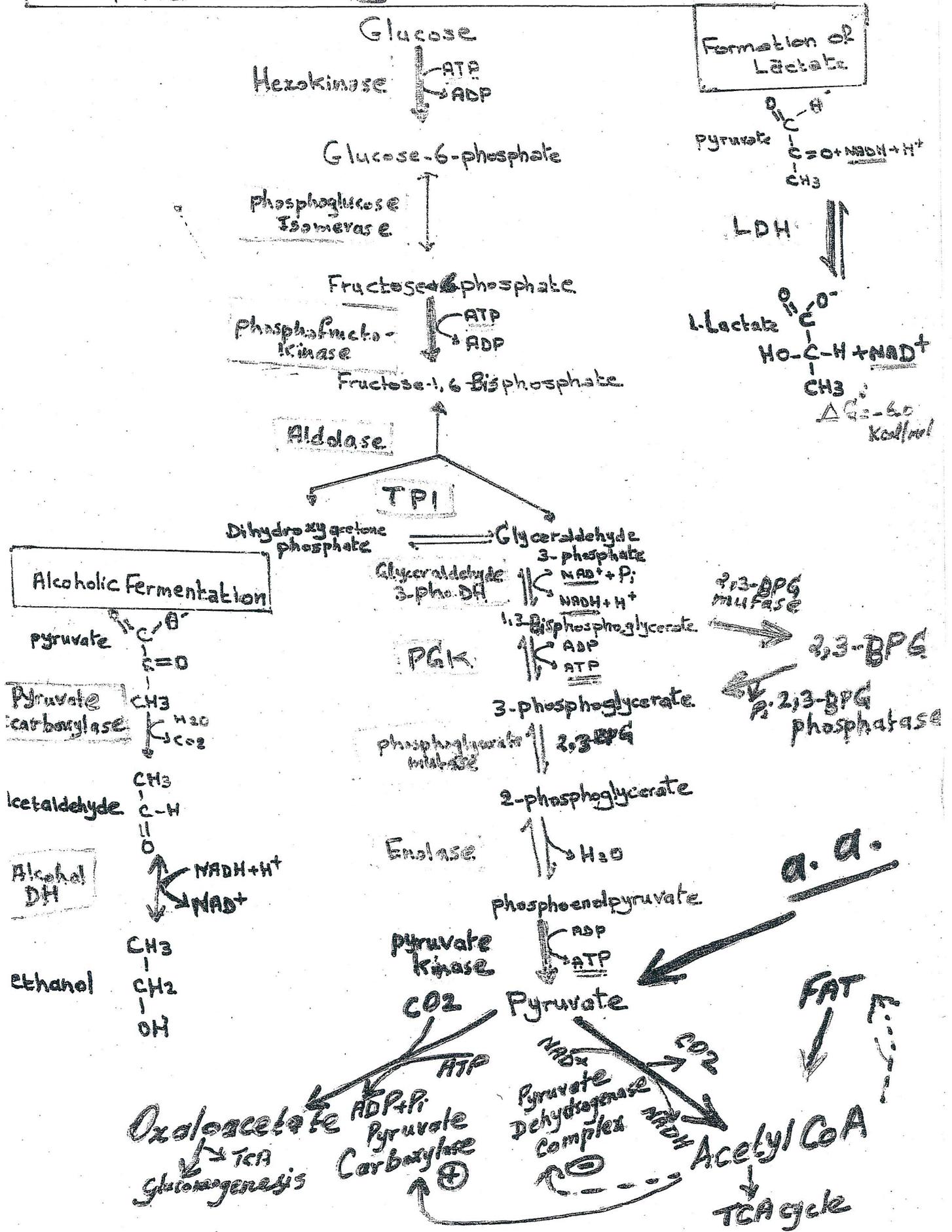
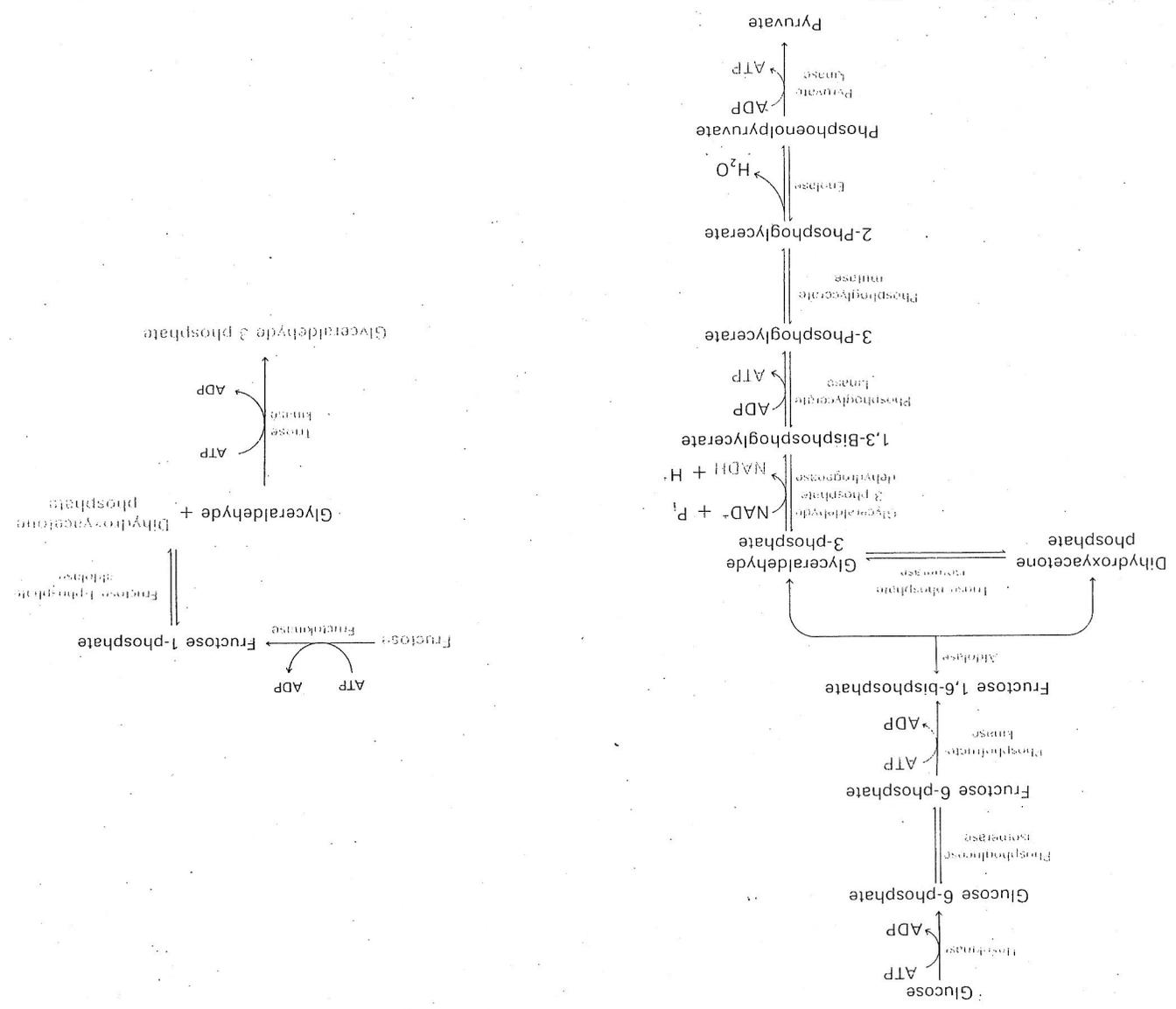


Figure 19-4, page 490; Figure 19-5, page 491



Lactate is produced anaerobically to meet the following demands

1. Cells with low energy demand
2. To cope with increased energy demands in vigorously exercising muscle

Lactate level is increased 5 to 10-fold

3. Hypoxia to survive brief episodes of hypoxia - but mixed blessings

Lactic Acidosis: \rightarrow lactate $> 5 \text{ mM}$ (0.4 - 1.8 mM) Ref. range
 \rightarrow PH < 7.2 (7.35 - 7.45)
is the most common cause of metabolic acidosis

- increased production of lactic acid
- decreased utilization

Most common cause is impairment of oxidative metabolism resulting from collapse of Circulatory System:-

- Impaired O_2 transport
e.g. myocardial infarction
- Respiratory Failure
e.g. Pulmonary embolism

- Uncontrolled hemorrhage 3b
- Direct inhibition of Oxidative-phosphorylation

Other Causes:-

- Hypoxia in any tissue

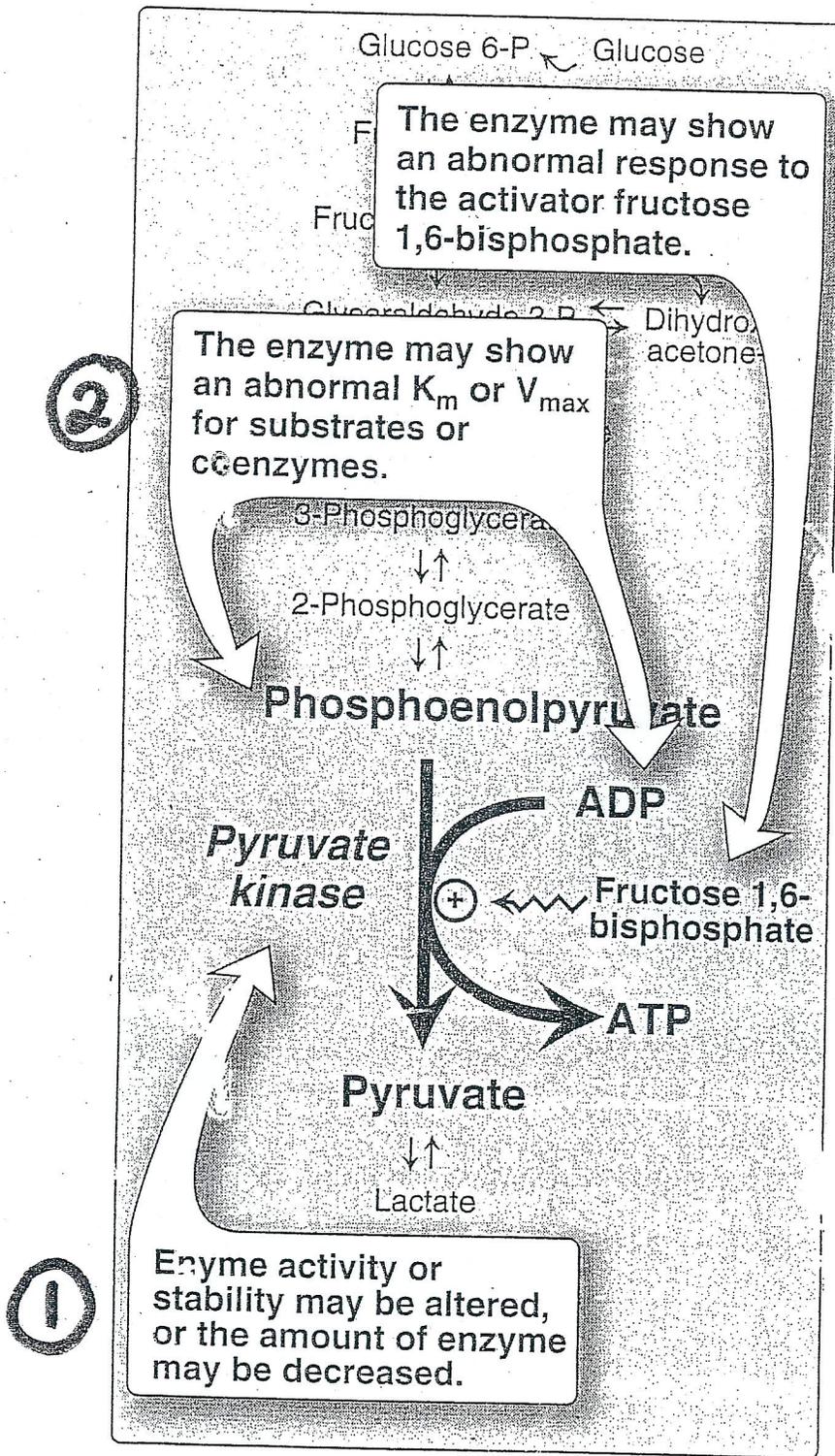
- Alcohol intoxication

→ ↑↑ NADH/NAD

- ↓ gluconeogenesis
- ↓ Pyruvate dehydrogenase
e.g. in heritted deficiency
thiamine deficiency
- ↓ TCA activity
- ↓ Pyruvate Carboxylase deficiency

- Pyruvate Kinase Deficiency

95% of glycolytic enz. deficiency cases



- Severe deficiency requires blood transfusion

- ↑ 2,3 BPG

- PGI (4% of glycolytic cases)