



Ministry of Higher Education and Scientific Research
AL-Mustaqbal University College of Science
Department of medical systems



Biochemistry

Lecture 7

Glycolysis

By

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GLYCOLYSIS

GLYCOLYSIS

Glycolysis comes from a merger of two Greek words:

- **Glykys = sweet**
- **Lysis = breakdown/ splitting**

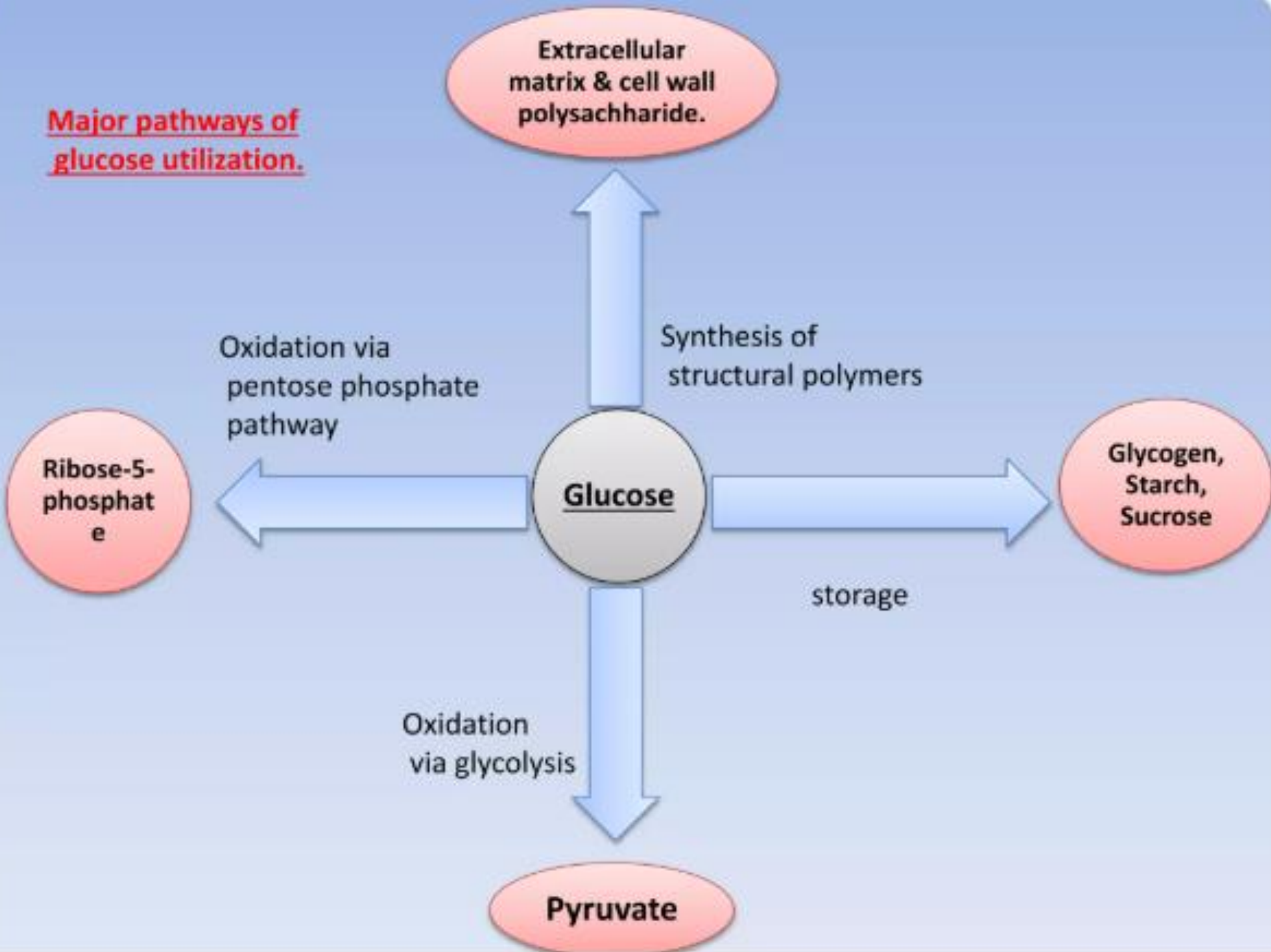
It is also known as Embden-Meyerhof-Parnas pathway or EMP pathway.

INTRODUCTION

- GLYCOLYSIS is the sequence of 10 enzyme-catalyzed reactions that converts glucose into pyruvate with simultaneous production on of ATP.
- In this oxidative process, 1mol of glucose is partially oxidised to 2 moles of pyruvate.
- This major pathway of glucose metabolism occurs in the cytosol of all cell.
- This unique pathway occurs **aerobically** as well as **anaerobically & doesn't involve molecular oxygen.**

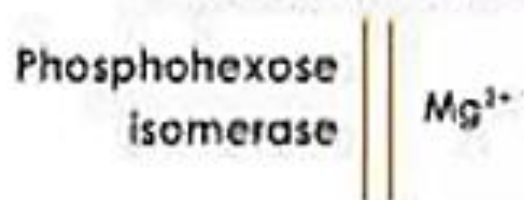
- It also includes formation of Lactate from Pyruvate.
- The glycolytic sequence of reactions differ from species to species only in the mechanism of its regulation & in the subsequent metabolic fate of the pyruvate formed.
- In aerobic organisms, glycolysis is the prelude to Citric acid cycle and ETC.
- Glycolysis is the central pathway for Glucose catabolism.

Major pathways of
glucose utilization.





Glucose 6-phosphate



Fructose 6-phosphate



Fructose 1 : 6 diphosphate

Aldolase

Phosphotriose

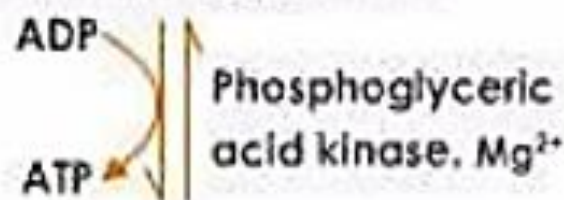
Isomerase

Dihydroxyacetone
3-phosphate

Glyceraldehyde
3-phosphate



1 : 3 Disphosphoglycerate



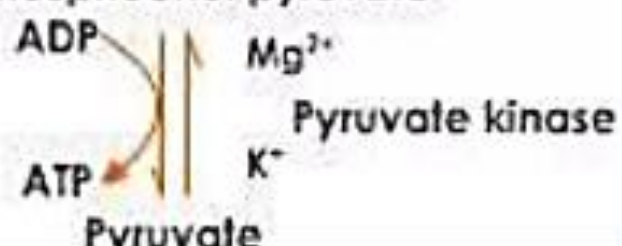
3-Phosphoglycerate

Phosphoglyceromutase

2-Phosphoglycerate



Phosphoenol pyruvate



TWO PHASES OF GLYCOLYSIS

- Glycolysis leads to breakdown of 6-C glucose into two molecules of 3-C pyruvate with the enzyme catalyzed reactions being bifurcated or categorized into 2 phases:
 1. **Phase 1- preparatory phase**
 2. **Phase 2- payoff phase.**

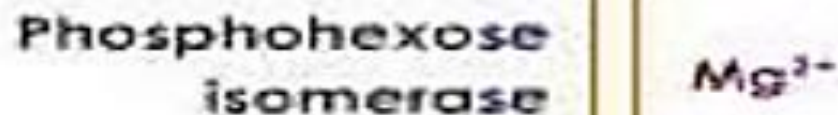
PREPARATORY PHASE

- It consists of the 1st 5 steps of glycolysis in which the glucose is enzymatically phosphorylated by ATP to yield Fructose-1,6-biphosphate.
- This fructose-1,6-biphosphate is then split in half to yield 2 molecules of 3-carbon containing Glyceraldehyde-3-phosphate/ dihydroxyacetone phosphate.

- Thus the first phase **results in cleavage of the hexose chain.**
- This cleavage requires an investment of 2 ATP molecules to activate the glucose molecule and prepare it for its cleavage into 3-carbon compound.



Glucose 6-phosphate



Fructose 6-phosphate



Fructose 1 : 6 diphosphate

Aldolase

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graph TD; F16BP -- "Aldolase" --> DHAP[Dihydroxyacetone 3-phosphate]; F16BP -- "Aldolase" --> GAP[Glyceraldehyde 3-phosphate];
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Phosphotriose

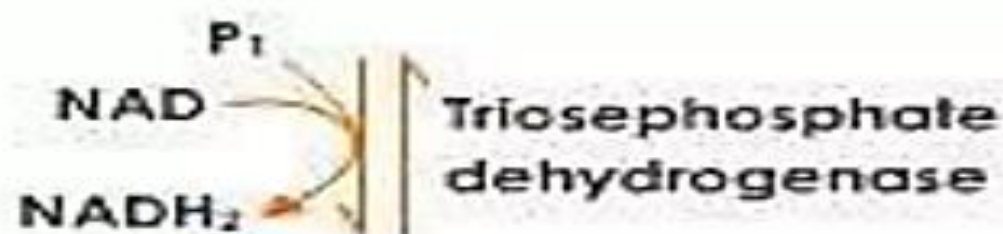
isomerase

Dihydroxyacetone
3-phosphate

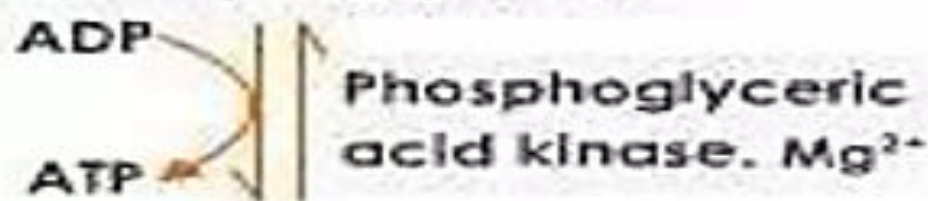
Glyceraldehyde
3-phosphate

PAYOFF PHASE

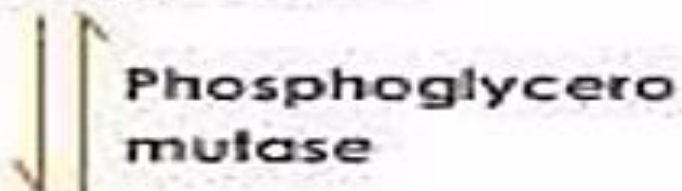
- This phase constitutes the last 5 reactions of Glycolysis.
- This phase marks the release of ATP molecules during conversion of Glyceraldehyde-3-phosphatae to 2 moles of Pyruvate.
- Here 4 moles of ADP are phosphorylated to ATP. Although 4 moles of ATP are formed, the net result is only 2 moles of ATP per mole of Glucose oxidized, since 2 moles of ATP are utilized in Phase 1.



1 : 3 Disphosphoglycerate



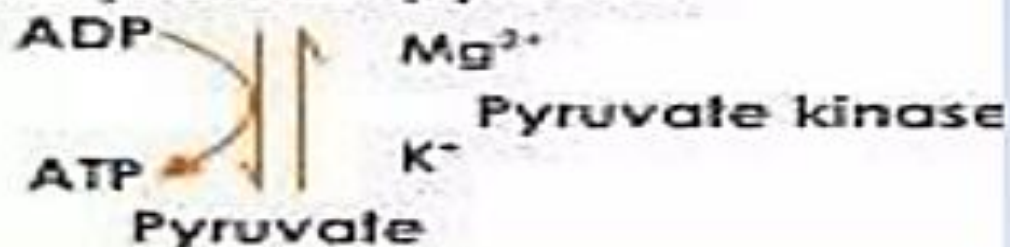
3-Phosphoglycerate



2-Phosphoglycerate



Phosphoenol pyruvate



*Thank
you*

