



WASHINGTON STATE UNIVERSITY

Elson S. Floyd
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READING GUIDE

GLYCOLYSIS

Objectives

1. Describe the four fates of glucose
2. Diagram and describe glycolysis, including its metabolic regulation
3. Differentiate between hexokinase and glucokinase and their respective importance in glycolysis
4. Diagram and describe the formation and utilization of pyruvate and lactate

METABOLISM OVERVIEW

Look at (Fig.) and have an appreciation for how all the metabolic pathways are related to each other (carbohydrates, lipids, and proteins)

There are three major stages of catabolism, what are they, and why are they important? (Fig. 8.3)

How does anabolism differ from catabolism?

What is the net energy yield from glycolysis? Compare and contrast anaerobic and aerobic glycolysis. (Fig. 8.22)



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REGULATION OF METABOLISM

Why is intracellular and extracellular communication important in metabolism?

How are adenylyl cyclase and G-protein-coupled receptors important for regulation of metabolism (Fig. 8.7 and 8.8). How do these cell signaling systems work?

Why is hormonal regulation of glycolysis important? How does this regulation occur (Fig. 8.23)?

GLUCOSE TRANSPORT

There are two different transport mechanisms that a cell uses to move glucose into a cell. What are they?

There are 14 different isoforms of GLUT proteins. Why are there so many different types? What is the difference between some of these?

What is an SGLT? When is it used?



GLYCOLYSIS

Glycolysis is considered the hub of carbohydrate metabolism. (Fig. 8.9) demonstrates why this is true. Glycolysis has ten steps. The first five need ATP and are considered to be an "energy investment" phase of the reaction. The remaining steps create ATP as well as pyruvate.

Glucose is phosphorylated by two different kinases. What are they and why are they different? (Fig. 8.12 and 8.13) How are these enzymes regulated? (Fig. 8.14)

After a phosphate is added to glucose it is isomerized, which enzyme is important for this? (Fig. 8.15)

Phosphofructokinase-1 is considered to be the main regulatory enzyme in glycolysis. How is it controlled (Fig. 8.16)? How does Fructose 2,6-bisphosphate relate to this control?

How does insulin affect the concentration of Fructose 2,6-bisphosphate? (Fig. 8.17)

What does the enzyme aldolase do and how does it relate to triose phosphate isomerase? (Fig. 8.16). What is the relationship between glyceraldehyde 3-phosphate and dihydroxyacetone phosphate?

What is made by the oxidation of glyceraldehyde 3-phosphate? (Fig. 8.18)

How is 1,3-BPG made?

How does arsenic disrupt the synthesis of 1,3-BPG?

Why is 2,3-BPG important?

The synthesis of 3-phosphoglycerate produces ATP. Which enzyme is important for this? How many molecules of ATP are made? Is this reaction reversible?

What are the enzymes enolase and phosphoglycerate mutase important for?



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PYRUVATE AND LACTATE

Why is the pyruvate kinase enzyme so important? What does it produce? Is it reversible?

- How does fructose 1,6-bisphosphate relate to pyruvate kinase?
- How is pyruvate kinase regulated? (Fig. 8.19)
- What happens during pyruvate kinase deficiency? (Fig. 8.20)

How is lactate formed? (Fig. 8.21) How is lactate utilized? What is Lactic acidosis?

What are three alternate fates of pyruvate (Fig. 8.24)?