

Chemistry 506: Allied Health Chemistry 2Chapter 22: Biosynthetic PathwaysMaking Complex Biomolecules

Introduction to General, Organic & Biochemistry, 5th Edition by
Bettelheim and March: Chapter 22, Pages 691-704

Outline Notes by Dr. Allen D. Hunter, YSU Department of
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Outline

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1A Section(s) 22.1 Introduction

- **Anabolism:** the synthesis of complex biomolecules

- **Flexibility**
 - There are several **alternate paths** to the synthesis of most products

- **Up Hill!!!**
 - **Anabolic Syntheses** yield more **complex molecules**
 - Atoms are typically more stable as CO₂, H₂O, O₂, etc., starting materials
 - Therefore one needs to add substantial **energy** to the system to get the reactions to proceed

- As one source of energy, synthesis steps are coupled to the **exothermic hydrolysis** of **ATP** to **ADP**

Simple Starting Materials + Energy → **Complex Biochemicals**

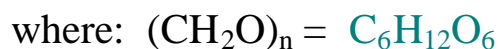


- **Anabolism** compared to **Catabolism**
 - The “reverse” chemical reactions
 - Different **paths** but often some common **enzymes**
 - Anabolism primarily in **Cytosol** rather than **Mitochondrion**
 - Different direction of **energy flow**

1B Section(s) 22.2 Biosynthesis of Carbohydrates

➤ Photosynthesis

- In plants uses **chlorophyll** and light
- Occurs in **chloroplasts**
- In other **photosynthetic organisms** uses other **light gathering pigments**



➤ Gluconeogenesis

- The synthesis of **glucose**
- Can be done using many different small molecules from **catabolic pathways**
- Many of the same enzymes as **glycolysis** but has 4 unique **enzymes**

➤ Oligomerization

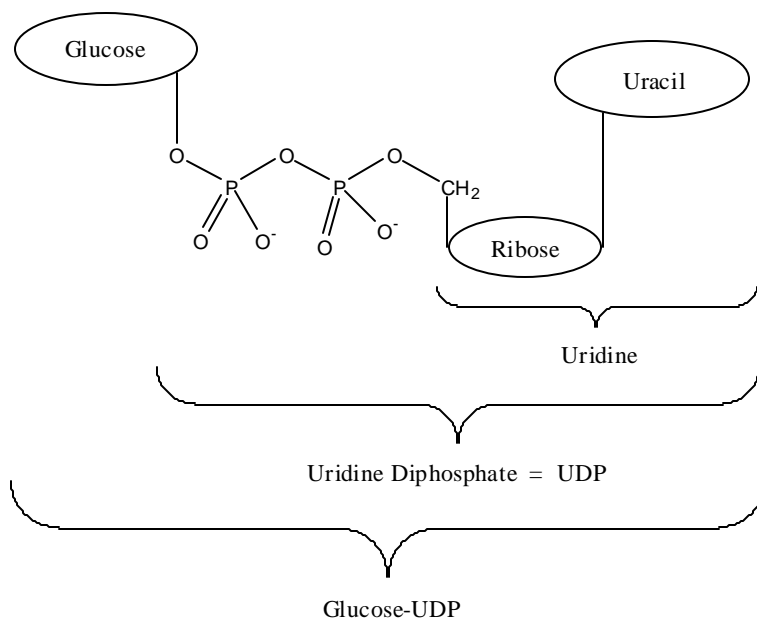
➤ The formation of new glycosidic linkages

➤ Driven by the energy of phosphate hydrolysis

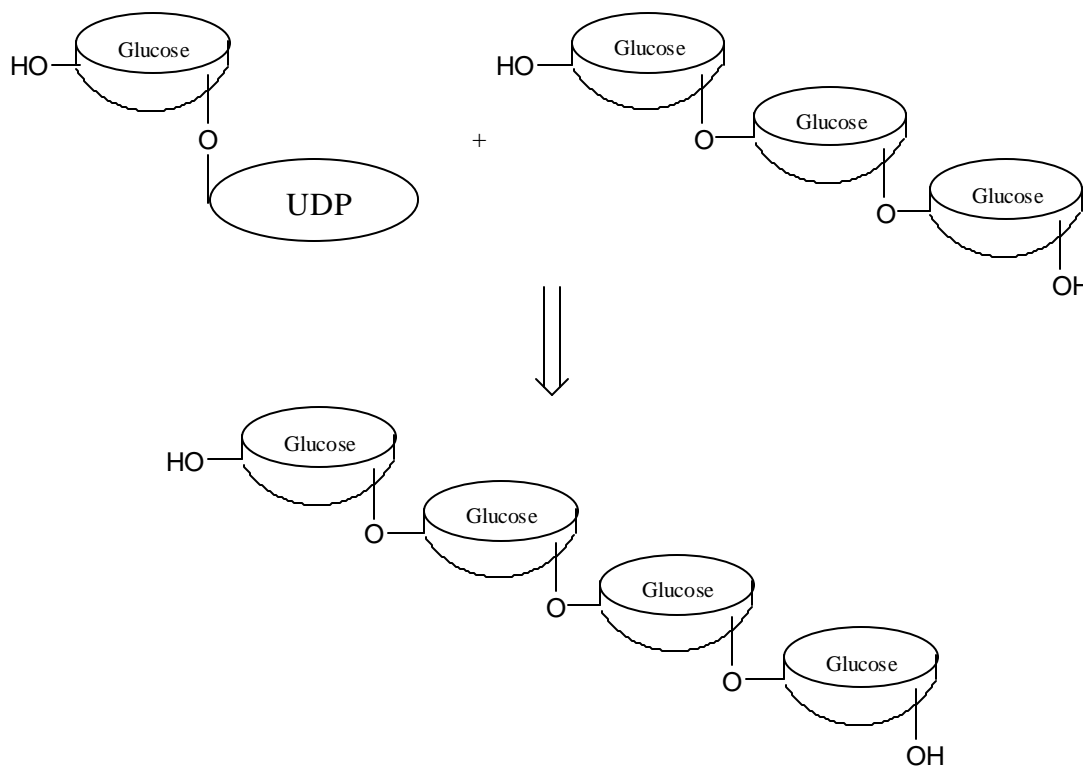
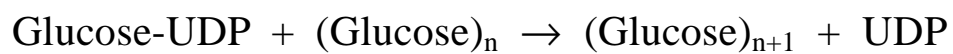
➤ Glucose-UDP is a “activated” glucose

➤ Contains a glucose covalently bonded to UDP

➤ UDP is similar to ADP but has Uracil replacing Adenine



➤ Reactions



1C Section(s) 22.3 Biosynthesis of Fatty Acids

- Acetyl CoA is the 2C starting material
- This is used to add two carbons to growing Fatty Acid Stepwise
- This explains why Fatty Acids always have an even number of carbons
- This process occurs in the cytosol
- Acyl Carrier Protein, ACP
- Synthase is an enzyme that “holds” the growing Fatty Acid





Skip: 22.4/5

Problems: 22.1 to 22.5

Index of Topics and Vocabulary

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