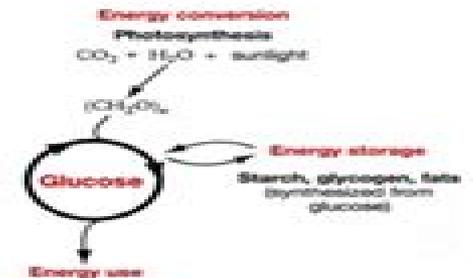
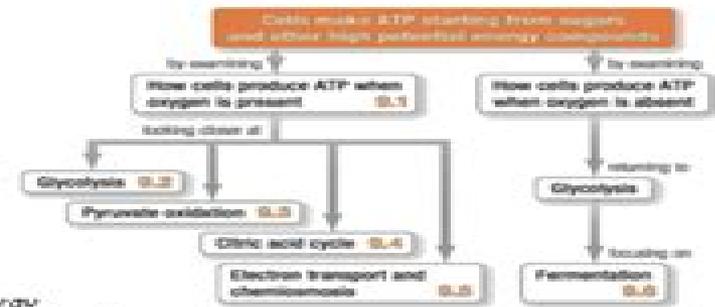


# Chapter 9: Cellular Respiration and Fermentation

## Important Background

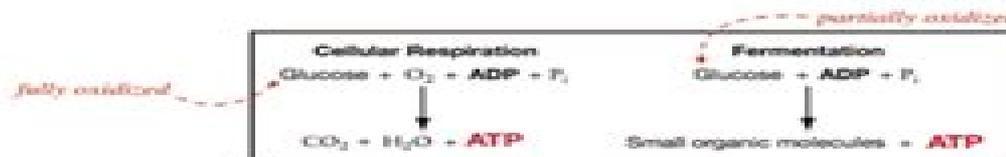
- Cells get their energy from the nucleotide, **Adenosine Triphosphate (ATP)**
  - Key characteristics of ATP:
    - ATP has **high potential energy (PE)** → this means ATP is **unstable** and thus, **can't be stored**
      - Cells only contain enough ATP to last a few mins of normal activity
    - ATP production is **fast** → cells are constantly making new ATP all the time
  - ATP is made from the energy that is stored in the sugar **Glucose**
  - Glucose is made via **Photosynthesis**
    - Glucose is a **high-energy molecule** → aka, it contains a lot of chemical energy
      - "RECALL:** "chemical energy" refers to PE that's stored within chemical bonds
      - So you can think of glucose as a molecule that stores high amounts of energy, which can potentially be used to drive other cellular processes (like ATP synthesis)
    - Glucose monomers can be synthesized into polymers such as **Starch & Glycogen**
      - Starch & glycogen are called "storage carbohydrates" because they contain glucose + all of it's stored energy
      - Metabolic pathways (discussed in this chapter) break these storage carbohydrates down into their glucose monomers → releases all the stored chemical energy
      - The released energy is then used to transfer a phosphate group to **Adenosine Diphosphate (ADP)**, thus generating ATP
- \*REMEMBER:** The prefix refers to the # of inorganic phosphorus (P) atoms:  
 "di —" = 2 P (as in ADP)  
 "tri —" = 3 P (as in ATP)



## 9.1 Overview of Cellular Respiration

- Glucose = most common source of energy** → plants/animals store glucose & oxidize it to provide chemical energy in the form of ATP
- Storage carbohydrates (like starch & glycogen) act like a "savings account" for chemical energy, and ATP is like cash
- To withdraw chemical energy from the savings, storage carbohydrates must be hydrolyzed (broken down) into their glucose monomers
- Glucose is then **oxidized** through a series of **controlled redox reactions**. The released free energy is used to synthesize ATP via:
  - CELLULAR RESPIRATION**
  - FERMENTATION**

*\*Difference between these 2 processes:  
The degree to which they oxidize glucose*
- Fermentation does **NOT** fully oxidize glucose
  - Instead, fermentation produces small reduced organic molecules which are released as waste from the cell
- Cellular respiration **completely oxidizes** glucose into **carbon dioxide (CO<sub>2</sub>)** and **water**
  - \*Cellular respiration releases **MORE ENERGY** than fermentation! This means more energy is released when glucose is **FULLY** oxidized (as in C.R.) compared to when it is only **PARTIALLY** oxidized (as in fermentation)



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**Thirumalaisamy P.  
Velavancorresponding**



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