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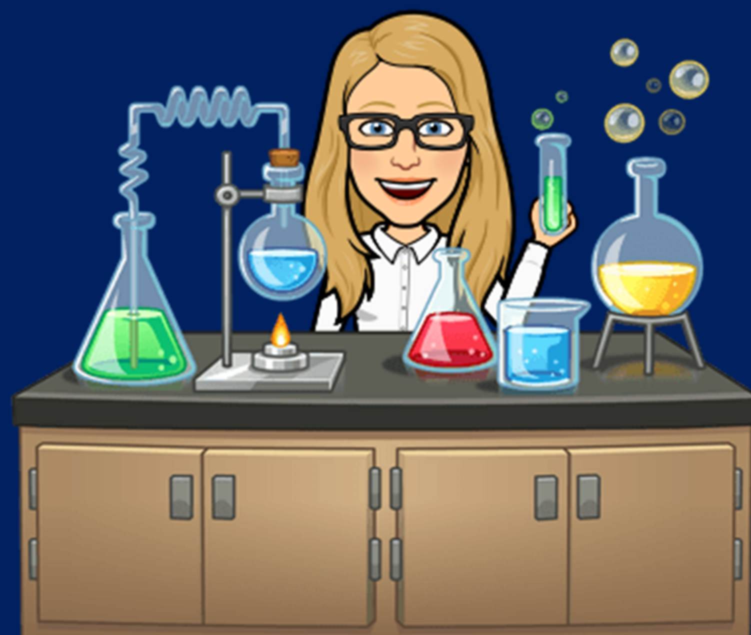
"Always do what you are afraid to do."

Ralph Waldo Emerson



Dr. Laurie S. Starkey
Cal Poly Pomona

CHM 3150 Organic Chemistry II 10/28/25

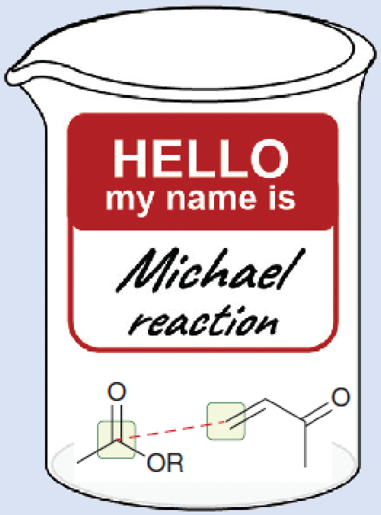
Today's Topic: Ch. 21 Conjugate Additions

Ch. 21 Part 3

- ✓ Watch
- ✓ Read
- ✓ Practice

Daily To-Do	Flipped Lectures
Step 3 • Read Klein 21.6 **Conjugate Addition Reactions** • Work through **Conceptual Checkpoints** 21.30, 21.31, 21.34, 21.35	Enols & Enolates Part 3 **31 minutes** *skeleton notes pages 21-10 through 21-13*

Flipped Lecture



Enols and Enolates, Part 2

Intro	0:00
Conjugate Additions	0:06
α, β-unsaturated Carbonyls	0:07
Conjugate Additions	1:50
'1,2-addition'	1:51
'1,-4-addition' or 'Conjugate Addition'	2:24
Conjugate Additions	4:53
Why can a Nu: Add to this Alkene?	4:54
Typical Alkene	5:09
α, β-unsaturated Alkene	5:39
Electrophilic Alkenes: Michael Acceptors	6:35
Other 'Electrophilic' Alkenes (Called 'Michael Acceptors)	6:36
1,4-Addition of Cuprates (R2CuLi)	8:29
1,4-Addition of Cuprates (R2CuLi)	8:30
1,4-Addition of Cuprates (R2CuLi)	11:23
Use Cuprates in Synthesis	11:24
Preparation of Cuprates	12:25
Prepare Organocuprate From Organolithium	12:26
Cuprates Also Do SN2 with RX E+ (Not True for RMgX, RLi)	13:06
1,4-Addition of Enolates: Michael Reaction	13:50
1,4-Addition of Enolates: Michael Reaction	13:51
Mechanism	15:57
1,4-Addition of Enolates: Michael Reaction	18:47
Example: 1,4-Addition of Enolates	18:48
1,4-Addition of Enolates: Michael Reaction	21:02
Michael Reaction, Followed by Intramolecular Aldol	21:03
Mechanism of the Robinson Annulation	24:26
Mechanism of the Robinson Annulation	24:27

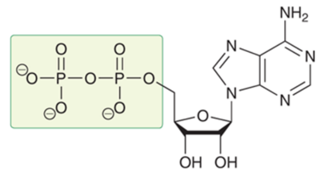
Conjugate Additions:
Cuprates,
Michael Reaction,
Robinson

Glycolysis produces **ATP** for *quick energy* needs (sprint).

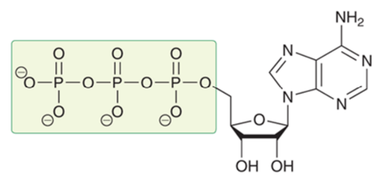
As **glucose** is converted to **pyruvic acid**, the carbon chain is shortened via a retro-aldol!

WorldLinks | Muscle Power

Retro-aldol reactions play a vital role in many biochemical processes, including one of the processes by which energy is generated for our muscles. We first mentioned in Section 12.11 that energy in our bodies is stored in the form of ATP molecules. That is, energy from the food we eat is used to convert ADP into ATP, which is stored. When energy is needed, ATP is broken down to ADP, and the energy that is released can be used for various life processes, such as muscle contraction.

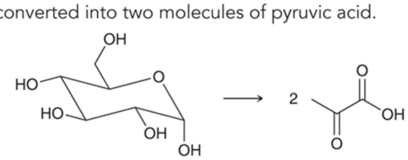


Adenosine diphosphate (ADP)



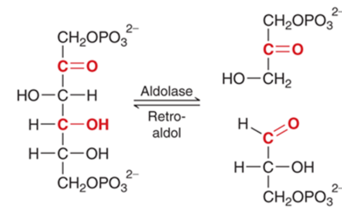
Adenosine triphosphate (ATP)

Notice that the structural difference between ATP and ADP is in the number of phosphate groups present (two in the case of ADP, three in the case of ATP). The ATP molecules in our muscles are used for any activity that requires a short burst of energy, such as a tennis serve, jumping, or throwing a ball. For activities that last longer than a second, such as sprinting, ATP molecules must be synthesized on the spot. This is initially achieved by a process called glycolysis, in which a molecule of glucose (obtained from metabolism of the carbohydrates we eat) is converted into two molecules of pyruvic acid.



Glucose | Pyruvic acid

Glycolysis involves many steps and is accompanied by the conversion of two molecules of ADP into ATP. This metabolic process therefore generates the necessary ATP for muscle contraction. One of the steps involved in glycolysis is a retro-aldol reaction, which is achieved with the help of an enzyme called aldolase.



The end product of glycolysis is pyruvic acid, which is used as a starting material in a variety of biochemical processes.

Glycolysis provides ATP for activities lasting up to 1.5 minutes. Activities that exceed this time frame, such as long-distance running, require a different process for ATP generation, called the citric acid cycle. Unlike glycolysis, which can be achieved without oxygen (it is an anaerobic process), the citric acid cycle requires oxygen (it is an aerobic process). This explains why we breathe more rapidly during and after strenuous activity. The term "aerobic workout" is commonly used to refer to a workout that utilizes ATP that was generated by the citric acid cycle (an aerobic process) rather than glycolysis (an anaerobic process). A casual athlete can sense a shift from anaerobic ATP synthesis to aerobic ATP synthesis after about 1.5 minutes. Seasoned athletes will detect the shift occurring after about 2.5 minutes. If you watch the summer Olympics, you are likely aware of the distinction between sprinting and long-distance running. Athletes can run faster in a sprinting race, which relies mostly on glycolysis for energy production. Long-distance running requires the citric acid cycle for energy production.