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# Enzymes


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# Biological catalysts

# Anselme Payen

**Anselme Payen (**6 January 1795 – 12 May 1871) was a French chemist known for discovering the enzyme **diastase** (1833) Breakdown of starch into maltose.

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# Wilhelm Kühne

**Wilhelm Friedrich Kühne** (28 March 1837 – 10 June 1900) was a German physiologist. He coined the word enzyme in 1878.

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# Ένζυμο

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# Έν+ζυμο

# In Leaven

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# Ένζυμο

## In Leaven

# Eduard Buchner
## Cell-free fermentation

**Eduard Buchner** (20 May 1860 – 13 August 1917) was a German chemist and zymologist, awarded the 1907 Nobel Prize in Chemistry for his work on fermentation.

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# Emil Fischer: Lock and Key model

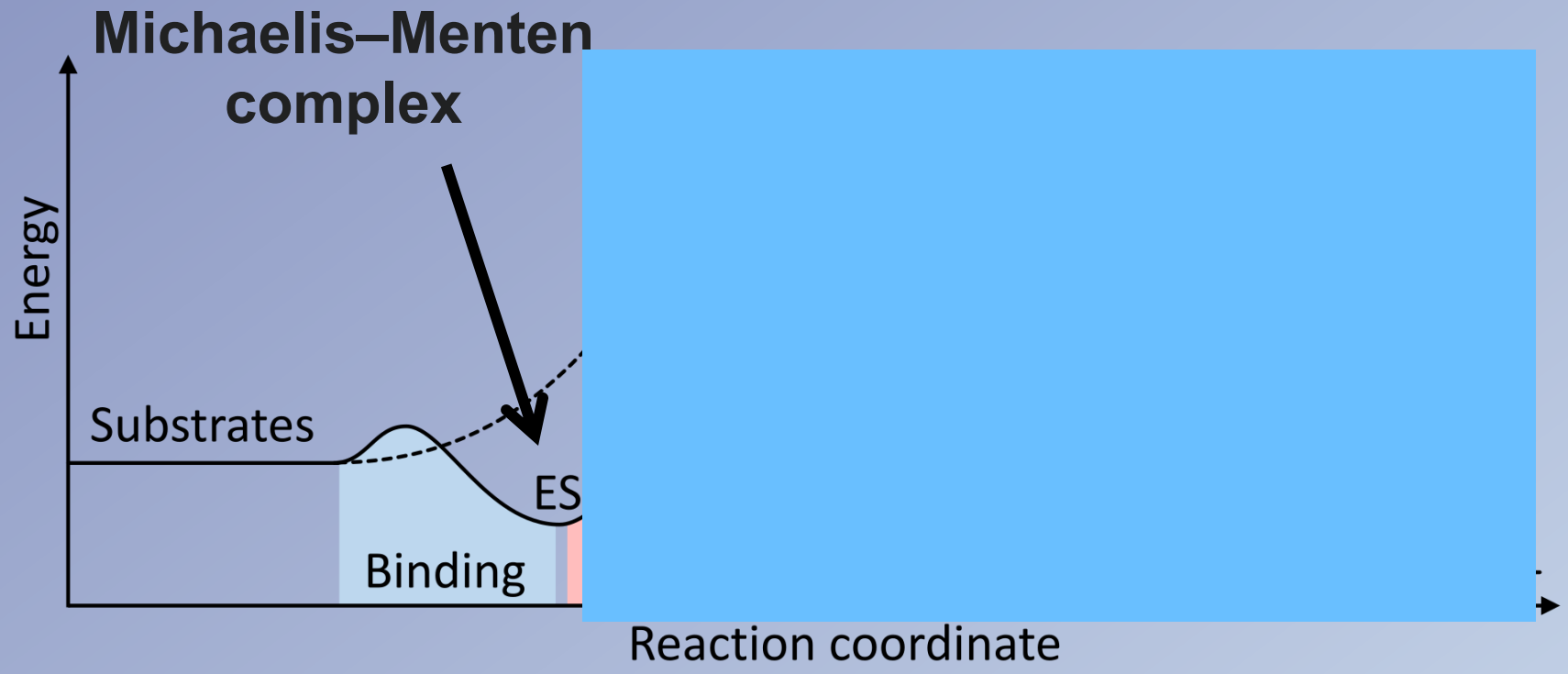
To explain the observed specificity of enzymes, in 1894 **Emil Fischer** proposed that both the enzyme and the substrate possess specific complementary geometric shapes that fit exactly into one another.

# اصل داستان

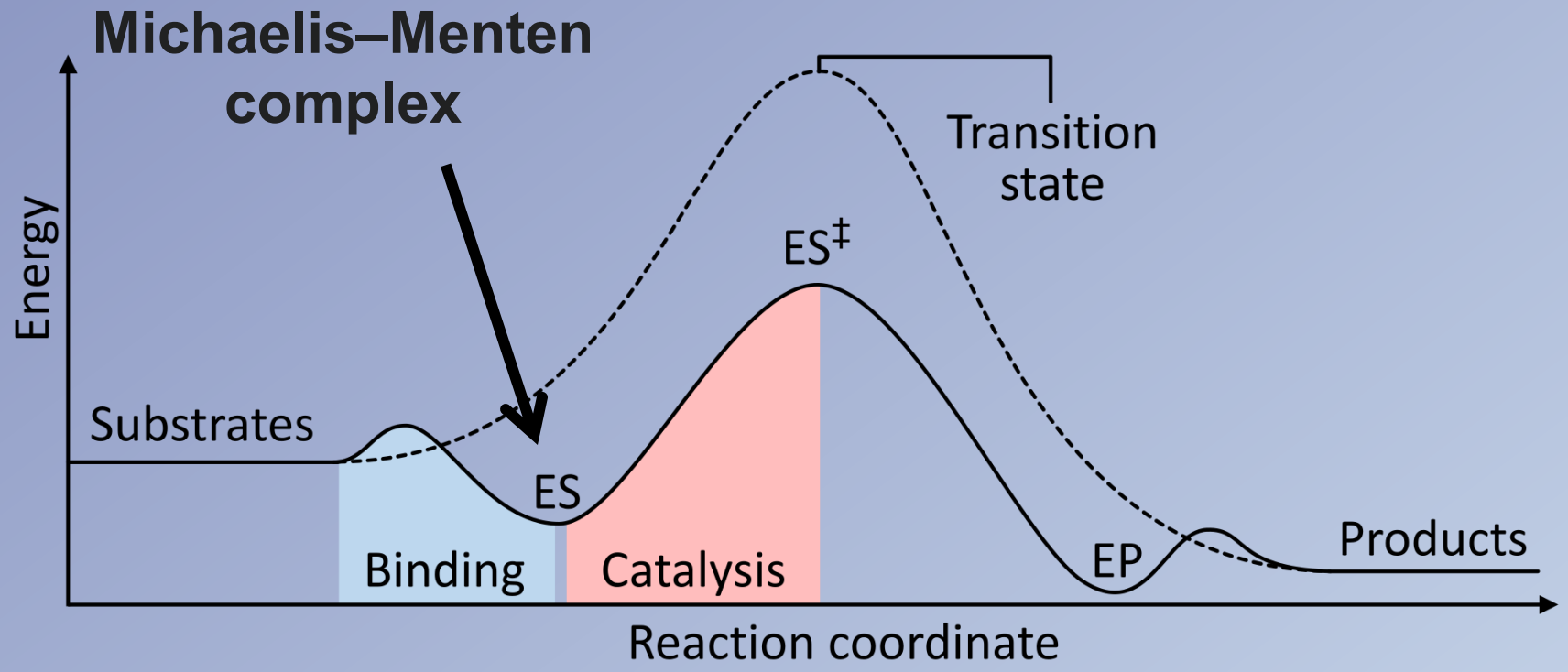
Maud Menten

Leonor Michaelis

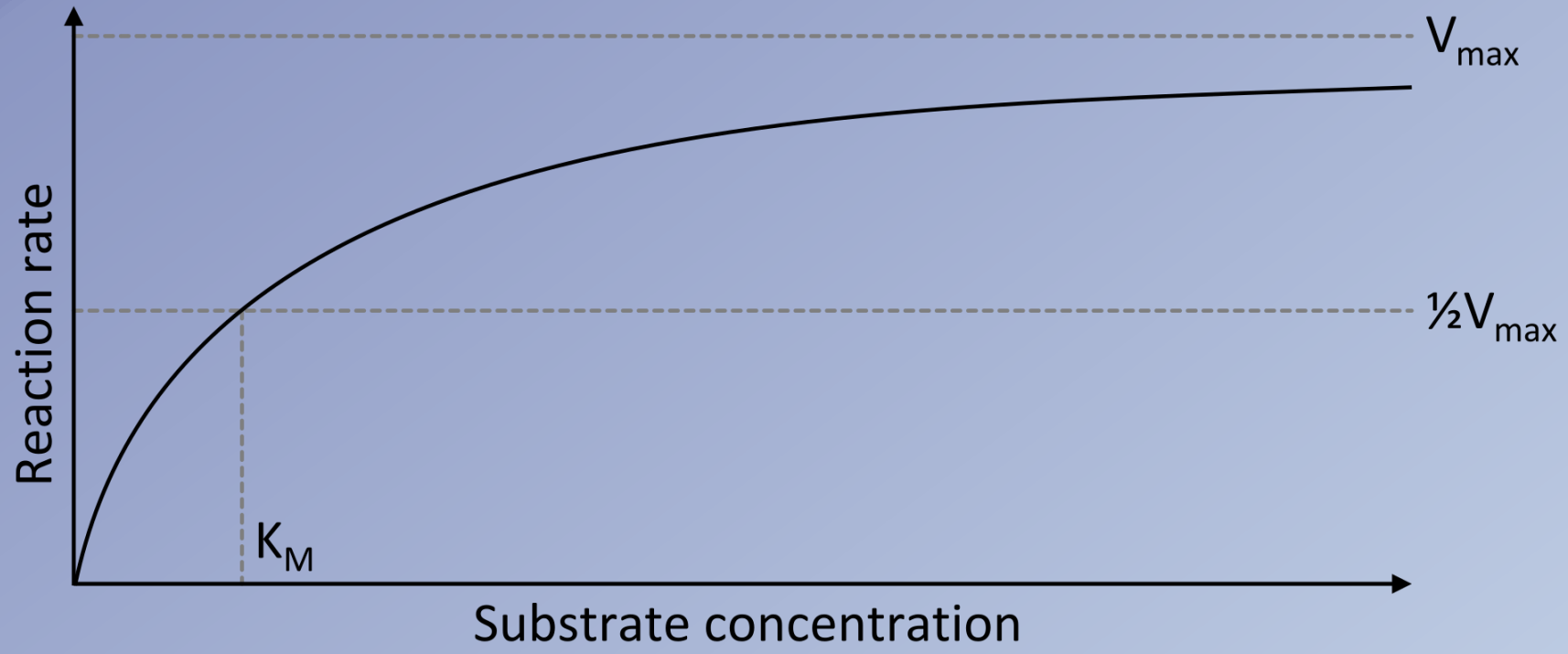
# Michaelis–Menten kinetics



# Michaelis–Menten kinetics



# Michaelis–Menten equation




$$V = \frac{V_{max} \cdot [S]}{K_m + [S]}$$

## PROTEIN STRUCTURE

Scaffold to support and position active site

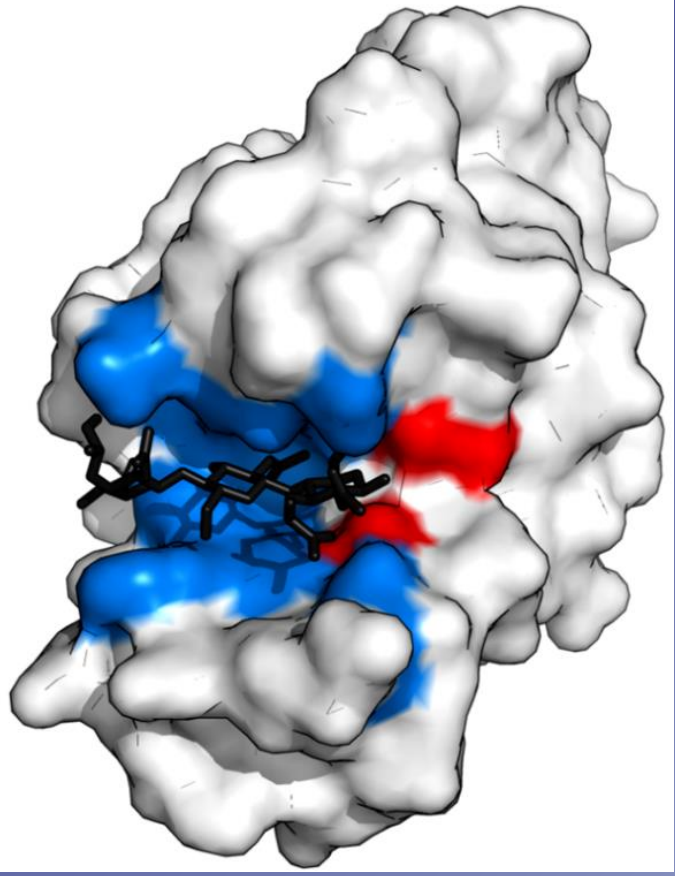
## ACTIVE SITE

**BINDING SITES**

Bind and orient substrate(s)

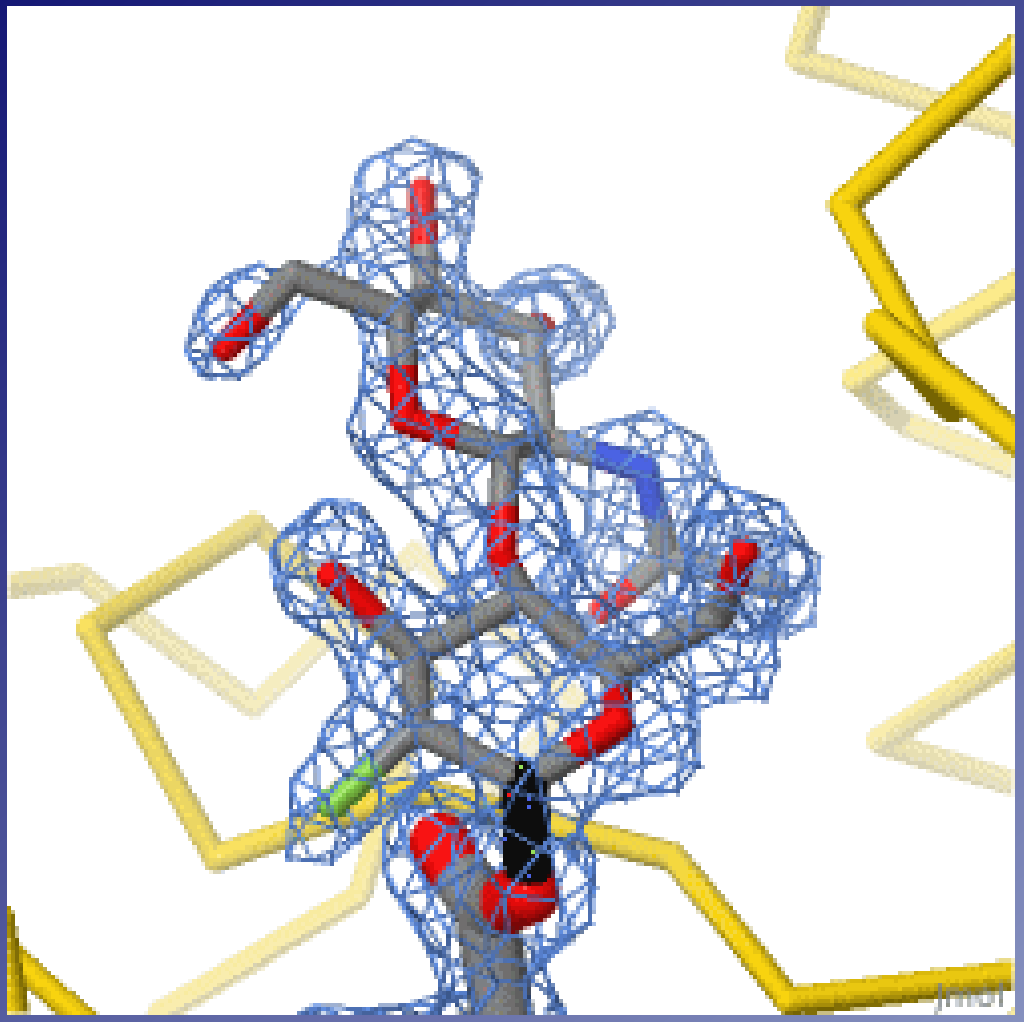
**CATALYTIC SITE**

Reduce chemical activation energy

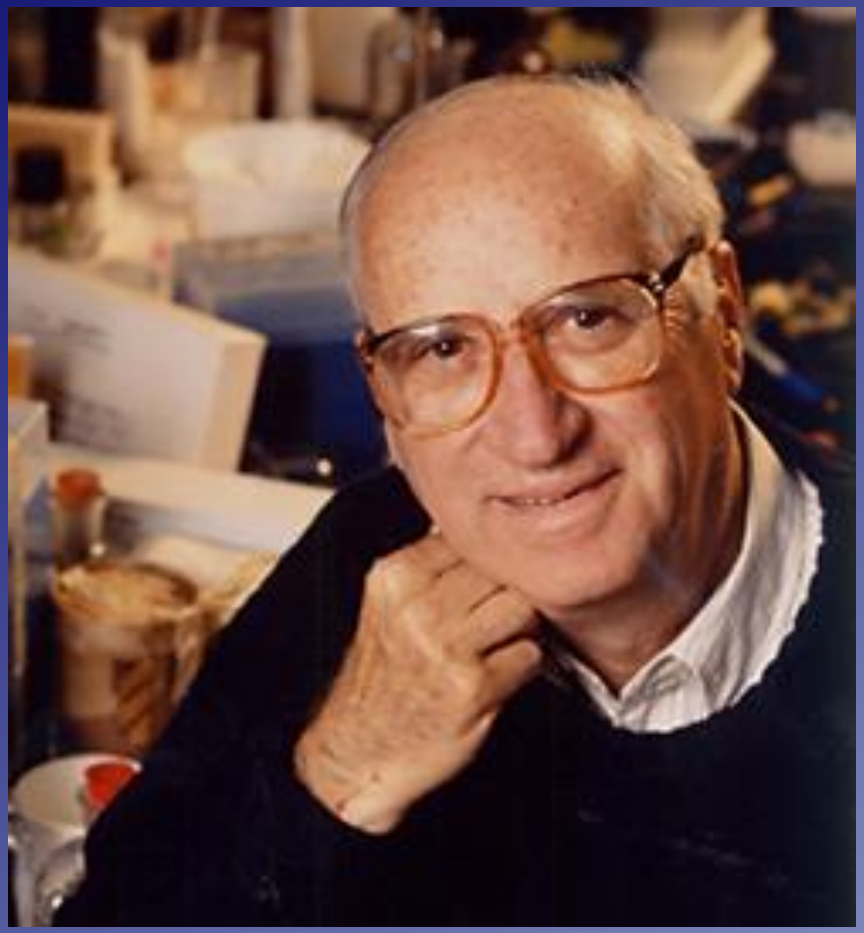


Organization of enzyme structure and **lysozyme** example. Binding sites in blue, catalytic site in red and **peptidoglycan** substrate in black.

# Active site of lysozyme and **peptidoglycan**



# Daniel Koshland
## Induced fit model



In 1958, Daniel Koshland suggested **induced fit model**

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# Nomenclature and Classification

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# Classification

EC 1: Oxidoreductases

EC 2: Transferases

EC 3: Hydrolases

EC 4: Lyases

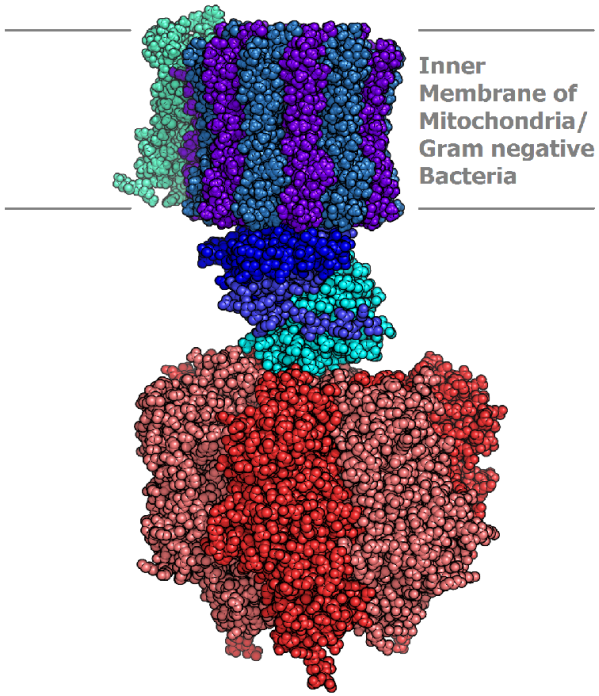
EC 5: Isomerases

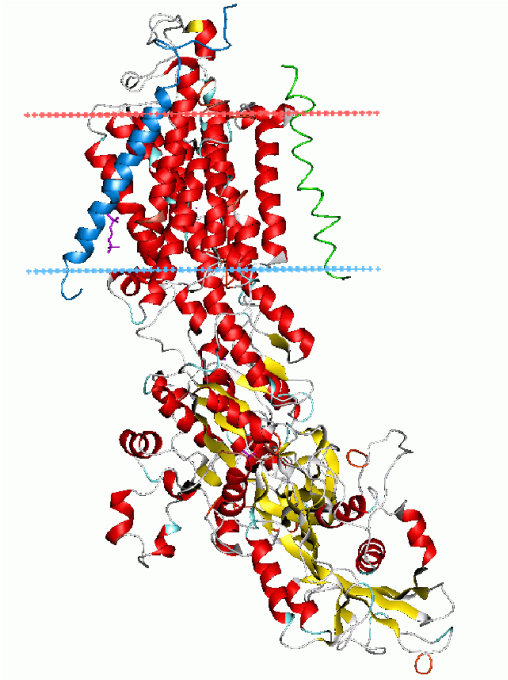
EC 6: Ligases

# EC 7: Translocases

In August 2018, the International Union of Biochemistry and Molecular Biology.

# EC 7, Translocases



**ATP synthase (EC 7.1.2.2)**

**Na+/K+ ATPase (EC 7.2.2.13).**

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# Carboxylases

Liver: Coagulation factors

Bone: Osteocalcin

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# Enzyme Activity

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# Specific Activity

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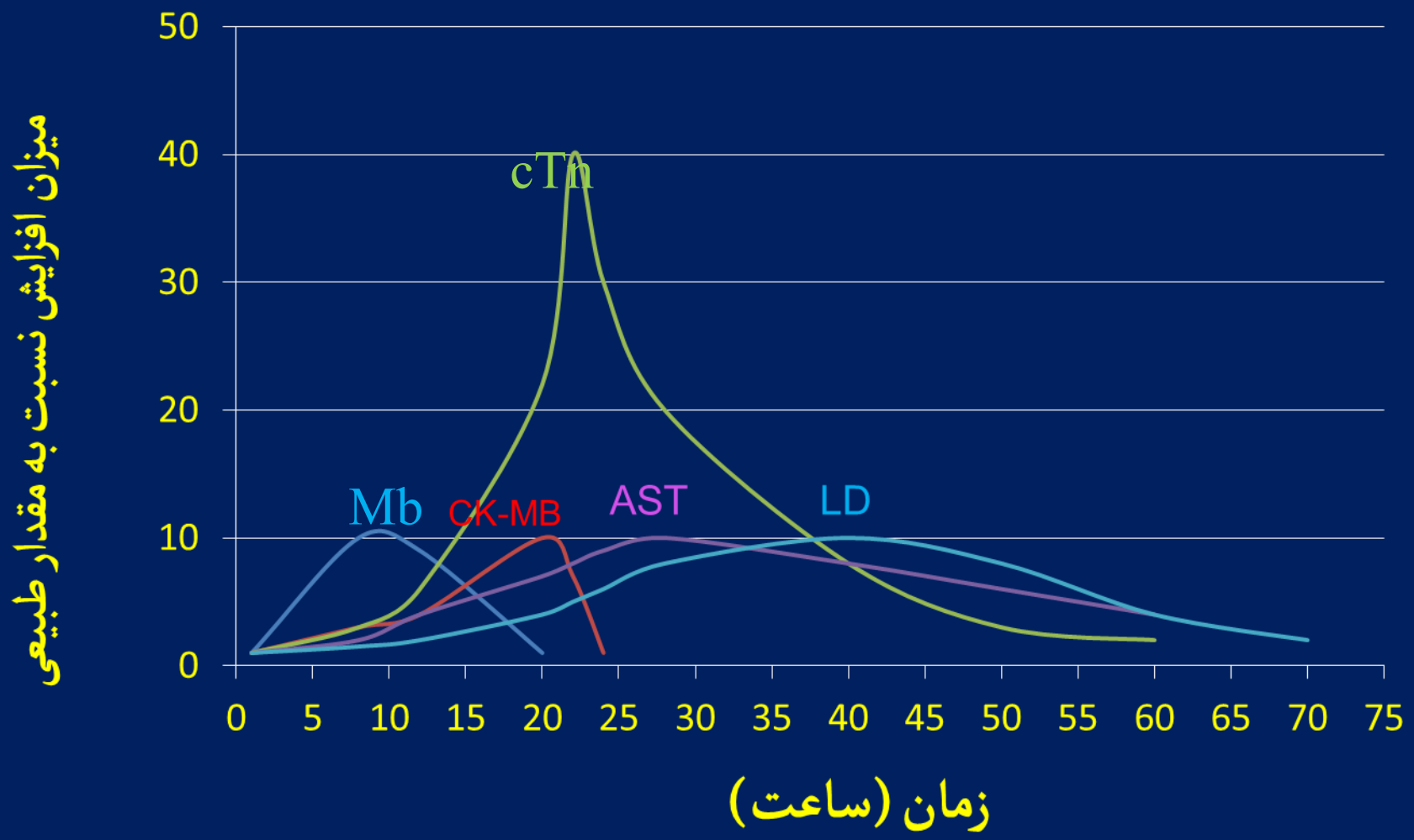
# Isoenzymes

# ارزش تشخیصی آنزیم ها

عوامل موثر در ارزش تشخیصی  پارامترها:

1. **حساس** بودن نسبت به تغییرات پاتولوژیک
2. **اختصاصی** بودن برای بافت
3. نحوه **توزیع** در سلول
4. **فعالیت نسبی** در بافت و پلاسما
5. مکانیسم **رهایش**
6. **نیمه عمر**: سرعت پاکسازی از پلاسما

# تغییر غلظت آنزیم ها در سرم، پس از انفارکتوس میوکارد



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# Effectors

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# Competition

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# Cofactors and Coenzymes

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# Vitamins