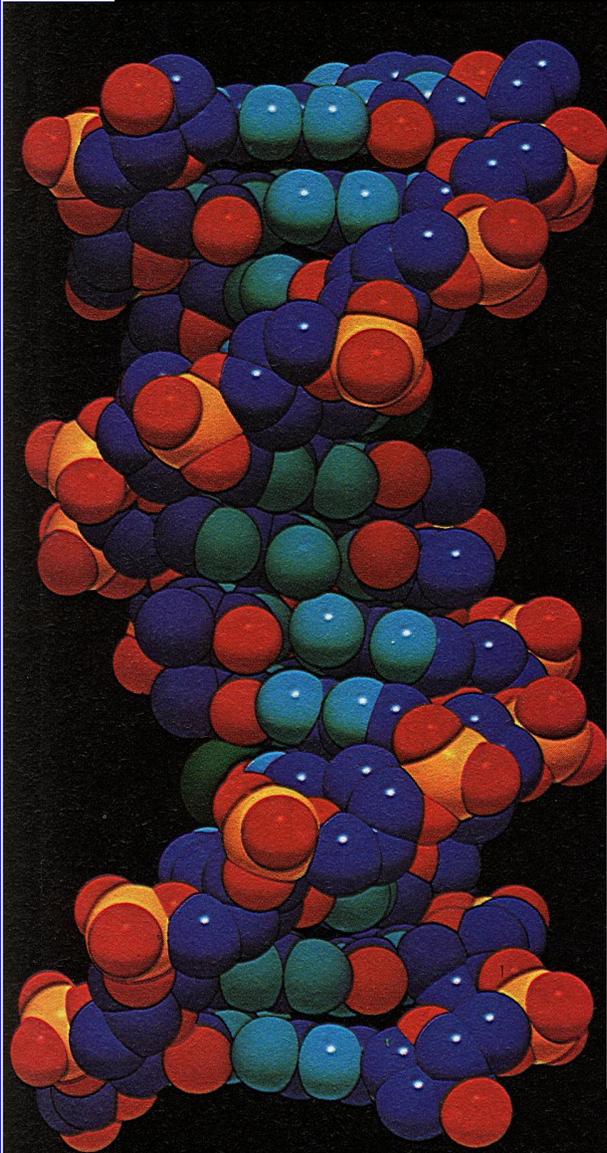


# BIOQUÍMICA



**CIENCIA QUE ESTUDIA LA COMPOSICIÓN QUÍMICA DE LOS SERES VIVOS Y LOS PROCESOS QUÍMICOS QUE SUSTENTAN LA VIDA**

- **BIOQUÍMICA ESTÁTICA O DESCRIPTIVA**
- **BIOQUÍMICA DINÁMICA O METABÓLICA**
- **BIOTECNOLOGÍA:**
  - **ADN RECOMBINANTE**
  - **GENÓMICA**
  - **PROTEÓMICA**

# **COMPOSICIÓN QUÍMICA DE LOS SERES VIVOS**

**COMPONENTES MAYORITARIOS:**

**C H O N**

**COMPONENTES BIOGENÉSICOS Y OLIGOELEMENTOS:**

**Ca Na K P Cl Fe S Mg Mn Zn Cu Co ...**

**PRINCIPIOS INMEDIATOS:**

**PROTEINAS, HIDRATOS DE CARBONO,  
LÍPIDOS Y NUCLEÓTIDOS**

# **PROTEÍNAS**

**SON COMPONENTES ESENCIALES DE LOS SERES VIVOS QUE DESARROLLAN FUNCIONES:**

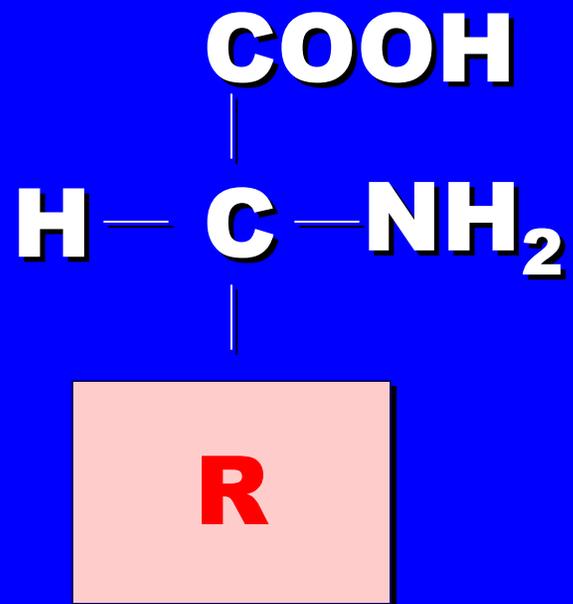
- **ESTRUCTURALES**
- **REGULACIÓN Y CONTROL**
- **HORMONALES**
- **INMUNITARIAS**
- **RELACIÓN**
- **TRANSPORTE**
- **ENERGÉTICAS**

**ESTÁN COMPUESTAS POR UNIDADES ELEMENTALES QUE SON LOS AMINOÁCIDOS**

**EXISTEN 20 AMINOÁCIDOS PROTEINOGENÉTICOS**

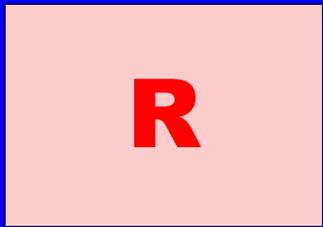
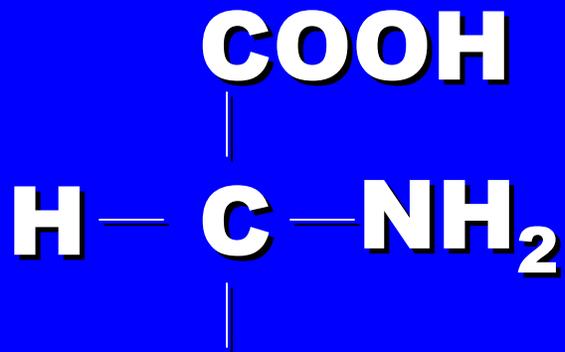
**SU SÍNTESIS ES CONSECUENCIA DIRECTA DE LA EXPRESIÓN DE LA INFORMACIÓN CONTENIDA EN ADN**

# AMINOÁCIDOS



# CLASIFICACIÓN DE AMINOÁCIDOS

## APOLARES ALIFÁTICOS



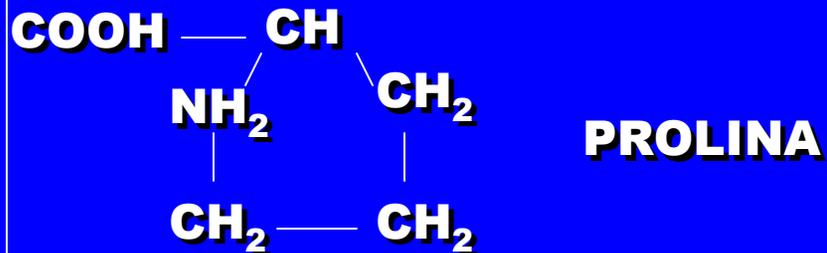
- H      GLICOCOLA

- CH<sub>3</sub>      ALANINA

- CH - CH<sub>3</sub>  
|  
CH<sub>3</sub>      VALINA

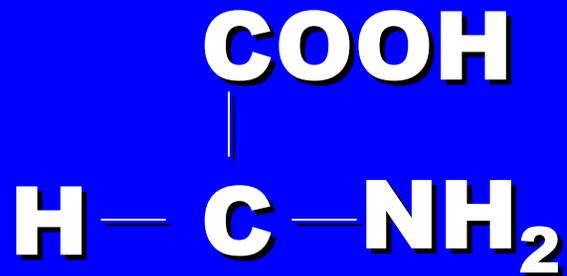
- CH<sub>2</sub> - CH - CH<sub>3</sub>  
|  
CH<sub>3</sub>      LEUCINA

- CH - CH<sub>3</sub>  
|  
CH<sub>2</sub> - CH<sub>3</sub>      ISOLEUCINA

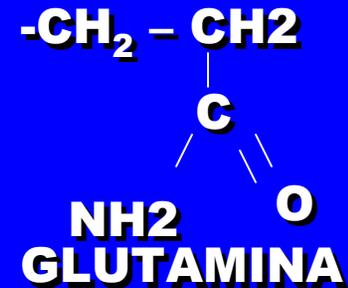
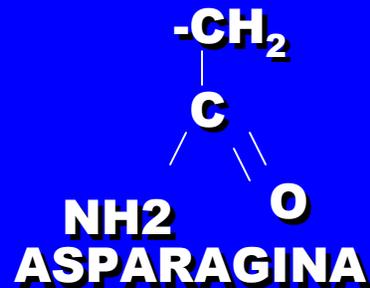


# CLASIFICACIÓN DE AMINOÁCIDOS

## POLARES SIN CARGA

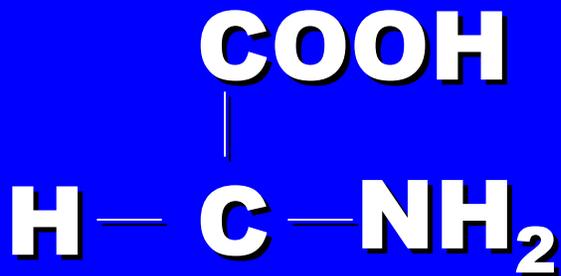


**R**



# CLASIFICACIÓN DE AMINOÁCIDOS

## AROMÁTICOS



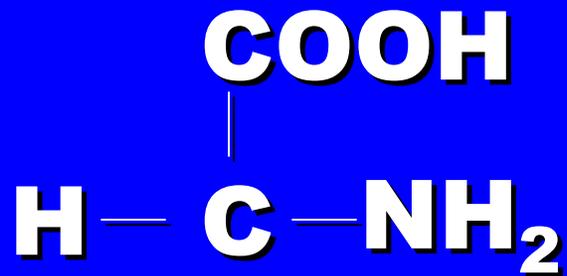
**R**



**- CH<sub>2</sub> TRIPTÓFANO**

# CLASIFICACIÓN DE AMINOÁCIDOS

## CON CARGA POSITIVA



**R**

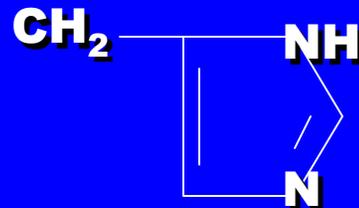
- (CH<sub>2</sub>)<sub>4</sub> - NH<sub>3</sub><sup>+</sup> LISINA

- (CH<sub>2</sub>)<sub>3</sub> - NH



NH<sub>2</sub>

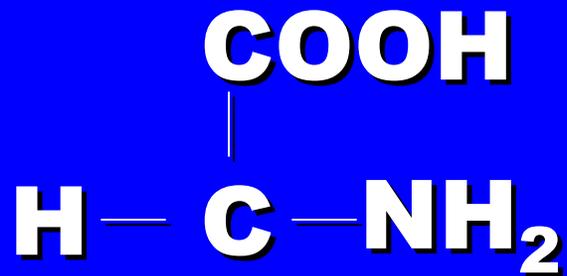
ARGININA



HISTIDINA

# CLASIFICACIÓN DE AMINOÁCIDOS

## CON CARGA NEGATIVA



**R**

- CH<sub>2</sub> - COO<sup>-</sup> ASPARTATO

- CH<sub>2</sub> - CH<sub>2</sub> - COO<sup>-</sup> GLUTAMATO

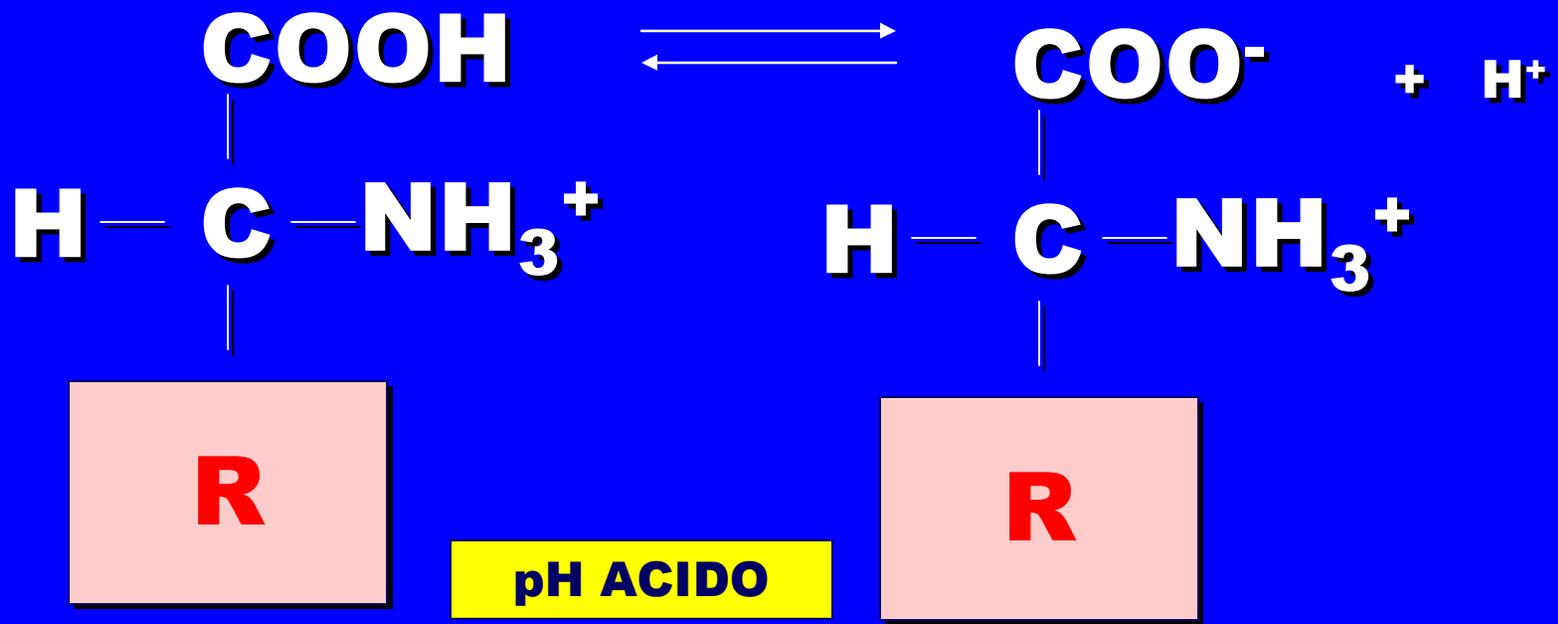
# **AMINOÁCIDOS ESENCIALES**

**SON AQUELLOS QUE NO PUEDEN SER SINTETIZADOS POR EL ORGANISMO Y DEBEN FORMAR PARTE DE LA DIETA**

- **VALINA**
- **LEUCINA**
- **ISOLEUCINA**
- **LISINA**
- **METIONINA**
- **TREONINA**
- **FENILALANINA**
- **TRIPTÓFANO**

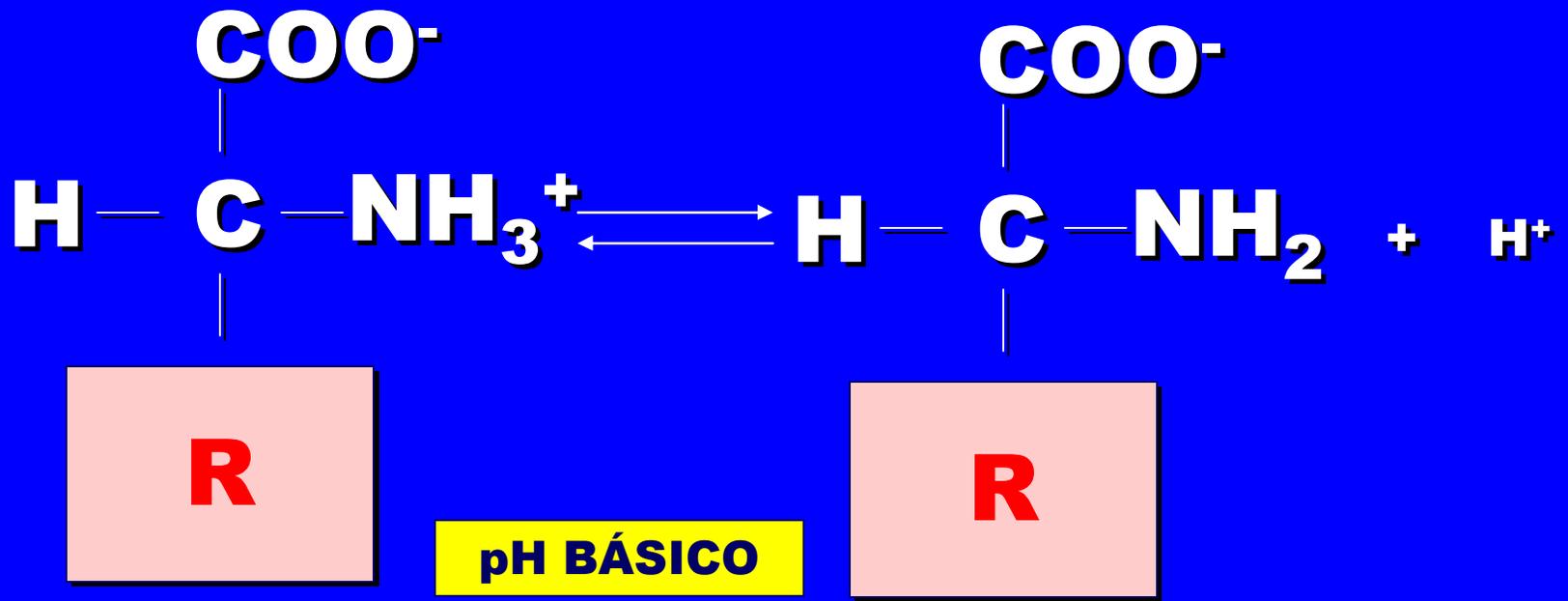
# PROPIEDADES ACIDO-BÁSICAS DE LOS AMINOÁCIDOS

LOS GRUPOS  $\alpha$ -CARBOXILO,  $\alpha$ -AMINO Y LOS DISOCIABLES DEL RADICAL SE DISOCIAN COMO ÁCIDOS Y BASES DÉBILES

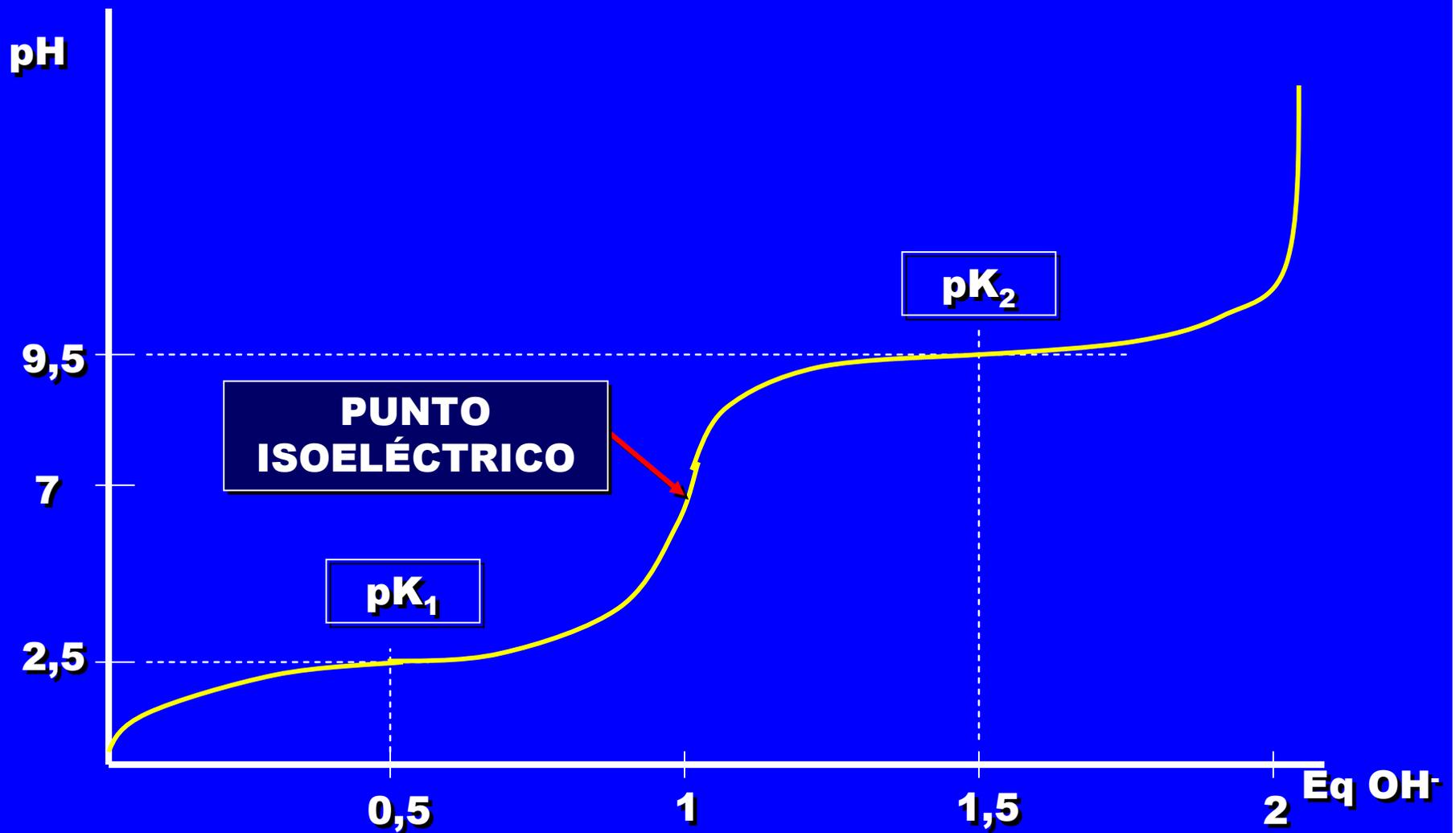


# PROPIEDADES ACIDO-BÁSICAS DE LOS AMINOÁCIDOS

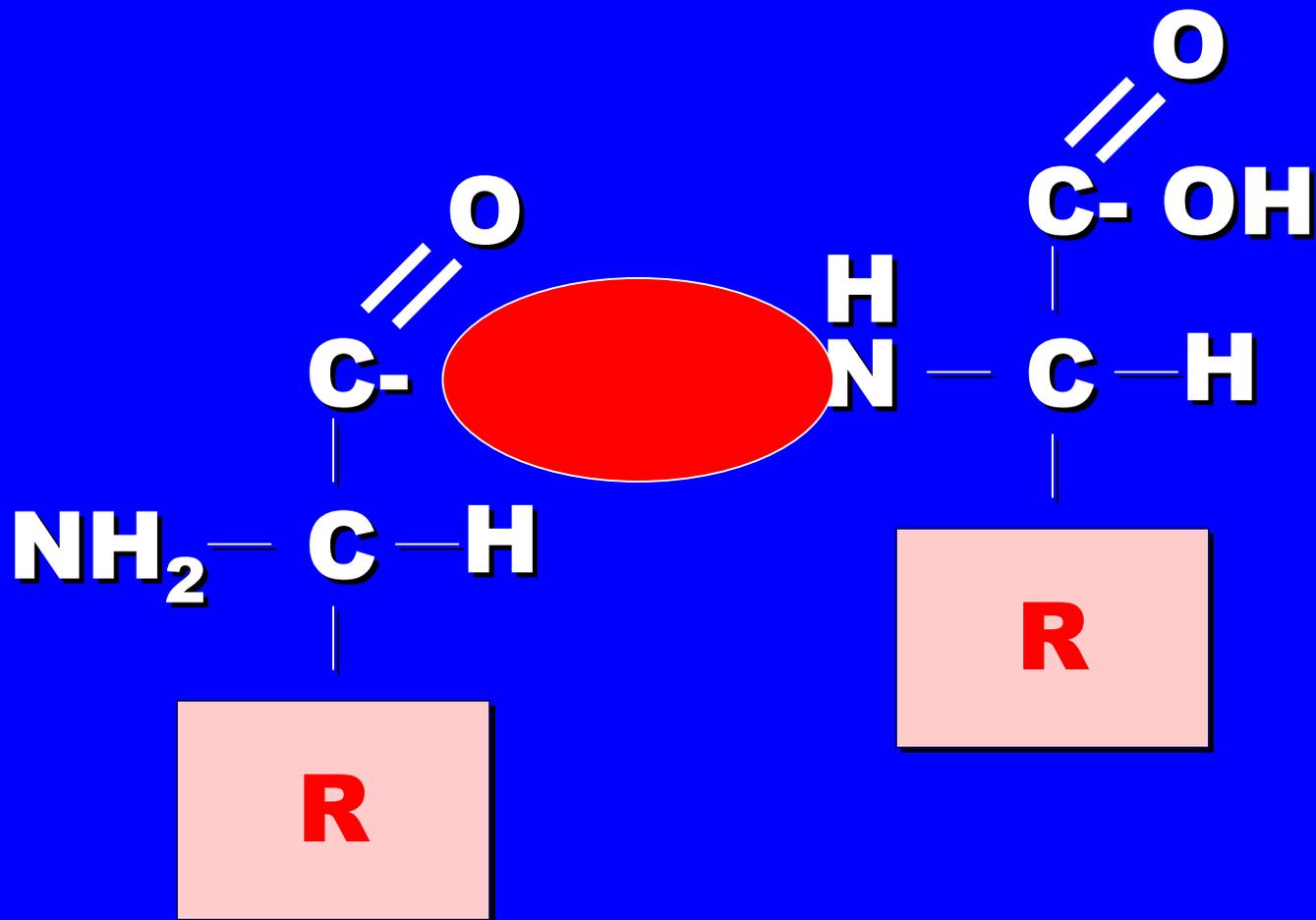
LOS GRUPOS  $\alpha$ -CARBOXILO,  $\alpha$ -AMINO Y LOS DISOCIABLES DEL RADICAL SE DISOCIAN COMO ÁCIDOS Y BASES DÉBILES



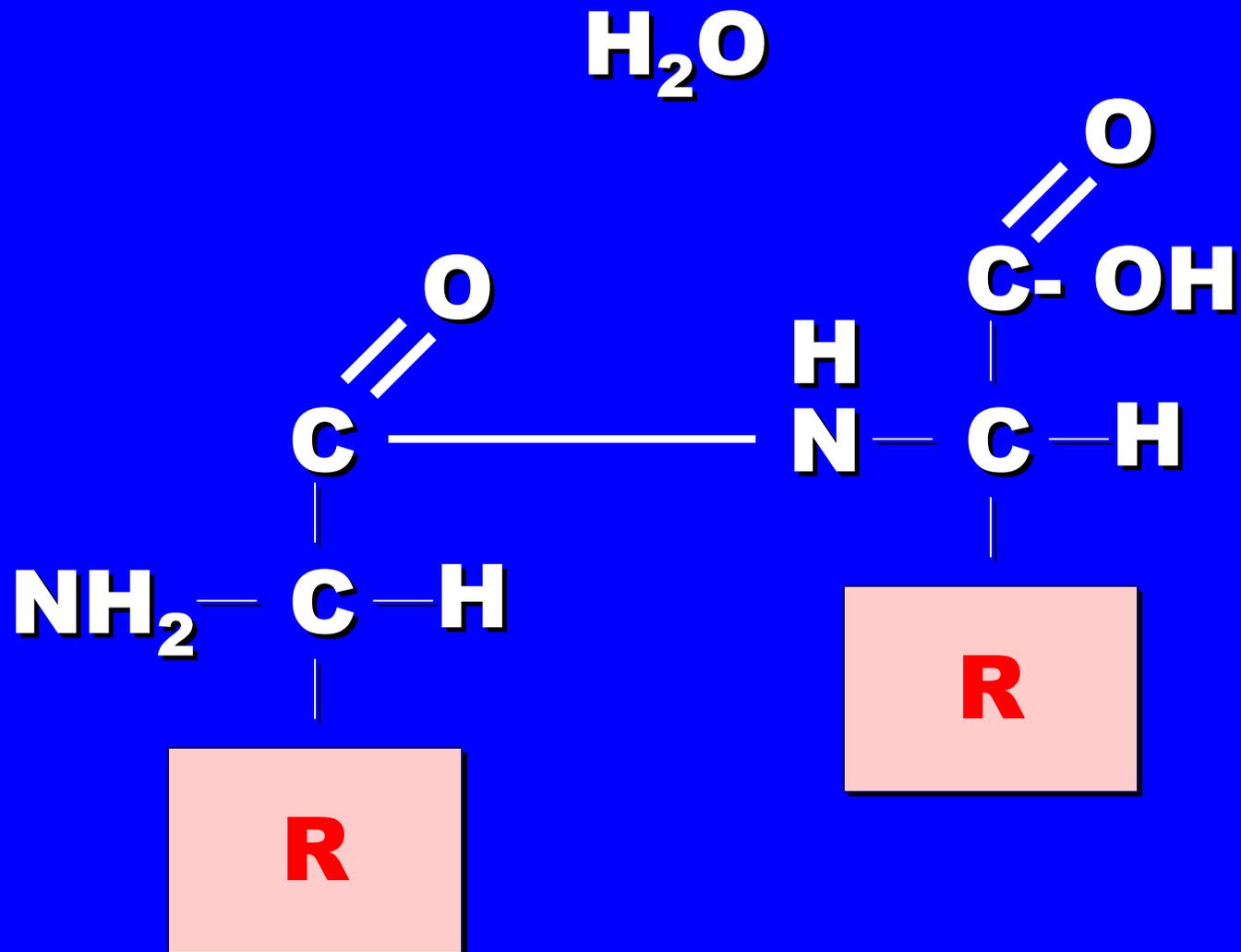
# CURVA DE TITULACIÓN DE UN AMINOÁCIDO MONOAMINO-MONOCARBOXÍLICO



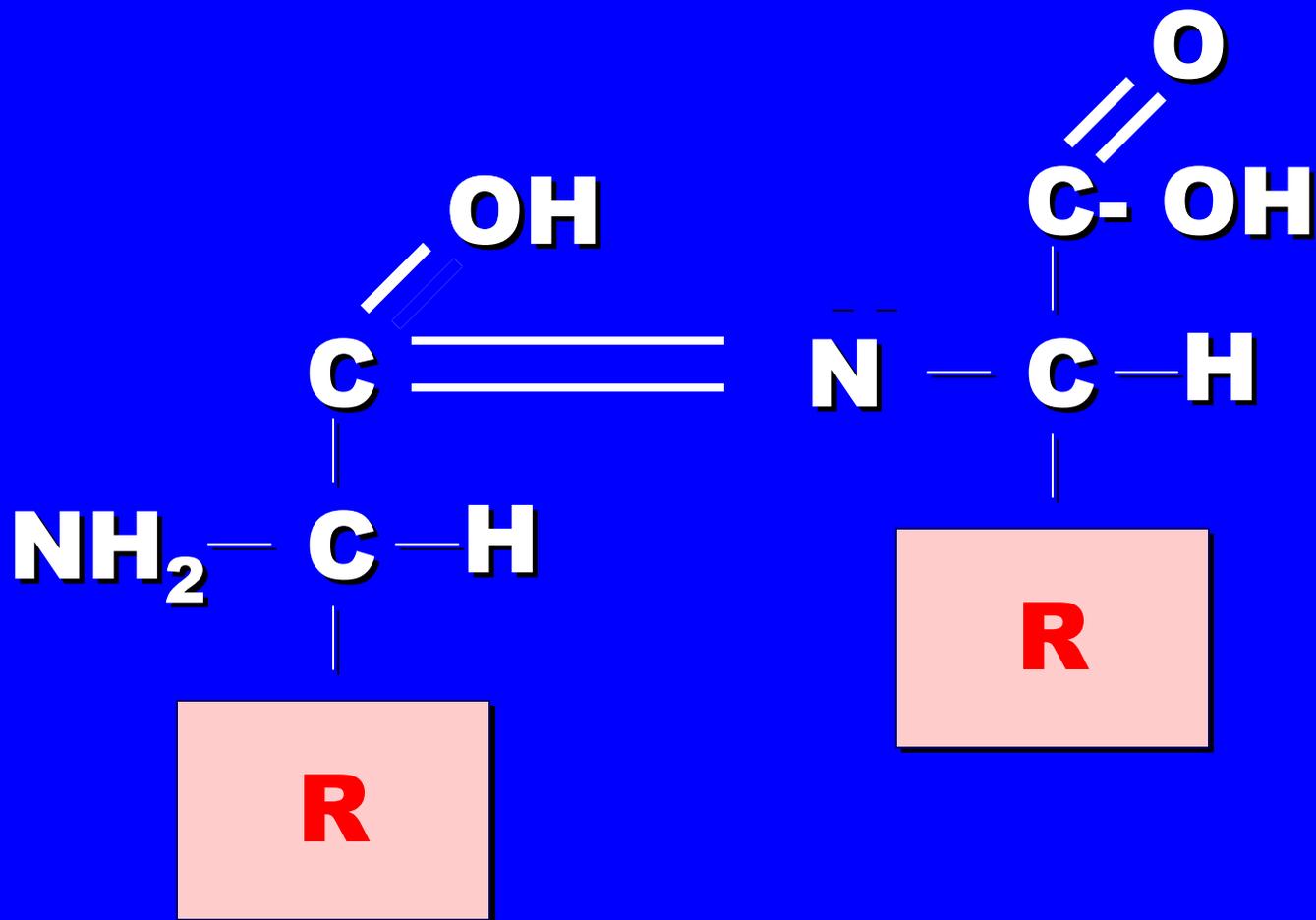
# ENLACE PEPTÍDICO



# ENLACE PEPTÍDICO



# ENLACE PEPTÍDICO



# **ESTRUCTURA Y ESTABILIDAD DE LAS PROTEÍNAS**

## **ESTRUCTURA PRIMARIA**

### **SECUENCIA DE AMINOÁCIDOS**

- **ENLACE PEPTÍDICO**

## **ESTRUCTURA SECUNDARIA**

### **ORGANIZACIÓN ESPACIAL DE LA CADENA PRIMARIA**

- **PUENTES DE HIDRÓGENO ENTRE ÁTOMOS QUE INTERVIENEN EN EL ENLACE PEPTÍDICO**
- **HELICE ALFA Y CADENAS BETA**

## **ESTRUCTURA TERCIARIA**

### **CONFORMACIÓN ESTABLE DE LAS CADENAS**

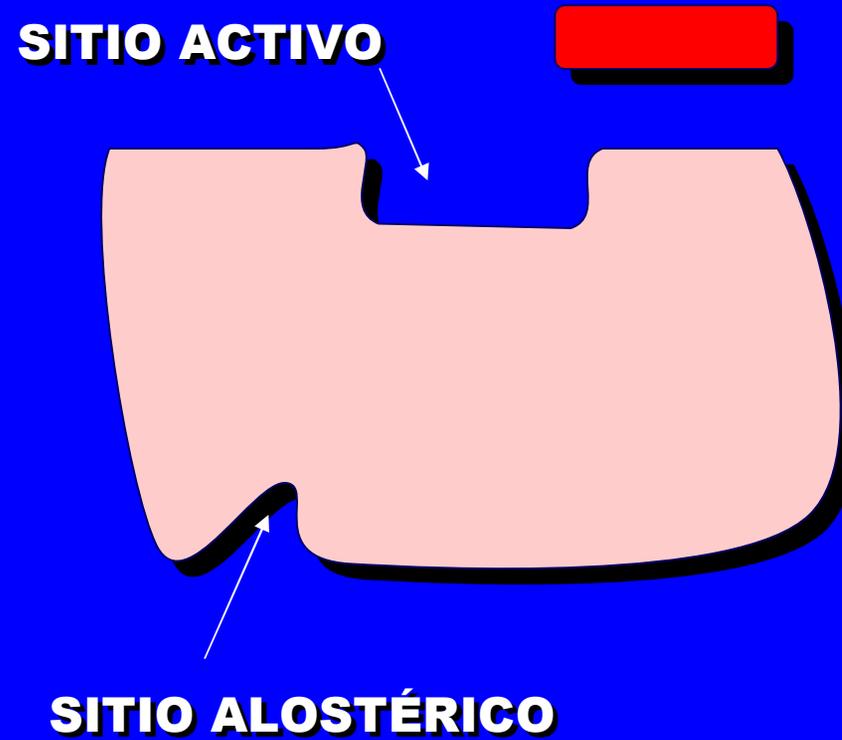
- **INTERACCIONES DÉBILES DISTALES, PUENTES DISULFURO**
- **ESTRUCTURAS FIBROSA Y GLOBULAR**

## **ESTRUCTURA CUATERNARIA**

### **CONFORMACIÓN ESTABLE DE LAS CADENAS POR UNIÓN DE MONÓMEROS**

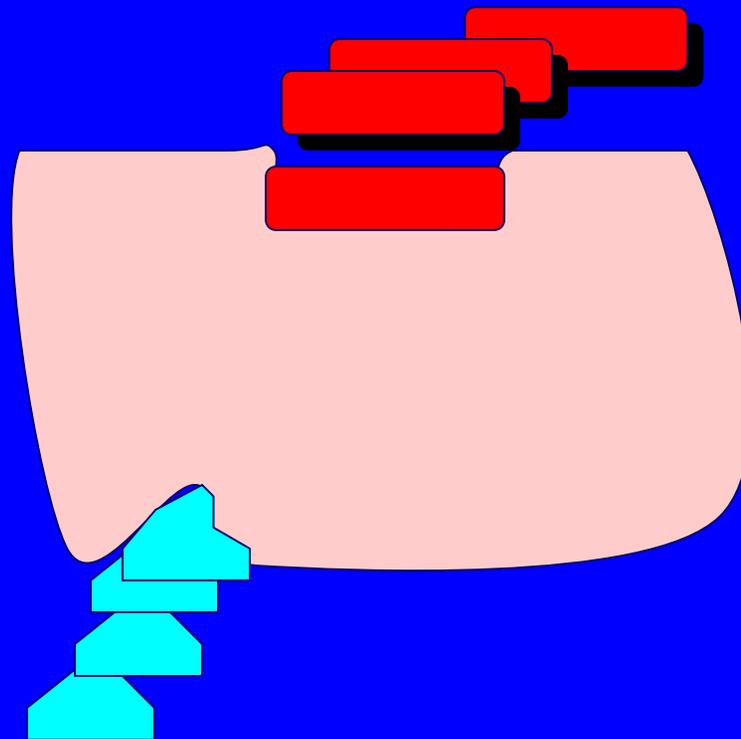
- **INTERACCIONES NO COVALENTES: DÉBILES Y DE COORDINACIÓN**

# ENZIMAS



# ENZIMAS

**RECONOCIMIENTO Y FIJACIÓN DEL SUSTRATO**



**FIJACIÓN DEL MODULADOR ALOSTÉRICO**

# ENZIMAS

**RECONOCIMIENTO Y FIJACIÓN DEL SUSTRATO**

**CAMBIO DE CONFORMACIÓN**

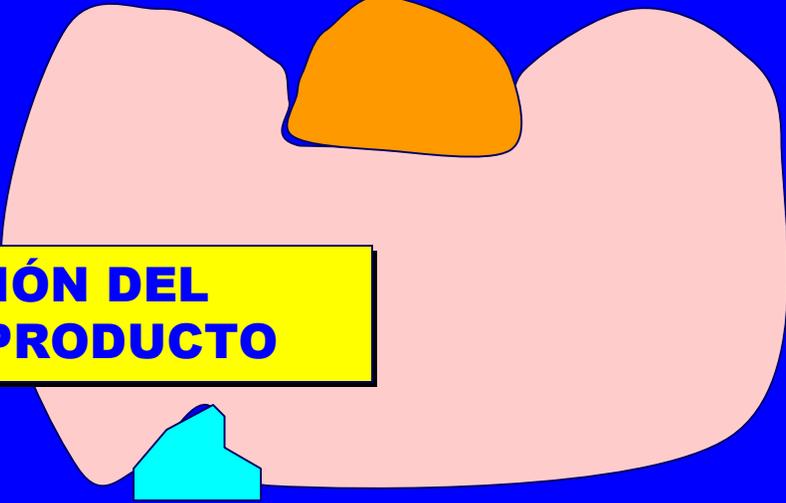
A diagram of a pink enzyme molecule with two subunits. A red substrate is bound to the top of the enzyme. A cyan allosteric modulator is bound to the bottom of the enzyme. A yellow box with the text 'CAMBIO DE CONFORMACIÓN' is positioned to the left of the enzyme, indicating a conformational change.

**FIJACIÓN DEL MODULADOR ALOSTÉRICO**

# ENZIMAS

**RECONOCIMIENTO Y FIJACIÓN DEL SUSTRATO**

**TRANSFORMACIÓN DEL  
SUSTRATO EN PRODUCTO**

A diagram of a pink enzyme molecule with two distinct binding sites. An orange substrate is bound to the top site, and a cyan allosteric modulator is bound to the bottom site. A yellow box with black text is positioned to the left of the enzyme, overlapping the substrate and modulator.

**FIJACIÓN DEL MODULADOR ALOSTÉRICO**

# ENZIMAS

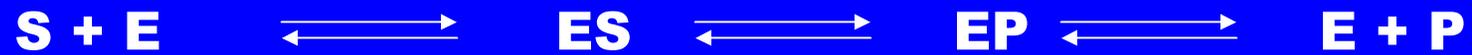
**RECONOCIMIENTO Y FIJACIÓN DEL SUSTRATO**



**LIBERACIÓN DEL PRODUCTO Y  
RELAJACIÓN DE LA ENZIMA**

**FIJACIÓN DEL MODULADOR ALOSTÉRICO**

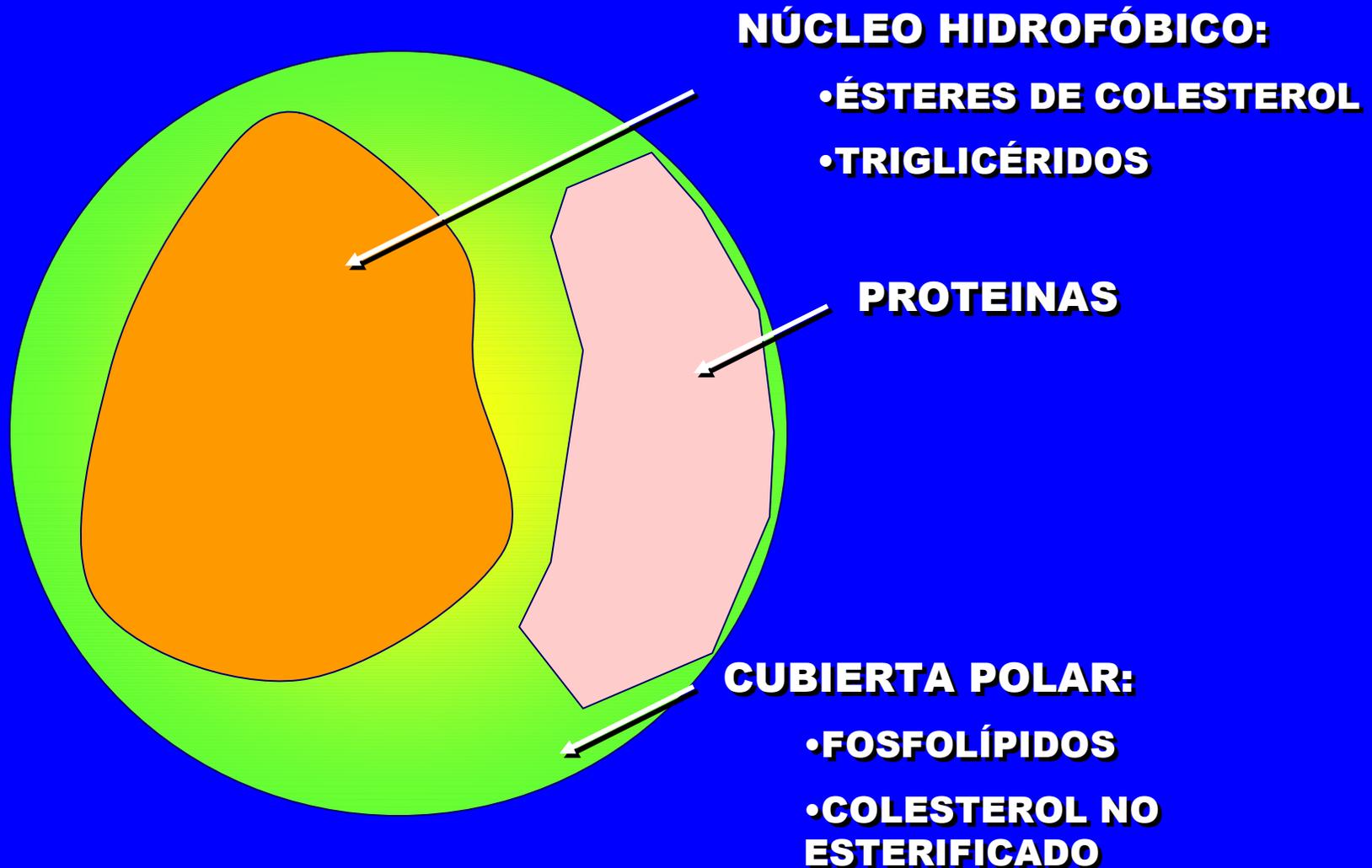
# CINÉTICA ENZIMÁTICA



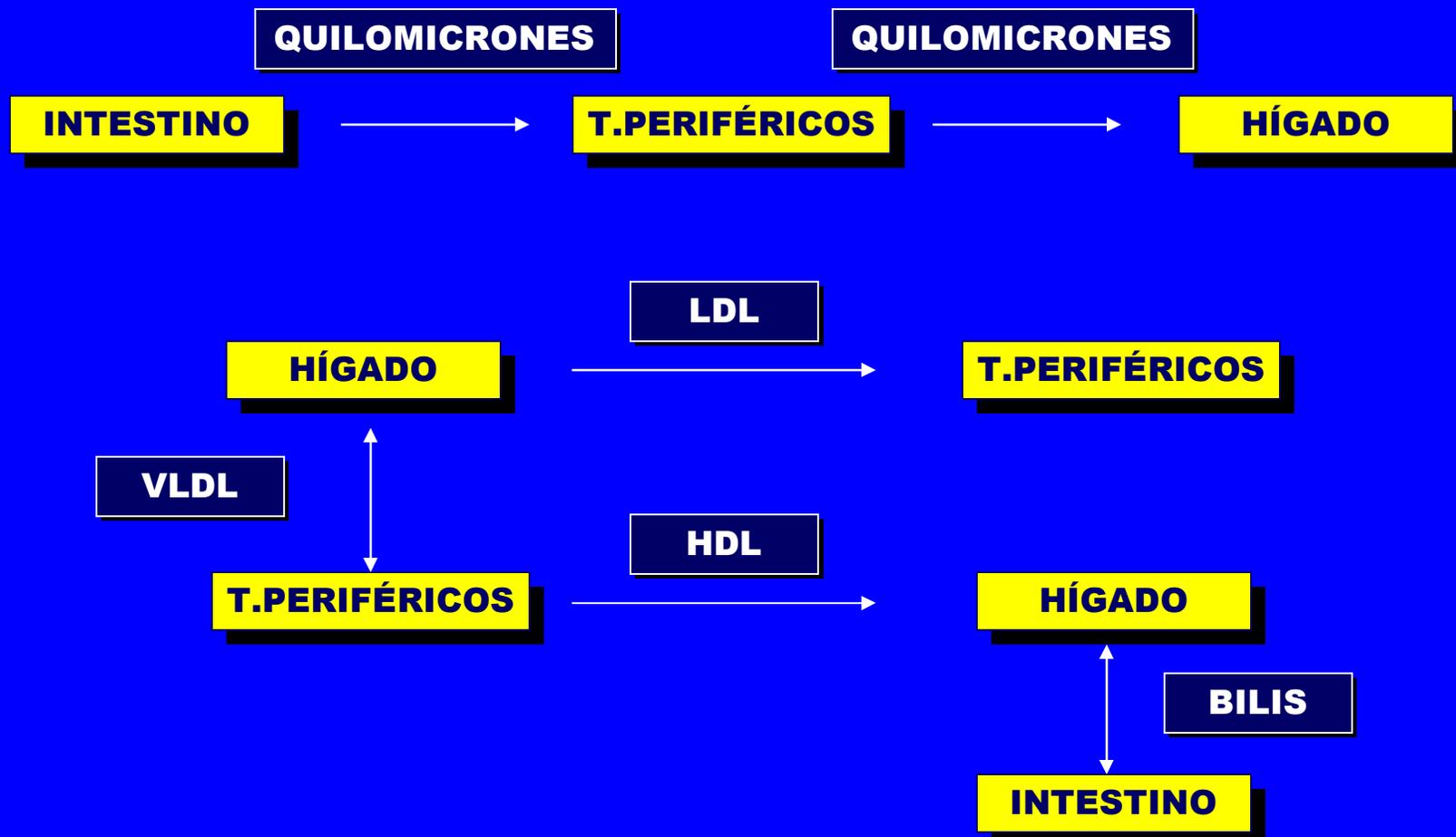
## ECUACIÓN DE MICHAELIS-MENTEN:

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

# ESTRUCTURA DE LAS LIPOPROTEÍNAS



# DIRECCIÓN DEL TRANSPORTE DE LÍPIDOS

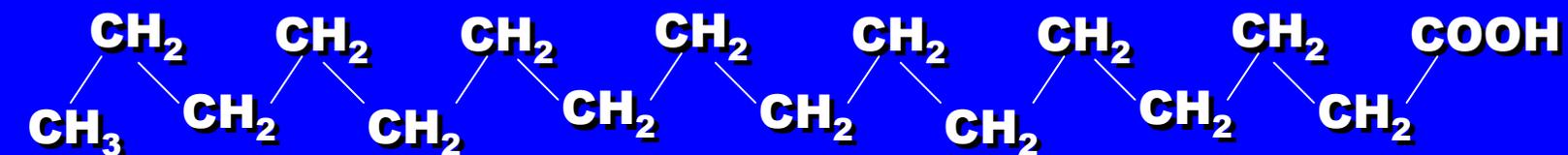


# **CLASIFICACIÓN DE LÍPIDOS**

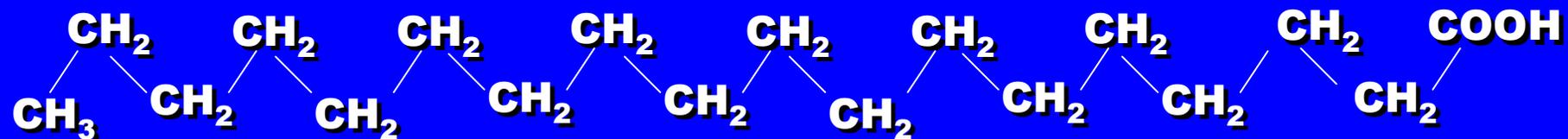
- **ÁCIDOS GRASOS Y DERIVADOS**
- **LÍPIDOS QUE CONTIENEN ÁCIDOS GRASOS**
  - **ACIL-GLICEROLES**
  - **CERAS**
  - **GLICOGLICEROLÍPIDOS**
  - **GLICEROFOSFOLÍPIDOS**
  - **ESFINGOLÍPIDOS**
- **LÍPIDOS NO RELACIONADOS CON ÁCIDOS GRASOS**

# ÁCIDOS GRASOS

## SATURADOS



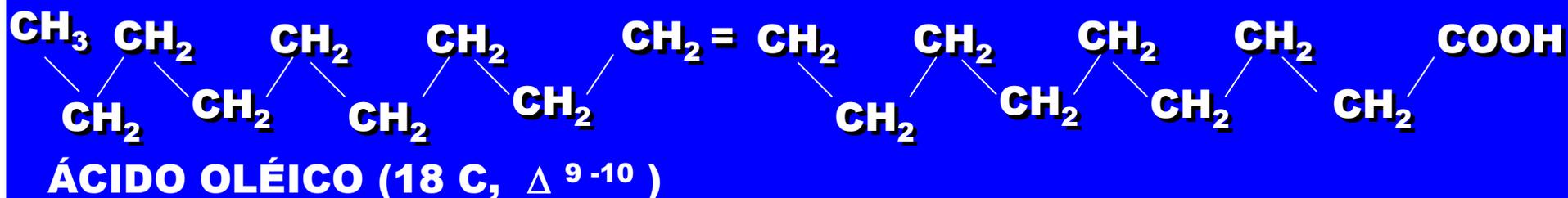
ÁCIDO PALMÍTICO (16 C)



ÁCIDO ESTEÁRICO (18 C)

# ÁCIDOS GRASOS

## INSATURADOS



ÁCIDO LINÓLICO (18 C  $\Delta^{9-10 12-13}$ )

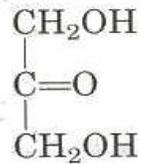
ÁCIDO LINOLÉNICO (18 C  $\Delta^{9-10 12-13 15-16}$ )

ÁCIDO ARAQUIDÓNICO (20 C  $\Delta^{8-9 11-12 14-15}$ )



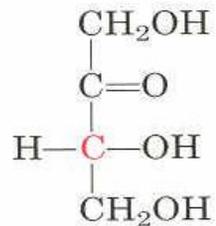
# MONOSACARIDOS: CETOSAS

## Tres carbonos



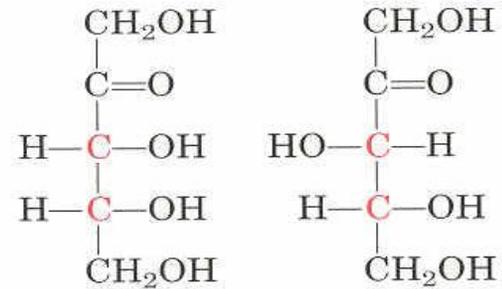
Dihidroxiacetona

## Cuatro carbonos



D-Eritrulosa

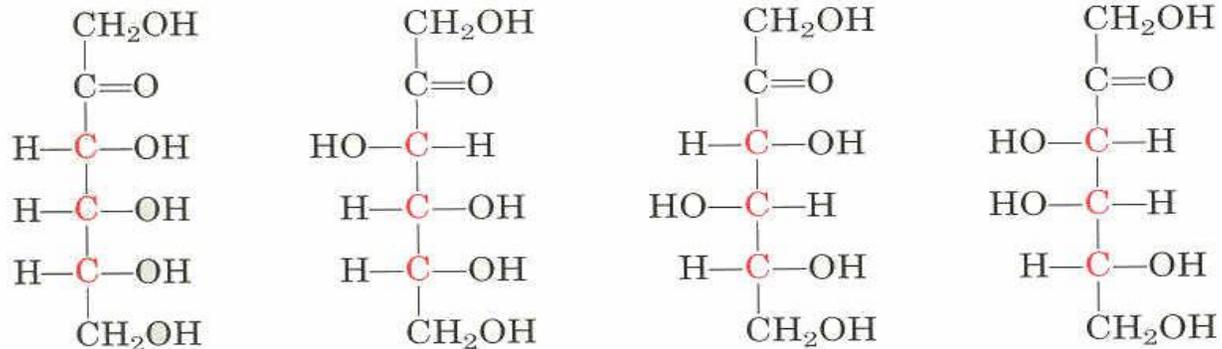
## Cinco carbonos



D-Ribulosa

D-Xilulosa

## Seis carbonos



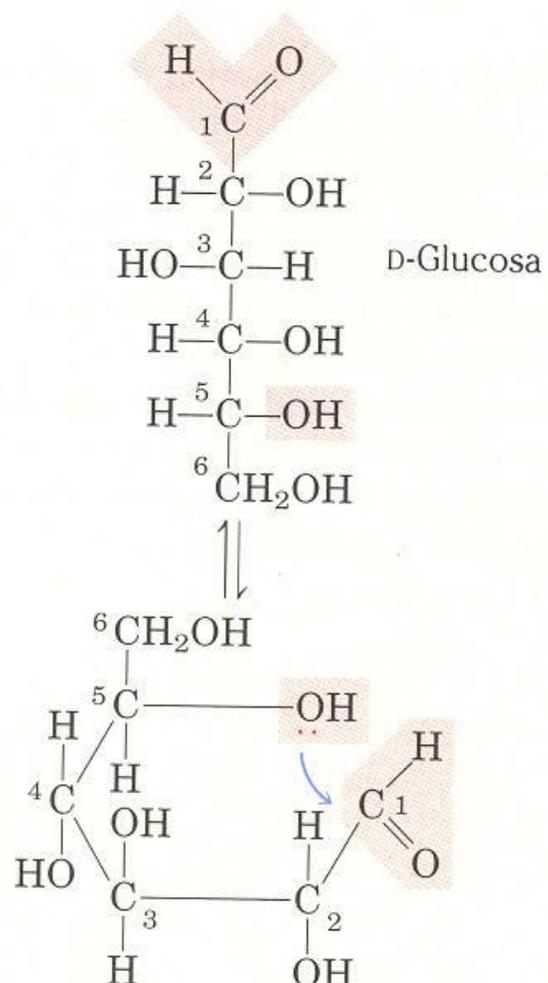
D-Psicosa

D-Fructosa

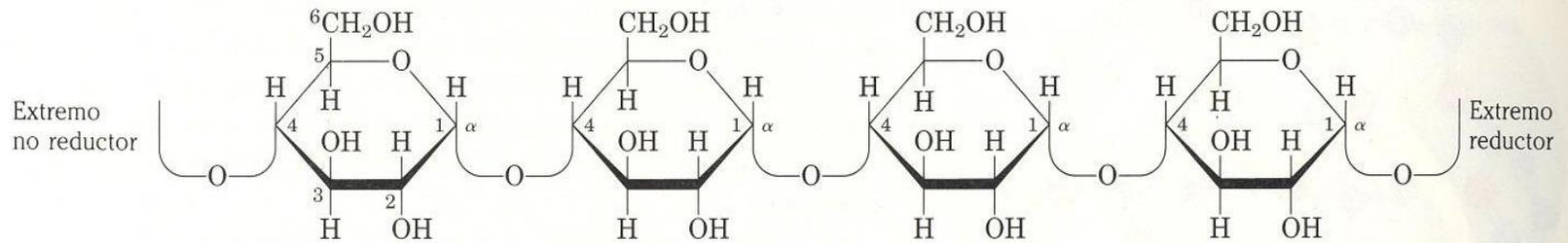
D-Sorbosa

D-Tagatosa

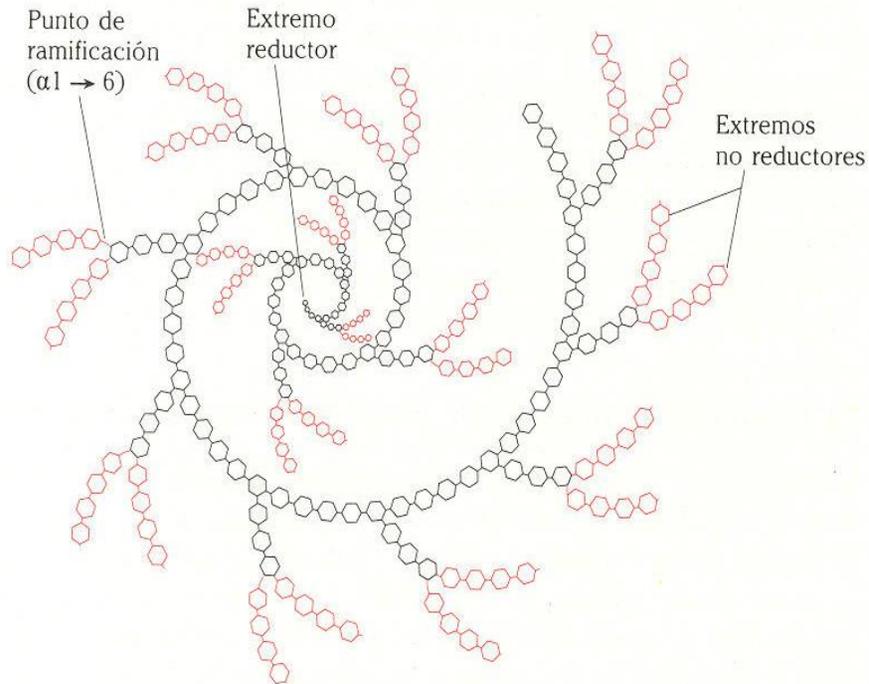
# FORMACIÓN DEL ANILLO HEMIACETAL



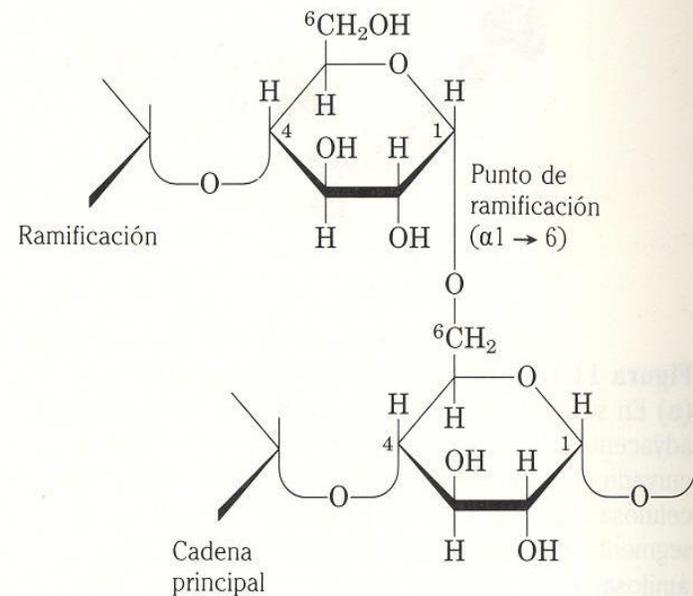
# POLISACARIDOS HOMOGLICANOS



(a)

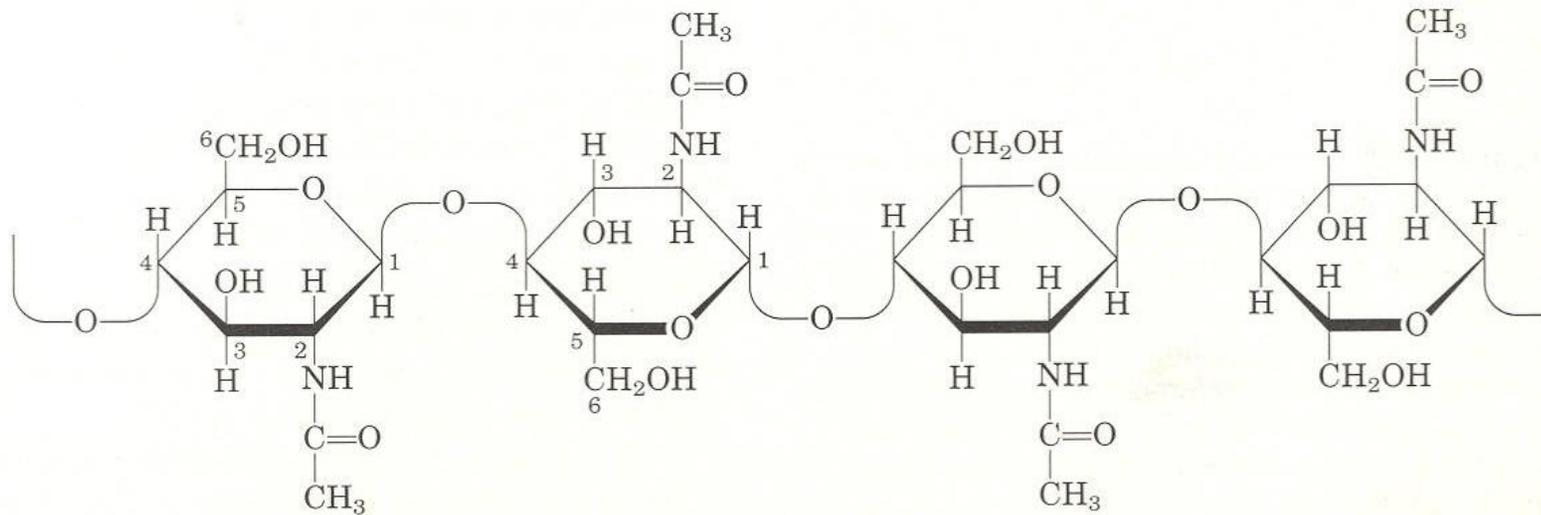


(b)

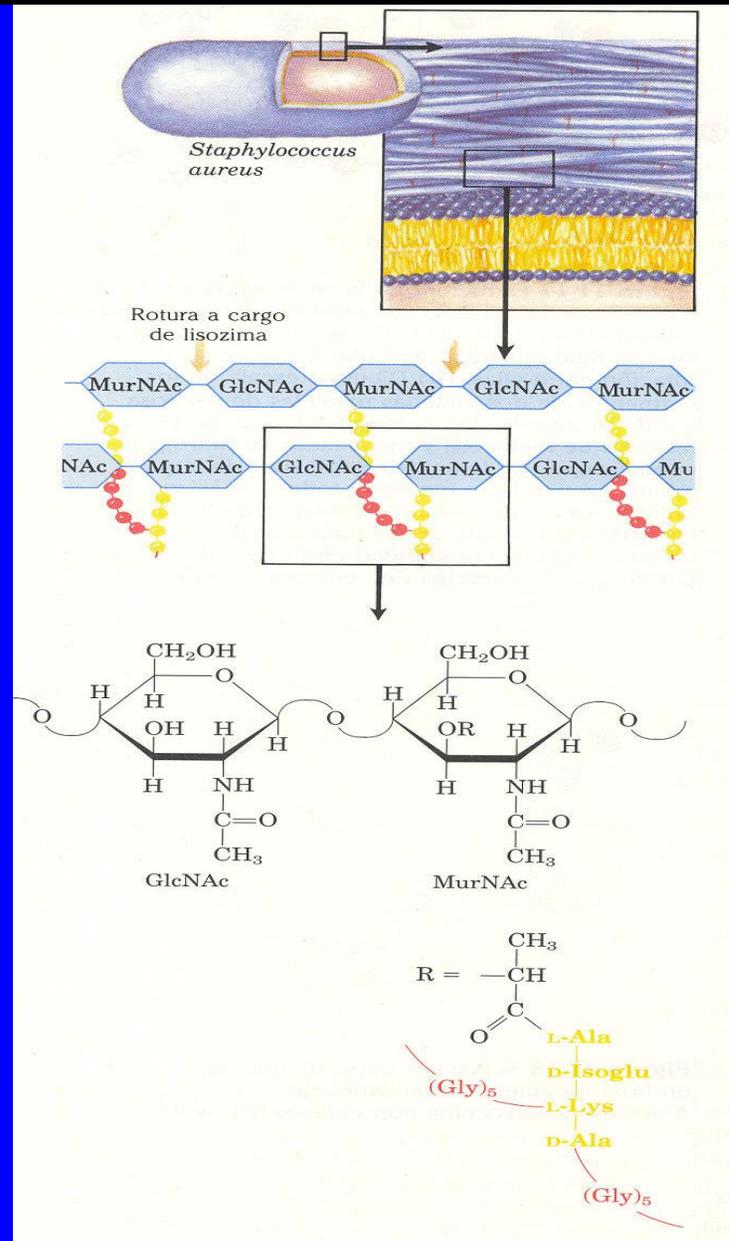


(c)

# QUITINA

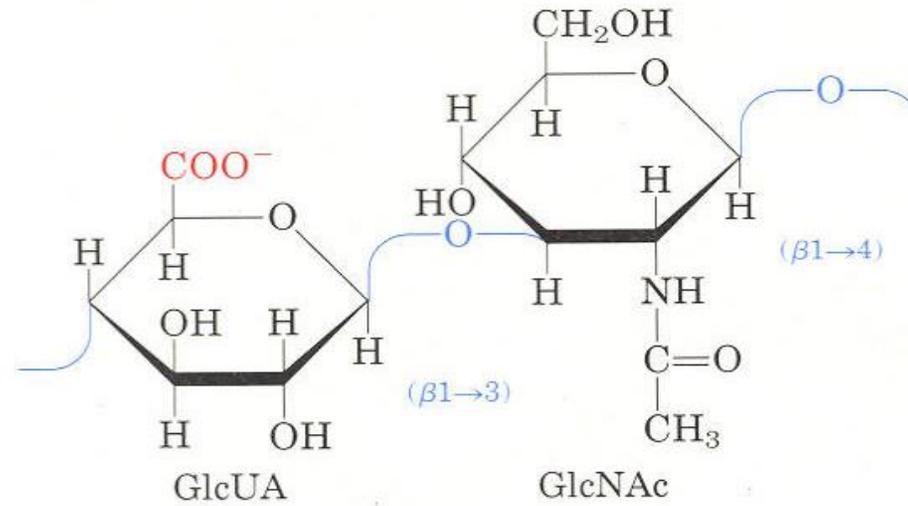


# HETEROGLICANOS: PARED BACTERIANA

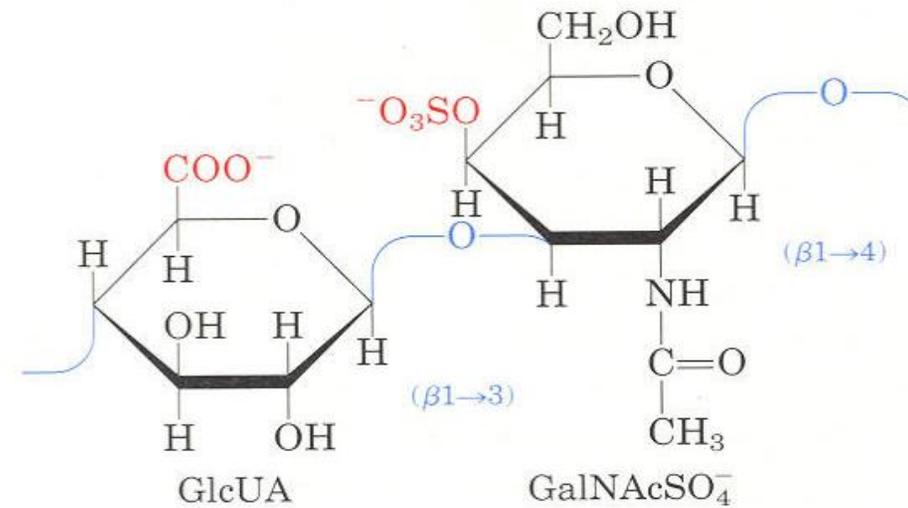


# HETEROGLICANOS

Hialuronato



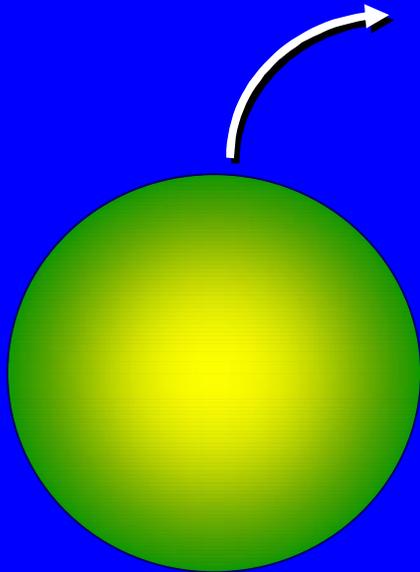
Sulfato de condroitina



# BIOENERGÉTICA

## FUNCIONES VITALES:

- AUTOCONSERVACIÓN
- AUTOCONTROL
- AUTORREPRODUCCIÓN



**SER VIVO**

**INTERCAMBIO DE MATERIA  
Y ENERGÍA**

**¿CÓMO LA OBTIENEN?**

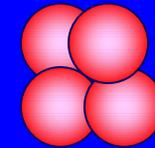
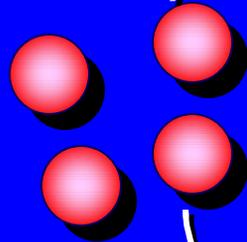
- AUTÓTROFOS
- HETERÓTOFOS

# ACOPLAMIENTO ENERGÉTICO

**PRECURSORES  
(SENCILLOS)**

**BIOMOLÉCULAS  
(COMPLEJAS)**

**ANABOLISMO**



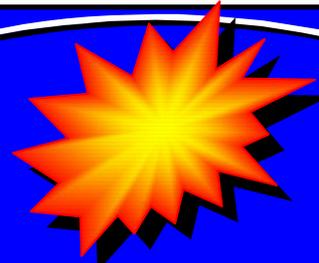
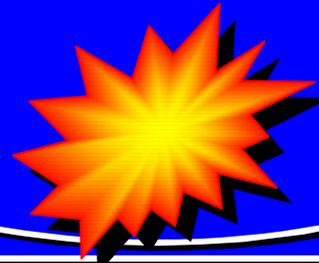
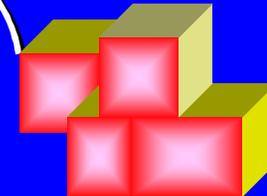
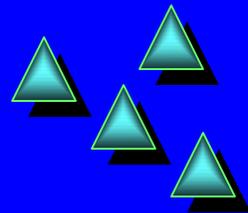
**ATP**

**ADP + P**

**CATABOLISMO**

**SUBPRODUCTOS  
DE DESECHO**

**SUSTRATOS  
ENERGÉTICOS**



# OXIDACIONES BIOLÓGICAS

**SUSTRATOS ENERGÉTICOS  
REDUCIDOS  
(DADORES)**

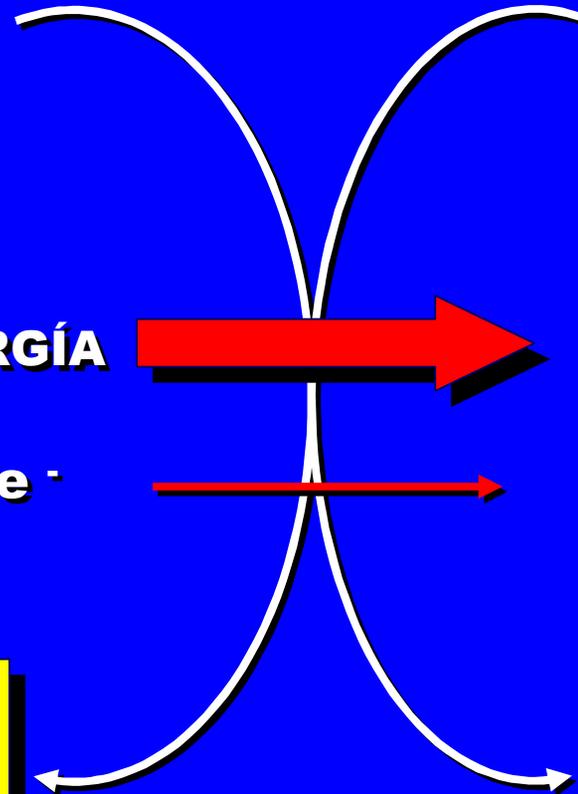
**ACEPTOR  
OXIDADO**

**ENERGÍA**

**e<sup>-</sup>**

**SUBPRODUCTOS OXIDADOS**

**ACEPTOR  
REDUCIDO**



# OXIDACIONES ANAEROBIAS

GLUCOSA

NAD

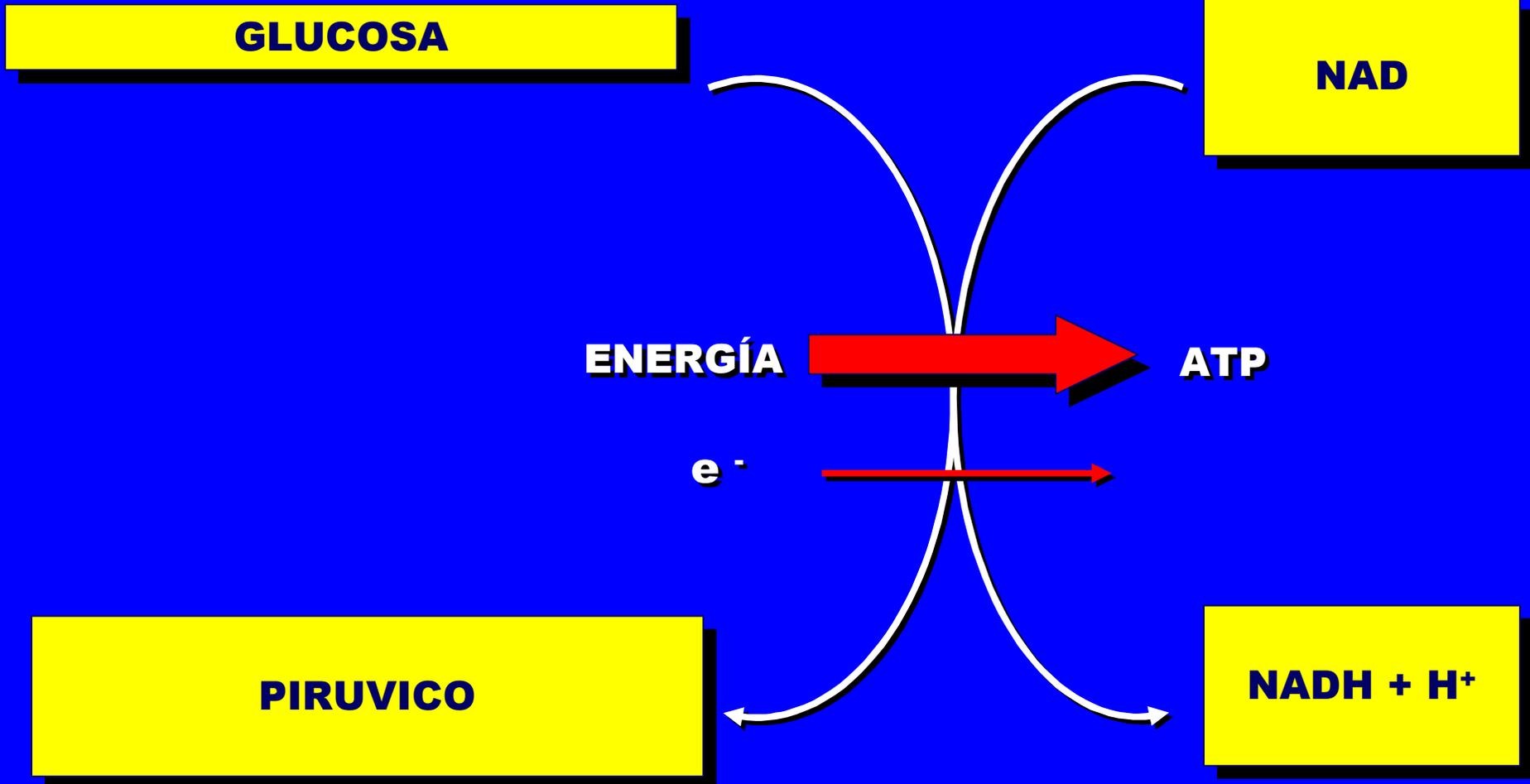
ENERGÍA

ATP

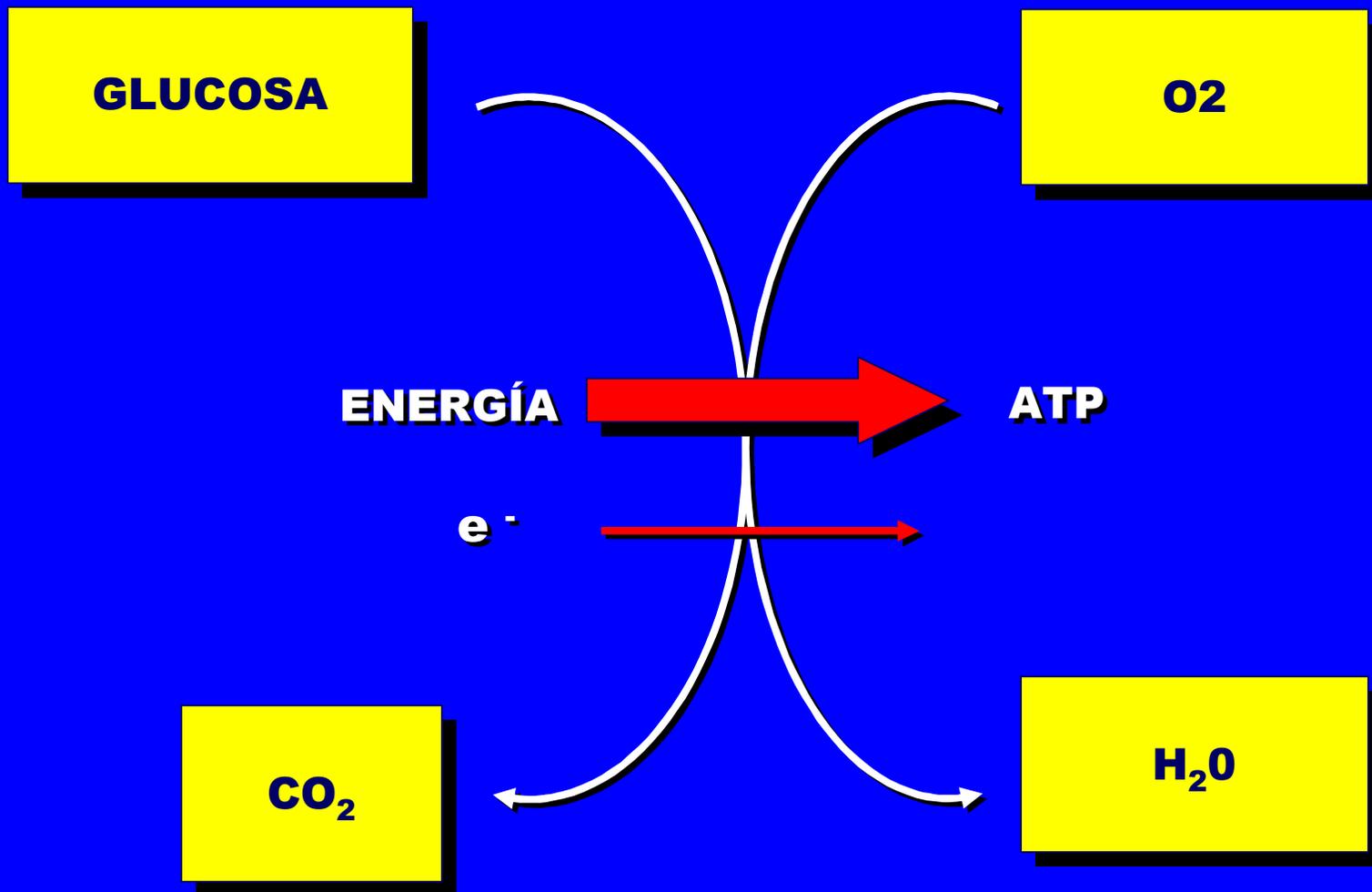
$e^-$

PIRUVICO

NADH + H<sup>+</sup>



# OXIDACIONES AEROBIAS



# ESQUEMA CENTRAL DEL METABOLISMO OXIDATIVO

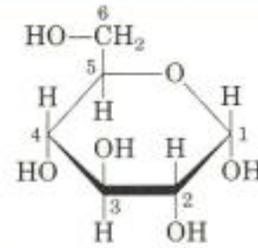
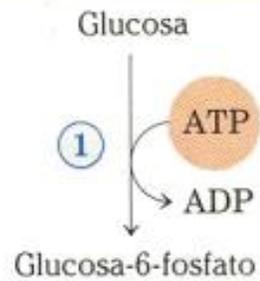


# **METABOLISMO GLUCÍDICO**

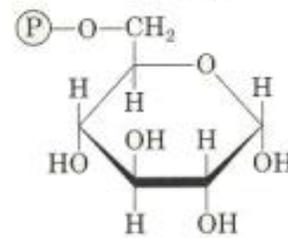
- **GLICOLISIS ANAEROBIA**
- **GLICOLISIS AEROBIA**
- **VIAS ALTERNATIVAS:**
  - PENTOSAS FOSFATO**
  - GLUCURONATO**
- **GLUCONEOGÉNESIS**
- **GLUCOGENOLISIS Y GLUCOGENOSÍNTESIS**

# GLICOLISIS ANAEROBIA I (FASE PREPARATORIA)

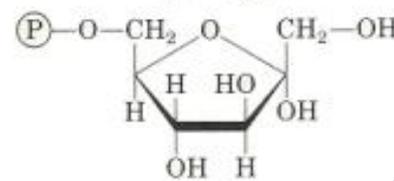
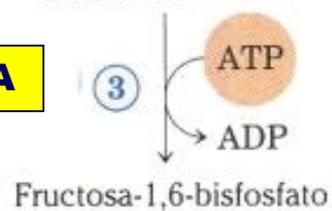
**HEXOKINASA  
(GLUCOKINASA)**



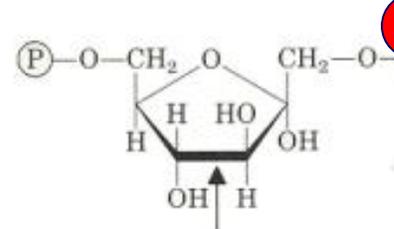
**[GLUCOSA 6 P] ↑**  
**ATP ↑**



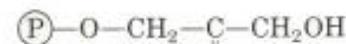
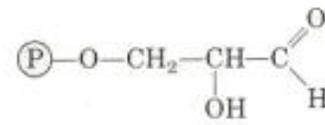
**FOSFOFRUCTOKINASA**



**[F2,6 bP] ↑**  
**AMP ↑**

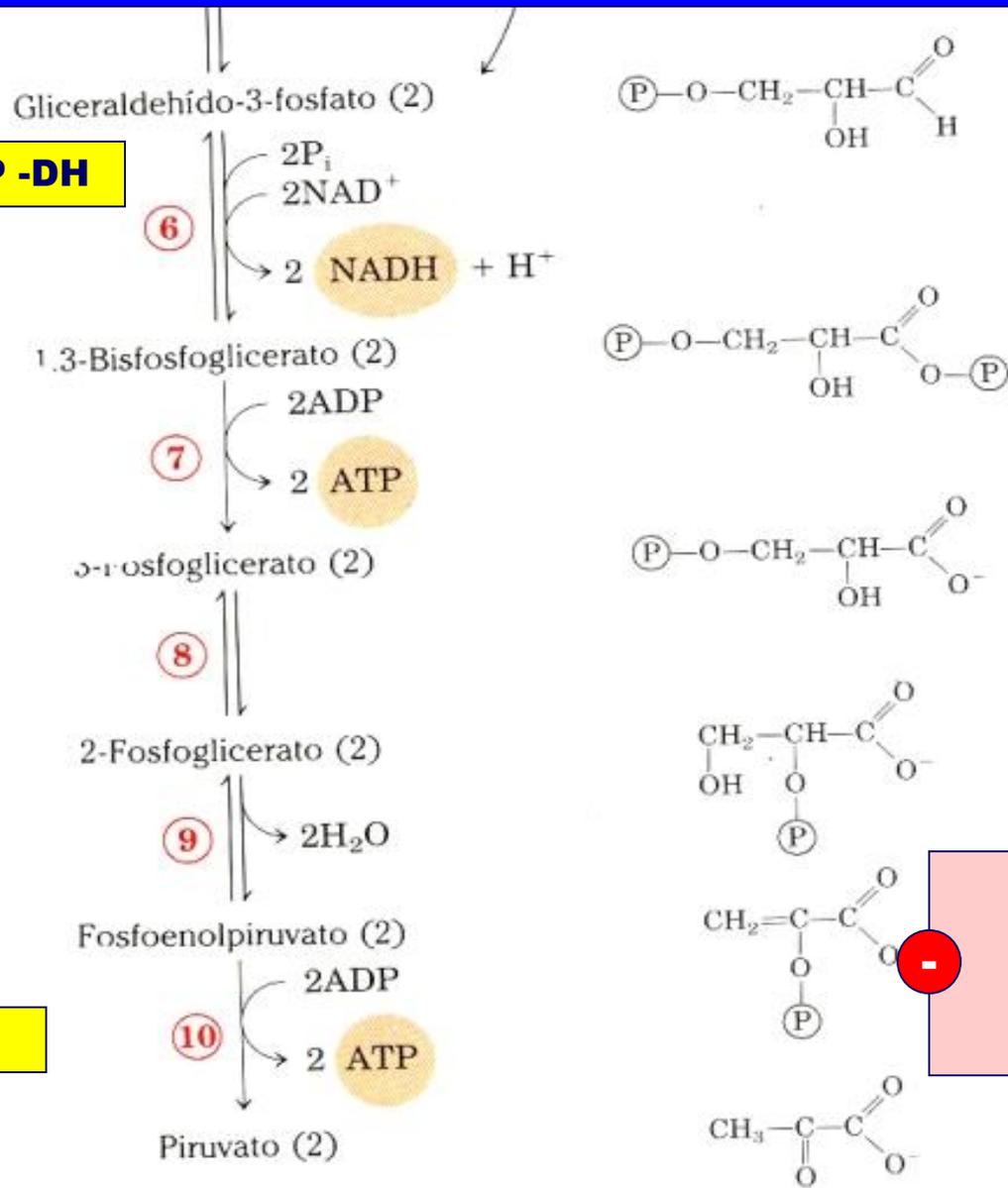


**CITRATO ↓**  
**ATP ↓**



# GLICOLISIS ANAEROBIA II (FASE DE BENEFICIOS)

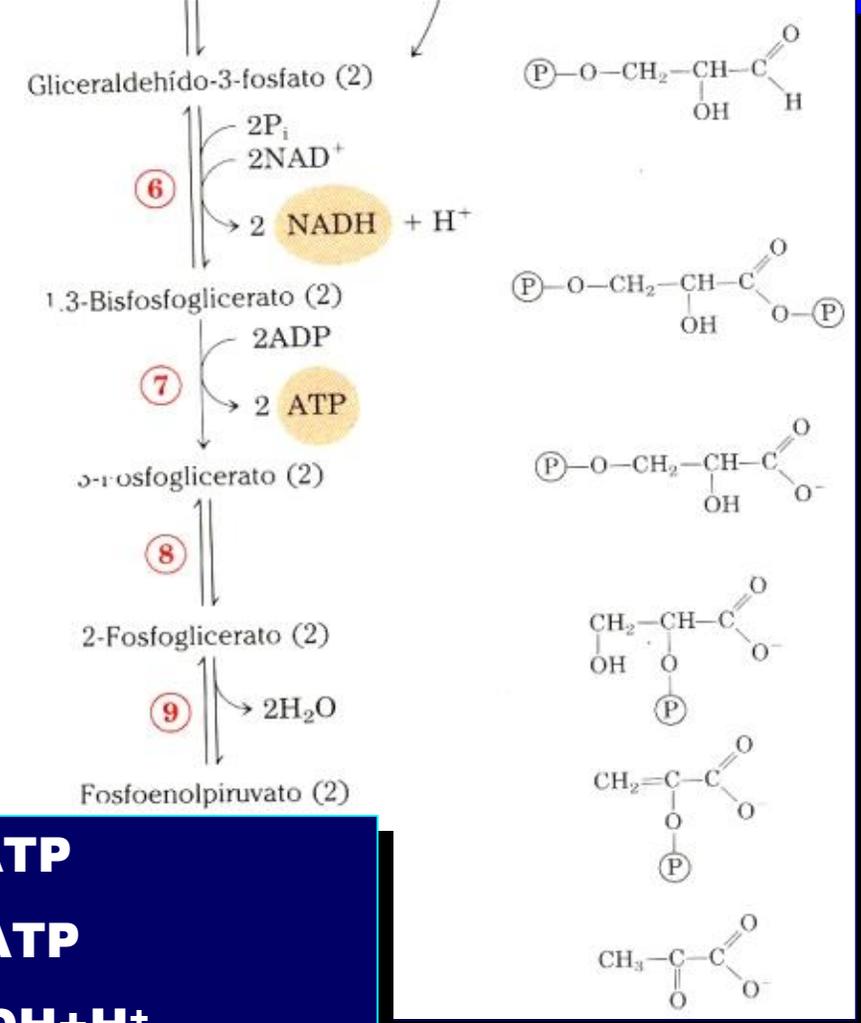
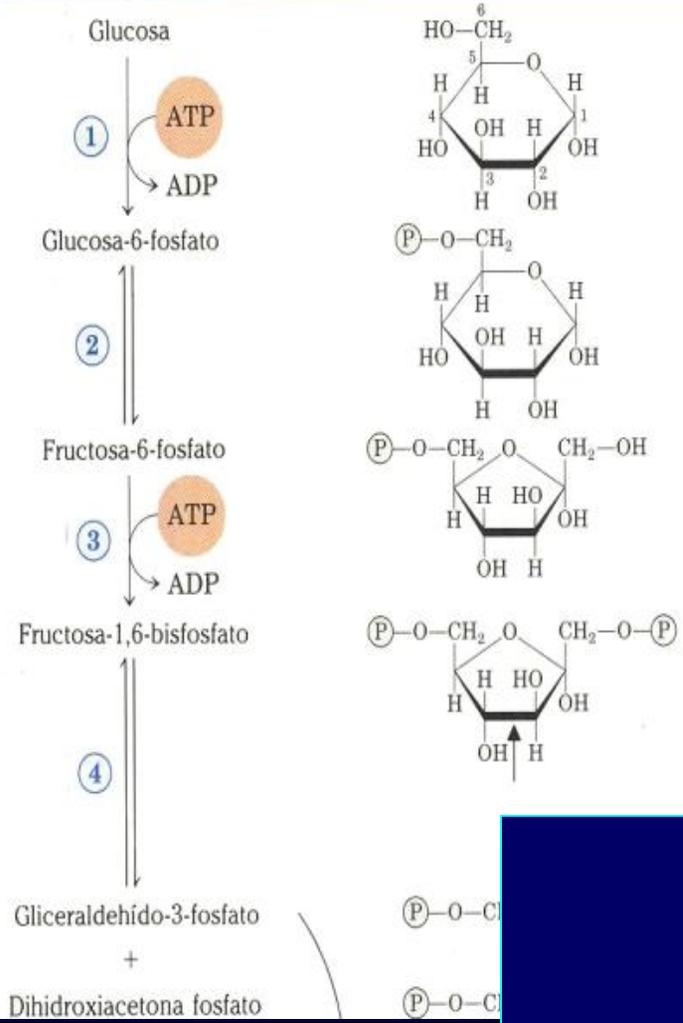
**GLICERALDEHIDO 3P -DH**



**PIRUVATO KINASA**

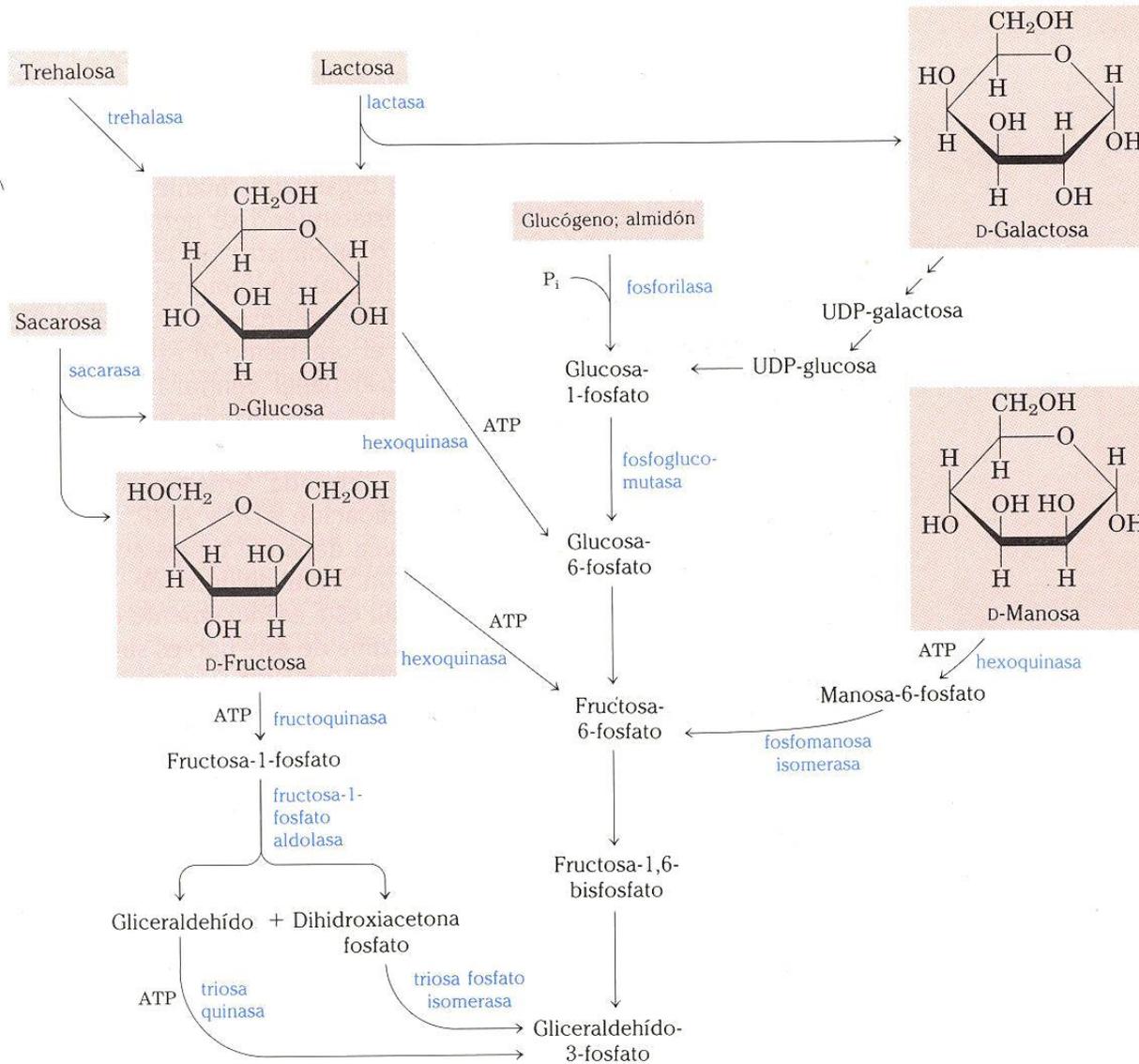
**ATP ↑**  
**ACETIL-CoA ↑**  
**Ac. GRASOS ↑**

# RESULTADOS (ESTEQUIOMETRÍA)

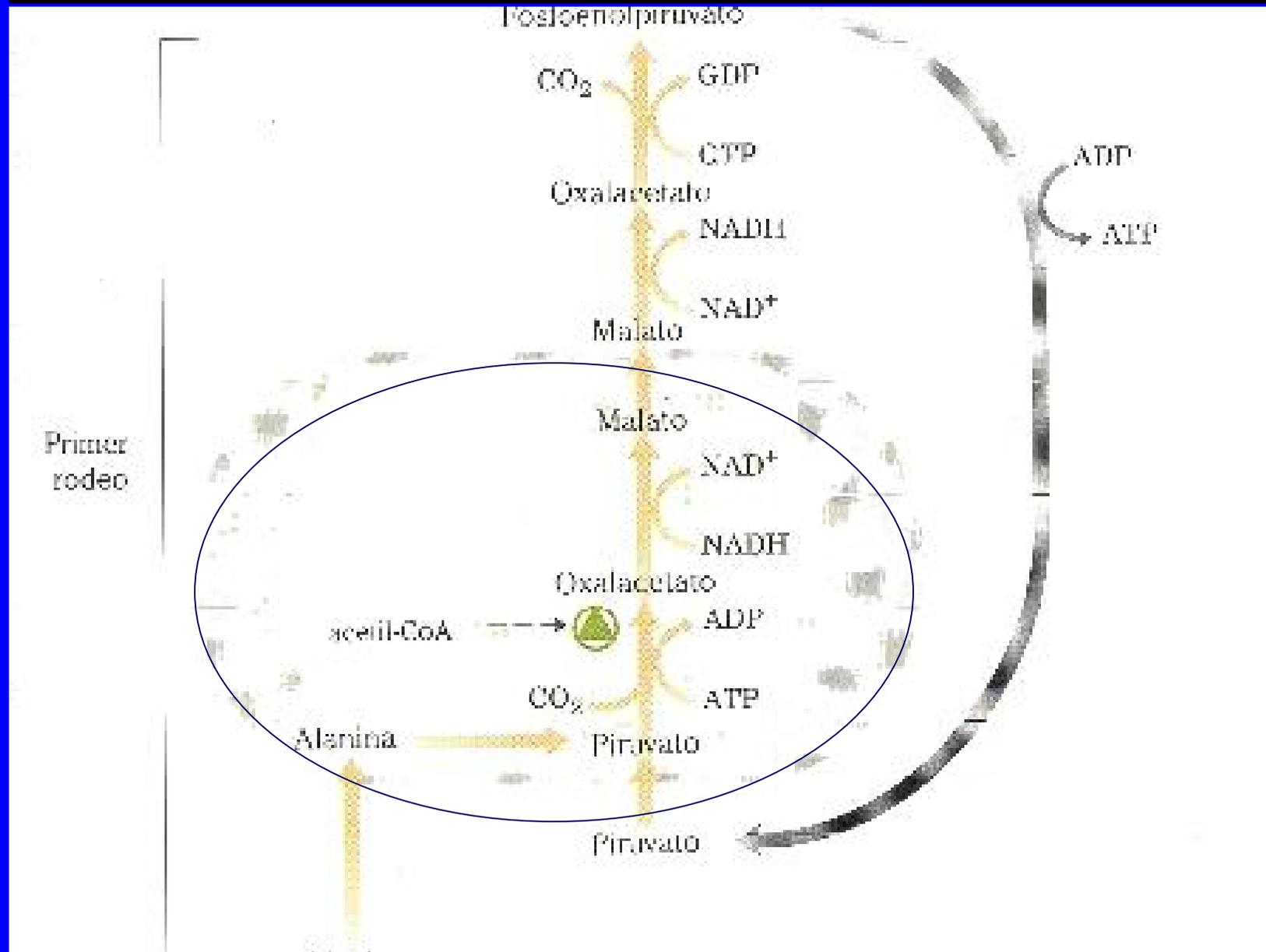


**-2 ATP**  
**+4 ATP**  
**+2 NADH+H<sup>+</sup>**

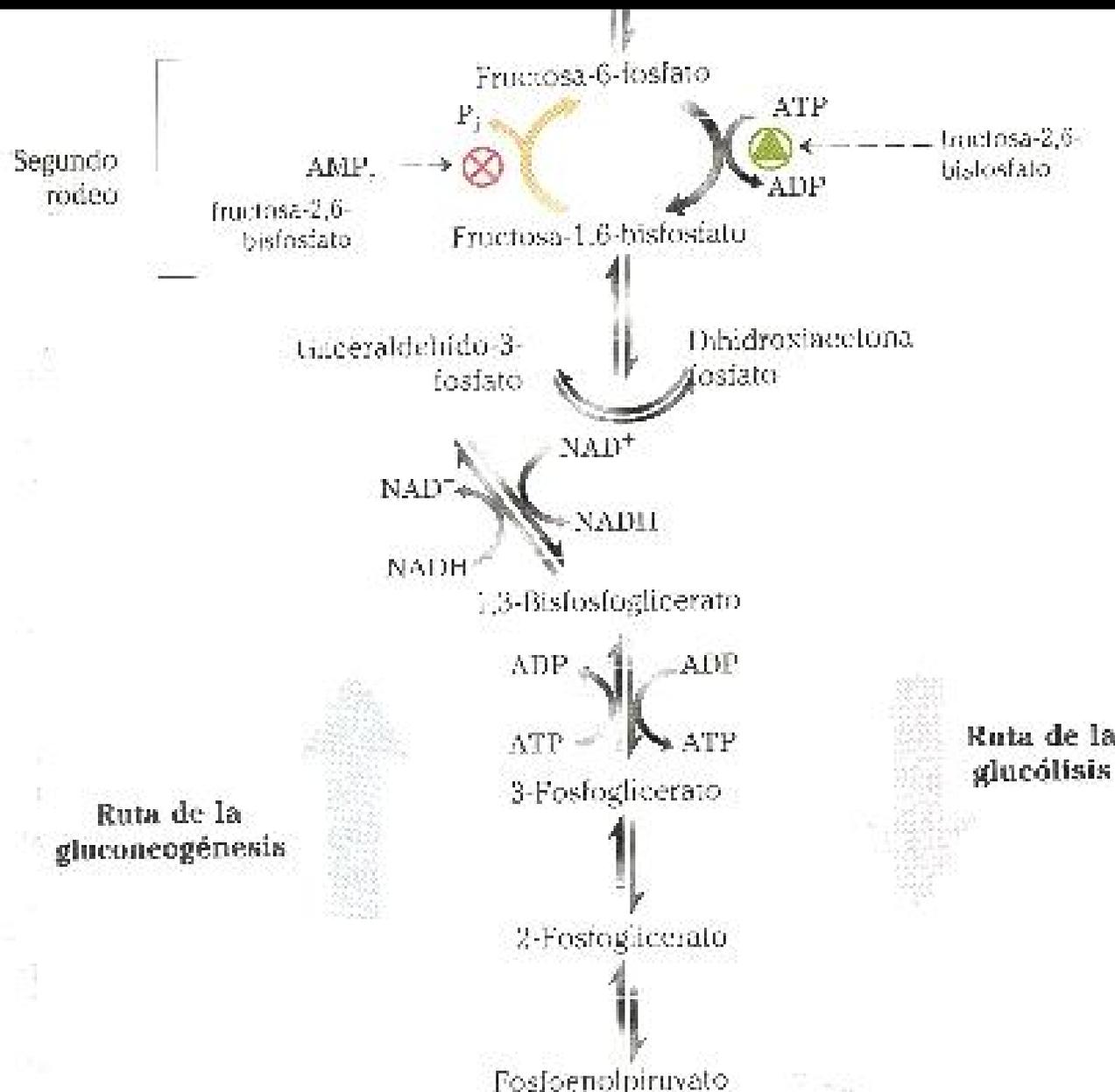
# ACCESO AL PROCESO



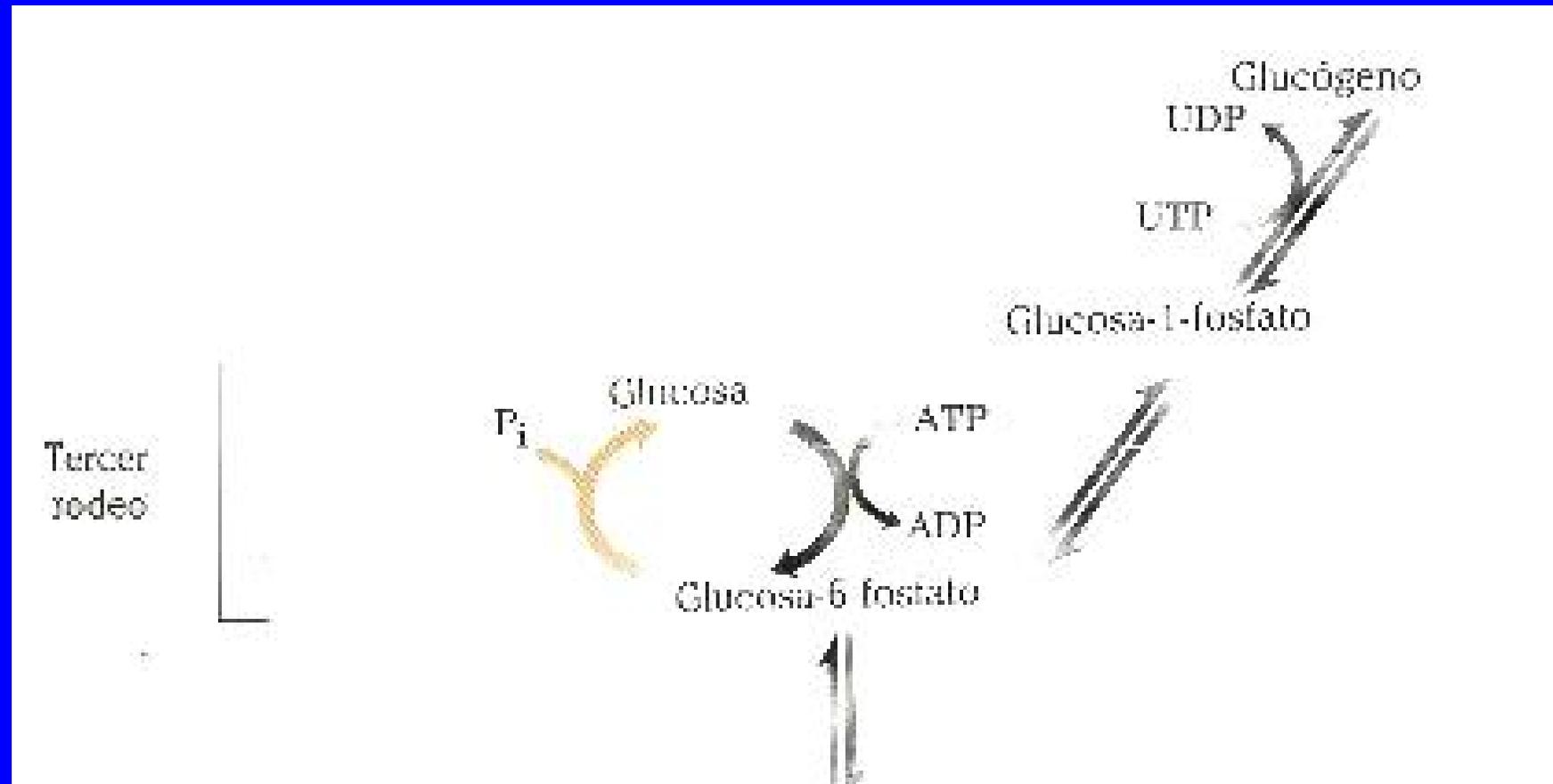
# GLUCONEOGENESIS



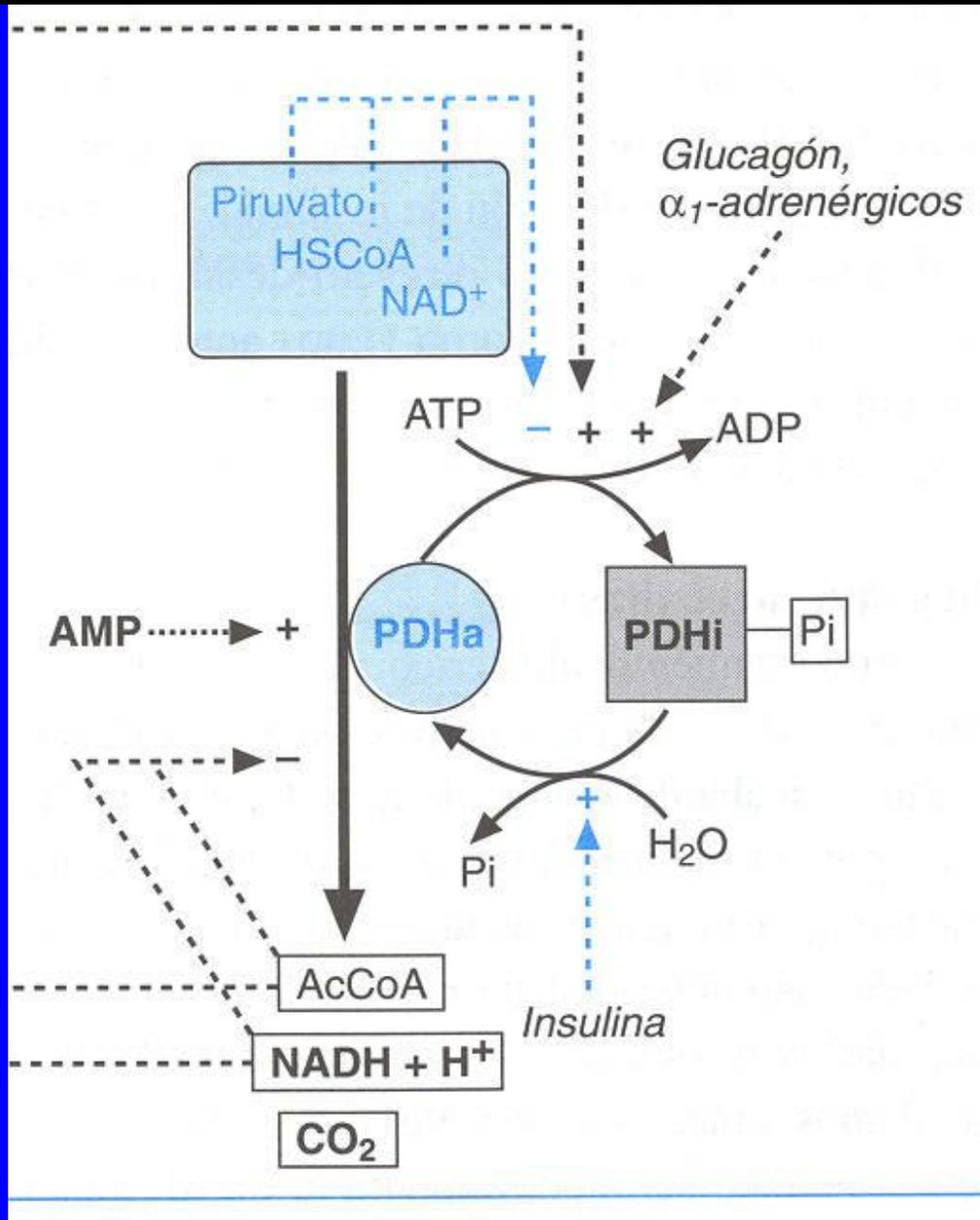
# GLUCONEOGENESIS



# GLUCONEOGENESIS



# PIRUVATO DESHIDROGENASA

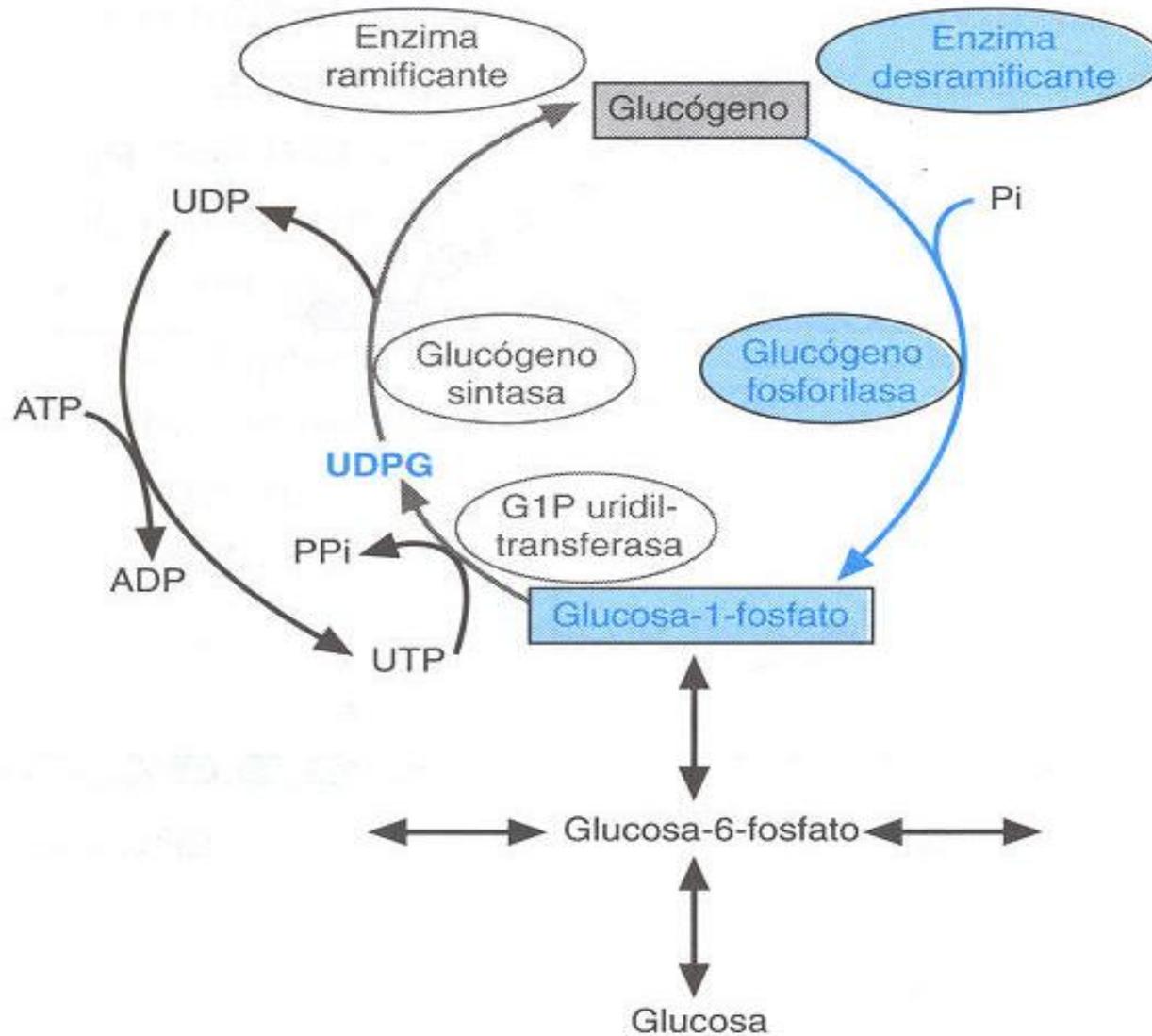


# FACTORES DE REGULACIÓN DE GLICOLISIS Y GLUCONEOGENESIS

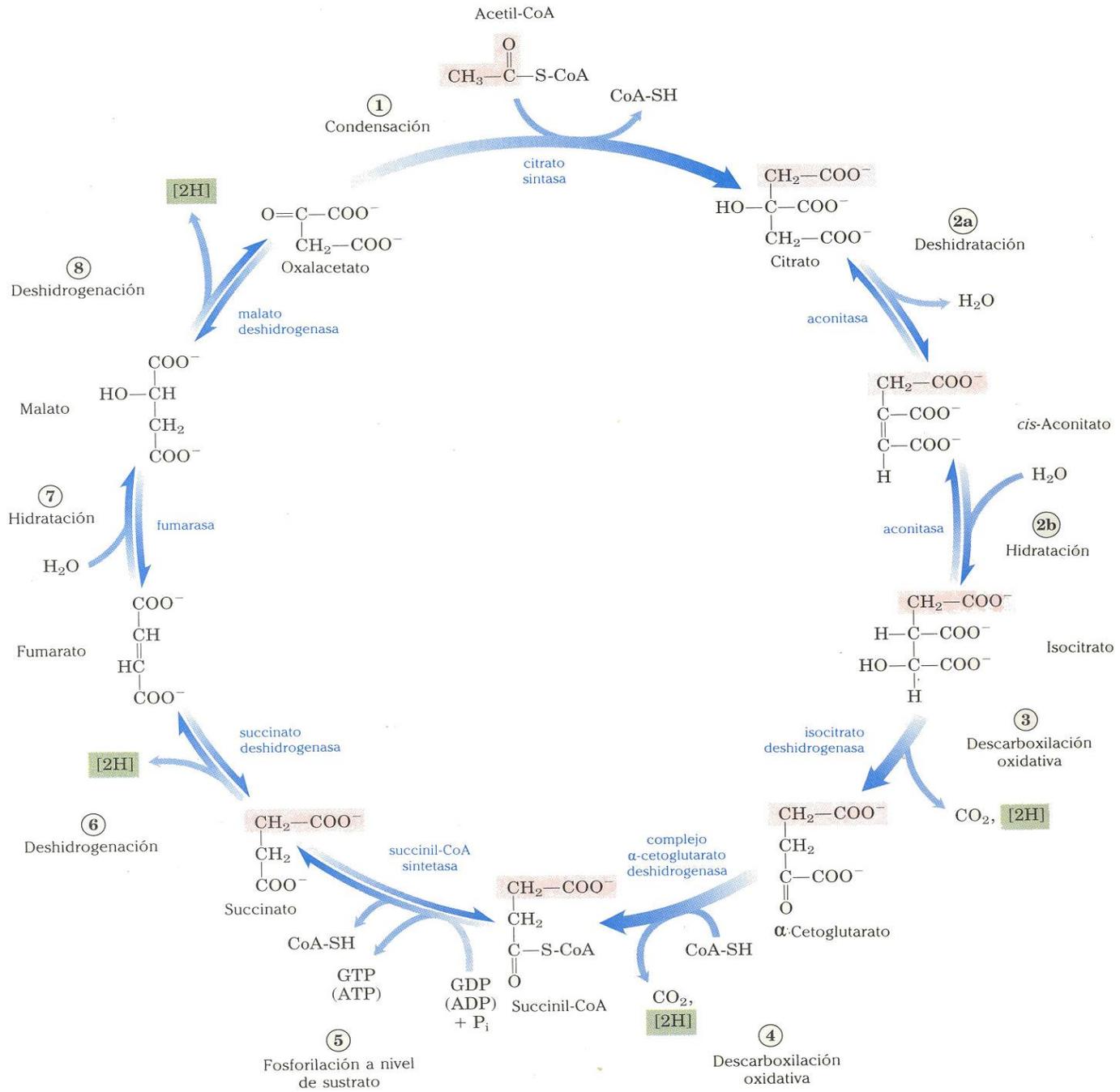
Tabla 12-2. Principales agentes reguladores de la glicólisis (G) y la gluconeogénesis (N)

	Enzimas glicolíticas				Enzimas gluconeogénicas				Efecto global	
	HK	PFK	PK	PDH	PC	PEPCK	FBP	G6Pasa	G	N
Insulina			+	+	-	-	-	-	↑	↓
Glucagón		=	-	-		+			↓	↑
Glucocorticoides						+		+	↓	↑
ATP		-	-		+				↓	↑
Citrato		-						+	↓	↑
G6P	-								↓	
F6P		+							↑	
F-1,6-BP			+						↑	
F-2,6-BP		+					-		↑	↓
H <sup>+</sup>		-				+			↓	↑
AMP		+					-		↑	↓
AcCoA				-	+				↑	↑

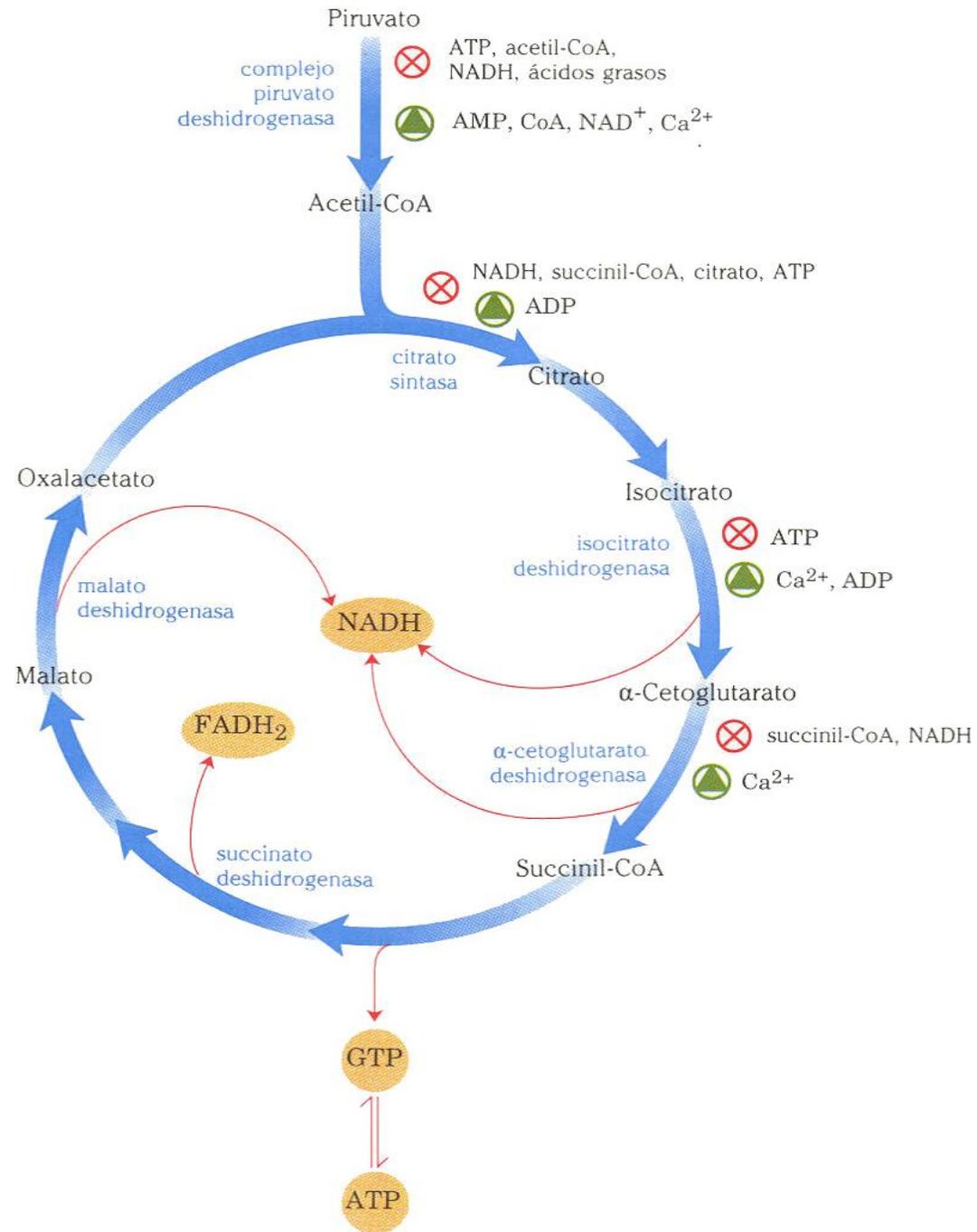
# METABOLISMO DEL GLUCÓGENO



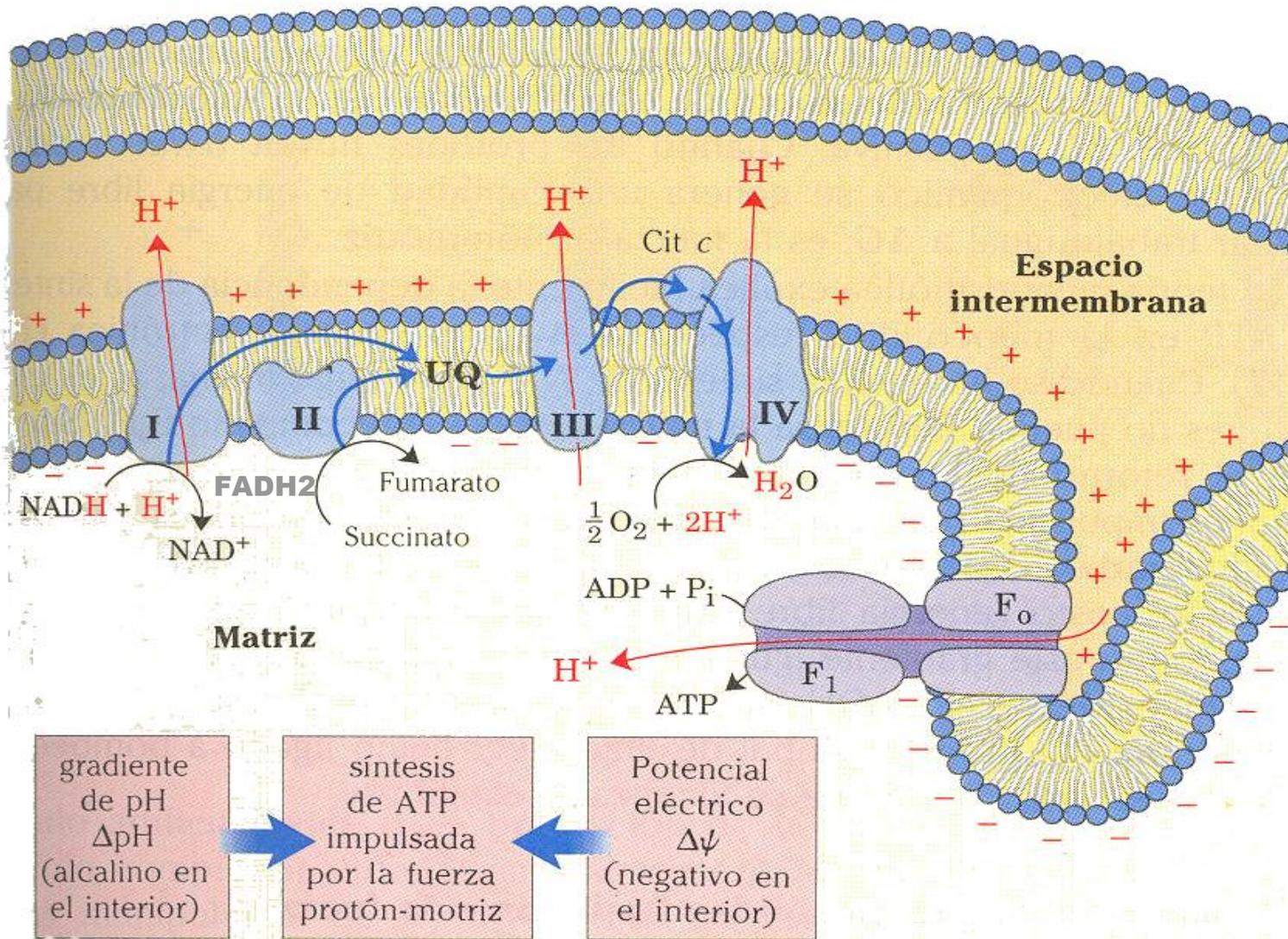
# CICLO DE KREBS



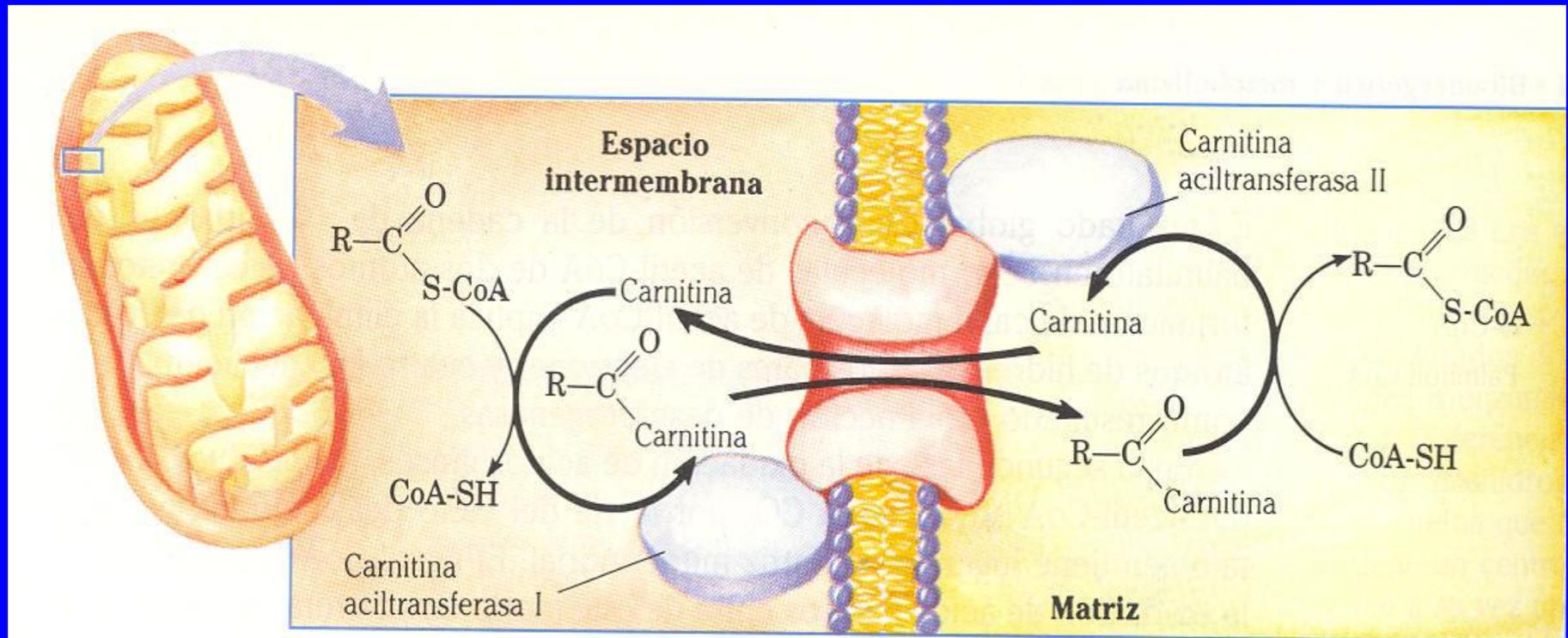
# NÓ-CÍCLICO



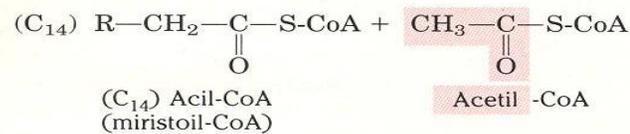
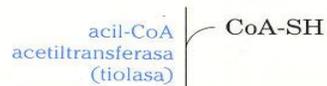
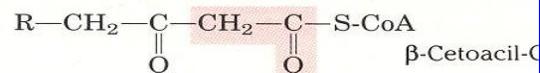
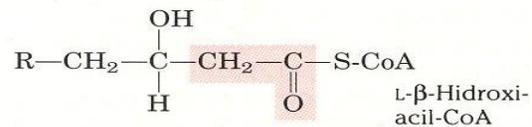
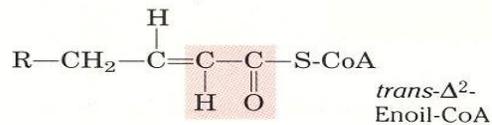
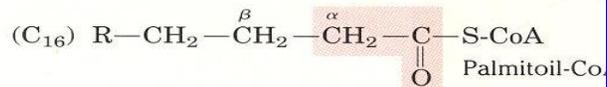
# CADENA DE TRANSPORTE ELECTRÓNICO



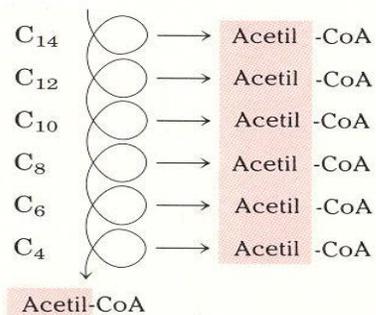
# $\beta$ - OXIDACIÓN DE ÁCIDOS GRASOS



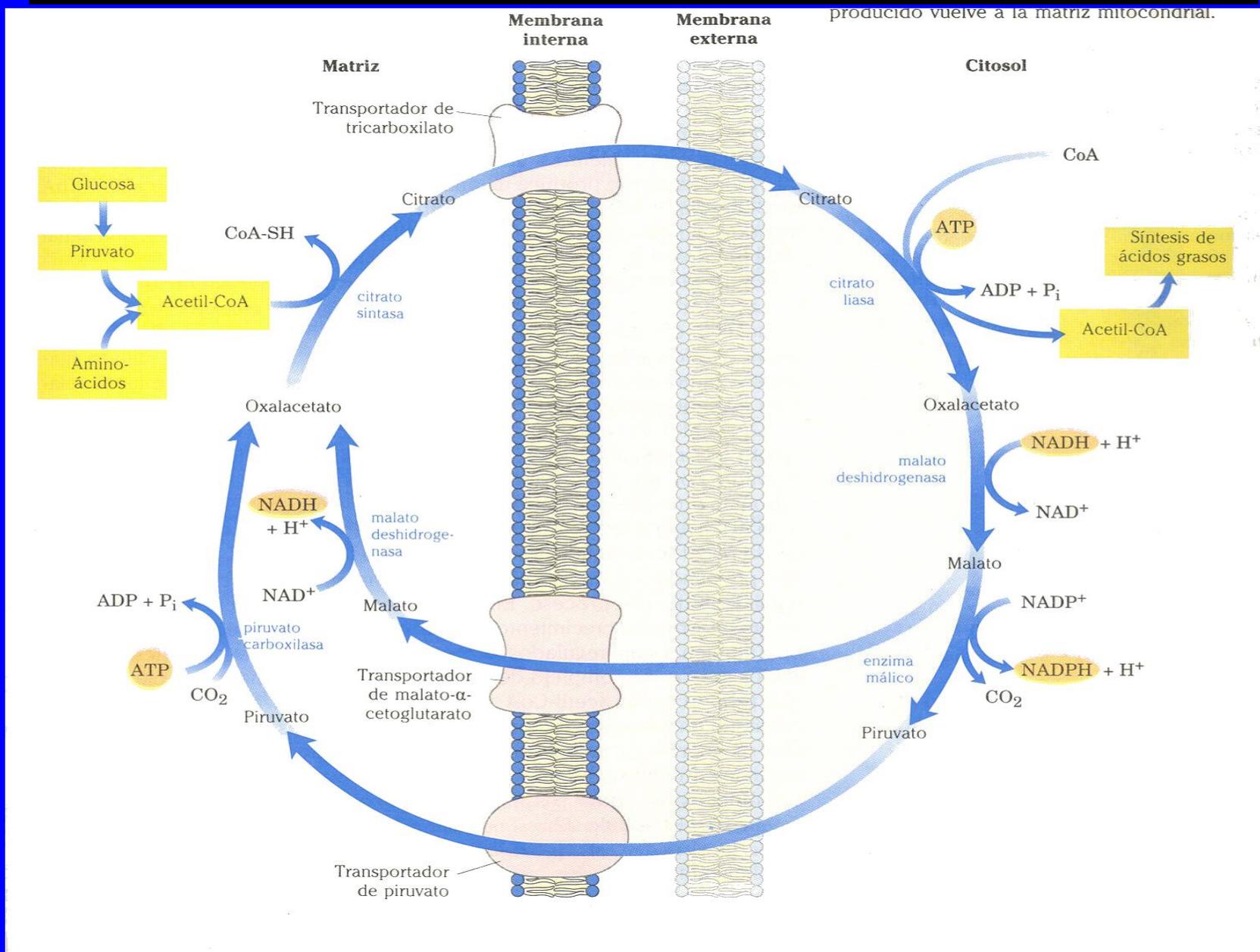
# β OXIDACIÓN



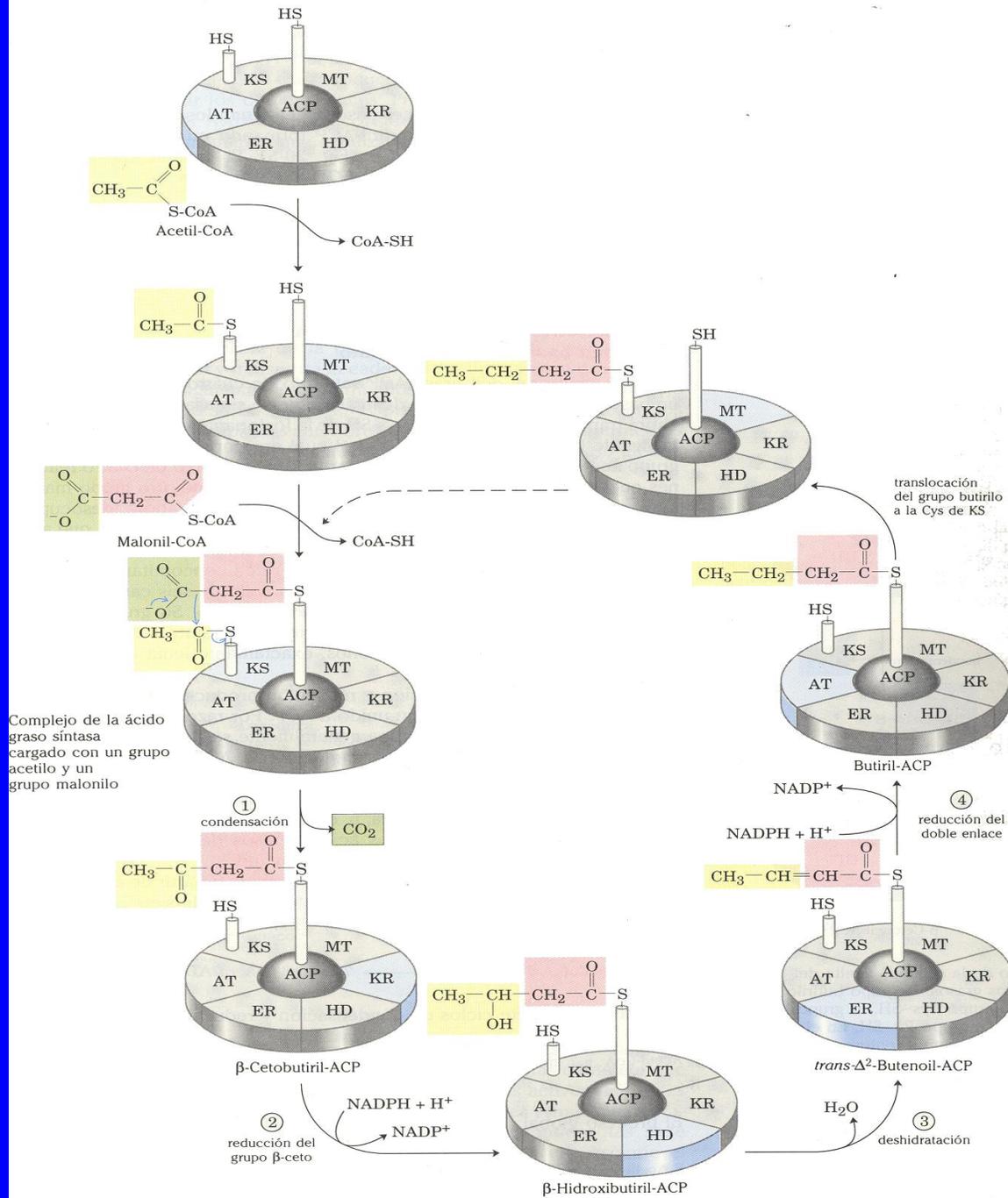
(a)



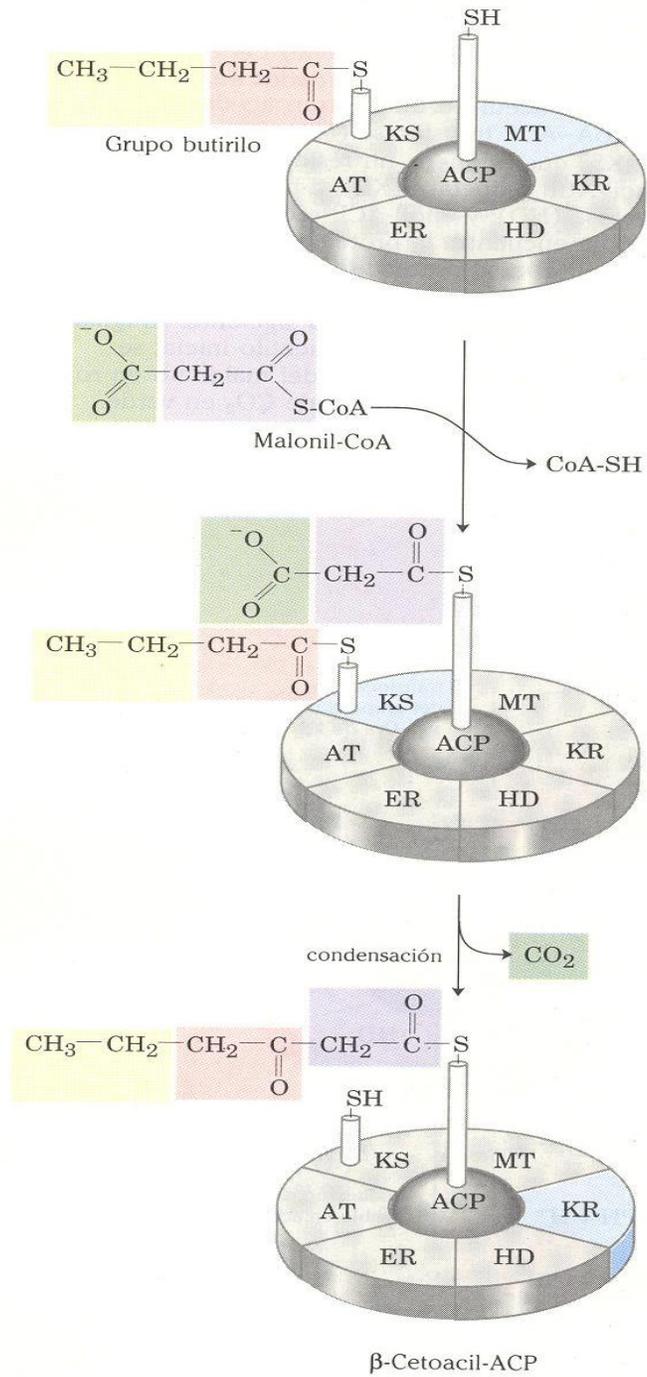
# SÍNTESIS DE AC. GRASOS



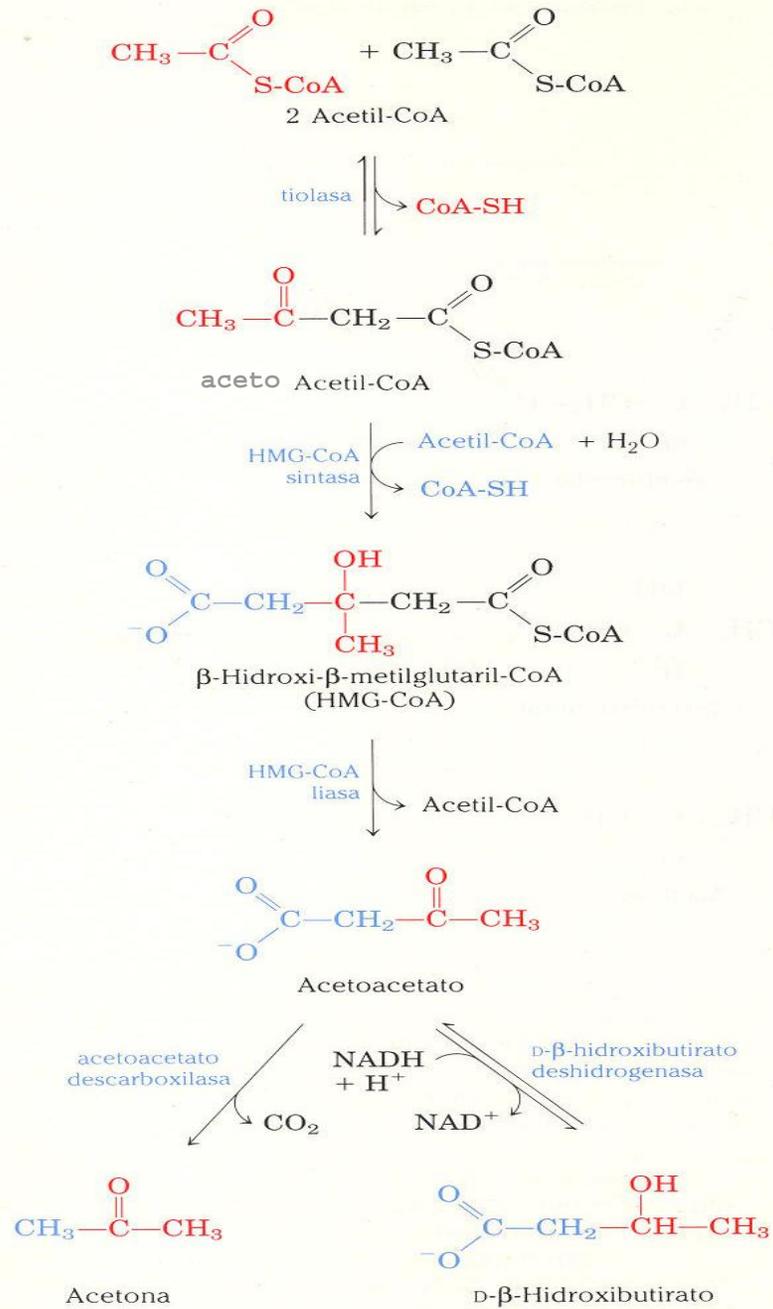
# SÍNTESIS ACGRASOS



# SÍNTESIS ACGRASOS

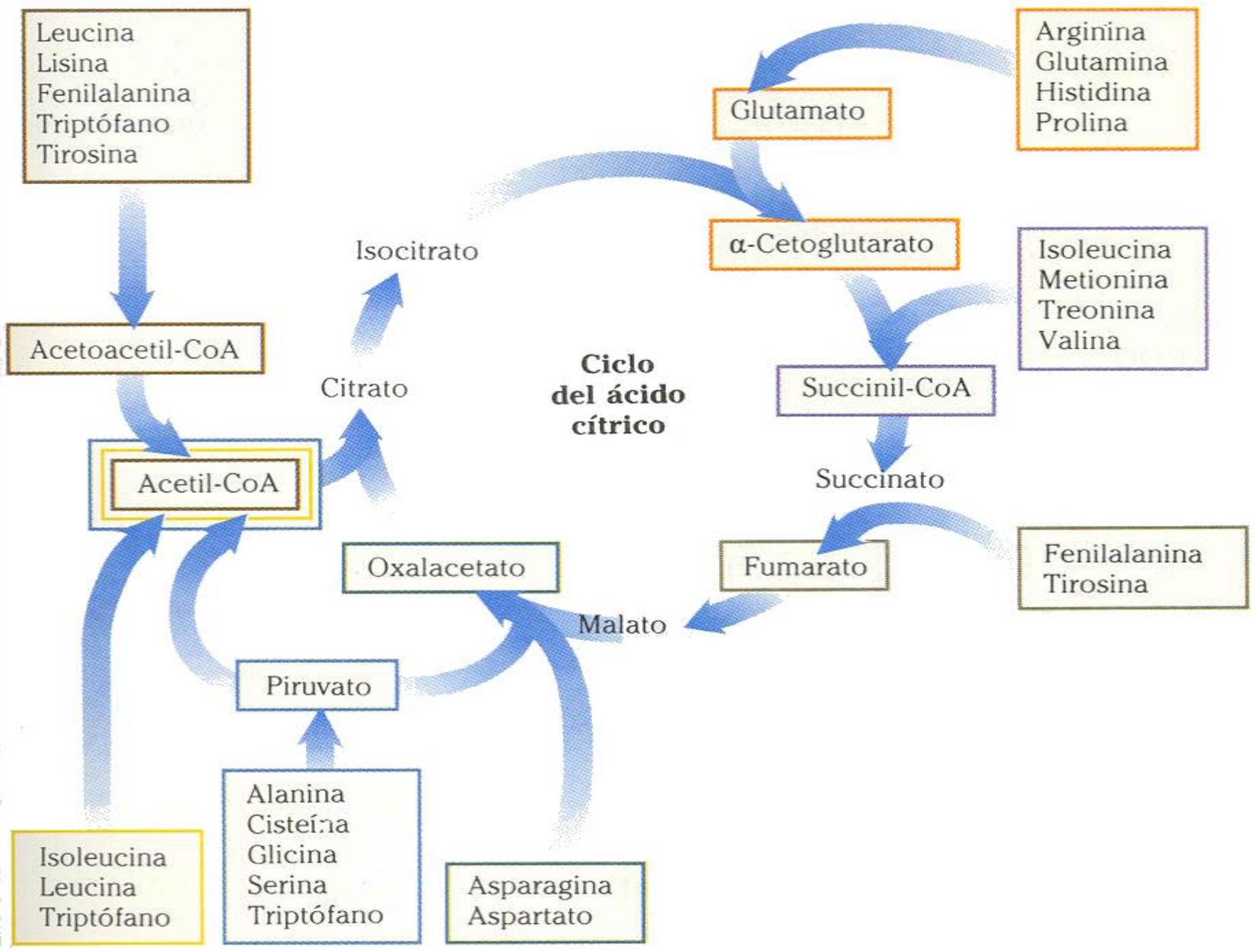


# S - S E M E S





**CATABOLISMO PROTEICO**



# CICLO DE LA UREA

