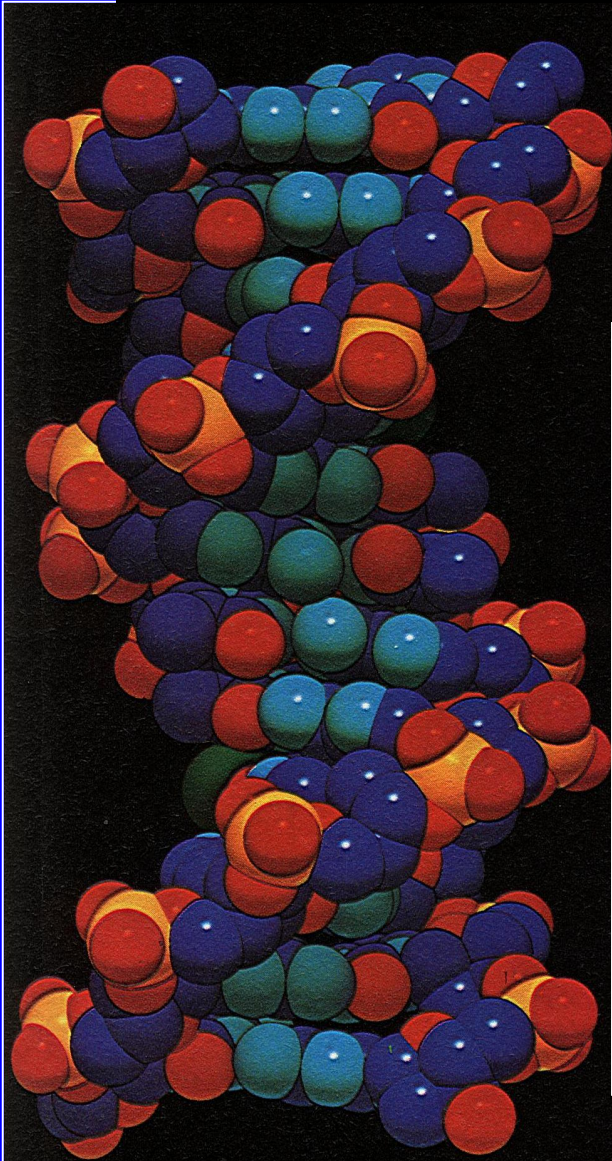


BIOQUÍMICA



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:

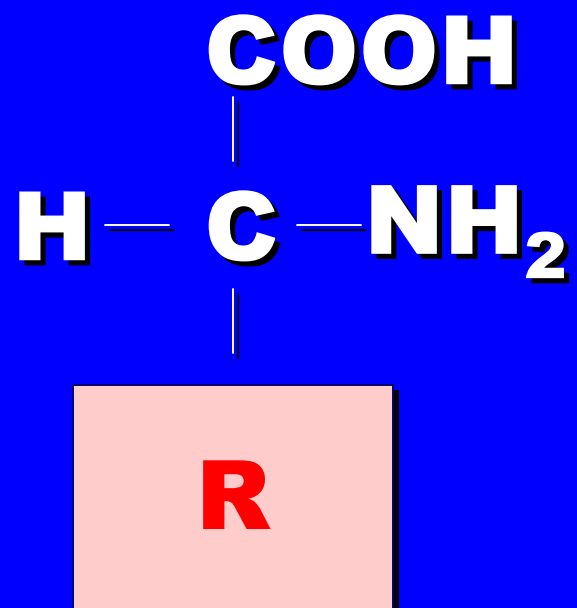
- **ESTRUCTURALES**
- **REGULACIÓN Y CONTROL**
- **HORMONALES**
- **INMUNITARIAS**
- **RELACIÓN**
- **TRANSPORTE**
- **ENERGÉTICAS**

ESTÁN COMPUESTAS POR UNIDADES ELEMENTALES QUE SON LOS AMINOÁCIDOS

EXISTEN 20 AMINOÁCIDOS PROTEINOGENÉTICOS

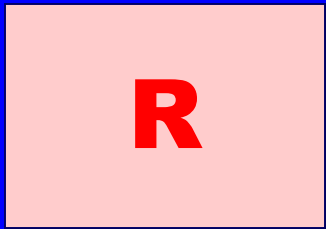
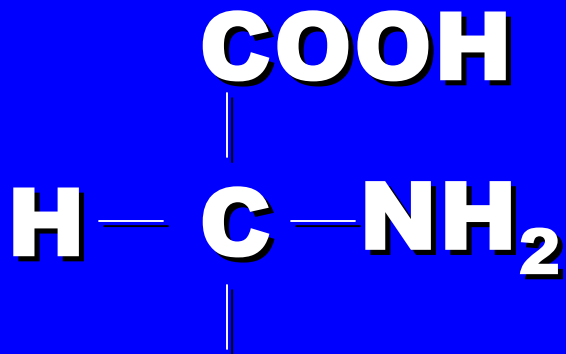
SU SÍNTESIS ES CONSECUENCIA DIRECTA DE LA EXPRESIÓN DE LA INFORMACIÓN CONTENIDA EN ADN

AMINOÁCIDOS



CLASIFICACIÓN DE AMINOÁCIDOS

APOLARES ALIFÁTICOS



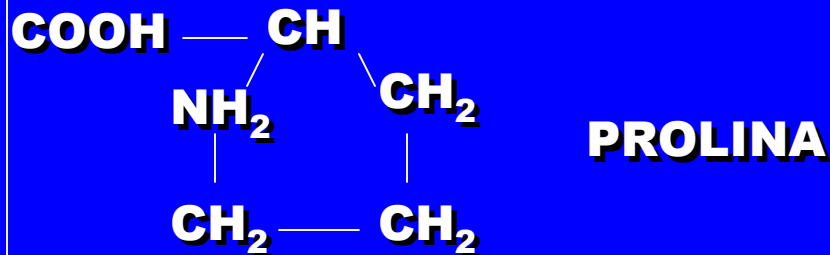
- H GLICOCOLA

- CH₃ ALANINA

- CH - CH₃
|
CH₃ VALINA

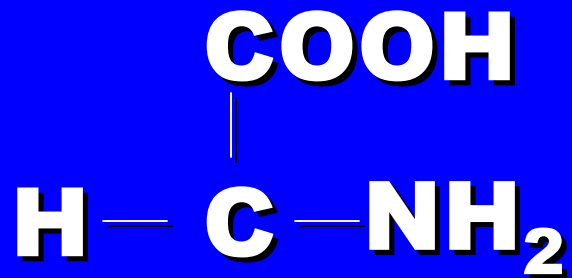
- CH₂ - CH - CH₃
|
CH₃ LEUCINA

- CH - CH₃
|
CH₂ - CH₃ ISOLEUCINA

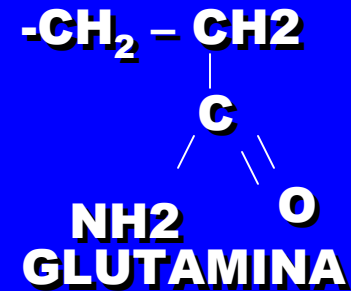
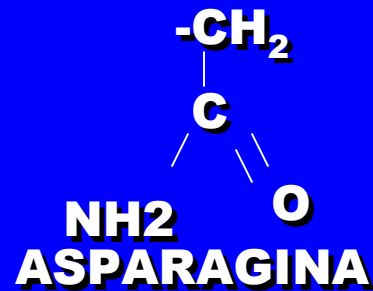


CLASIFICACIÓN DE AMINOÁCIDOS

POLARES SIN CARGA

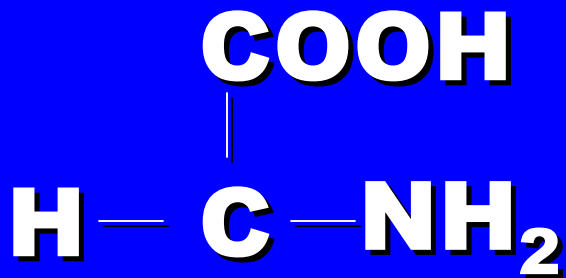


R

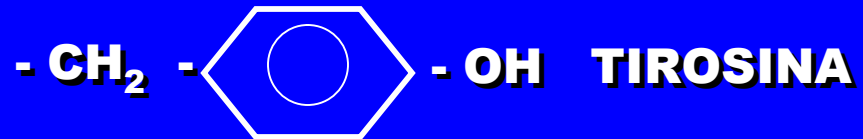


CLASIFICACIÓN DE AMINOÁCIDOS

AROMÁTICOS



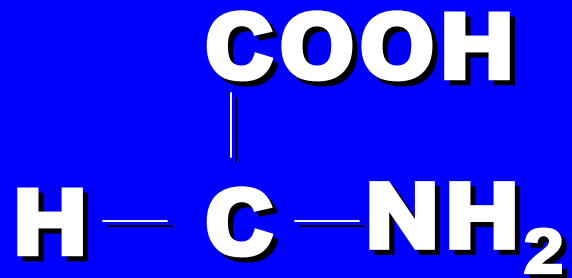
R



$-\text{CH}_2$ **TRIPTÓFANO**

CLASIFICACIÓN DE AMINOÁCIDOS

CON CARGA POSITIVA



R

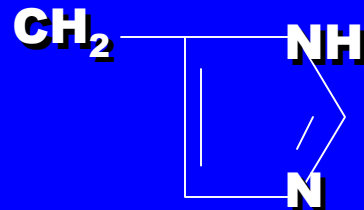
- (CH₂)₄ - NH₃⁺ LISINA

- (CH₂)₃ - NH



NH₂

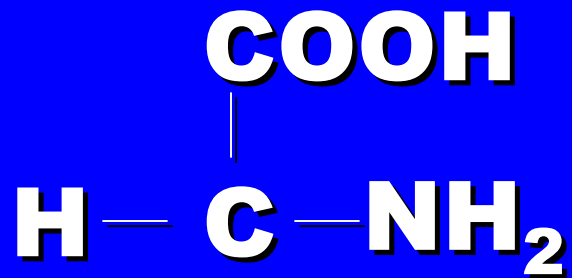
ARGININA



HISTIDINA

CLASIFICACIÓN DE AMINOÁCIDOS

CON CARGA NEGATIVA



R

- CH₂ - COO⁻ ASPARTATO

- CH₂ - CH₂ - COO⁻ GLUTAMATO

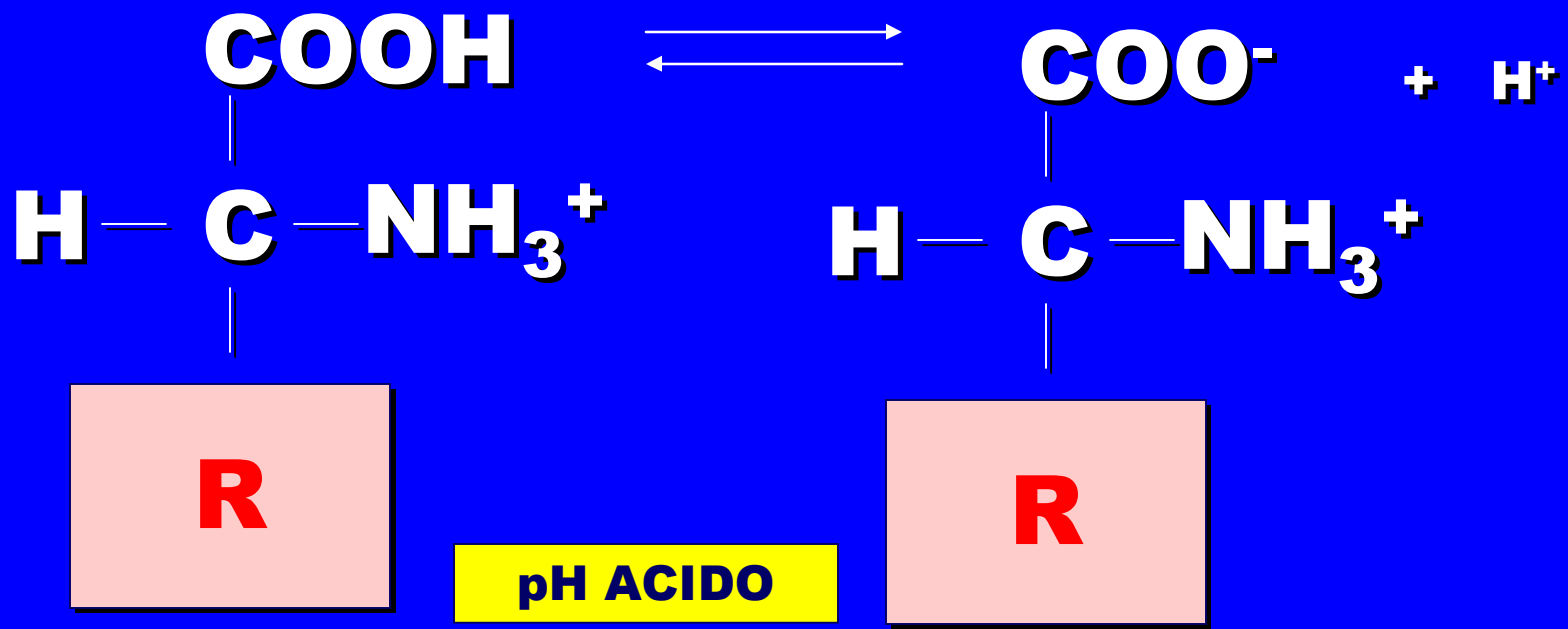
AMINOÁCIDOS ESENCIALES

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**

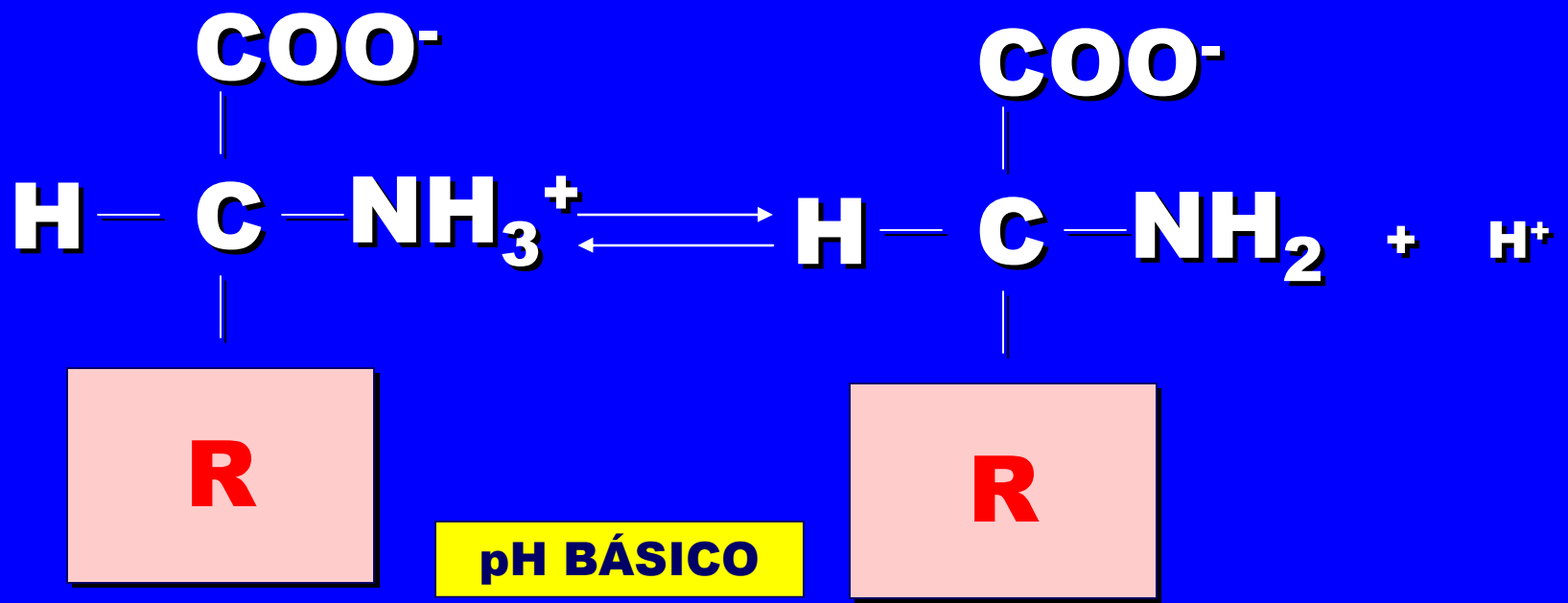
PROPIEDADES ACIDO-BÁSICAS DE LOS AMINOÁCIDOS

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

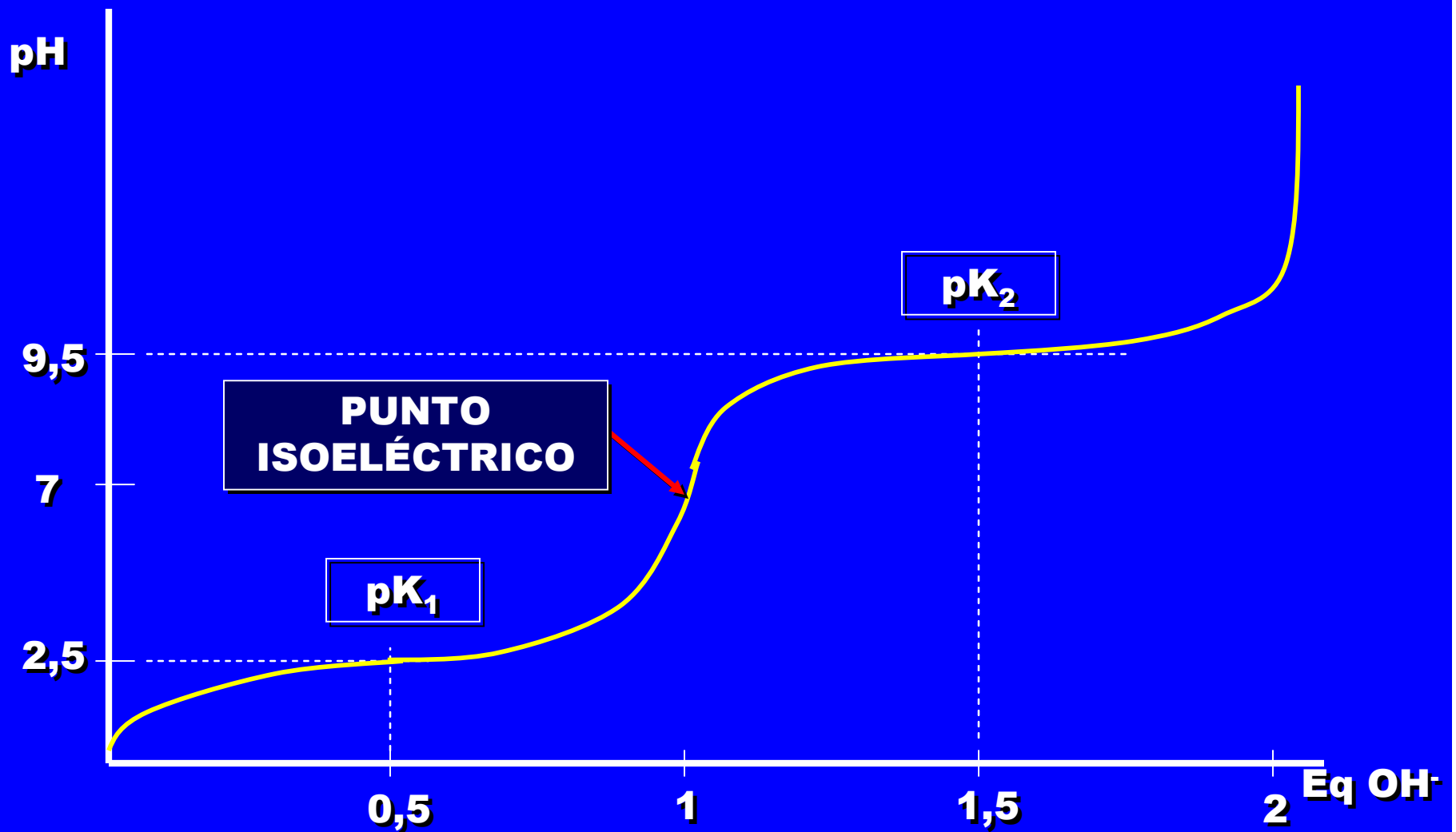


PROPIEDADES ACIDO-BÁSICAS DE LOS AMINOÁCIDOS

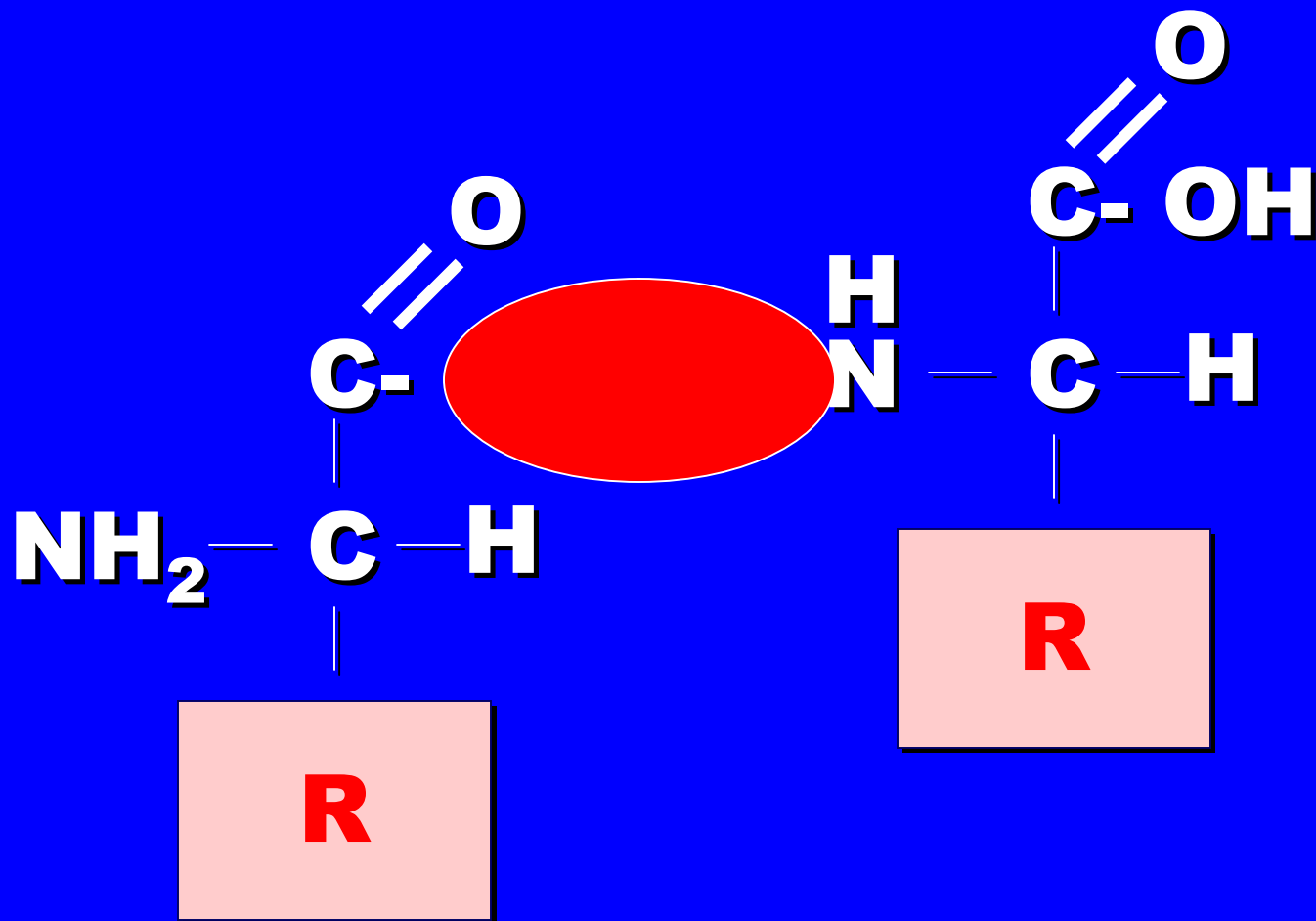
LOS GRUPOS α -CARBOXILO, α -AMINO Y LOS DISOCIABLES DEL RADICAL SE DISOCIAN COMO ÁCIDOS Y BASES DÉBILES



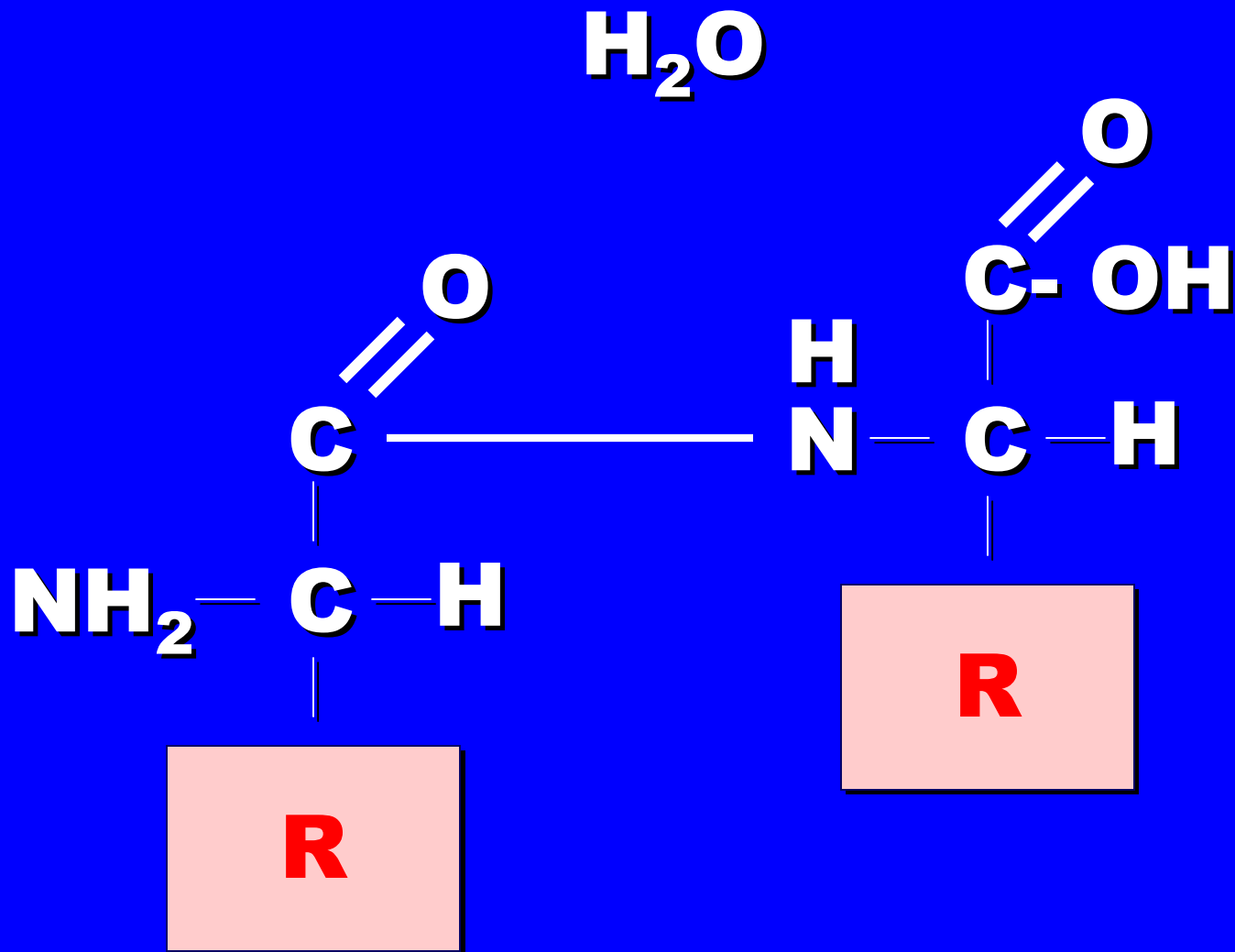
CURVA DE TITULACIÓN DE UN AMINOÁCIDO MONOAMINO-MONOCARBOXÍLICO



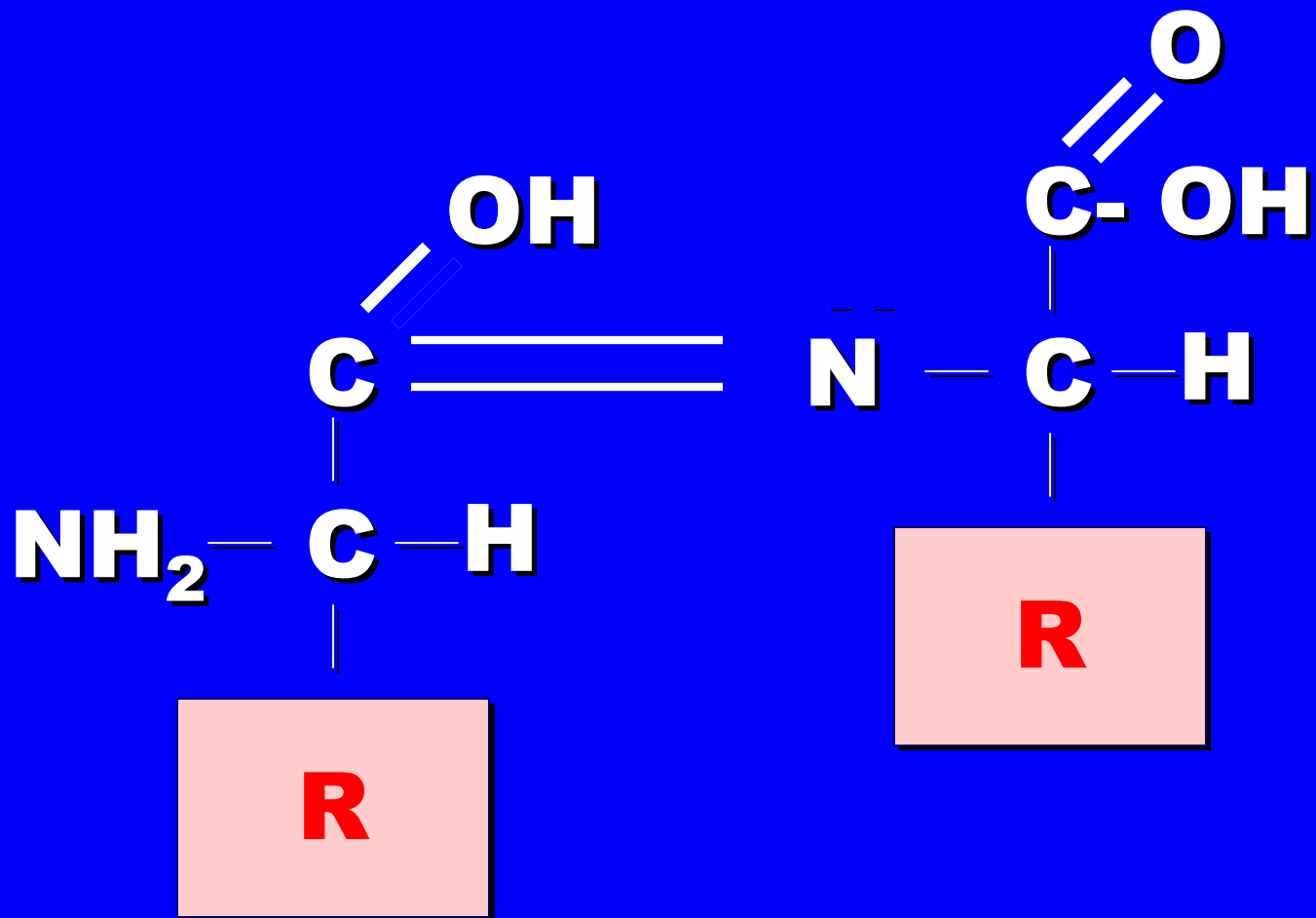
ENLACE PEPTÍDICO



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**

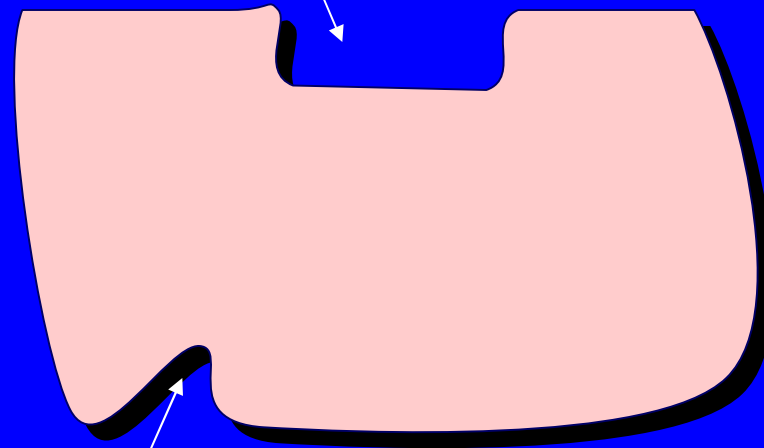
ESTRUCTURA CUATERNARIA

CONFORMACIÓN ESTABLE DE LAS CADENAS POR UNIÓN DE MONÓMEROS

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

ENZIMAS

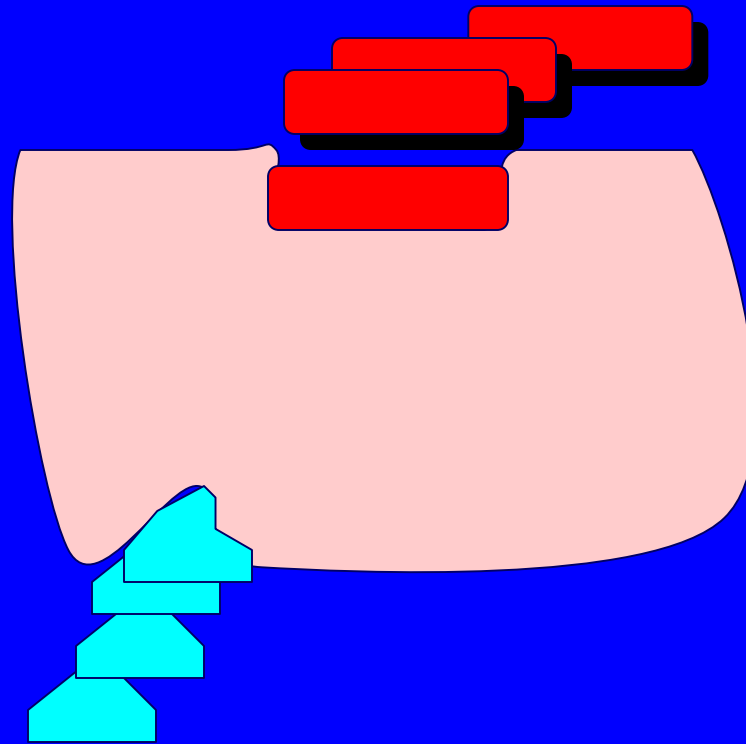
SITIO ACTIVO



SITIO ALOSTÉRICO

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 blue 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

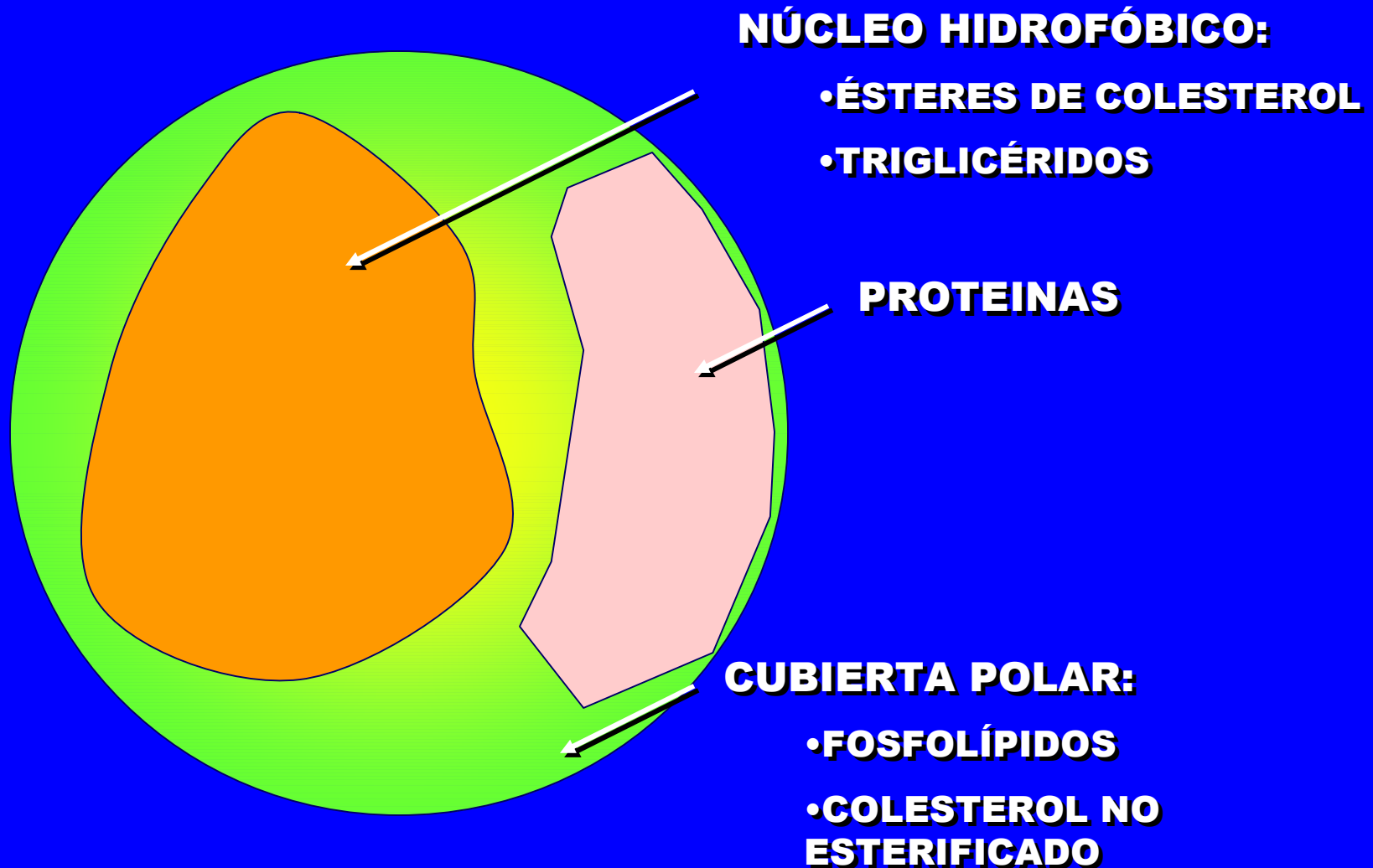
CINÉTICA ENZIMÁTICA



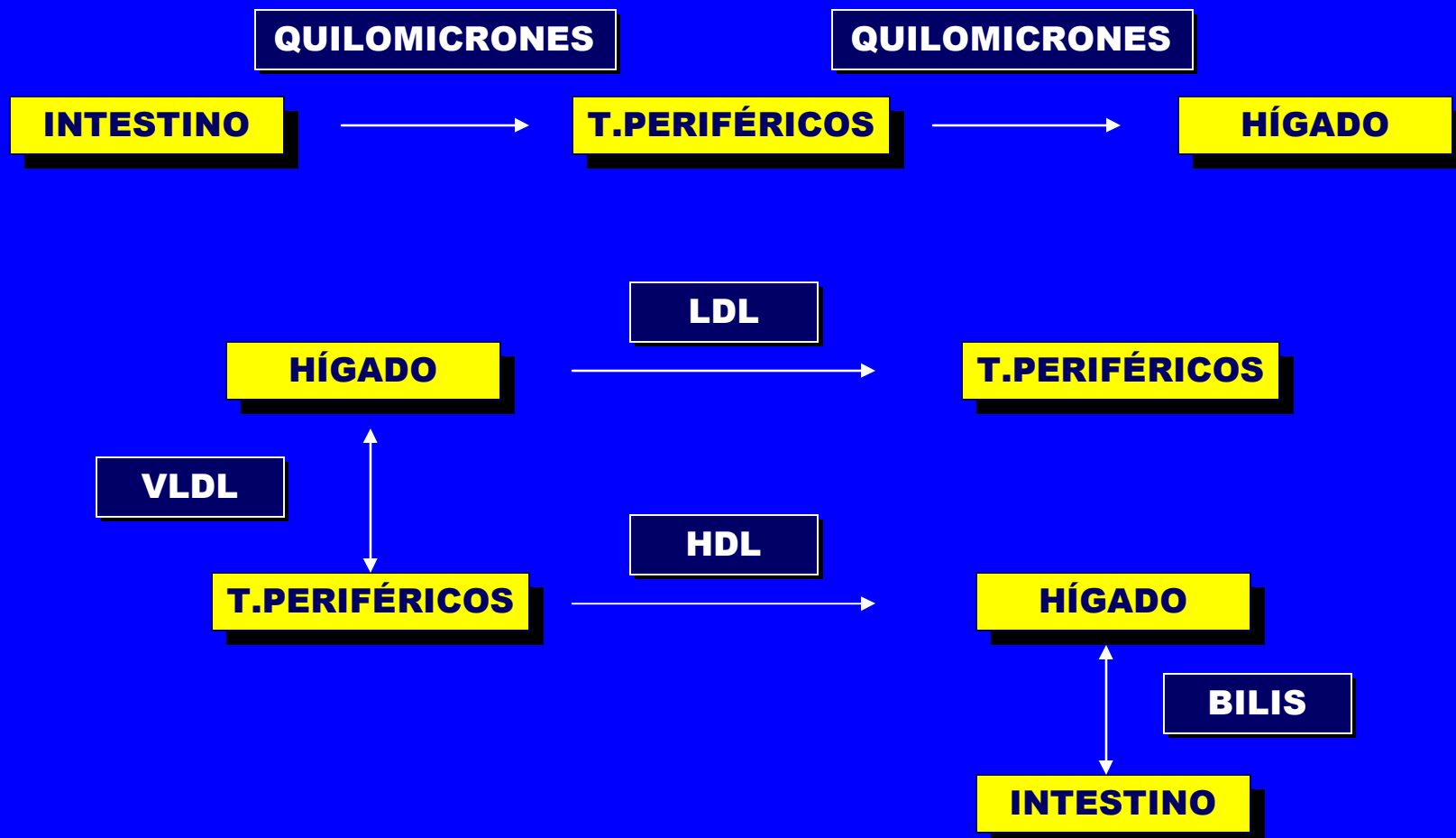
ECUACIÓN DE MICHAELIS-MENTEN:

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

ESTRUCTURA DE LAS LIPOPROTEÍNAS



DIRECCIÓN DEL TRANSPORTE DE LÍPIDOS

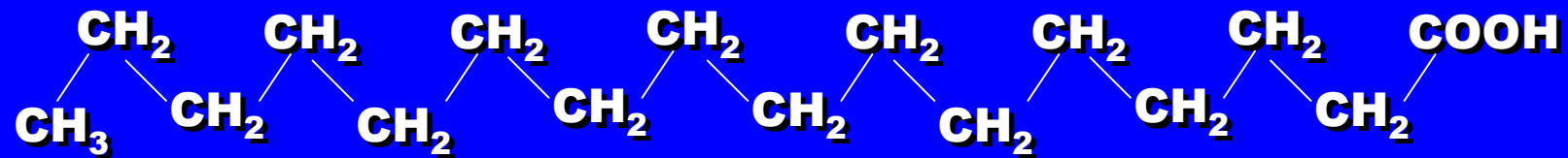


CLASIFICACIÓN DE LÍPIDOS

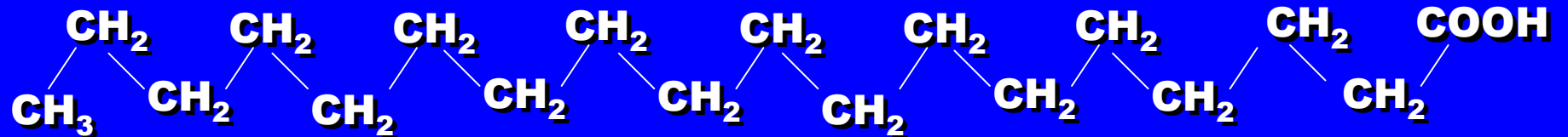
- **ÁCIDOS GRASOS Y DERIVADOS**
- **LÍPIDOS QUE CONTIENEN ÁCIDOS GRASOS**
 - **ACIL-GLICEROLES**
 - **CERAS**
 - **GLICOGLICEROLÍPIDOS**
 - **GLICEROFOSFOLÍPIDOS**
 - **ESFINGOLÍPIDOS**
- **LÍPIDOS NO RELACIONADOS CON ÁCIDOS GRASOS**

ÁCIDOS GRASOS

SATURADOS



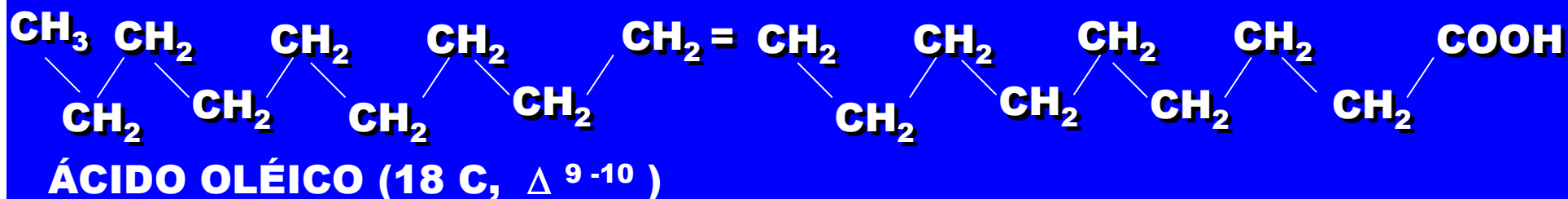
ÁCIDO PALMÍTICO (16 C)



ÁCIDO ESTEÁRICO (18 C)

ÁCIDOS GRASOS

INSATURADOS



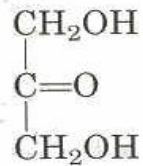
ÁCIDO LINÓLICO (18 C $\Delta^{9-10, 12-13}$)

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

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

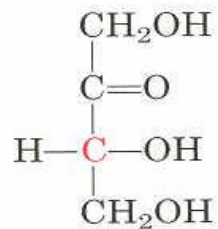
MONOSACARIDOS: CETOSAS

Tres carbonos



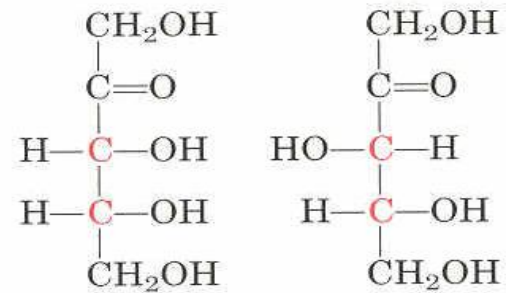
Dihidroxiacetona

Cuatro carbonos



D-Eritrulosa

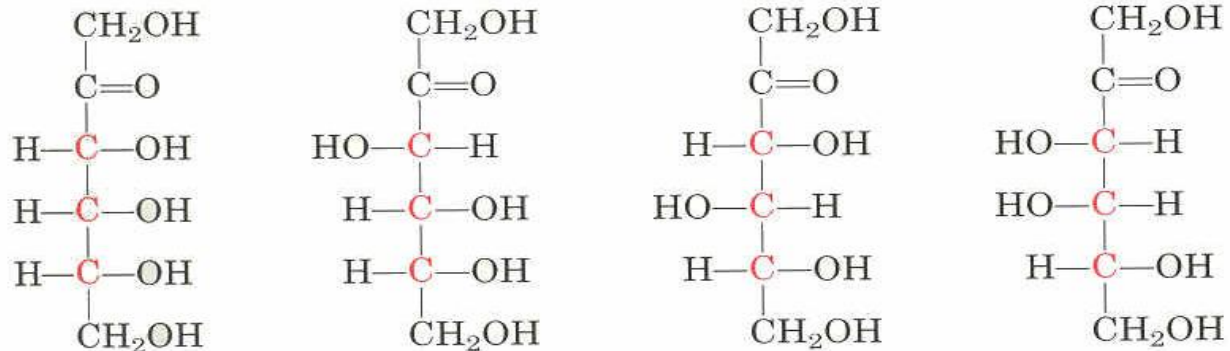
Cinco carbonos



D-Ribulosa

D-Xilulosa

Seis carbonos



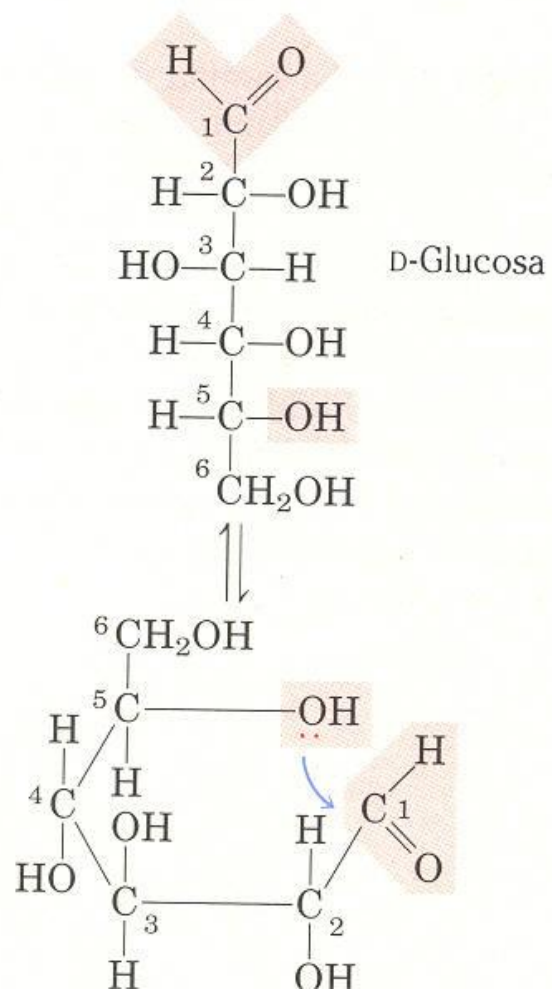
D-Psicosa

D-Fructosa

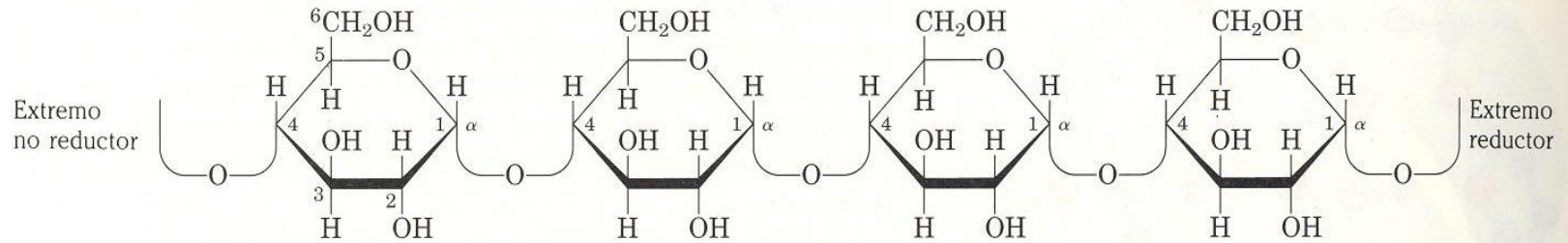
D-Sorbosa

D-Tagatosa

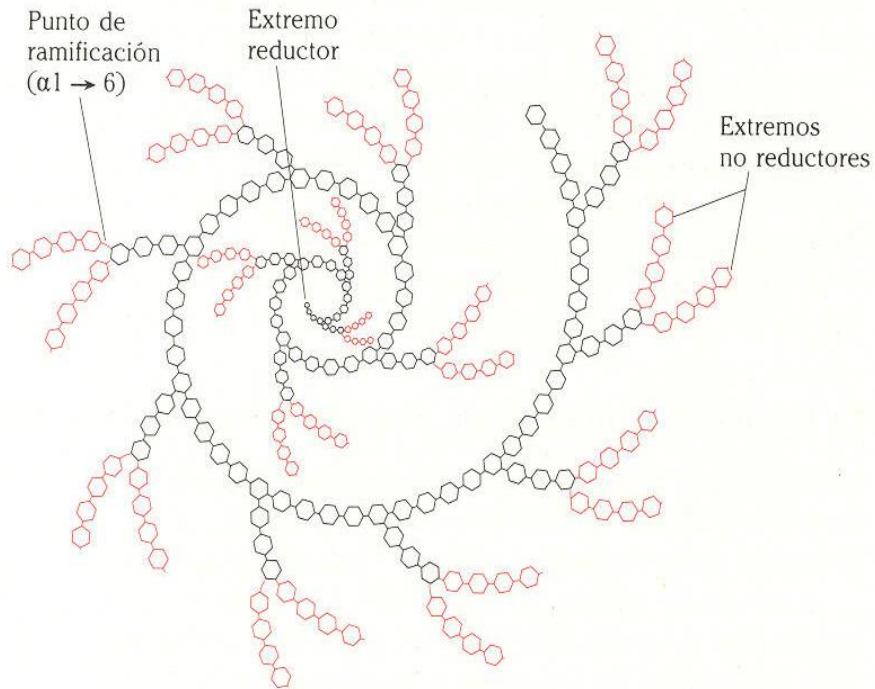
FORMACIÓN DEL ANILLO HEMIACETAL



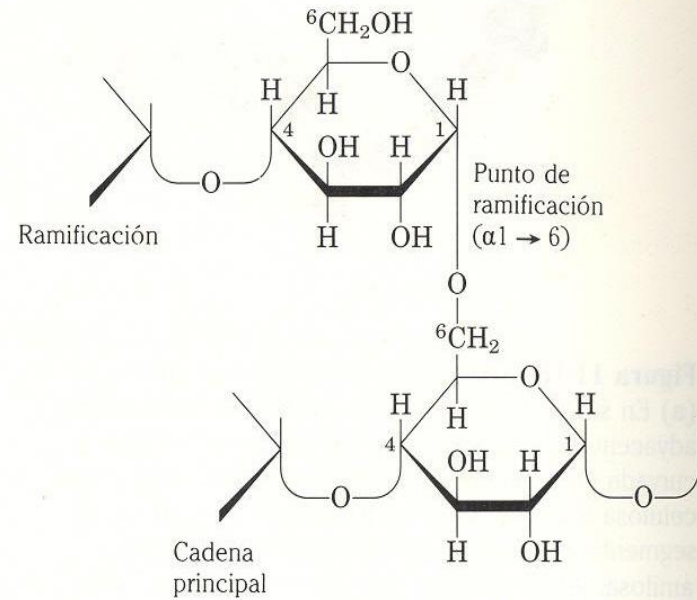
POLISACARIDOS HOMOGLICANOS



(a)

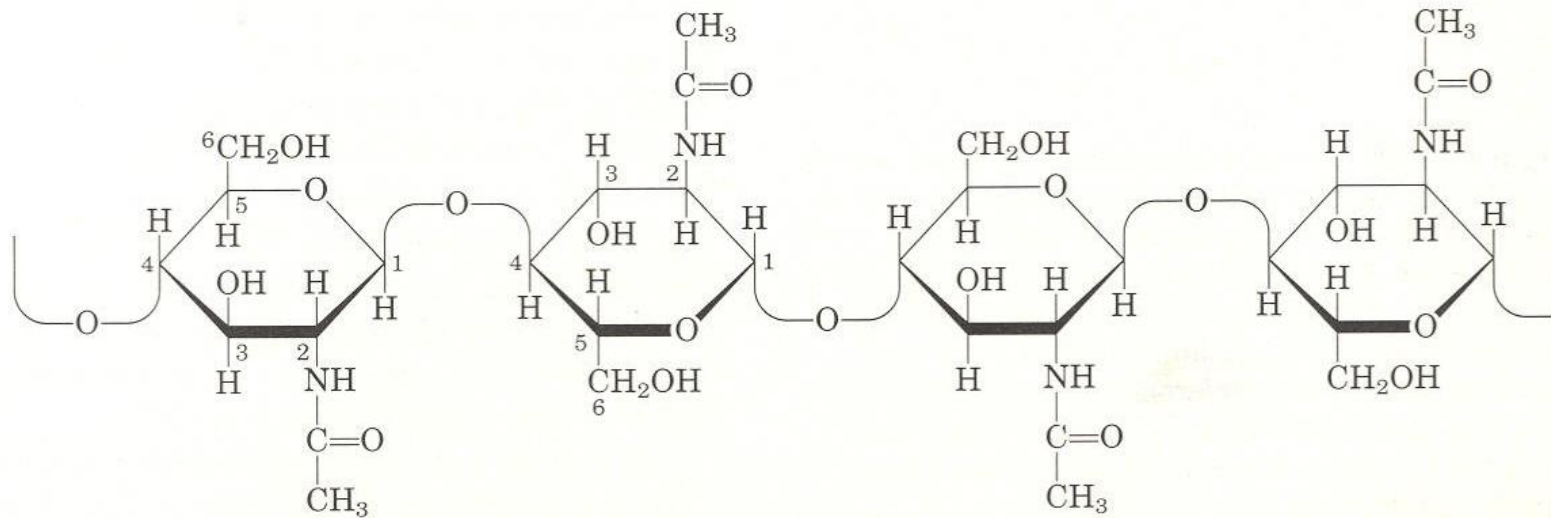


(b)

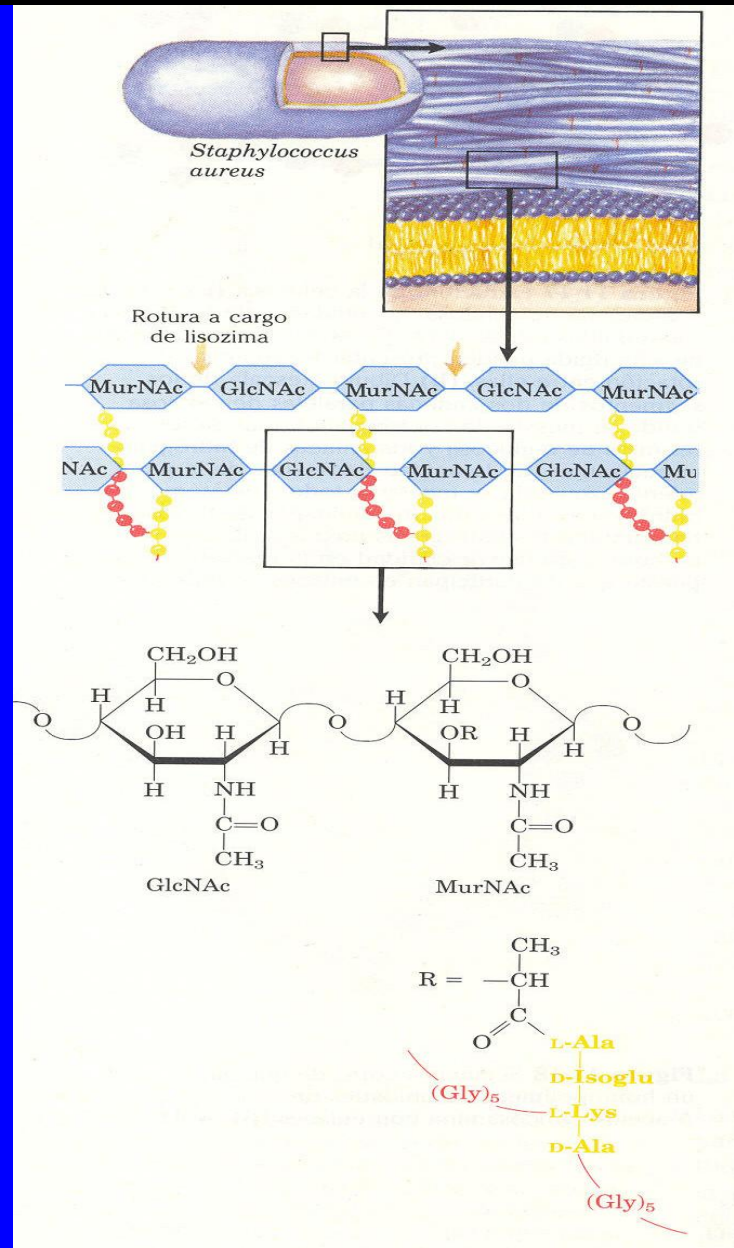


(c)

QUITINA

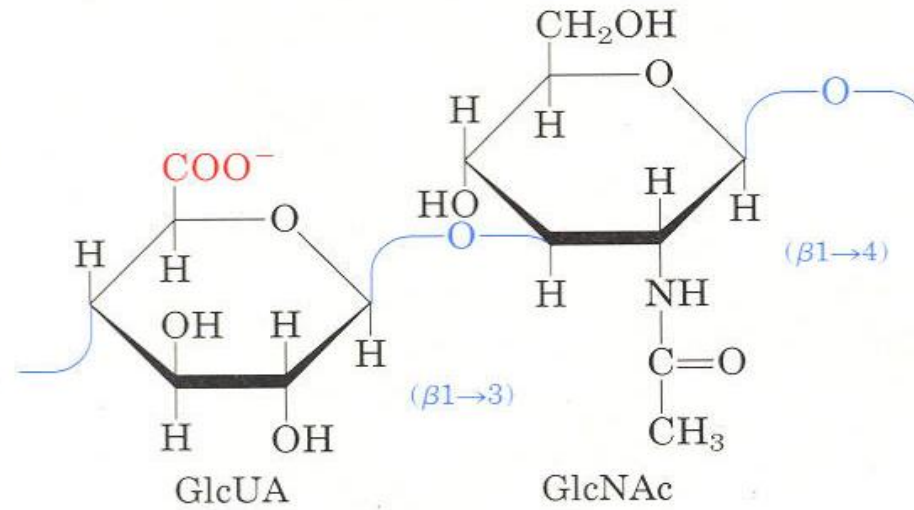


HETEROGLICANOS: PARED BACTERIANA

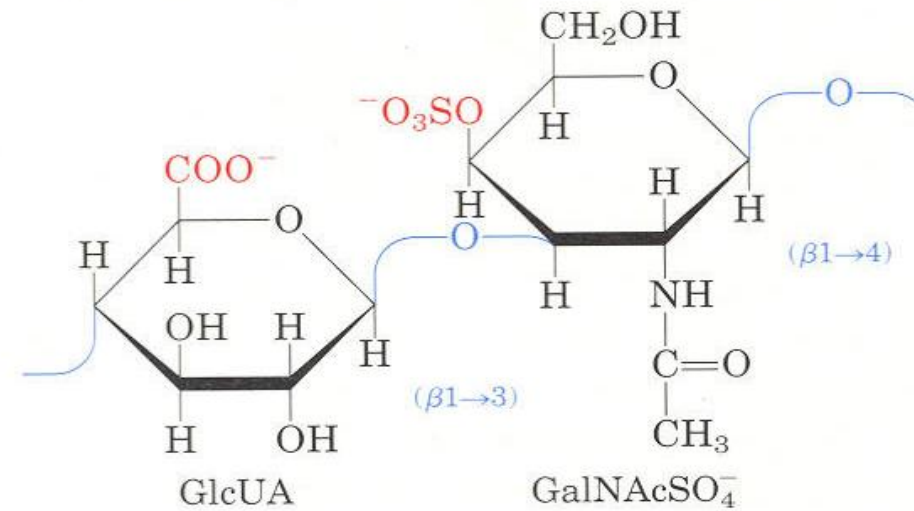


HETEROGLICANOS

Hialuronato



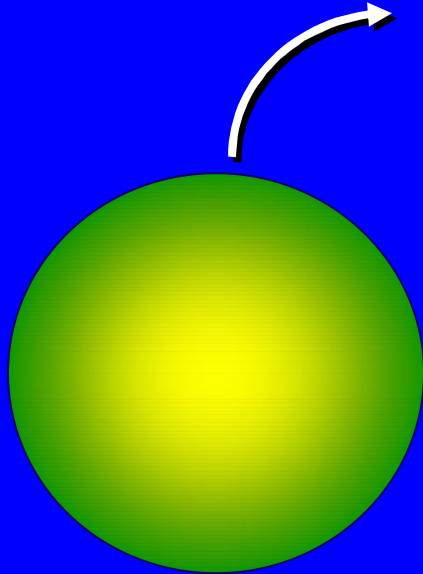
Sulfato de condroitina



BIOENERGÉTICA

FUNCIONES VITALES:

- AUTOCONSERVACIÓN
- AUTOCONTROL
- AUTORREPRODUCCIÓN



SER VIVO

**INTERCAMBIO DE MATERIA
Y ENERGÍA**

¿CÓMO LA OBTIENEN?

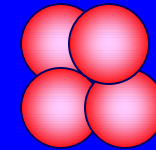
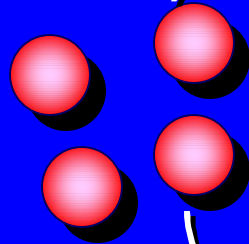
- AUTÓTROFOS
- HETERÓTOFOS

ACOPLAMIENTO ENERGÉTICO

**PRECURSORES
(SENCILLOS)**

**BIOMOLÉCULAS
(COMPLEJAS)**

ANABOLISMO



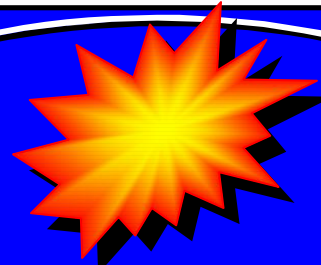
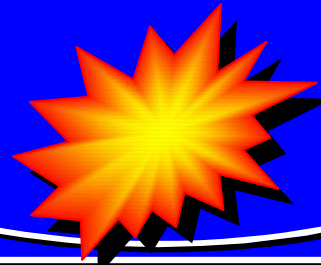
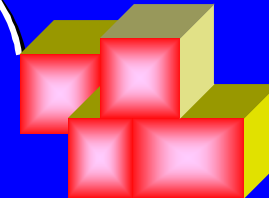
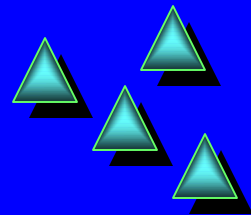
ATP

ADP + P

CATABOLISMO

**SUBPRODUCTOS
DE DESECHO**

**SUSTRATOS
ENERGÉTICOS**



OXIDACIONES BIOLÓGICAS

**SUSTRATOS ENERGÉTICOS
REDUCIDOS
(DADORES)**

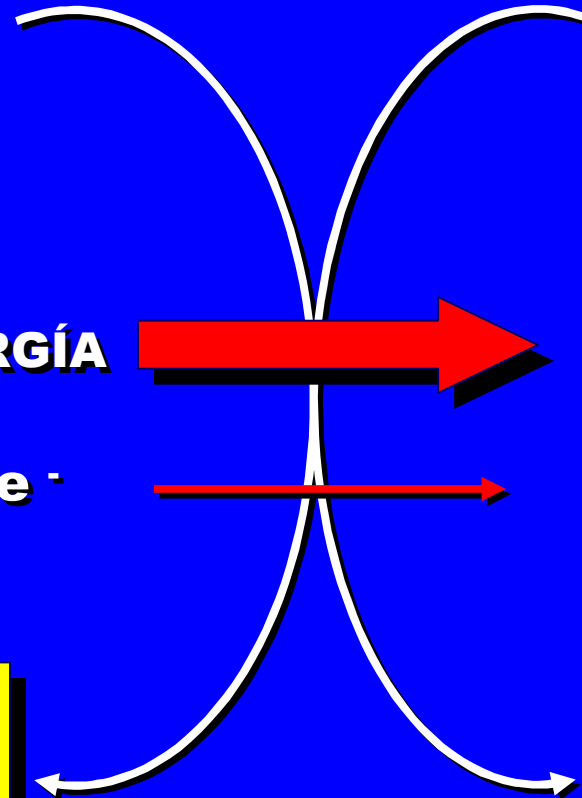
**ACEPTOR
OXIDADO**

ENERGÍA

e^-

SUBPRODUCTOS OXIDADOS

**ACEPTOR
REDUCIDO**



OXIDACIONES ANAEROBIAS

GLUCOSA

NAD

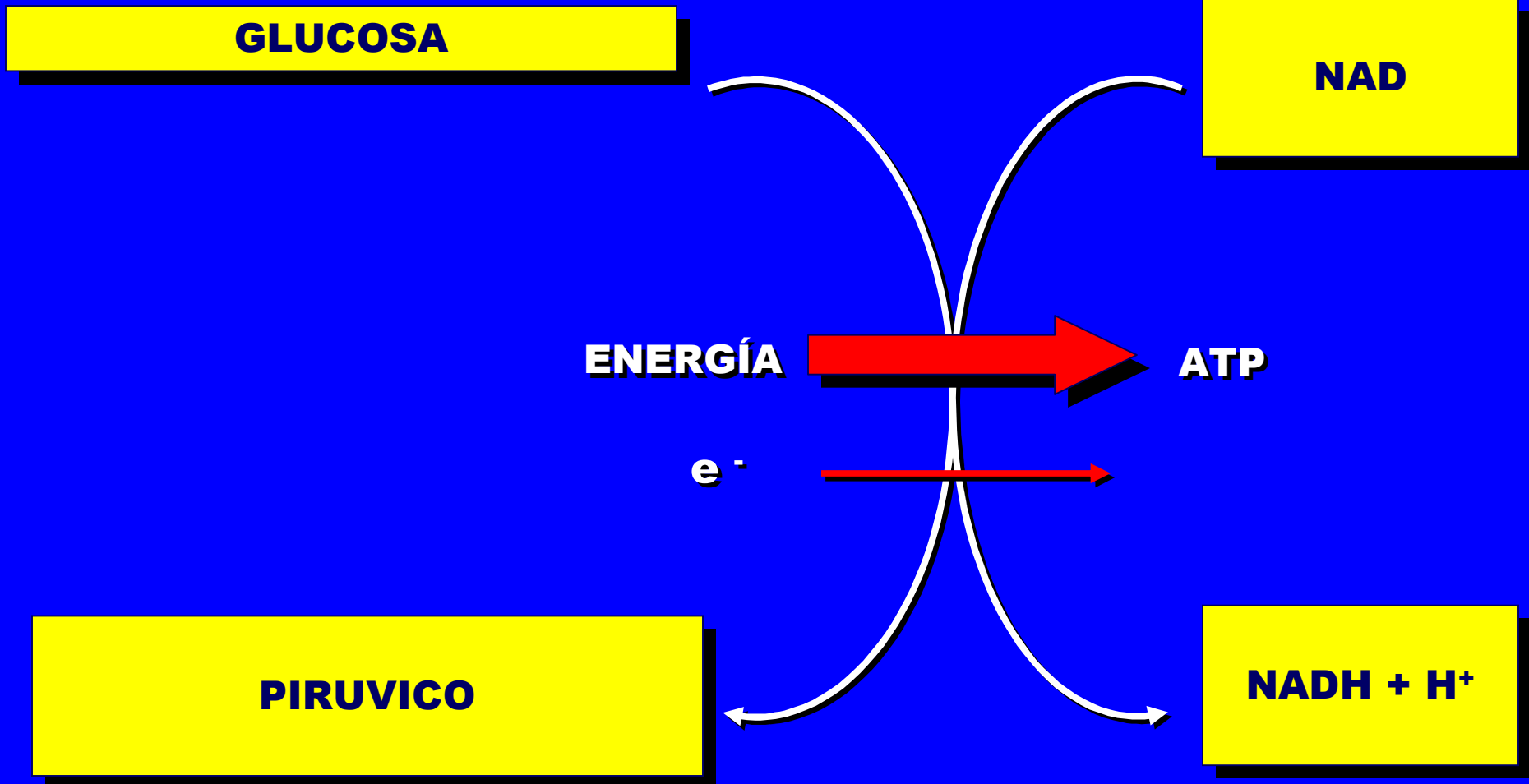
ENERGÍA

ATP

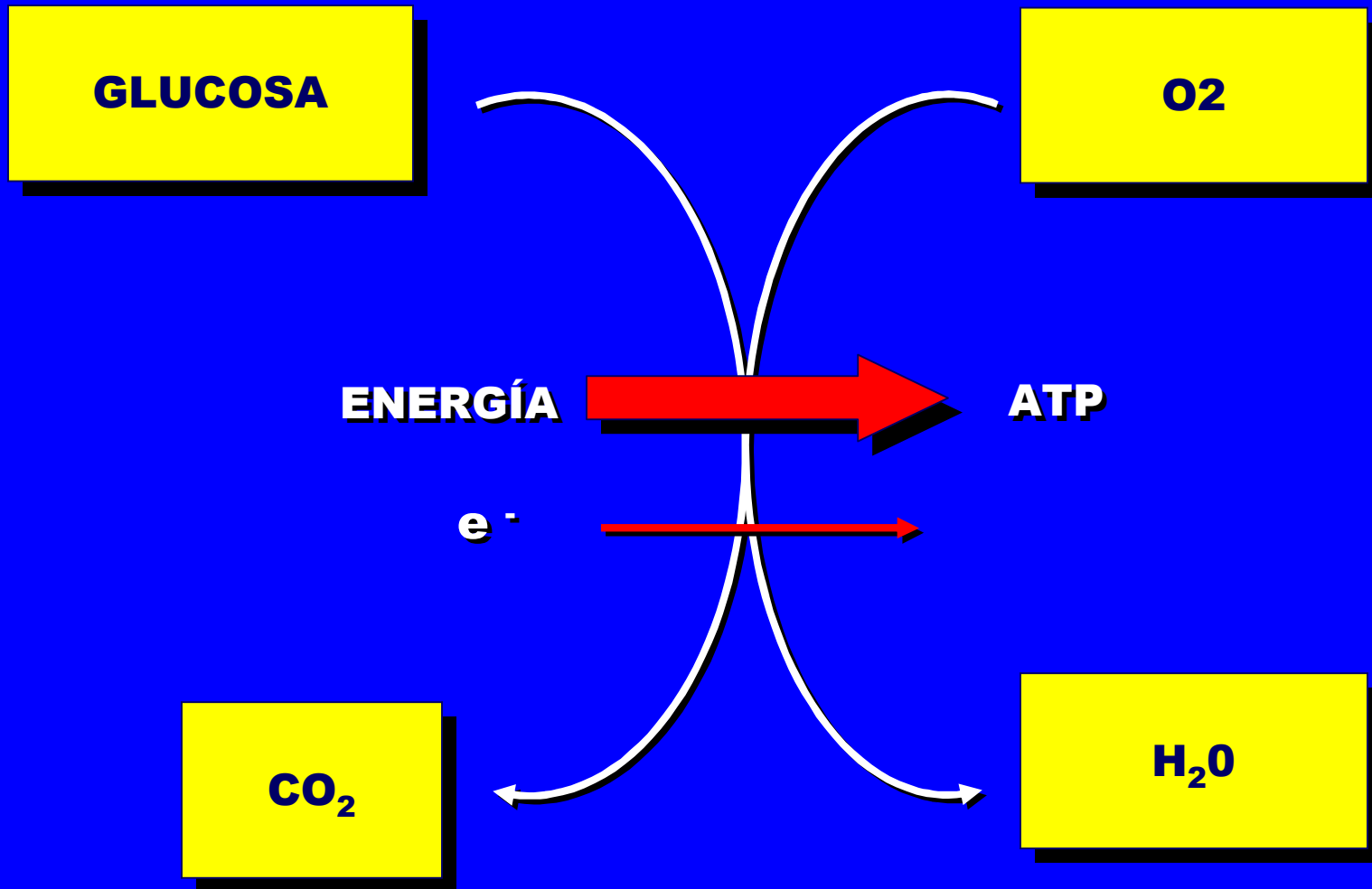
e^-

PIRUVICO

NADH + H⁺



OXIDACIONES AEROBIAS



ESQUEMA CENTRAL DEL METABOLISMO OXIDATIVO

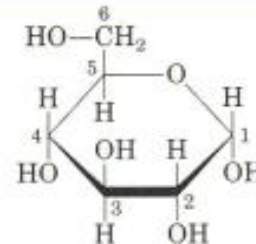


METABOLISMO GLUCÍDICO

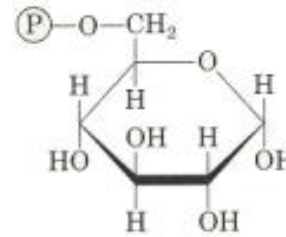
- **GLICOLISIS ANAEROBIA**
- **GLICOLISIS AEROBIA**
- **VIAS ALTERNATIVAS:**
 - PENTOSAS FOSFATO**
 - GLUCURONATO**
- **GLUCONEOGÉNESIS**
- **GLUCOGENOLISIS Y GLUCOGENOSÍNTESIS**

GLICOLISIS ANAEROBIA I (FASE PREPARATORIA)

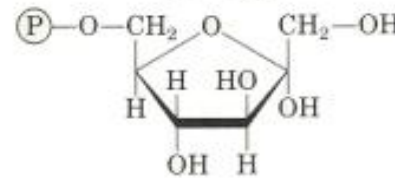
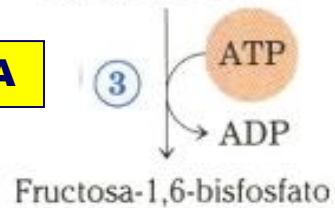
**HEXOKINASA
(GLUCOKINASA)**



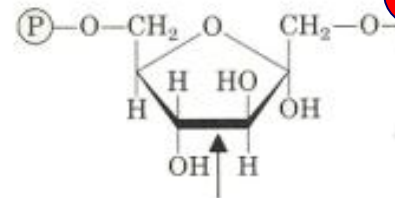
[GLUCOSA 6 P] ↑
ATP ↑



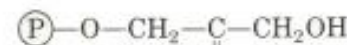
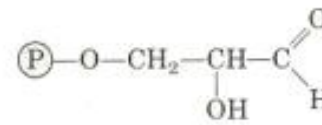
FOSFOFRUCTOKINASA



[F2,6 bP] ↑
AMP ↑

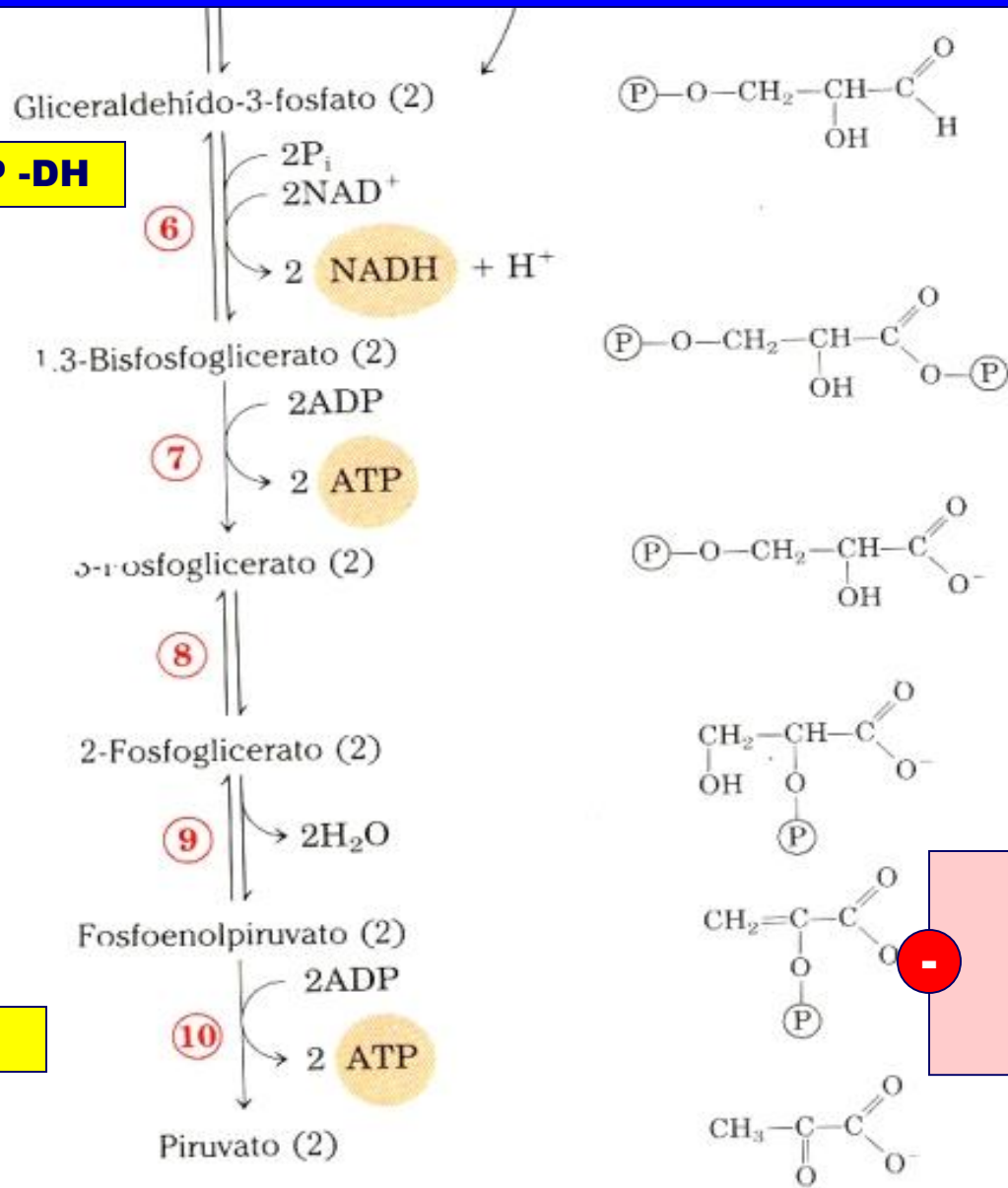


CITRATO ↓
ATP ↓



GLICOLISIS ANAEROBIA II (FASE DE BENEFICIOS)

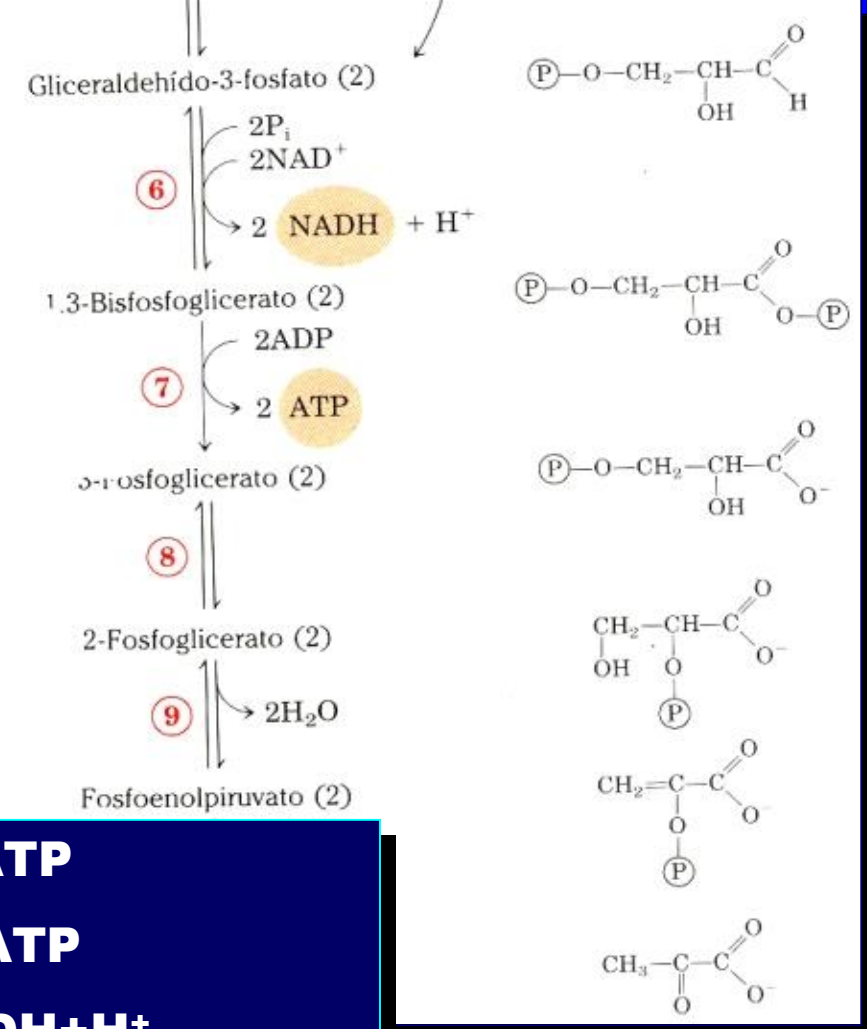
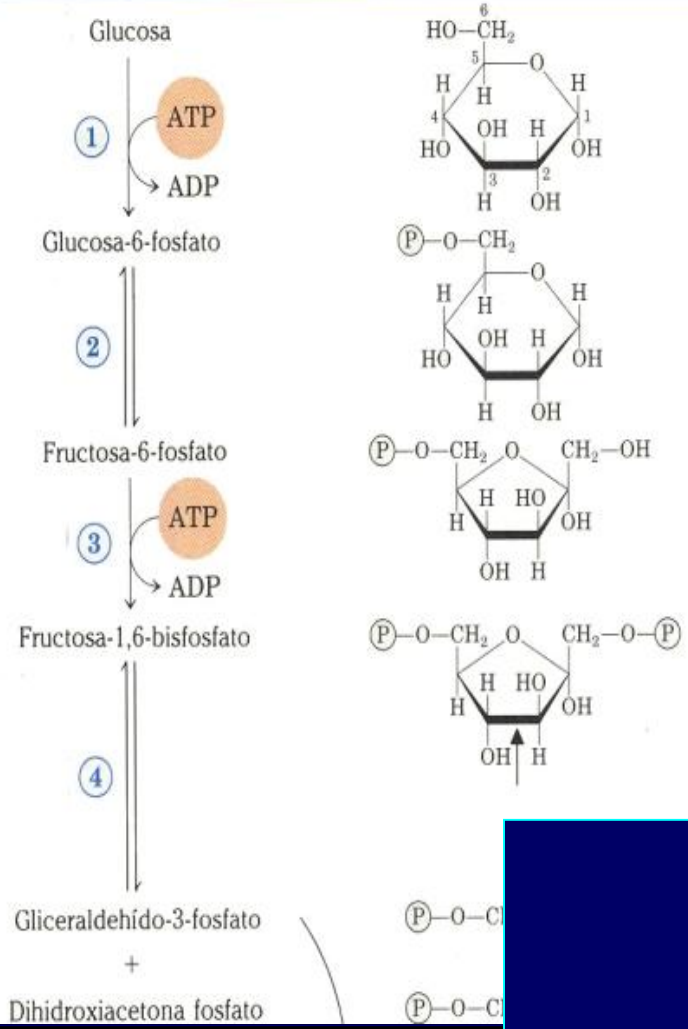
GLICERALDEHIDO 3P -DH



PIRUVATO KINASA

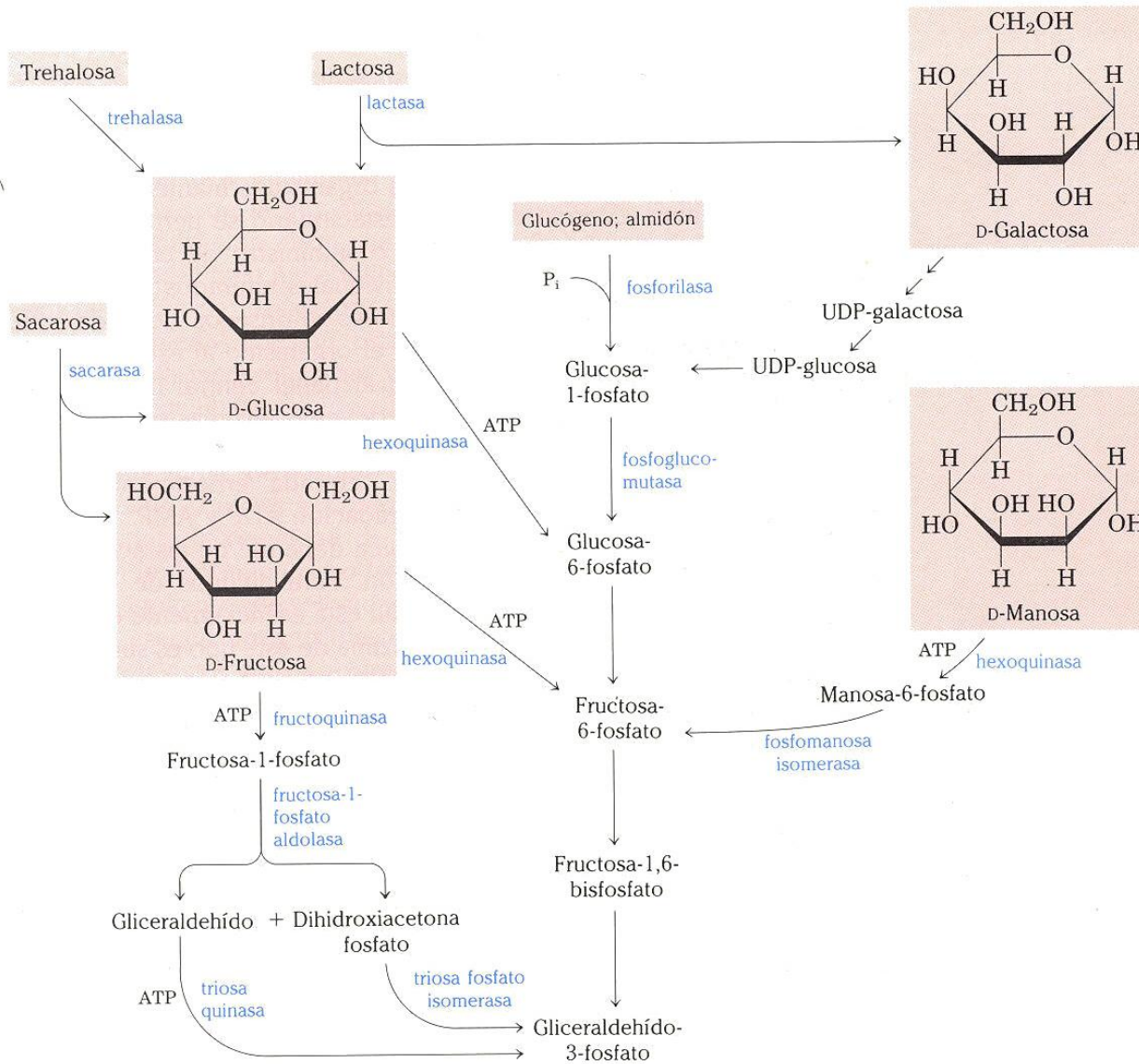
ATP ↑
ACETIL-CoA ↑
Ac. GRASOS ↑

RESULTADOS (ESTEQUIOMETRÍA)

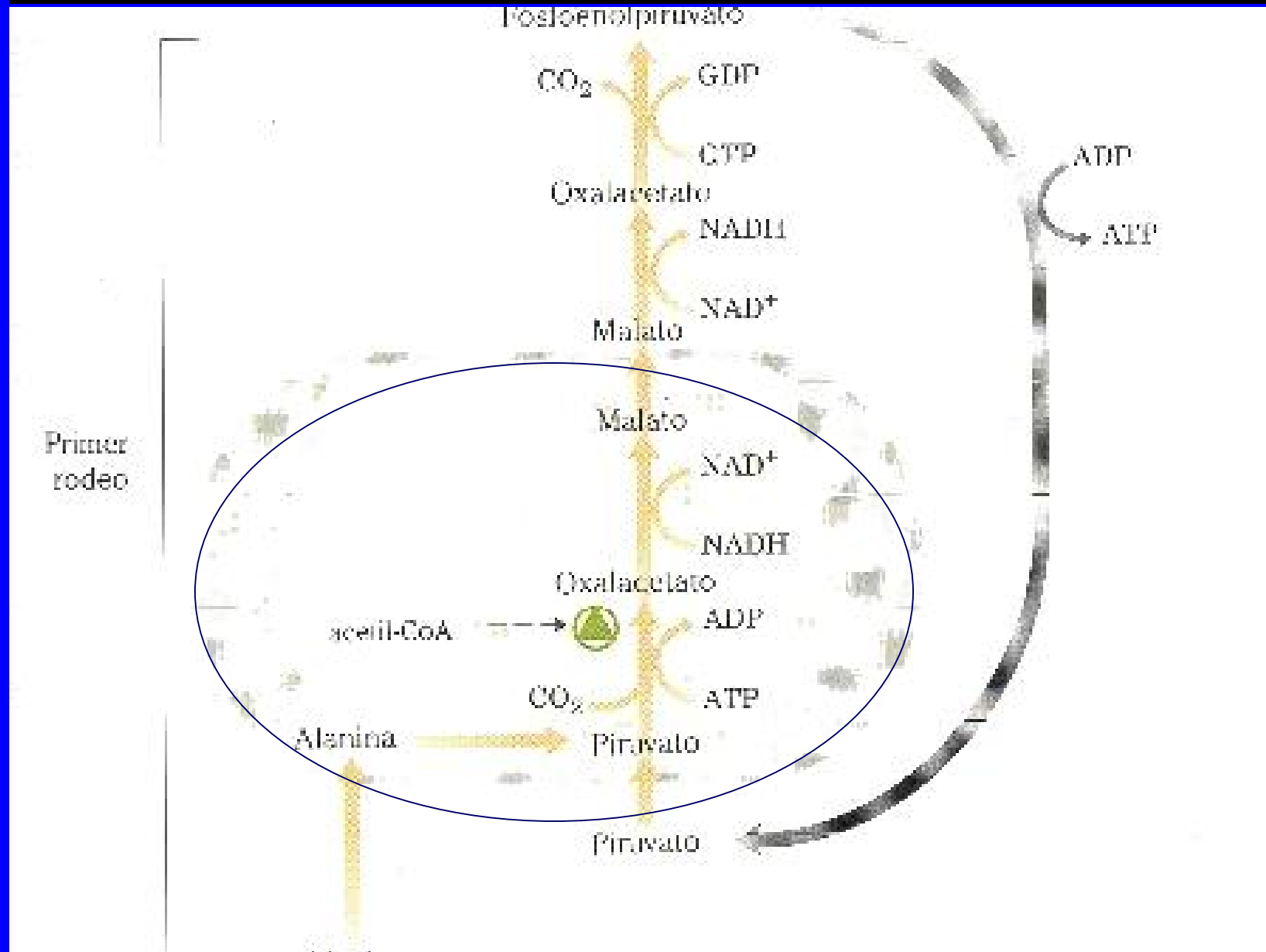


-2 ATP
+4 ATP
+2 NADH+H⁺

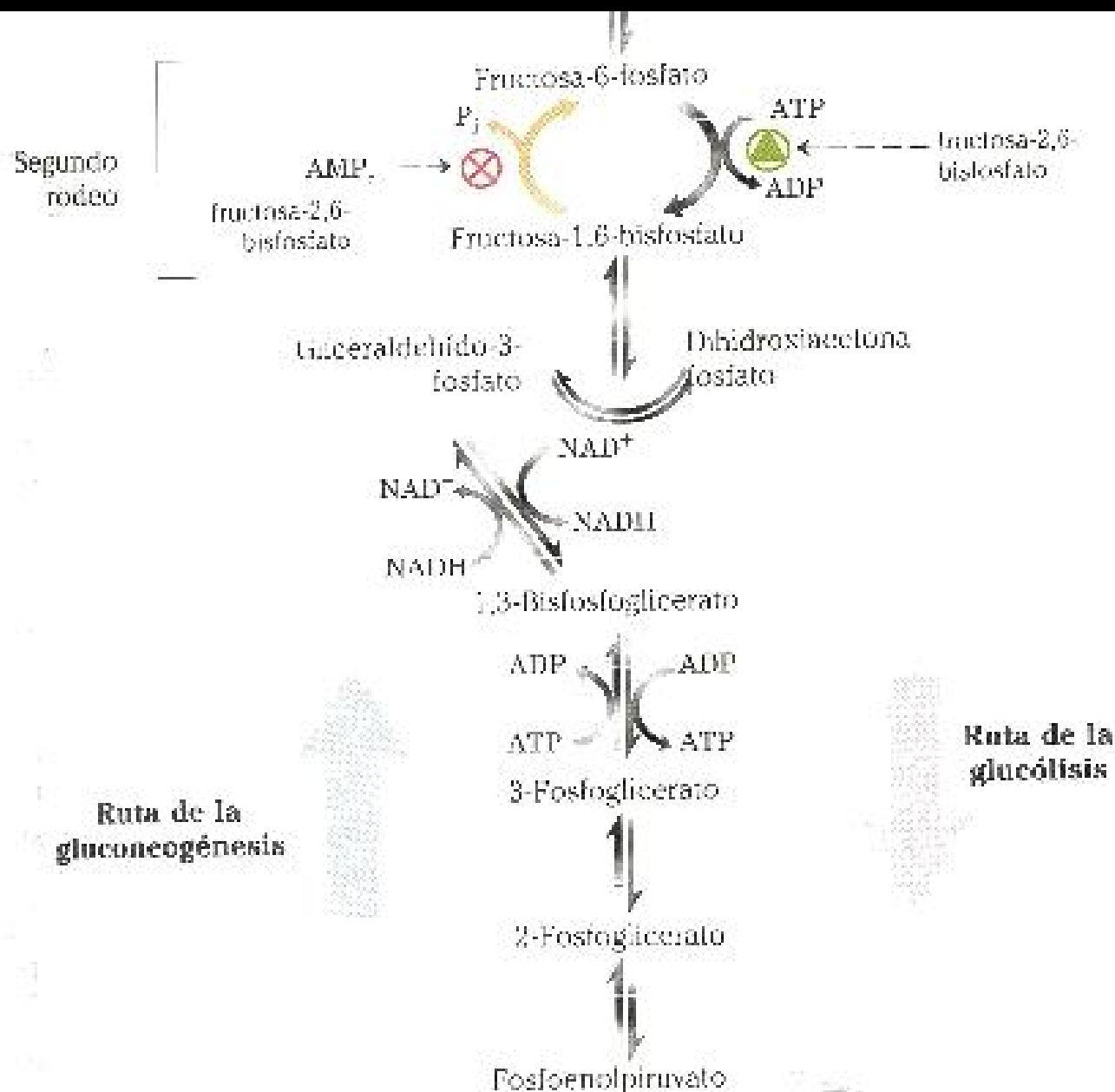
ACCESO AL PROCESO



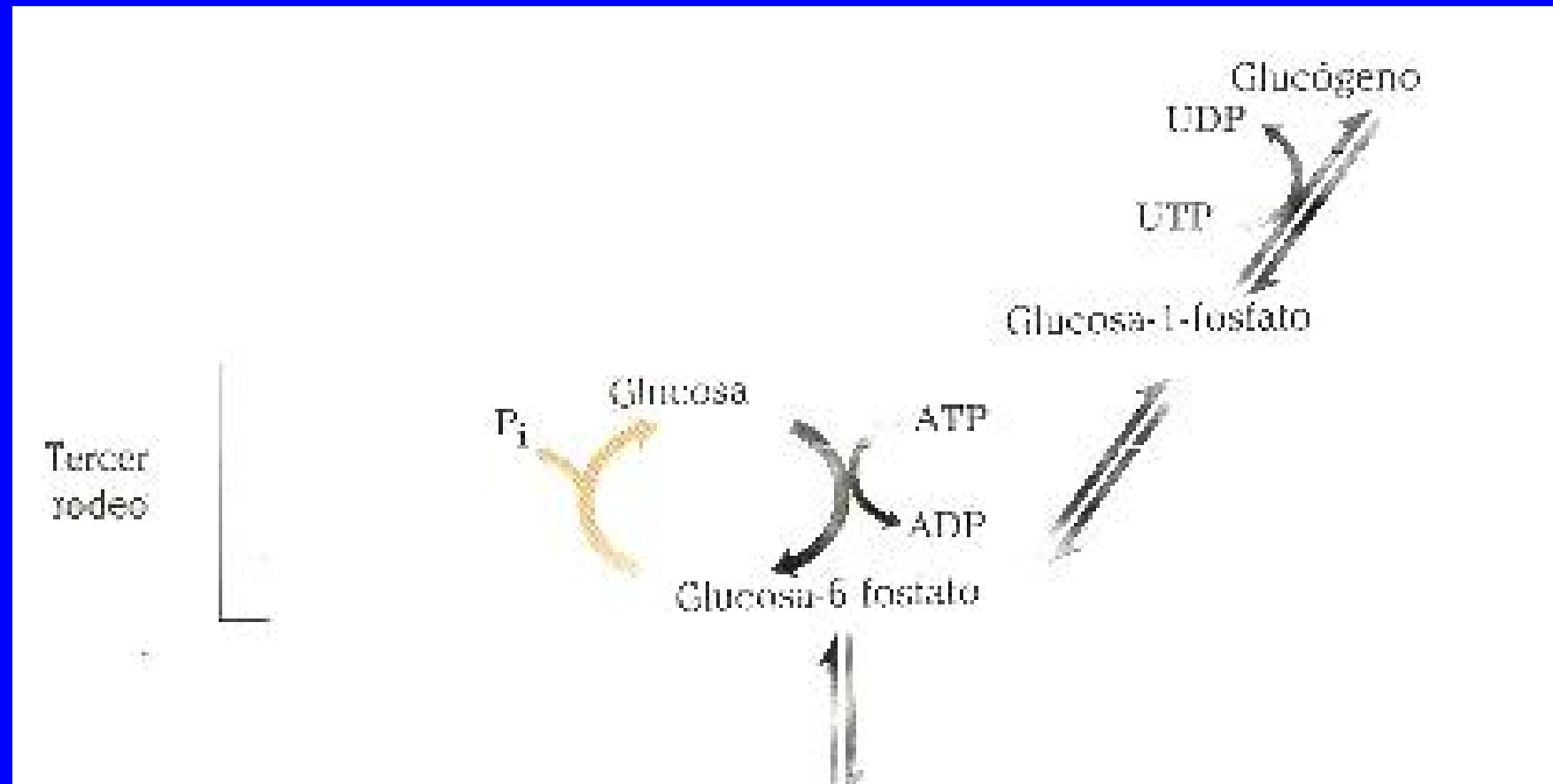
GLUCONEOGENESIS



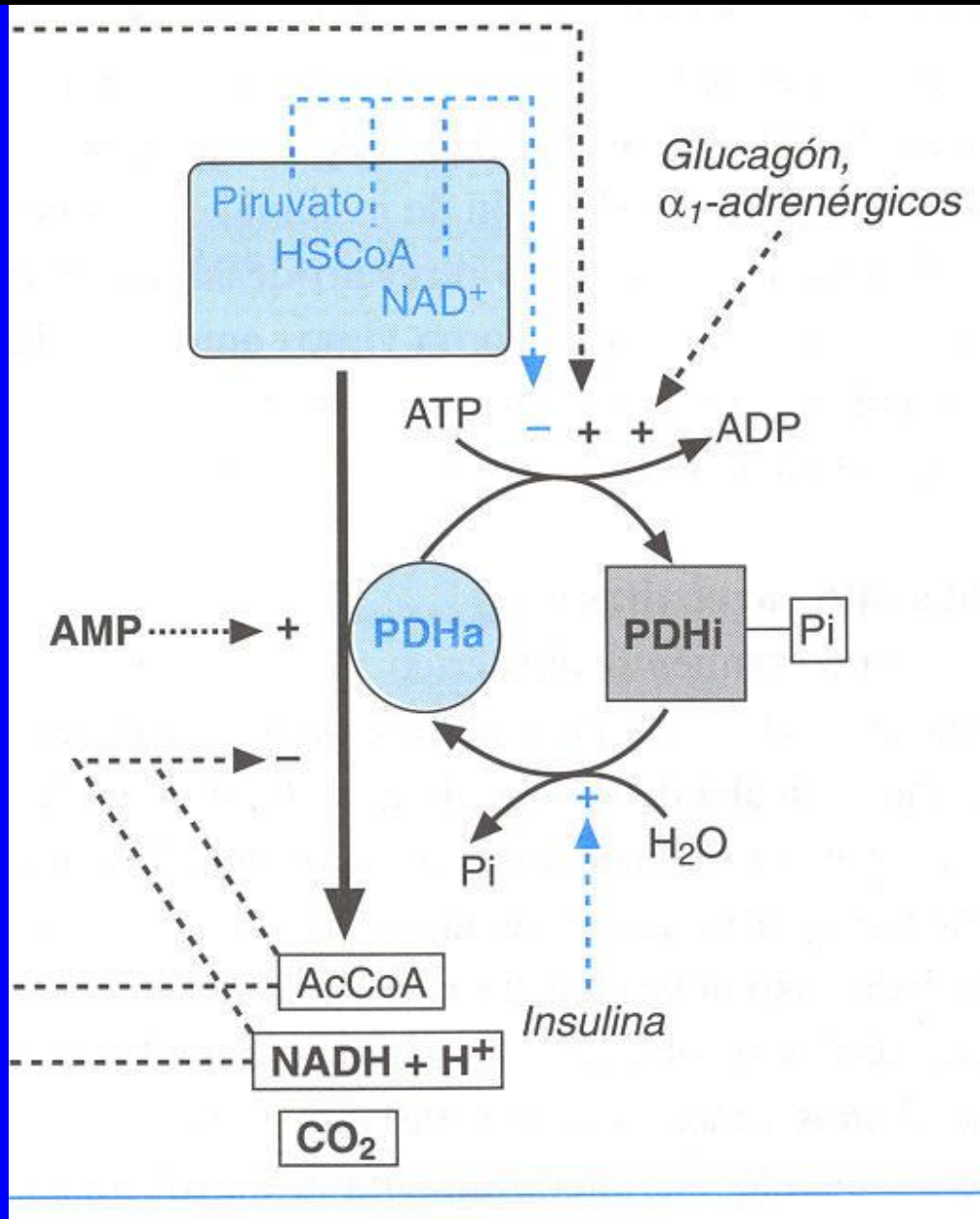
GLUCONEOGENESIS



GLUCONEOGENESIS



PIRUVATO DESHIDROGENASA

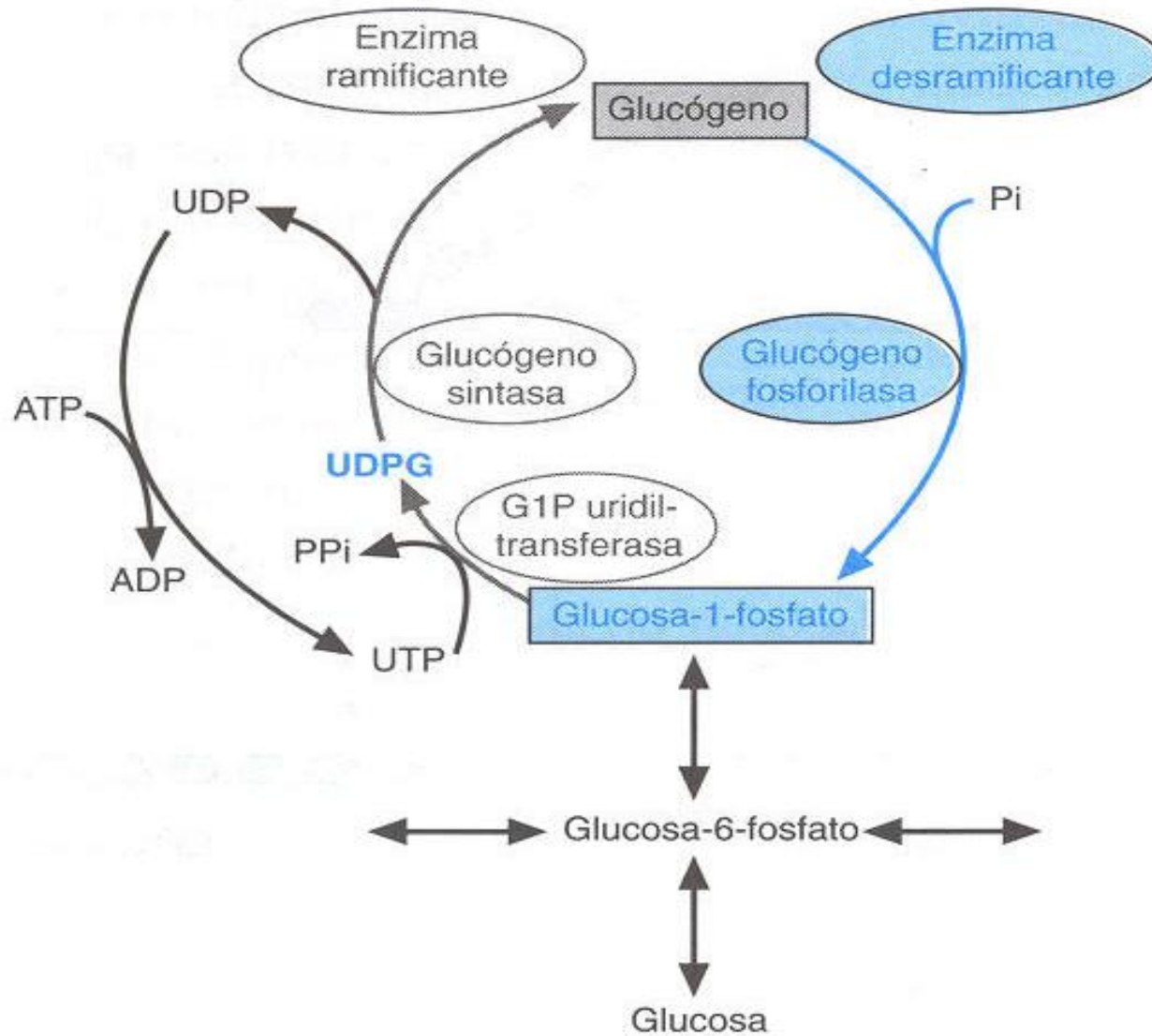


FACTORES DE REGULACIÓN DE GLICOLISIS Y GLUCONEOGENESIS

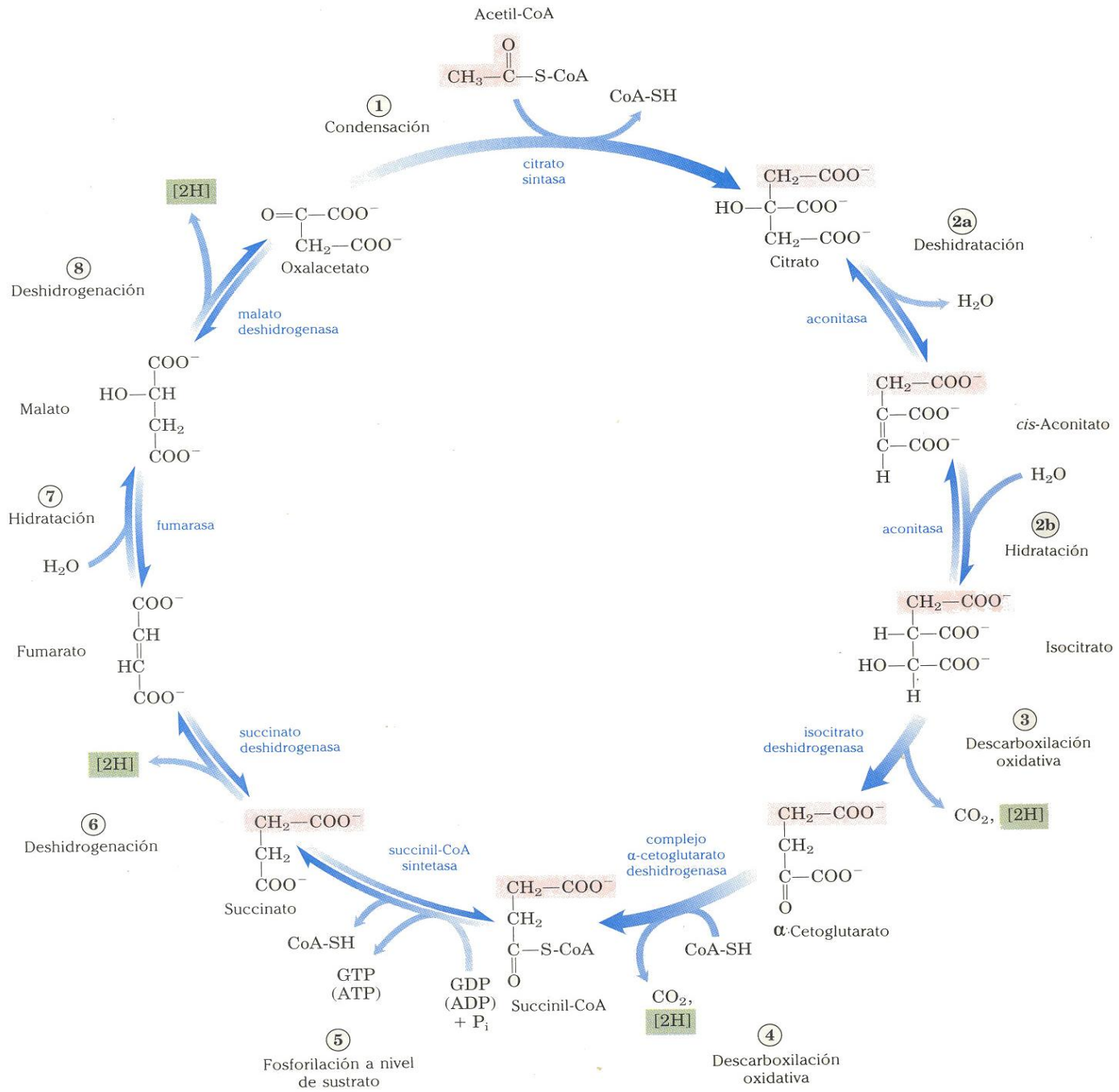
Tabla 12-2. Principales agentes reguladores de la glicólisis (G) y la gluconeogénesis (N)

	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 ⁺		-				+			↓	↑
AMP		+					-		↑	↓
AcCoA				-	+				↑	↑

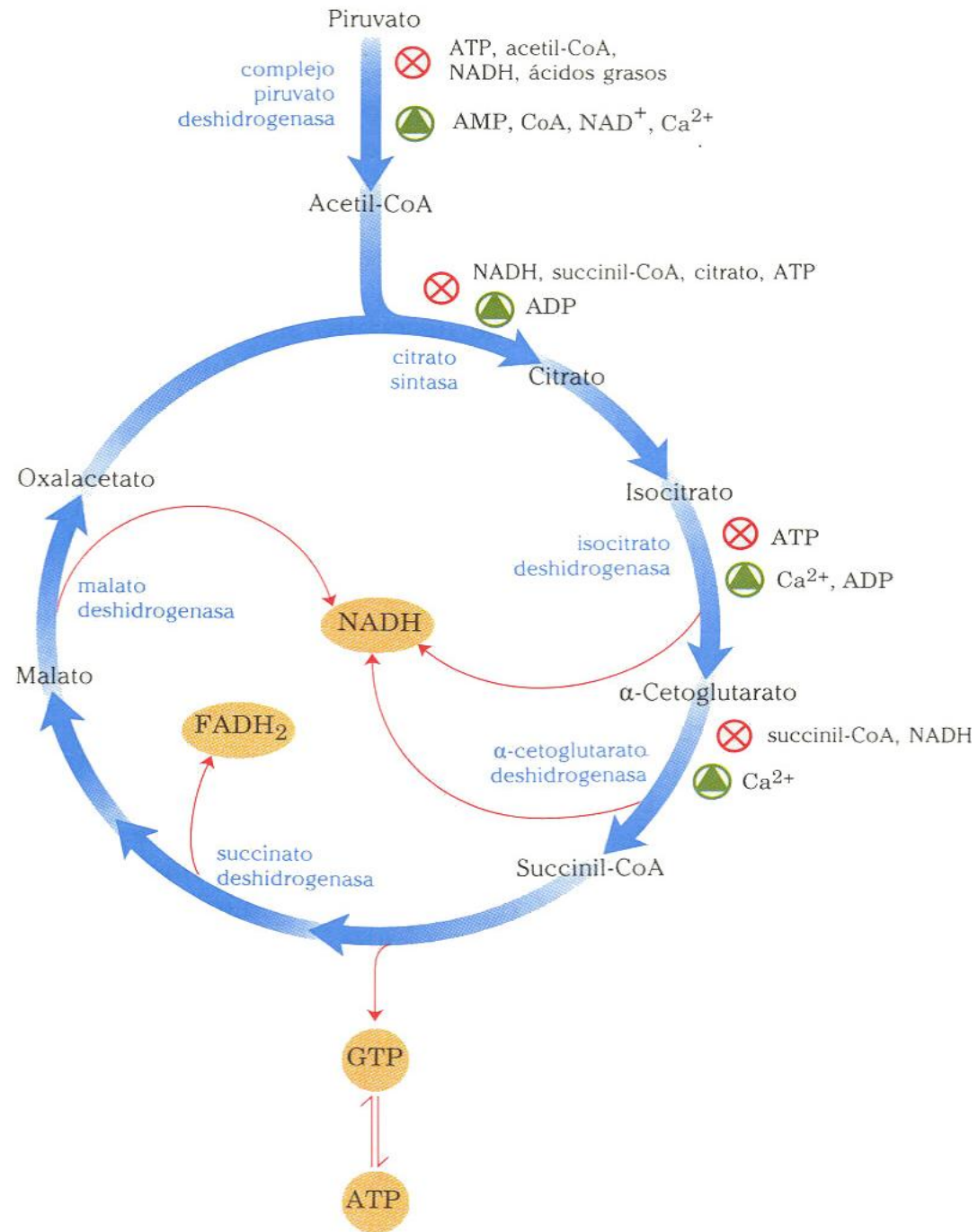
METABOLISMO DEL GLUCÓGENO



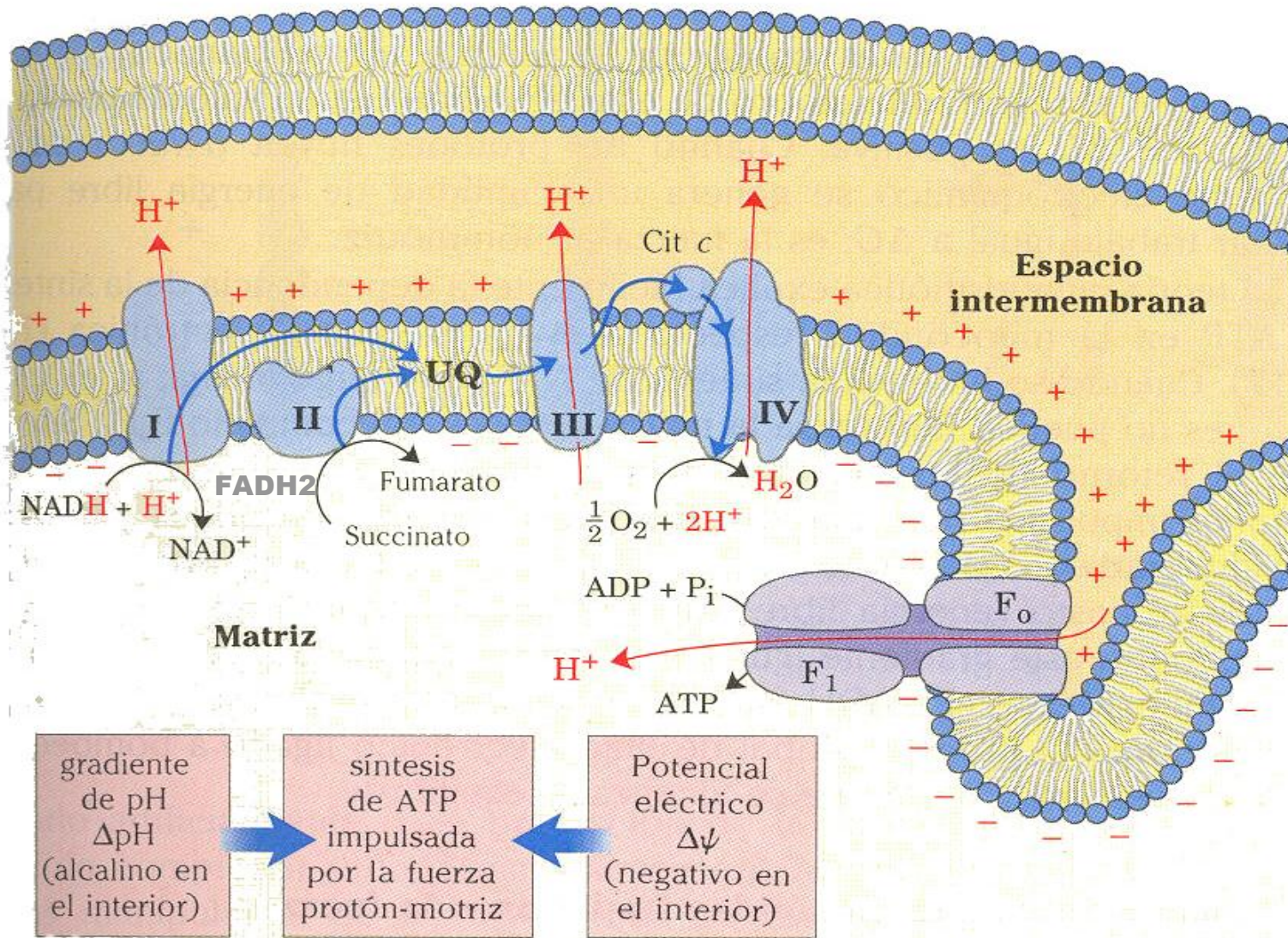
CICLO DE KREBS



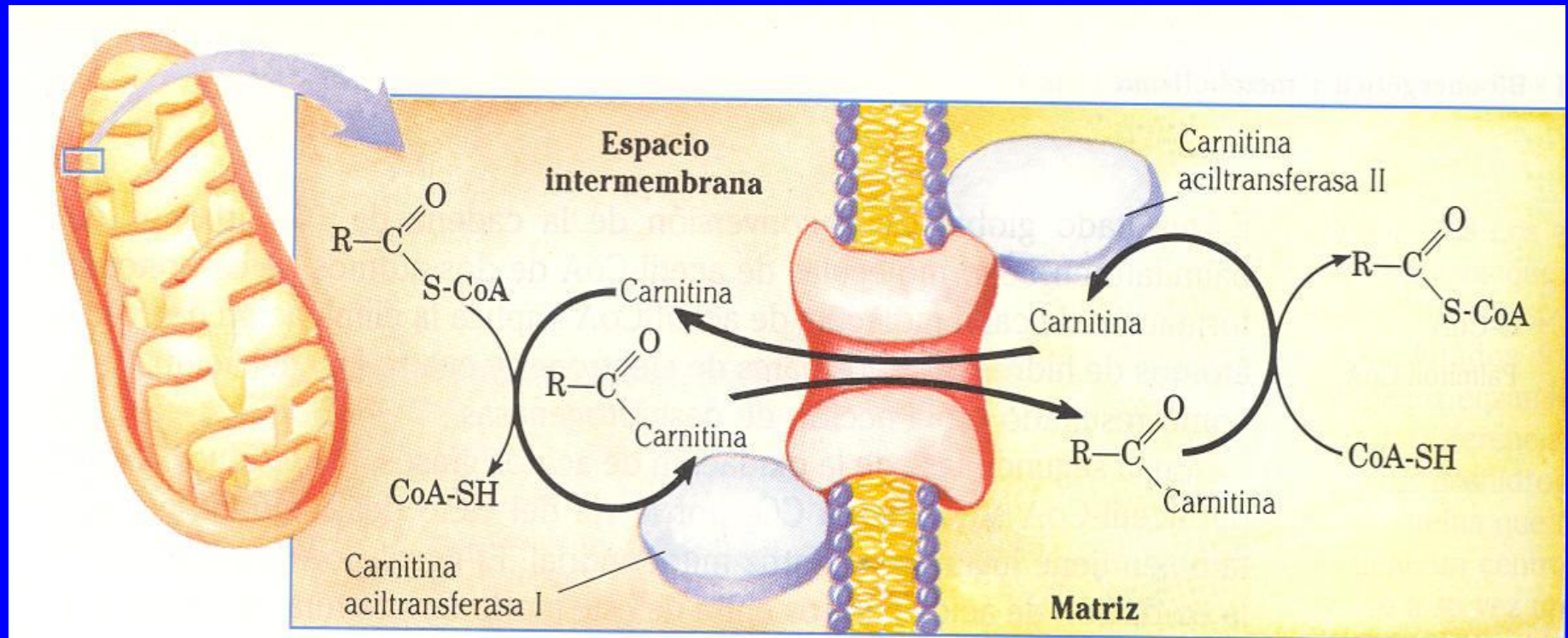
NÓ-CÍCLICO



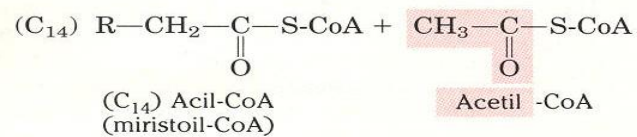
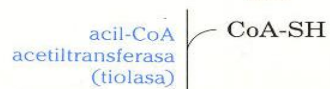
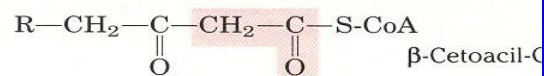
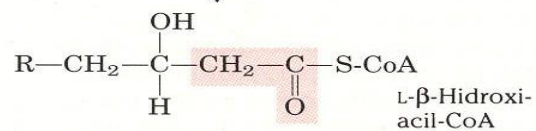
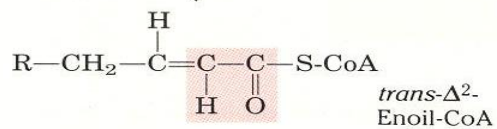
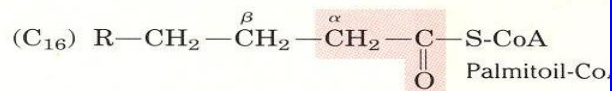
CADENA DE TRANSPORTE ELECTRÓNICO



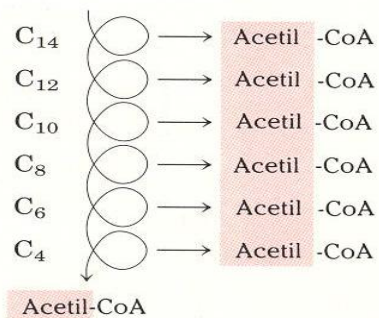
β - OXIDACIÓN DE ÁCIDOS GRASOS



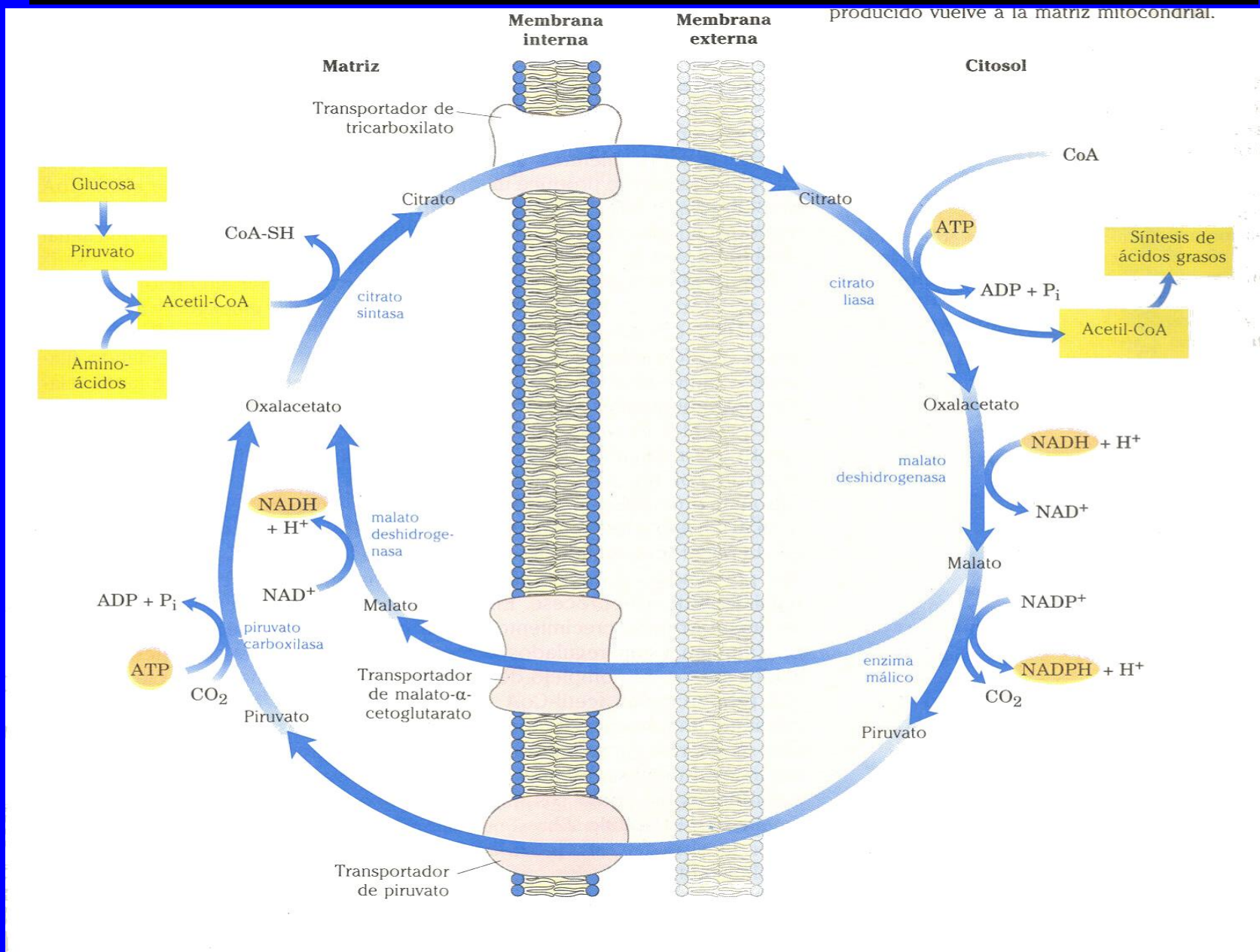
β OXIDACIÓN



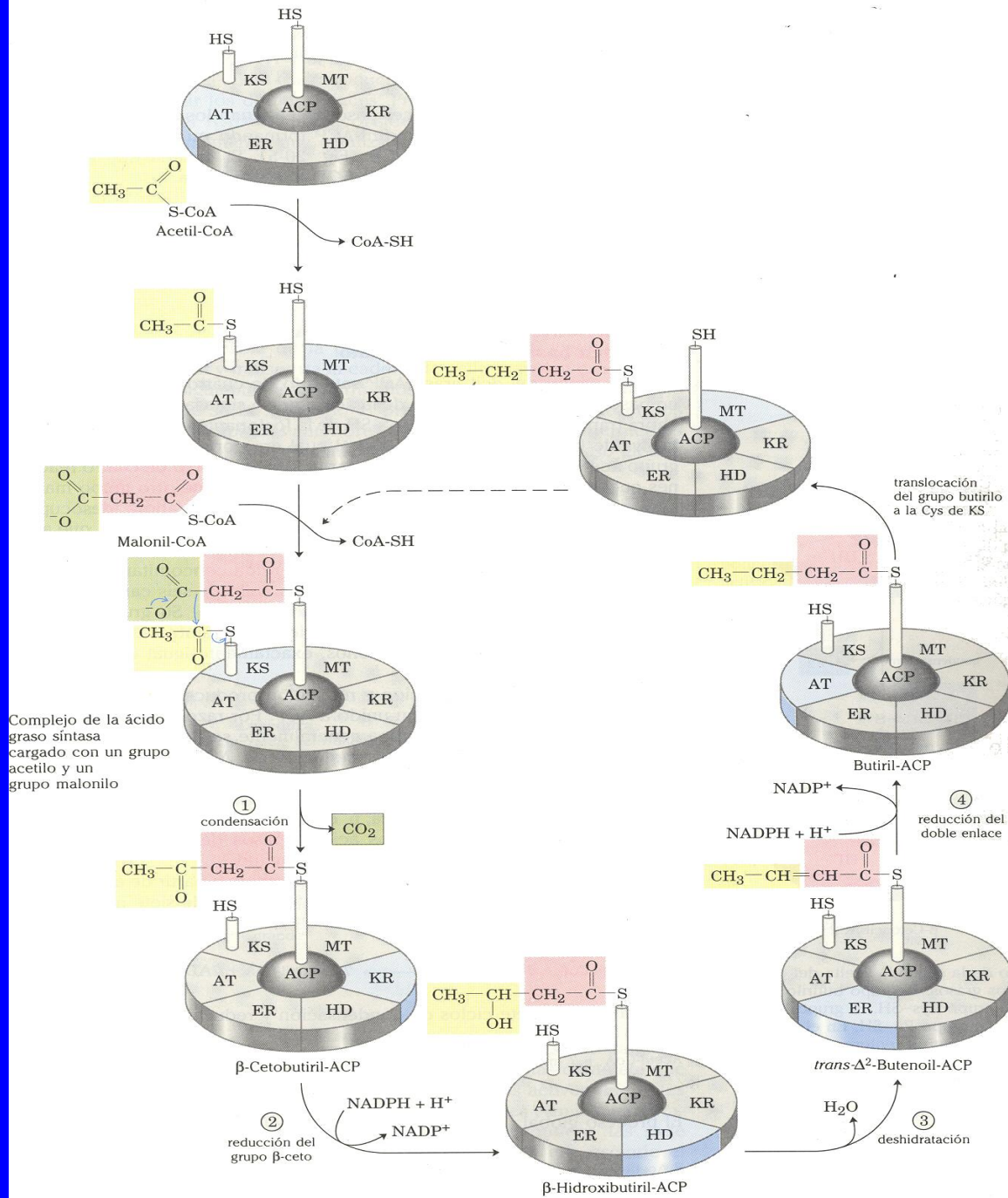
(a)



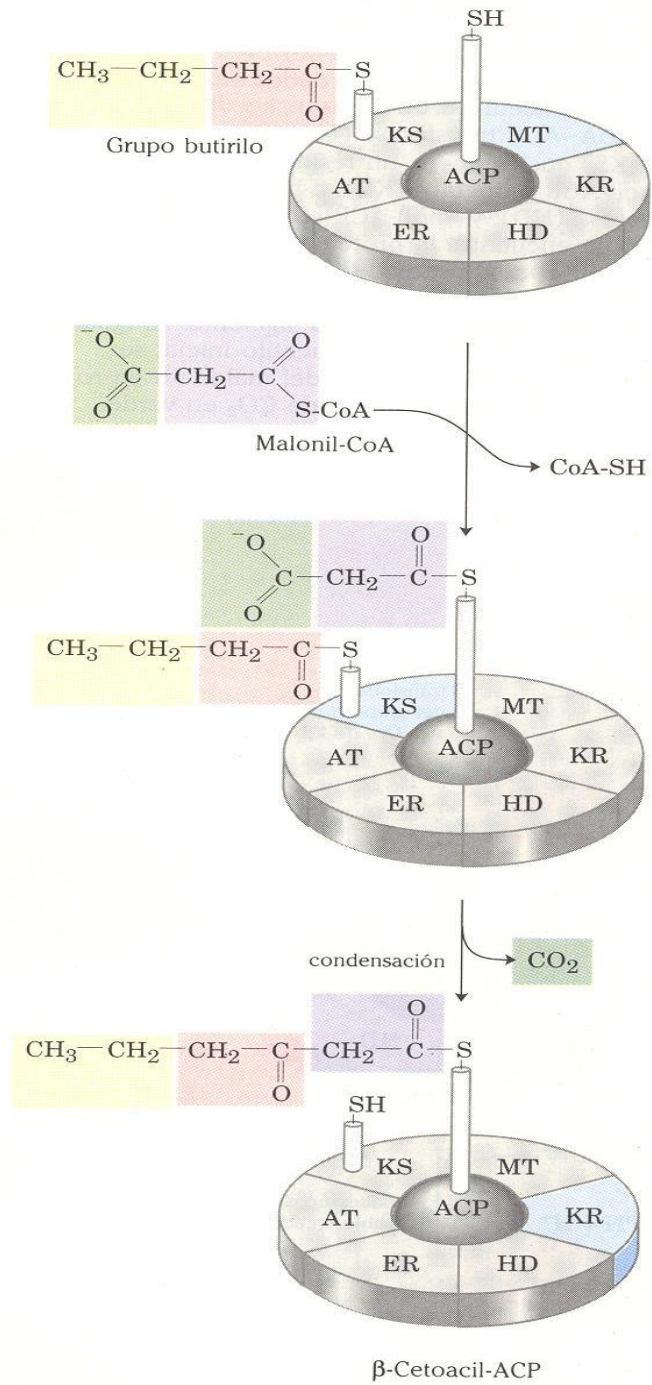
SÍNTESIS DE AC. GRASOS



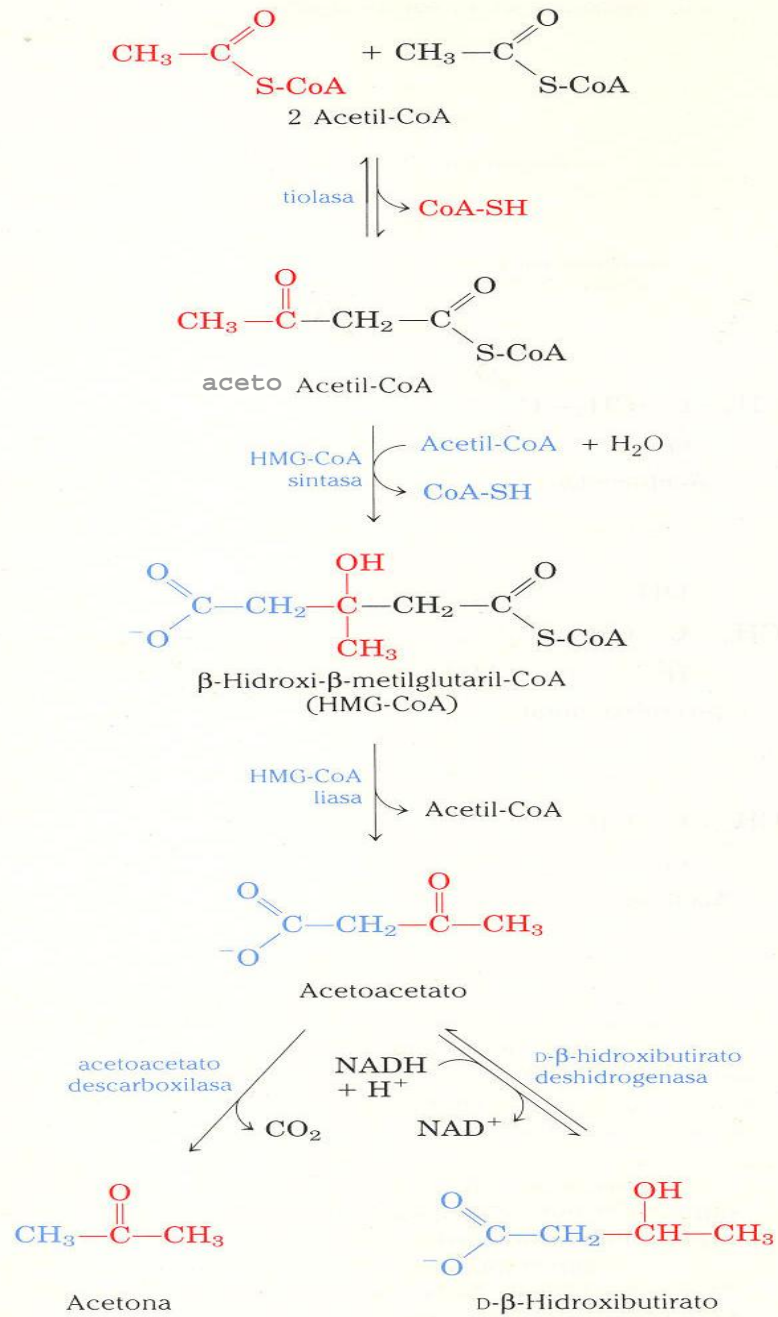
SÍNTESIS ACGRASOS



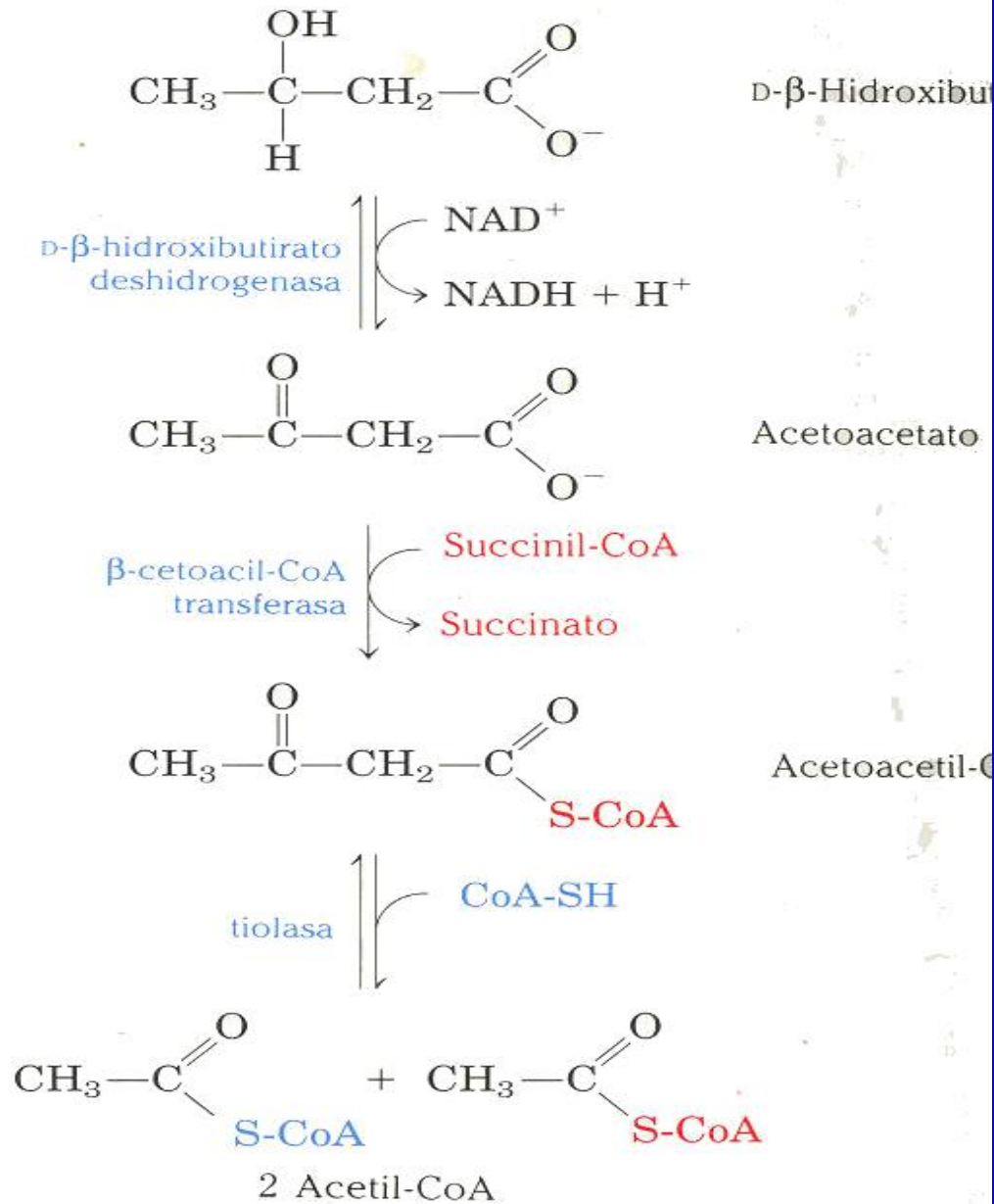
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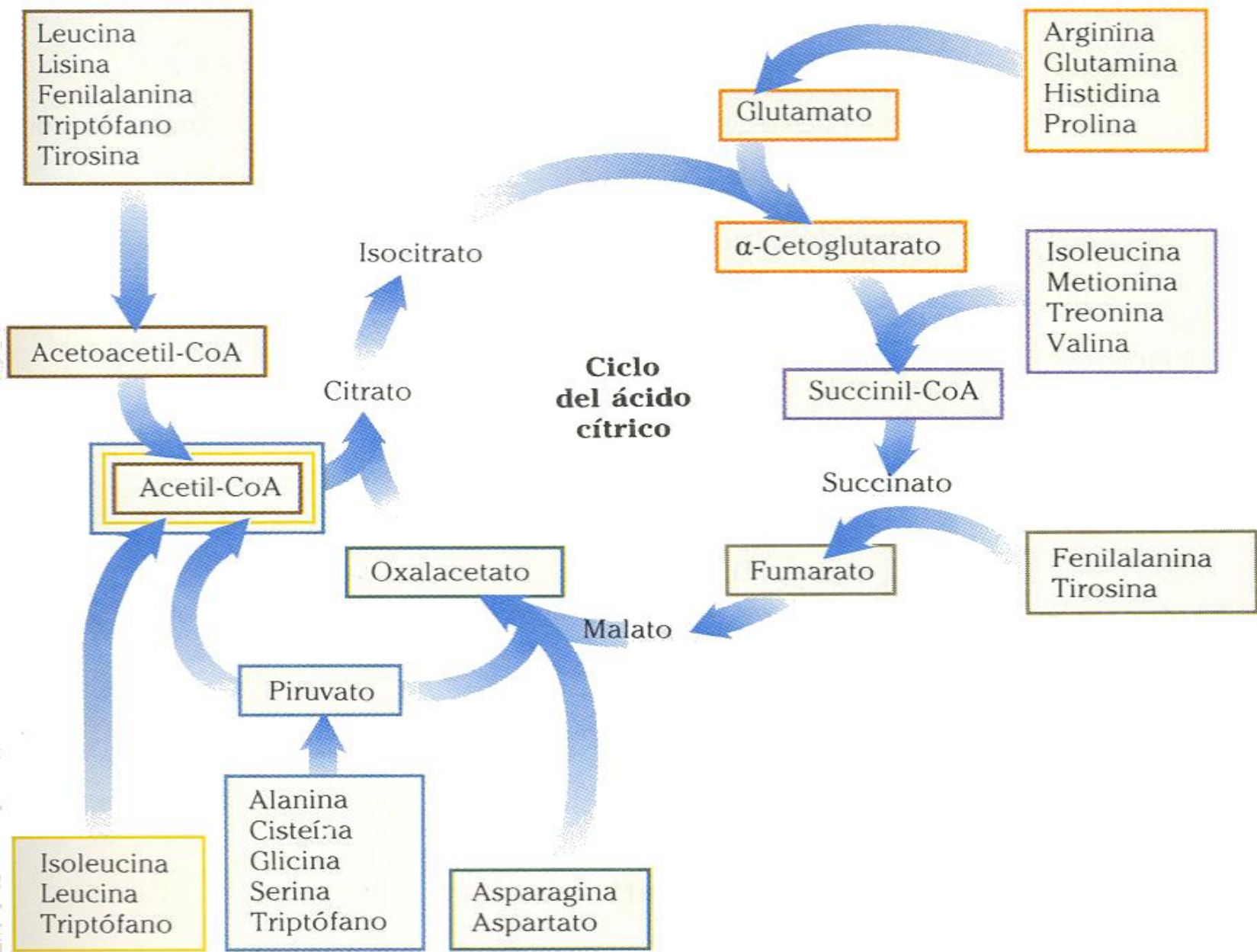
S - S E M E S I - S



S - S E N Z I M O - H E C



CATABOLISMO PROTEICO



CICLO DE LA UREA

