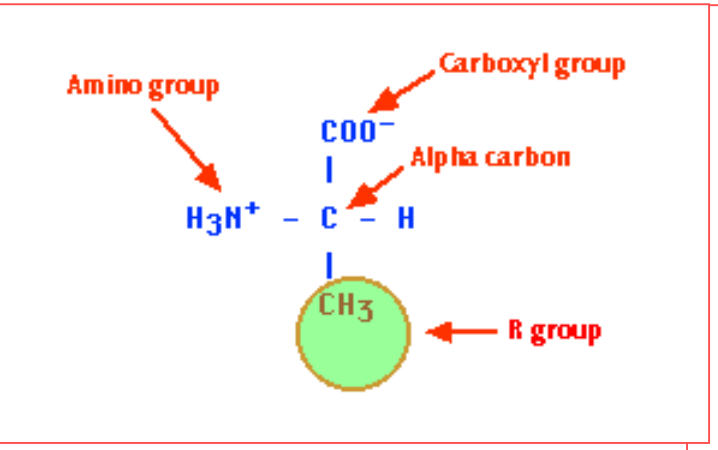
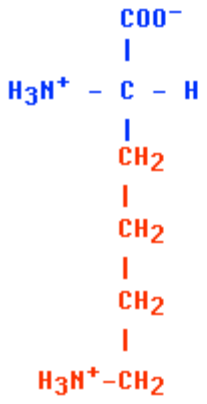
4. Síntese e transporte de aminoácidos

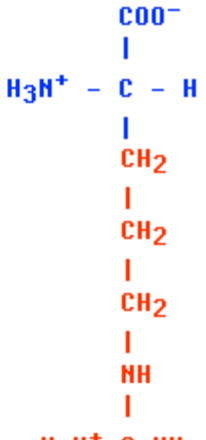
Fórmula geral dos aminoácidos
-Cα, a que se liga:
-H
-NH_2 grupo amina
-COOH grupo ácido
Exemplo: Alanina



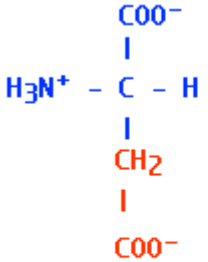
Principais aminoácidos que asseguram a remobilização de N orgânico:
Gln /Asn (depende da espécie)
Glu/Asp
Arg



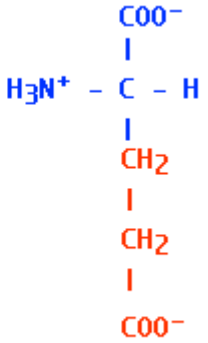
Lysine (Lys)[K]



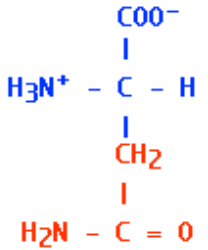
Arginine (Arg)[R]



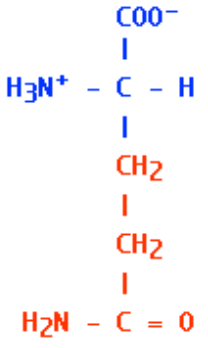
Aspartic acid (Asp)[D]



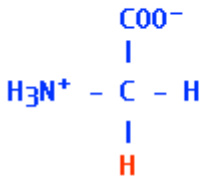
Glutamic acid (Glu)[E]



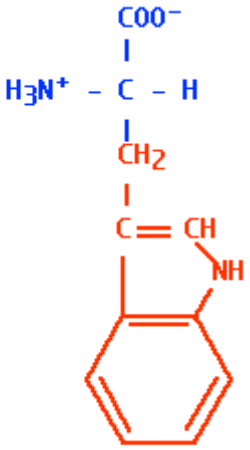
Asparagine (Asn)[N]



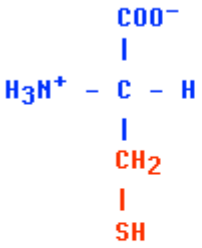
Glutamine (Gln)[Q]



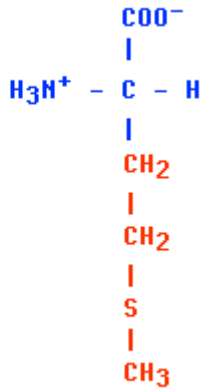
Glycine (Gly)[G]



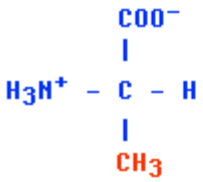
Tryptophan (Trp)[W]



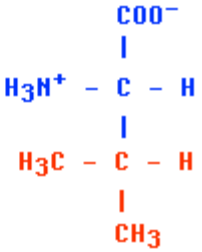
Cysteine (Cys)[C]



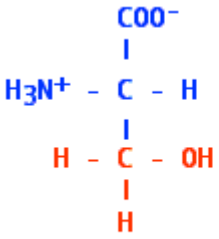
Methionine (Met)[M]



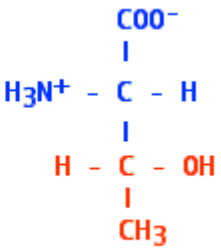
Alanine (Ala)[A]



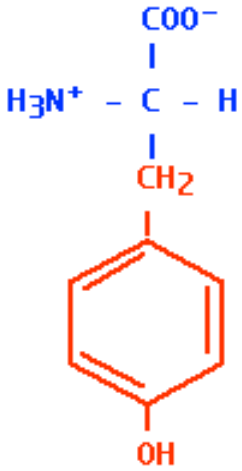
Valine (Val)[V]



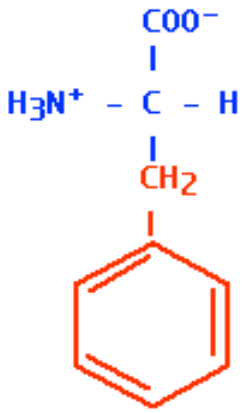
Serine (Ser)[S]



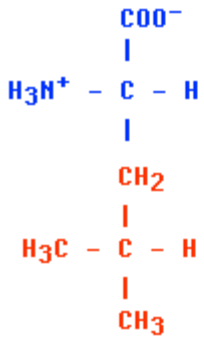
Threonine (Thr)[T]



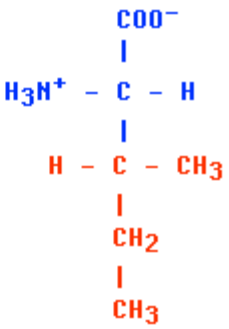
Tyrosine (Tyr)[Y]



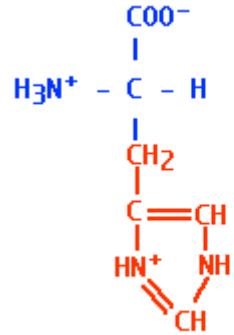
Phenylalanine (Phe)[F]



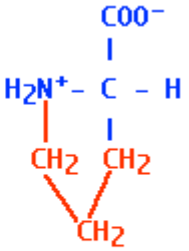
Leucine (Leu)[L]



Isoleucine (Ile)[I]



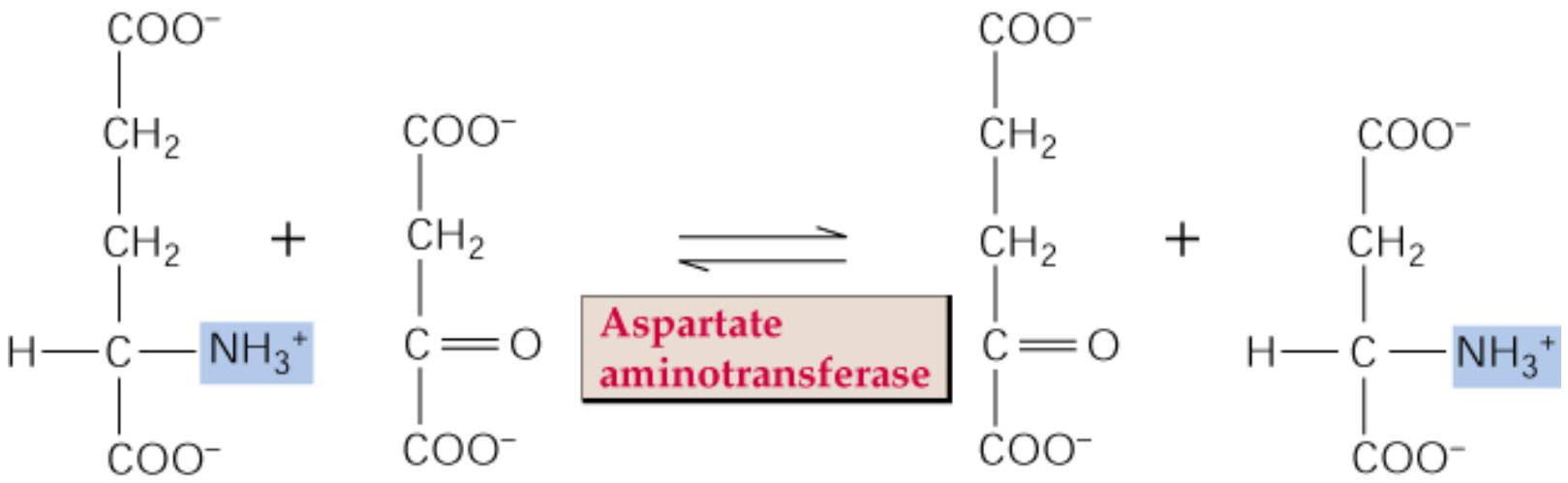
Histidine (His)[H]



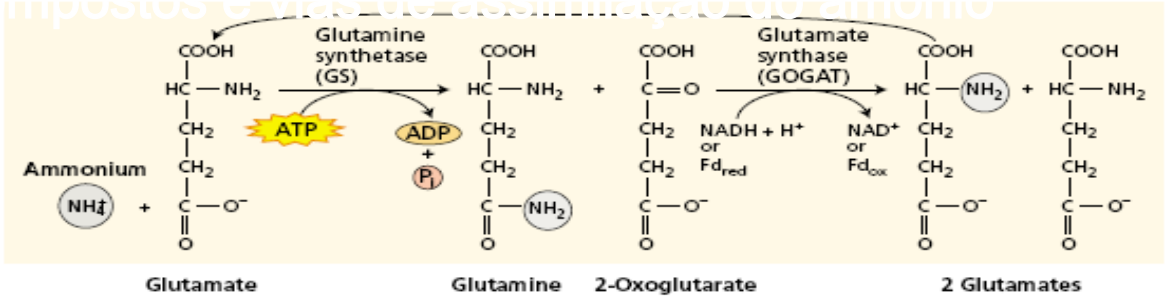
Proline (Pro)[P]

4. Síntese de aminoácidos

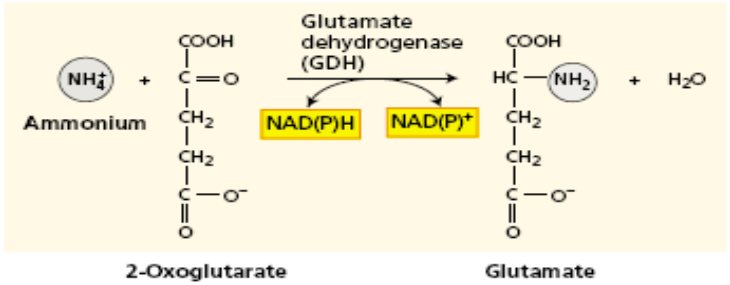
Reacções de Transaminação



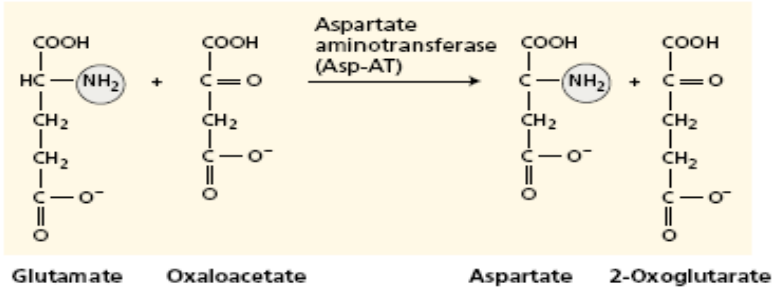
(A)


Glutamine synthetase (GS)
ATP
ADP
+
P_i
Ammonium
NH_4^+
Glutamate synthase (GOGAT)
NADH + H^+ or Fd_{red}
NAD^+ or Fd_{ox}
Glutamate
Glutamine
2-Oxoglutarate
2 Glutamates

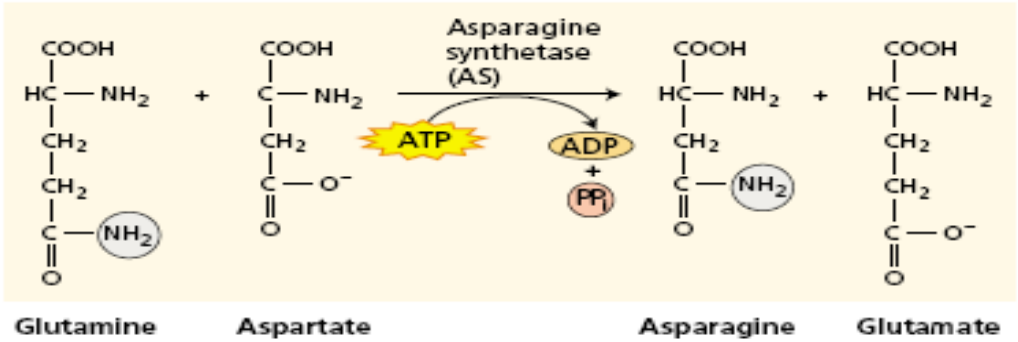
(B)

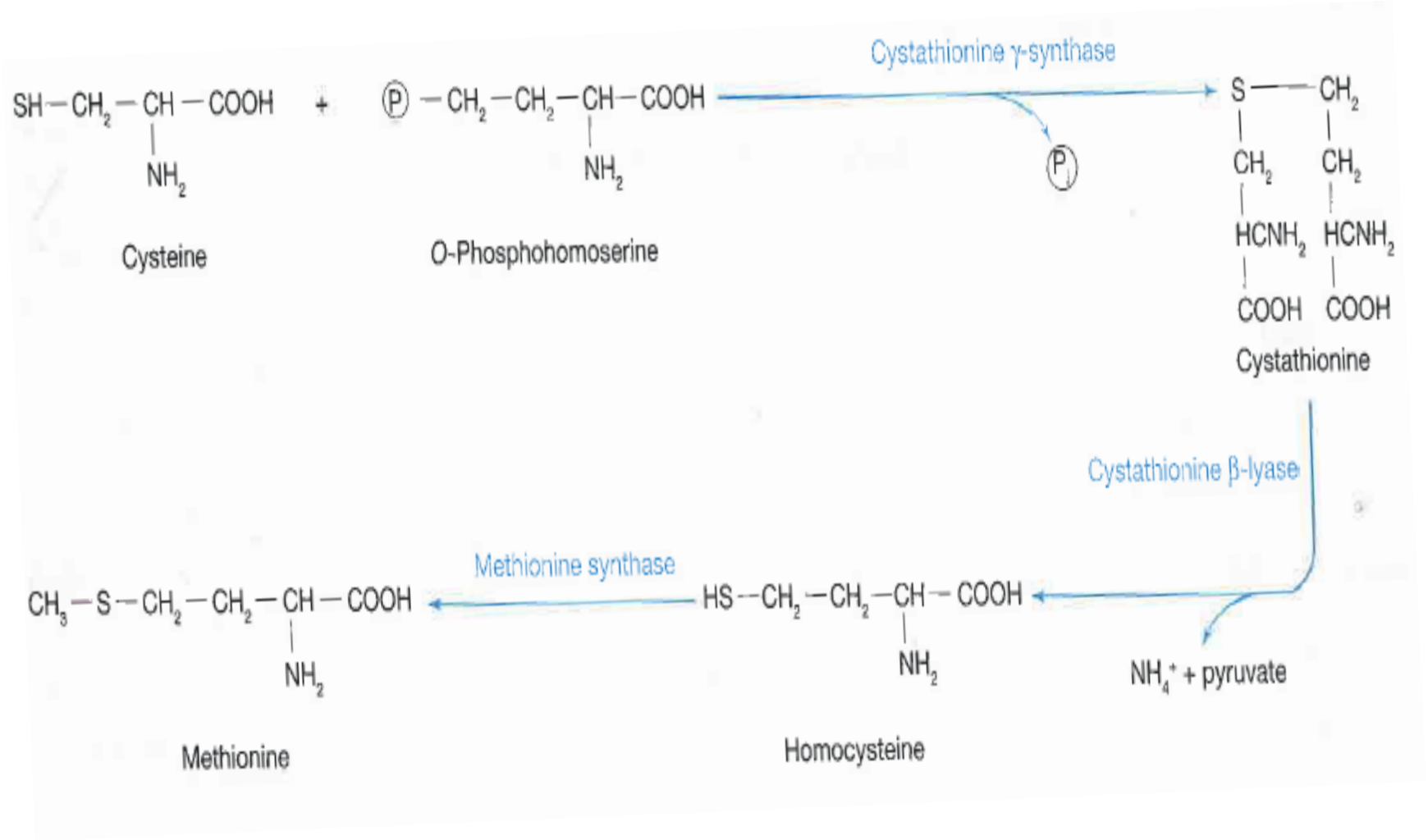

Glutamate dehydrogenase (GDH)
NH_4^+
Ammonium
NAD(P)H
$NAD(P)^+$
H_2O
2-Oxoglutarate
Glutamate

(C)

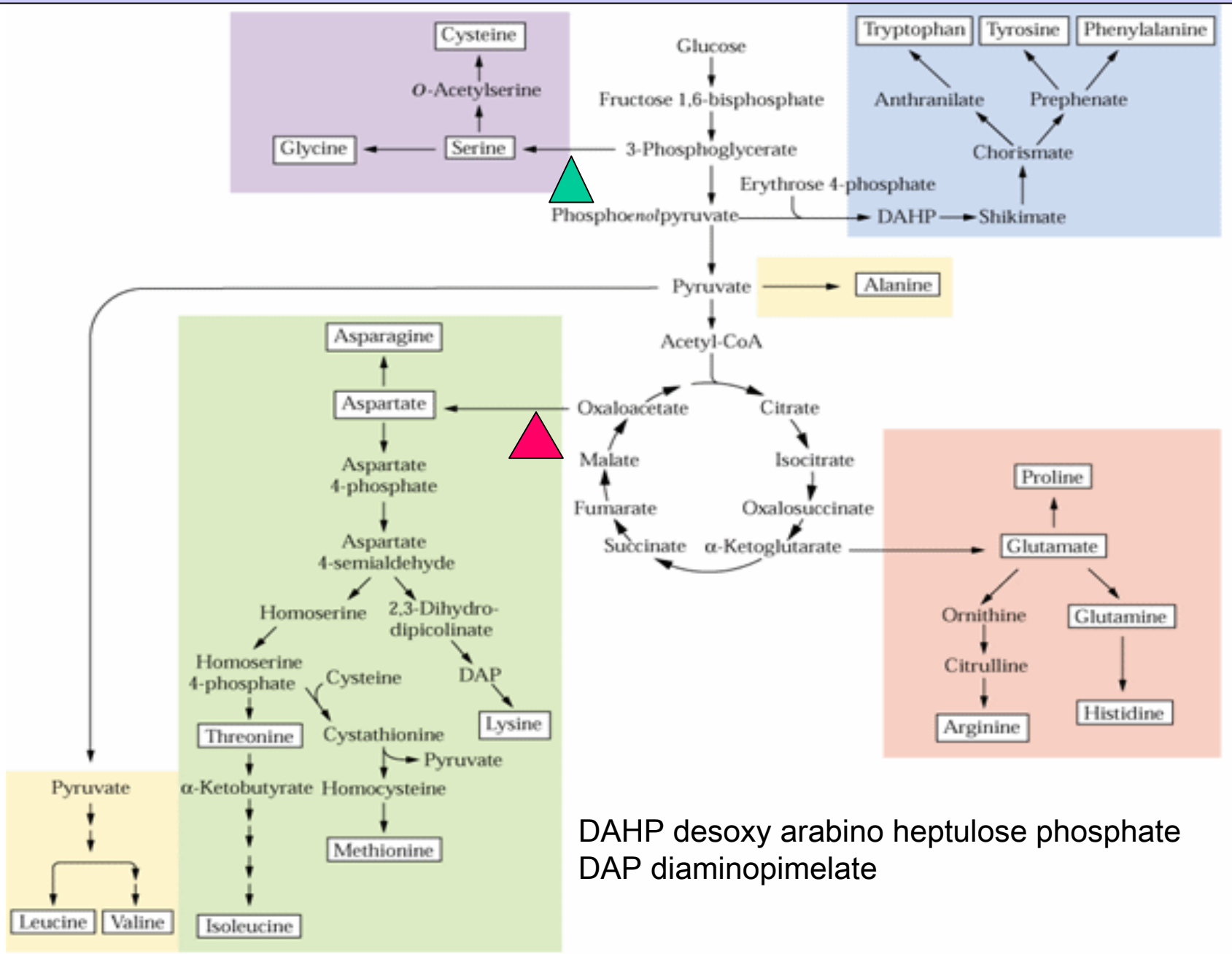

Aspartate aminotransferase (Asp-AT)
Glutamate
Oxaloacetate
Aspartate
2-Oxoglutarate

(D)

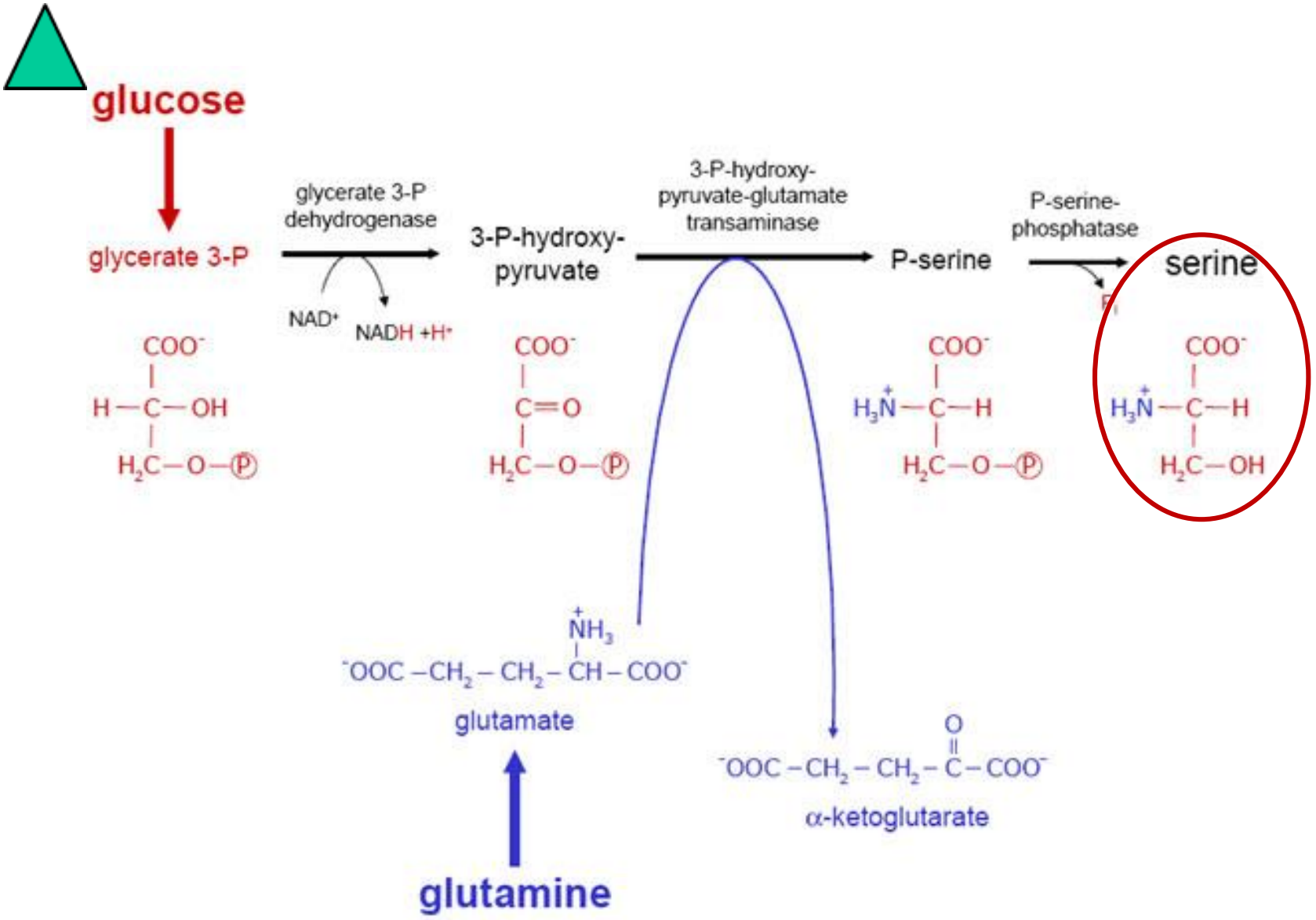

Asparagine synthetase (AS)
ATP
ADP
+
PP_i
Glutamine
Aspartate
Asparagine
Glutamate

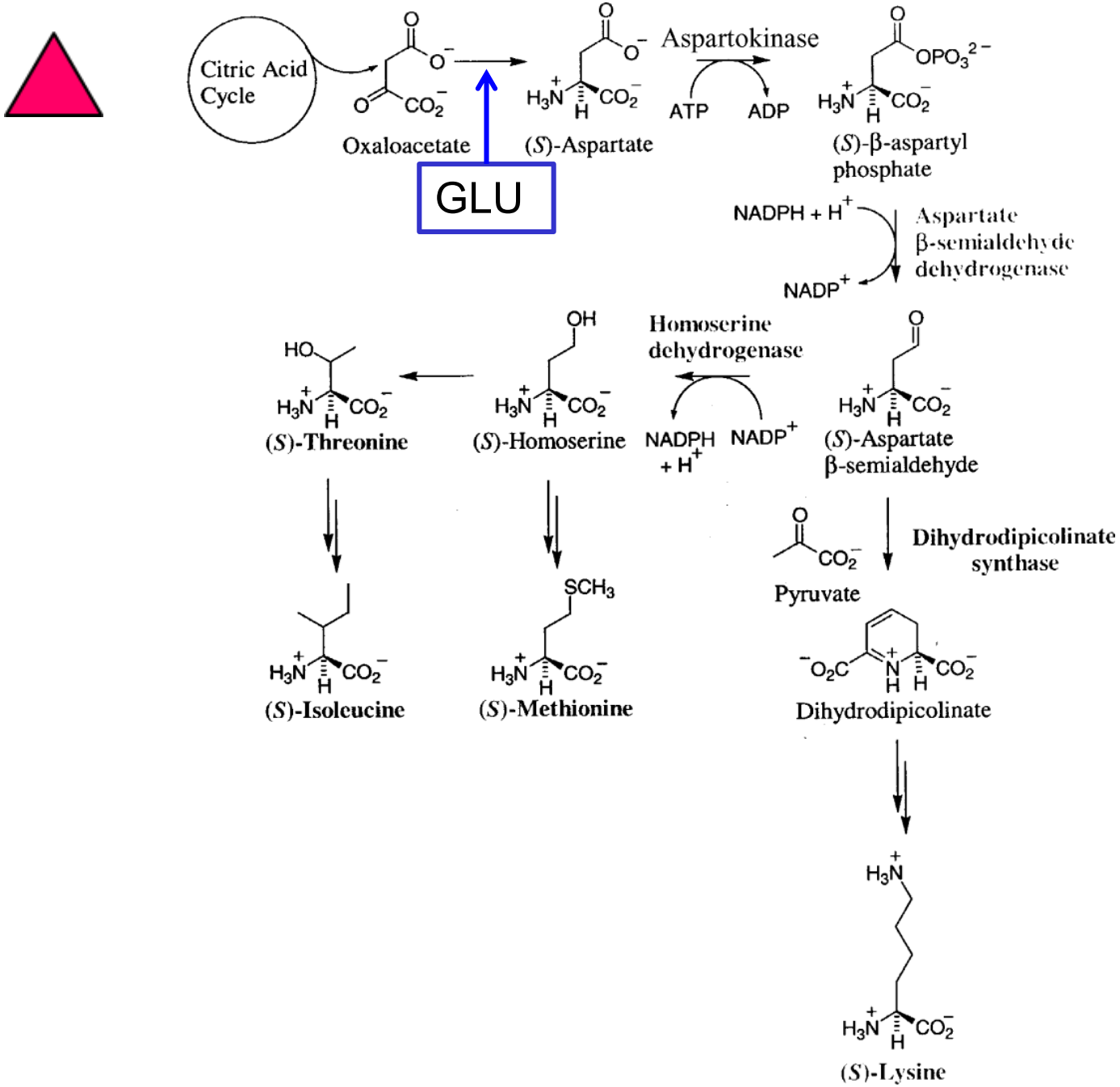

Cystathionine γ-synthase
Cysteine
O-Phosphohomoserine
Cystathionine
Cystathionine β-lyase
Methionine synthase
Methionine
Homocysteine
NH4+ + pyruvate

Vias da biossíntese de aminoácidos nas plantas. Reacções de transaminação



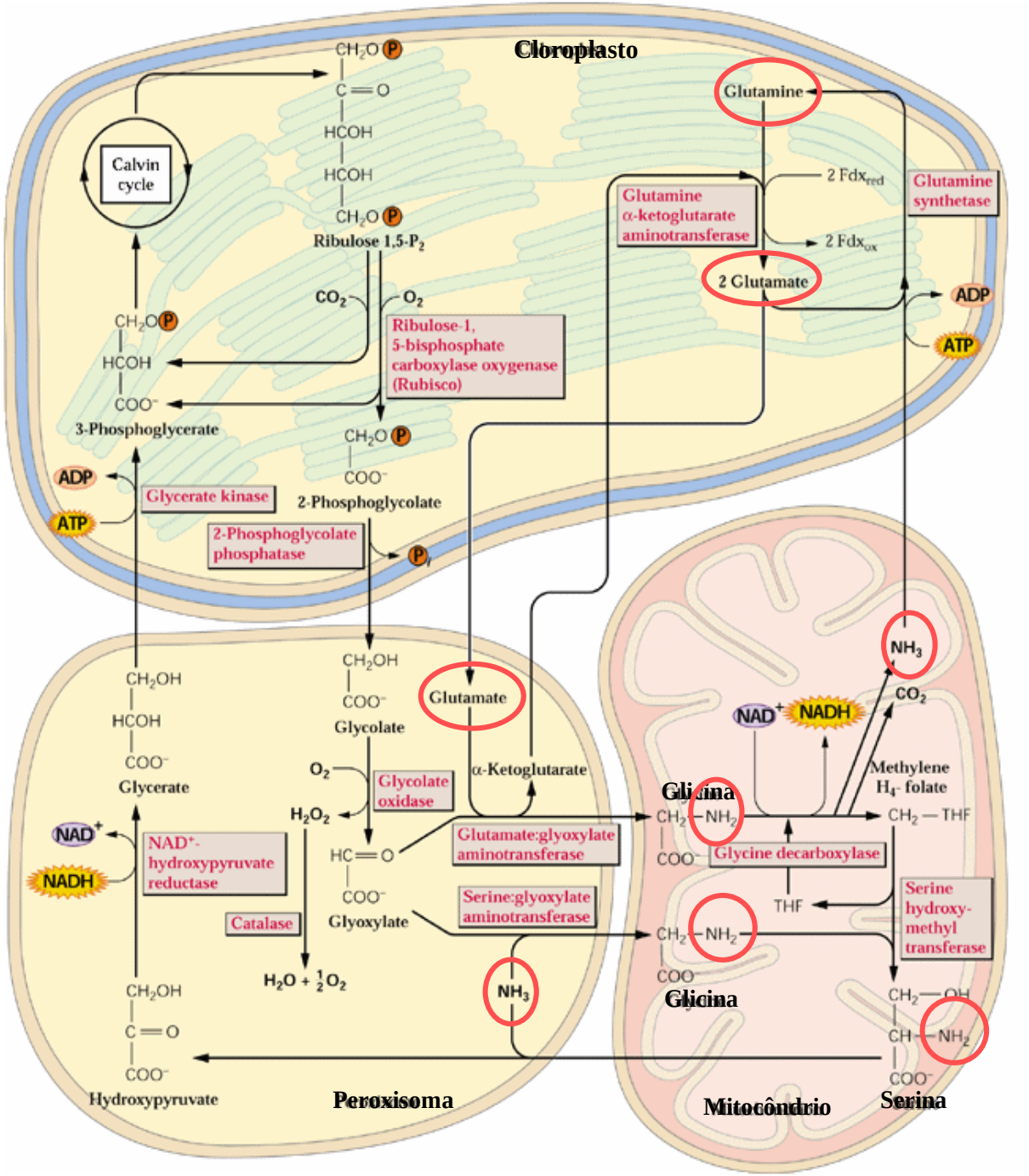
DAHP desoxy arabino heptulose phosphate
DAP diaminopimelate


glucose
glycerate 3-P
glycerate 3-P dehydrogenase
NAD+
NADH +H+
3-P-hydroxy-pyruvate
3-P-hydroxy-pyruvate-glutamate transaminase
P-serine
P-serine-phosphatase
serine
glutamate
α-ketoglutarate
glutamine


Citric Acid Cycle
Oxaloacetate
GLU
(S)-Aspartate
Aspartokinase
ATP
ADP
(S)-β-aspartyl phosphate
NADPH + H+
NADP+
Aspartate β-semialdehyde dehydrogenase
(S)-Threonine
(S)-Homoserine
Homoserine dehydrogenase
NADPH + H+
NADP+
(S)-Aspartate β-semialdehyde
Pyruvate
Dihydrodipicolinate synthase
(S)-Isoleucine
(S)-Methionine
Dihydrodipicolinate
(S)-Lysine

5. Coordenação entre o metabolismo do carbono e do azoto.

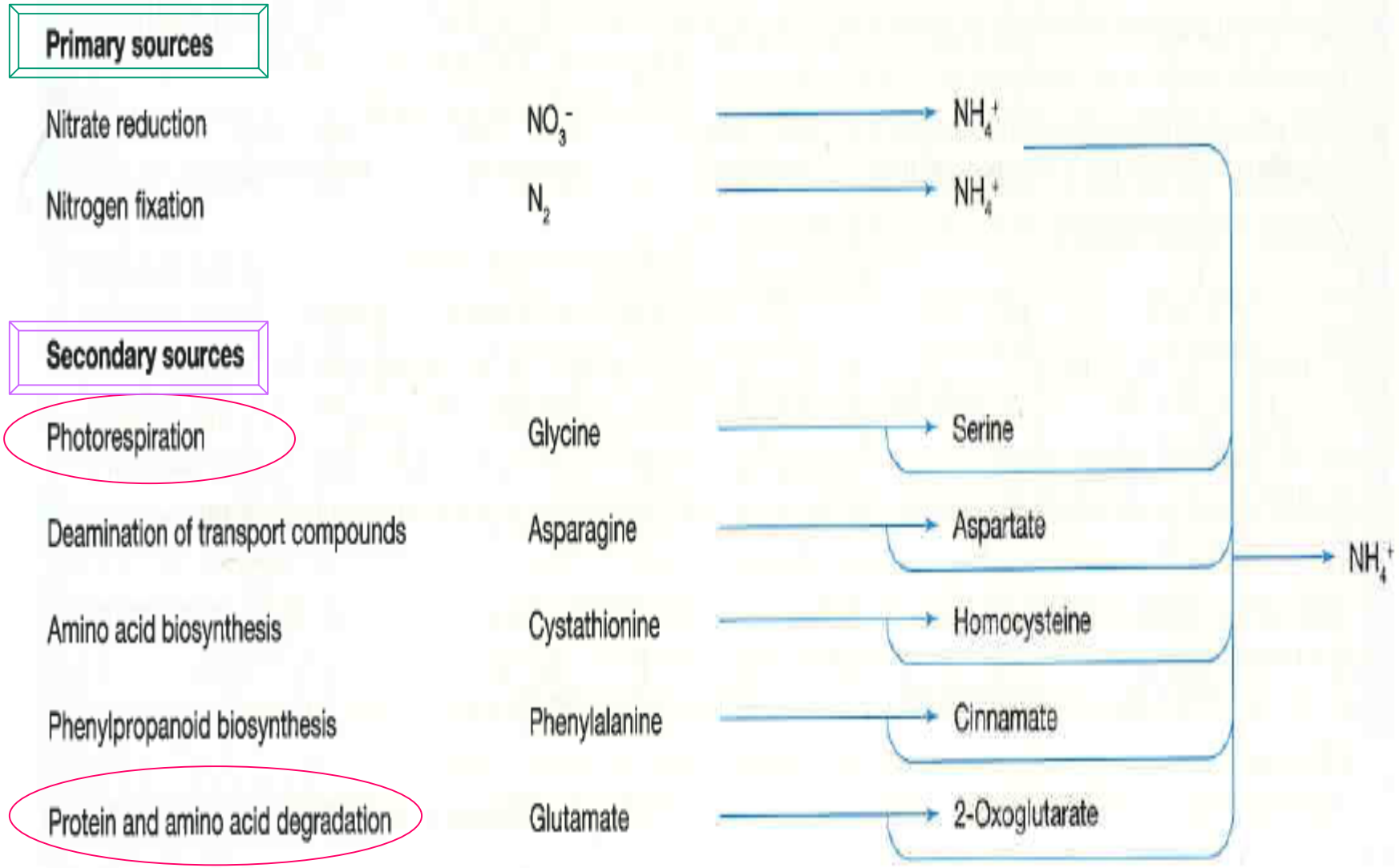
Ciclo fotorrespiratório do azoto.



3. Coordenação entre o metabolismo do carbono e do azoto: Reassimilação do amónio produzido pela fotorrespiração

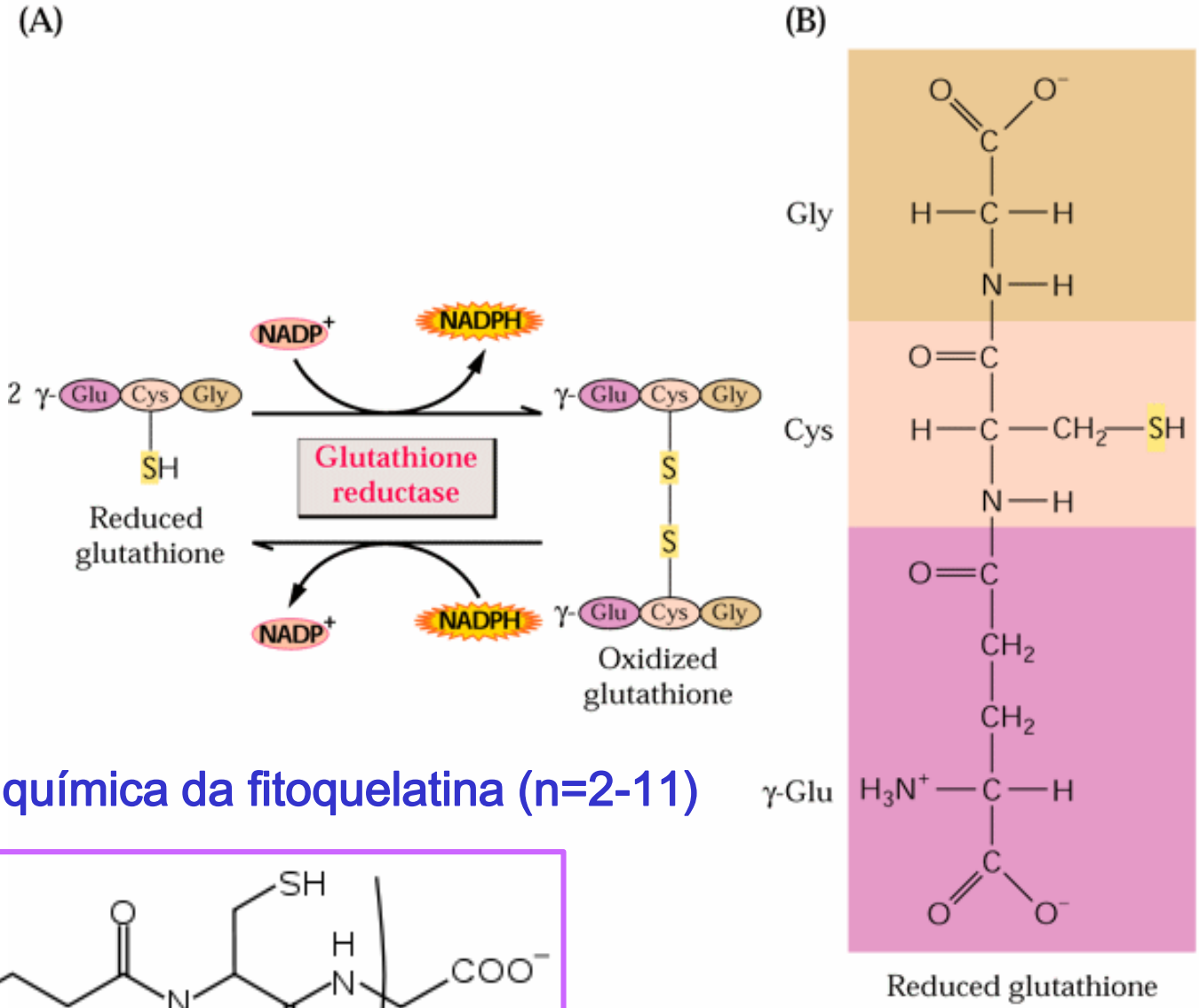
Ciclo fotorespiratório do azoto

Fontes primárias e secundárias de NH_4^+

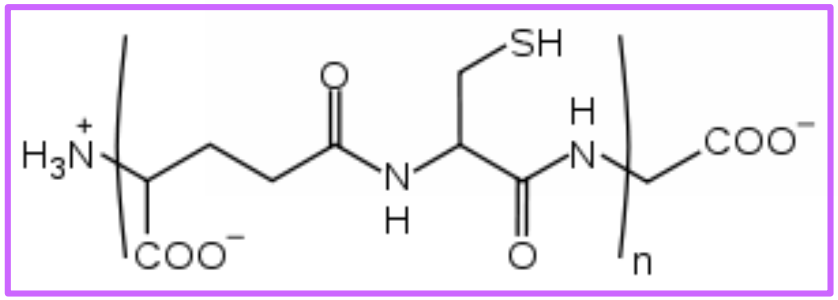


6. Glutationa: natureza, composição e principais funções

Glutationa na forma oxidada e reduzida



Estrutura química da fitoquelatina (n=2-11)



Síntese da glutationa

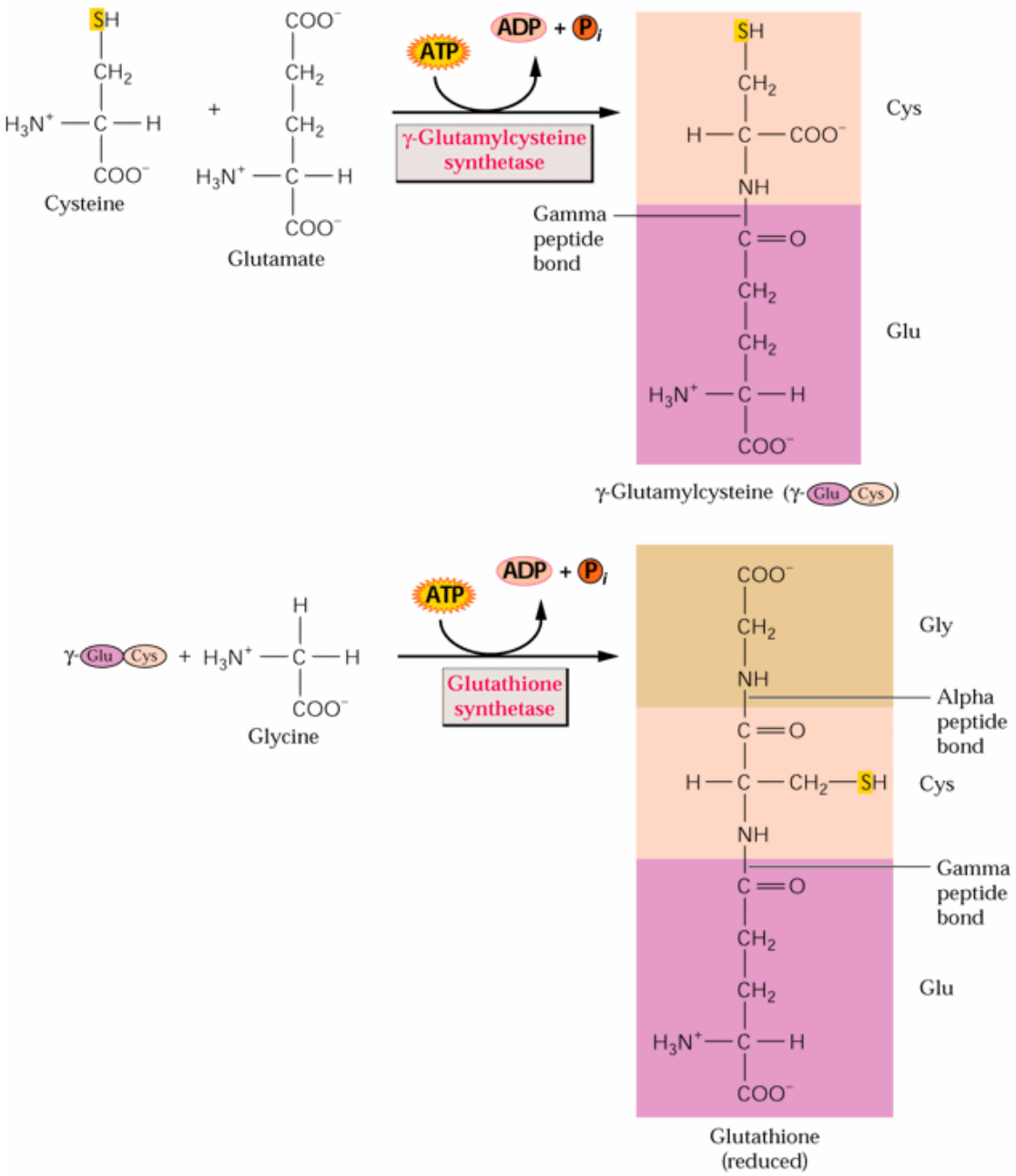


Table 1 Roles for glutathione in higher plants

Processes in which glutathione and its derivatives are involved
Signal transduction
Scavenging H_2O_2
Scavenging reactive O_2 species
Detoxifying xenobiotics
Activating and conjugating phenylpropanoids
Activating and conjugating hormones
Substrate for phyochelatin biosynthesis

Funções da Glutationa (GSH) no metabolismo das plantas superiores

Processos em que participa a Glutationa (GSH) ou os seus derivados (GSSG, conjugados com GSH, etc)

» Transdução de sinal celular

» Eliminação de H_2O_2 (peroxido de hidrogénio)

» Eliminação de espécies reativas de O_2 (ROS: superóxido O_2^-)

Desintoxicação de xenobióticos (**xenobiotico: composto ou substância química estranha a um organismo ou sistema biológico**

Ativação e conjugação de fenilpropanóides

Ativação e conjugação de hormonas

Substrato da biossíntese de fitoquelatinas (**oligómeros n= 2- 11) de GSH, produzidos pela enzima fitotoquelatina sintase. Agem como agentes quealtantes e portanto são fundamentais na desintoxicação de metais pesados.**

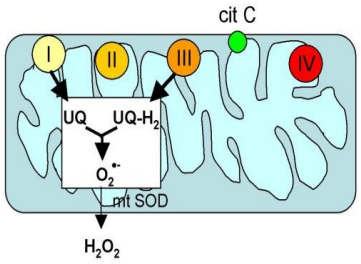
Reactive Oxygen Species (ROS)

Animais

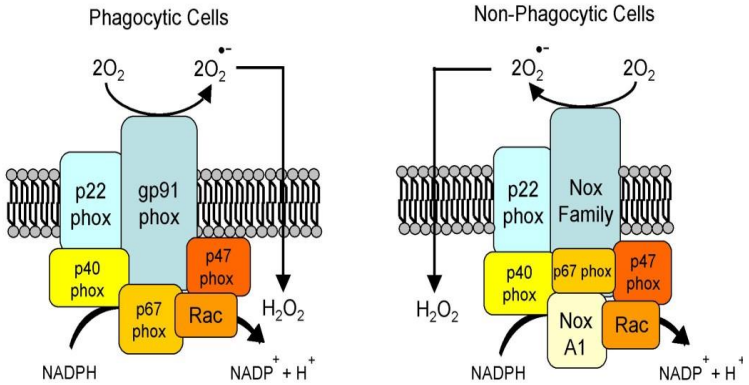
a) Mitochondria

Stimuli inducing increased mitochondrial generation of ROS:

- serum deprivation
- integrin signalling
- apoptosis
- TNFα
- hypoxia
- ceramide
- p53
- oncogenic Ras



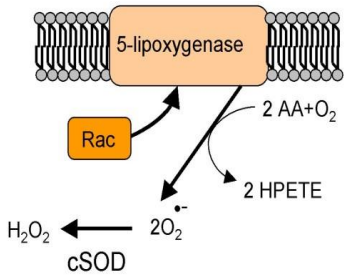
b) NADPH oxidase



Stimuli for activation of NADPH oxidase and 5-lipooxygenase

- integrin signalling
- growth factors
- cytokines/hormones
- immunological stimuli
- hypoxia
- oncogenic Ras

c) 5-lipoxygenase



Plantas