



Module 12

Gluconeogenesis

Session Slides with Notes

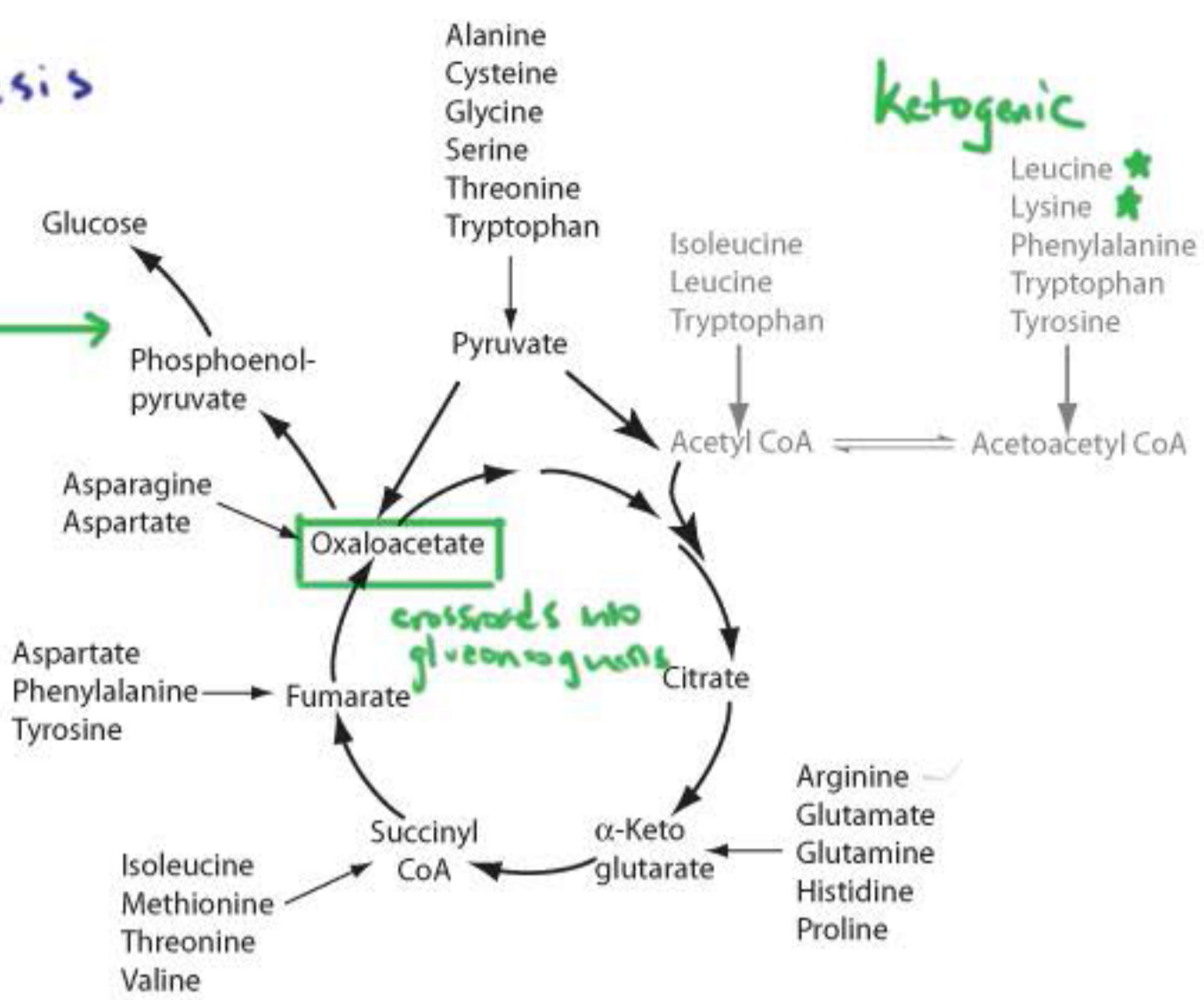
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Glucogenesis

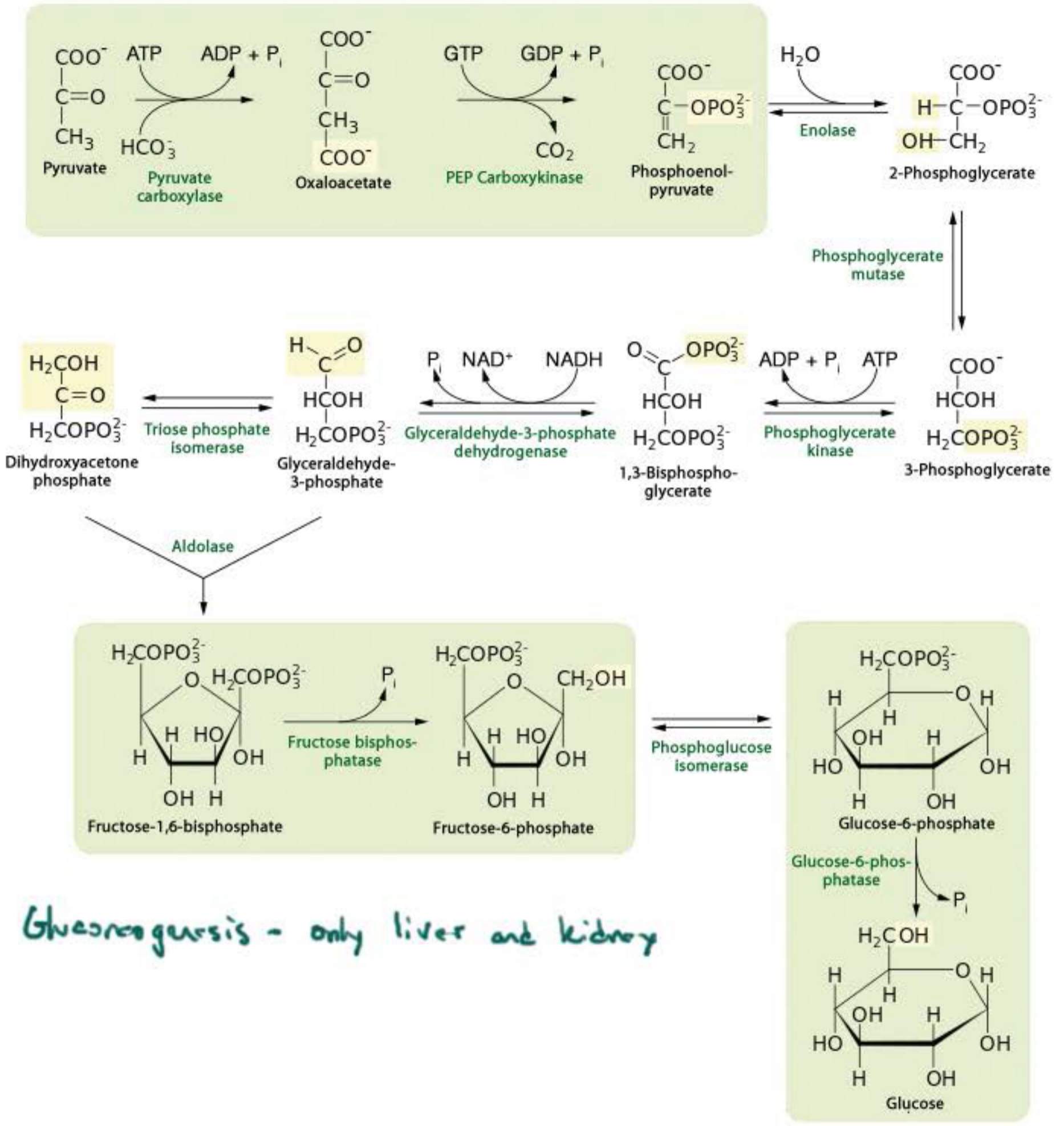
Ketogenic

glucogenesis →



most important precursors

- amino acids
- lactate
- glycerol

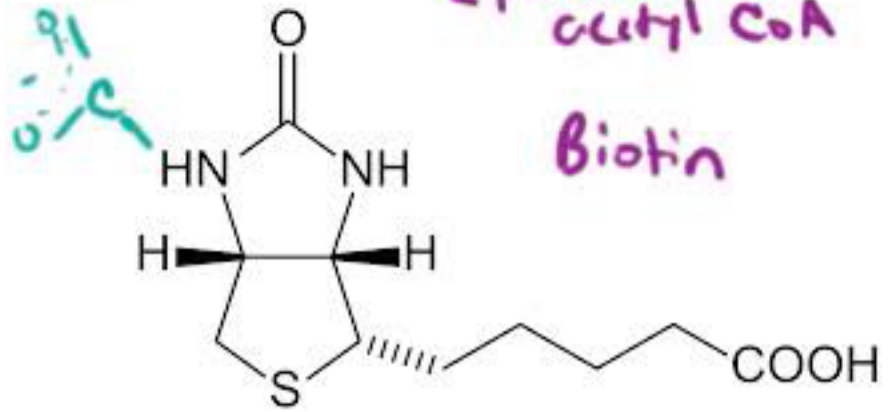
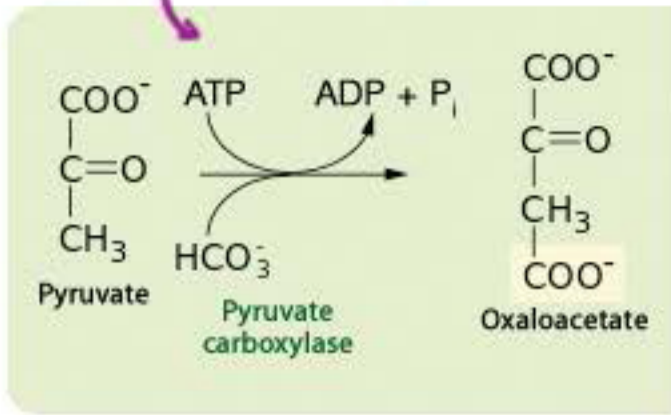


Glucose-6-phosphatase - only liver and kidney

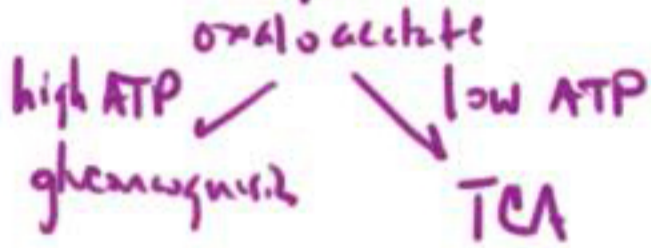
ATP activates biotin

Pyruvate Carboxylase

[enzyme activated by presence of acetyl CoA]



pyruvate (presence of acetyl CoA)



Biotin carries activated CO₂

target benchtop application of biotin
 (Note - remember biotinylation for affinity chromatography with avidin beads)

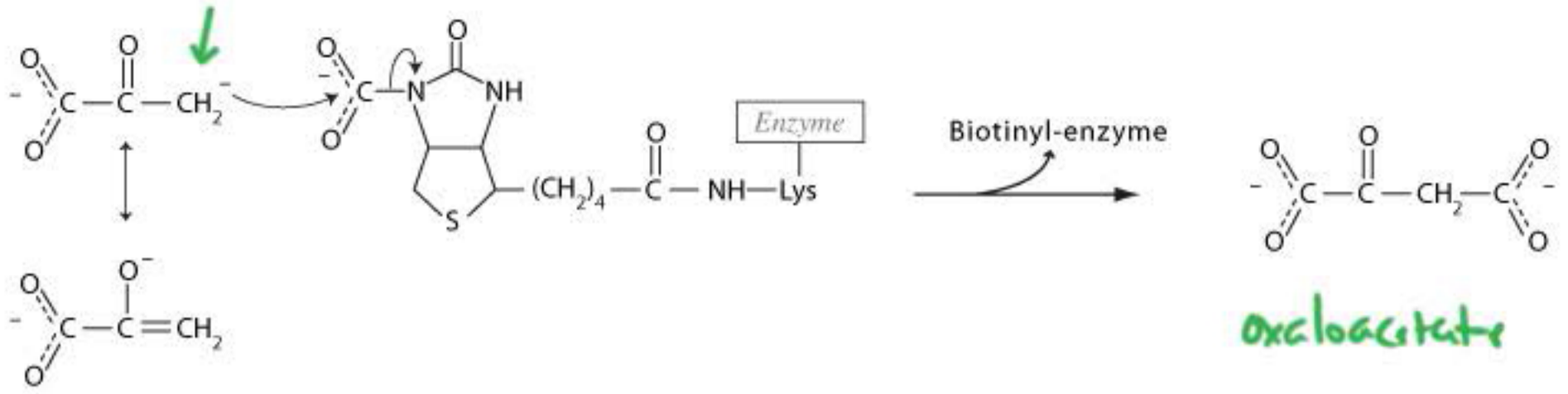
• in mitochondria

proton + substrate = bound complex

$$K_a = \frac{[\text{bound}]}{[\text{proton}][\text{substrate}]}$$

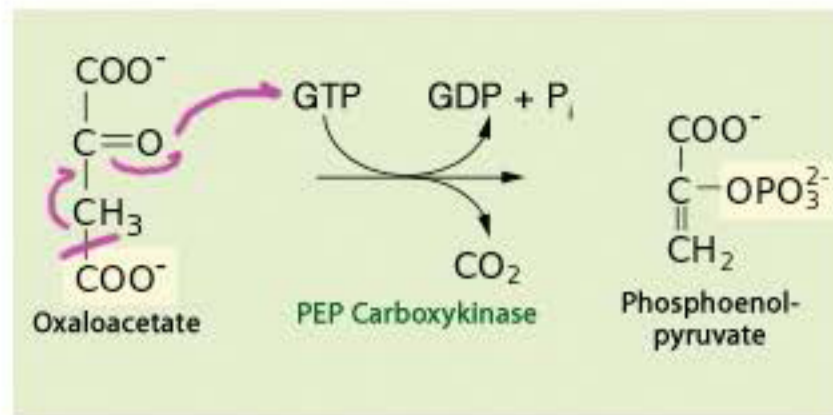
Pyruvate Carboxylase

nucleophilic



enolate of pyruvate

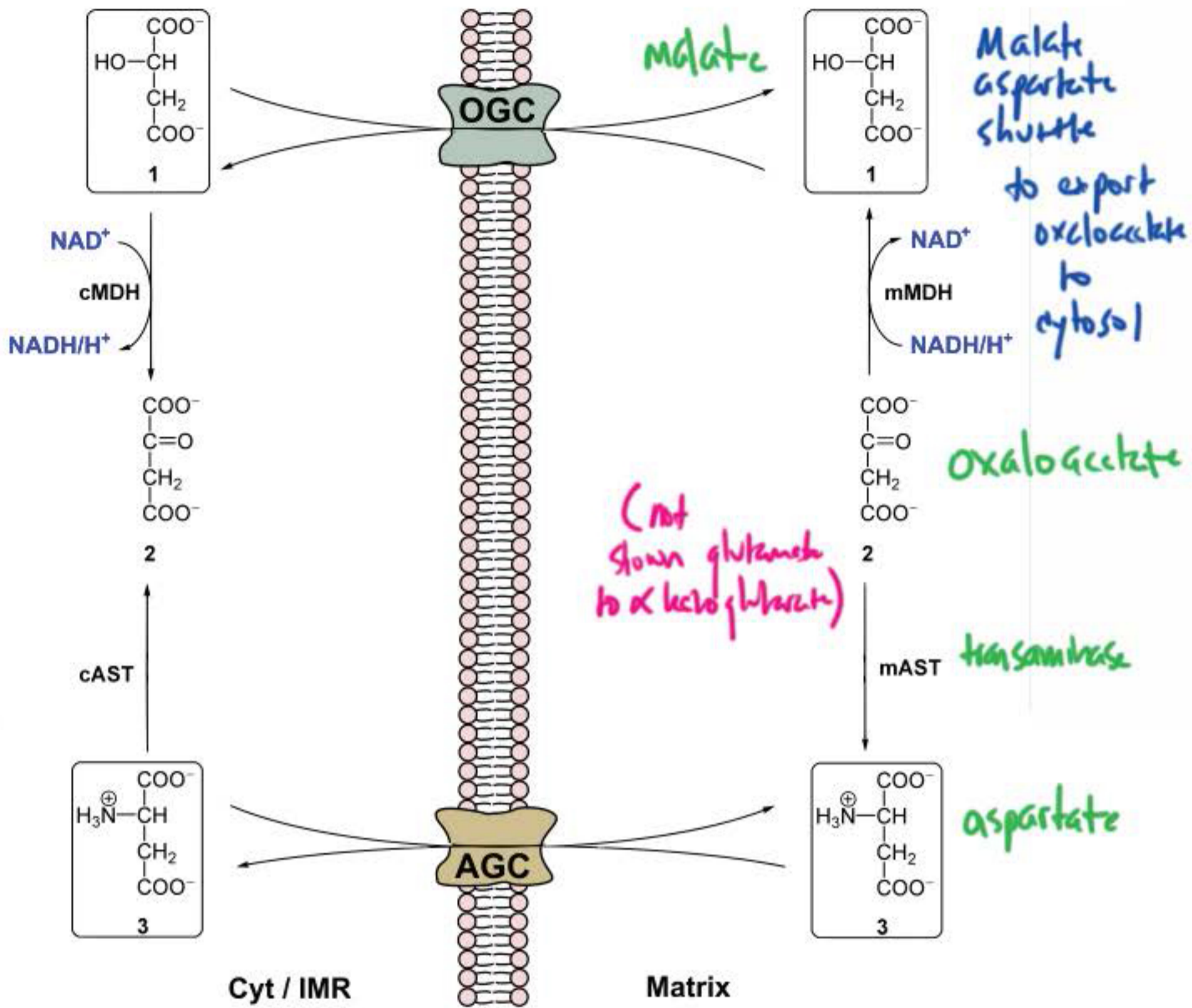
oxaloacetate

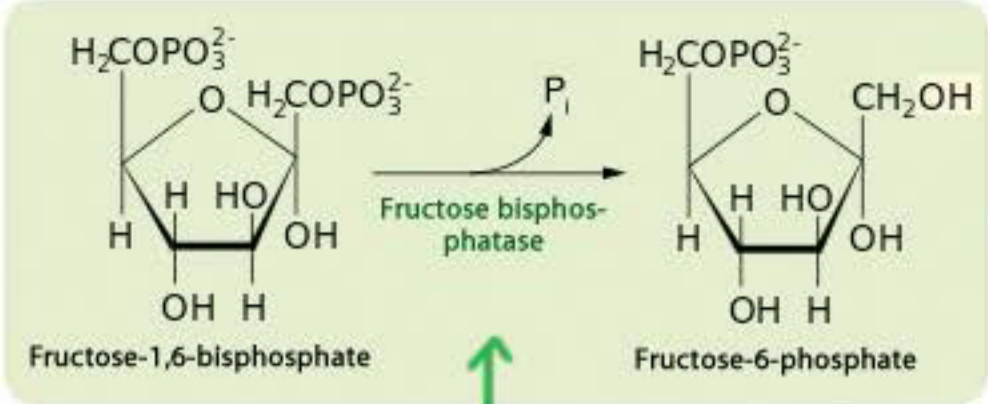


In cytosol

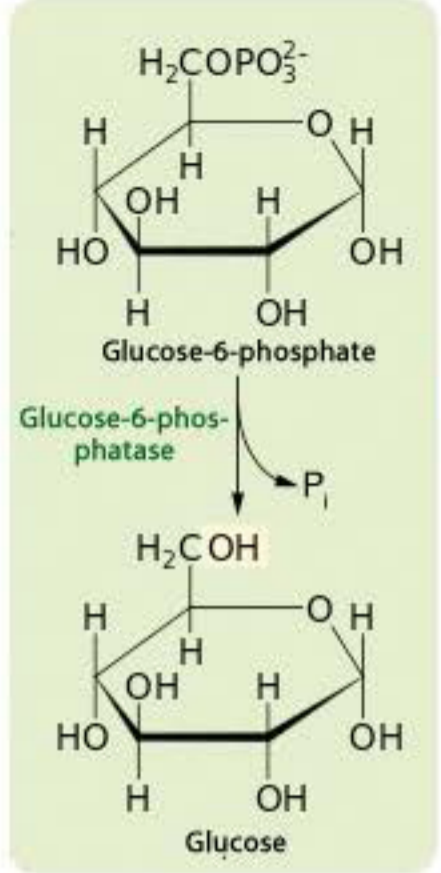
- PKA activates transcription factor

PEP-CK reaction may happen in either the cytosol or the mitochondrion, actually. It depends on the gluconeogenic precursor. If lactate is the precursor, PEP-CK happens in the mitochondrion. This is because lactate to pyruvate will generate the NADH gluconeogenesis needs later, so there is no need to move one to the cytosol. If the precursor is glycerol or an amino acid, on the other hand, the NADH (equivalent) is carried out to the cytosol before PEP-CK with the oxaloacetate being transported out as malate. This is just on the edge of the MCAT knowledge, probably.



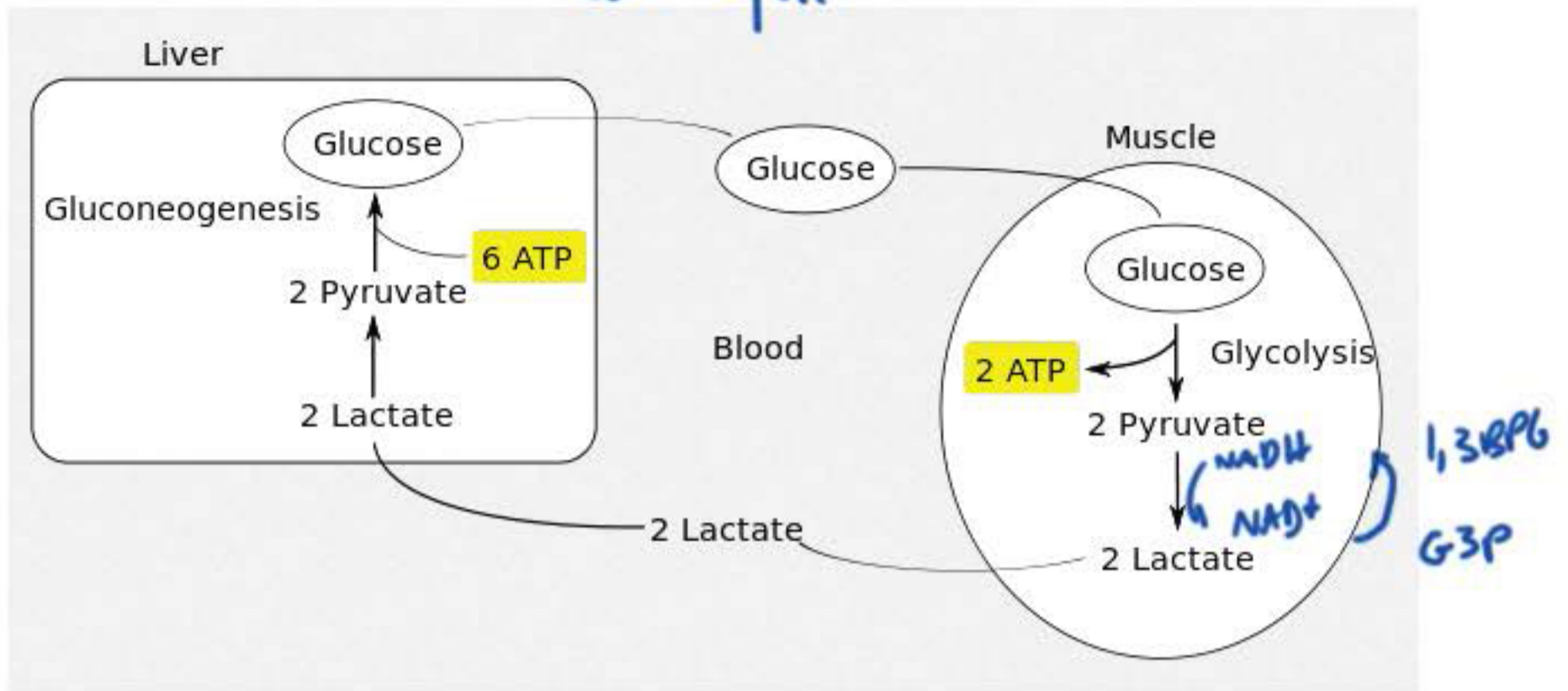


↑
reciprocally
regulated with
PFK I

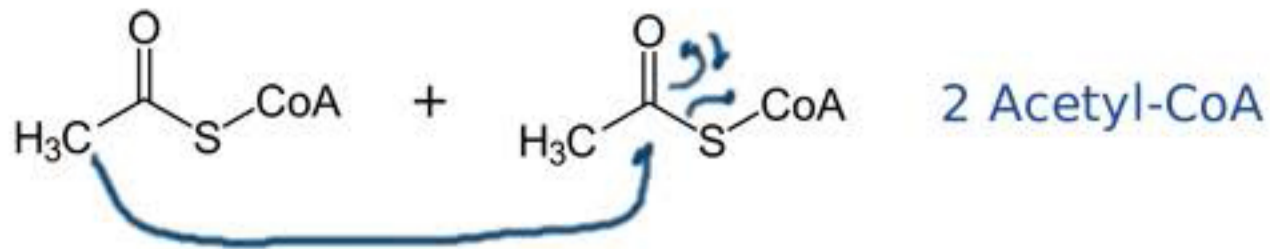


liver
and
kidney

Cori Cycle

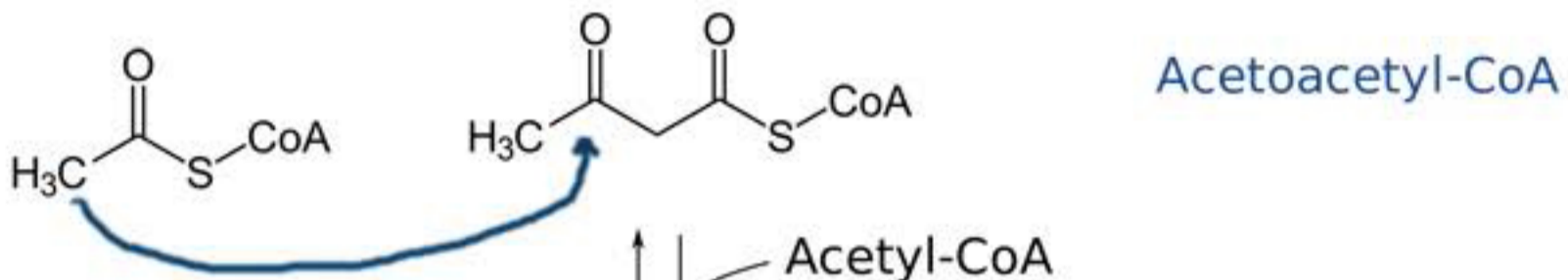
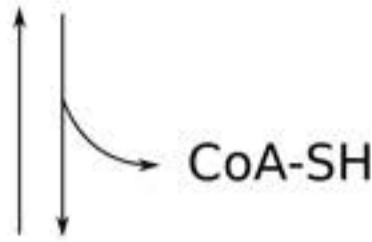


ketosis



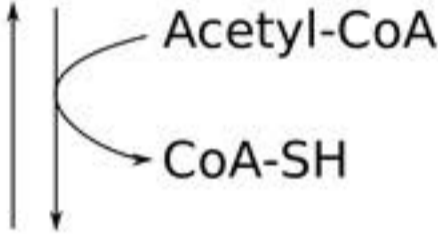
Thiolase

Claisen condensation

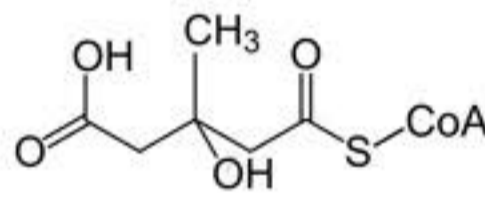


HMG-CoA synthase

Aldol addition

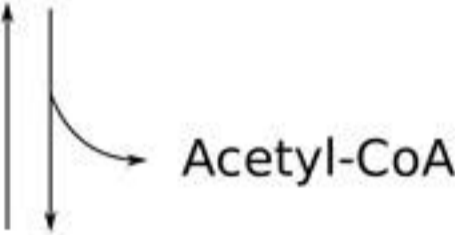


followed by hydrolysis of CoA



HMG-CoA lyase

β -hydroxy- β -methylglutaryl-CoA (HMG-CoA)

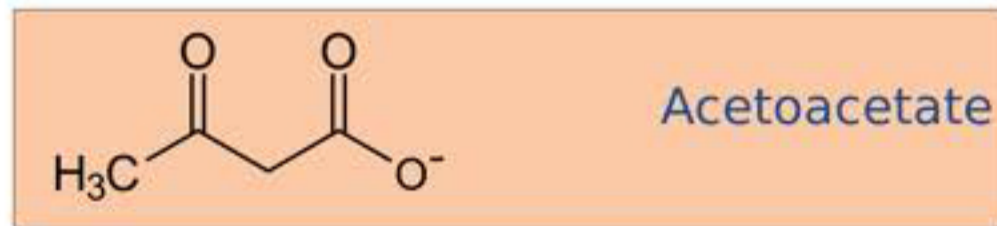


ketone bodies

mevalonate

isopentenyl pyrophosphate

isoprenoid lipids



Non-enzymatic decarboxylation



D- β -hydroxybutyrate dehydrogenase

