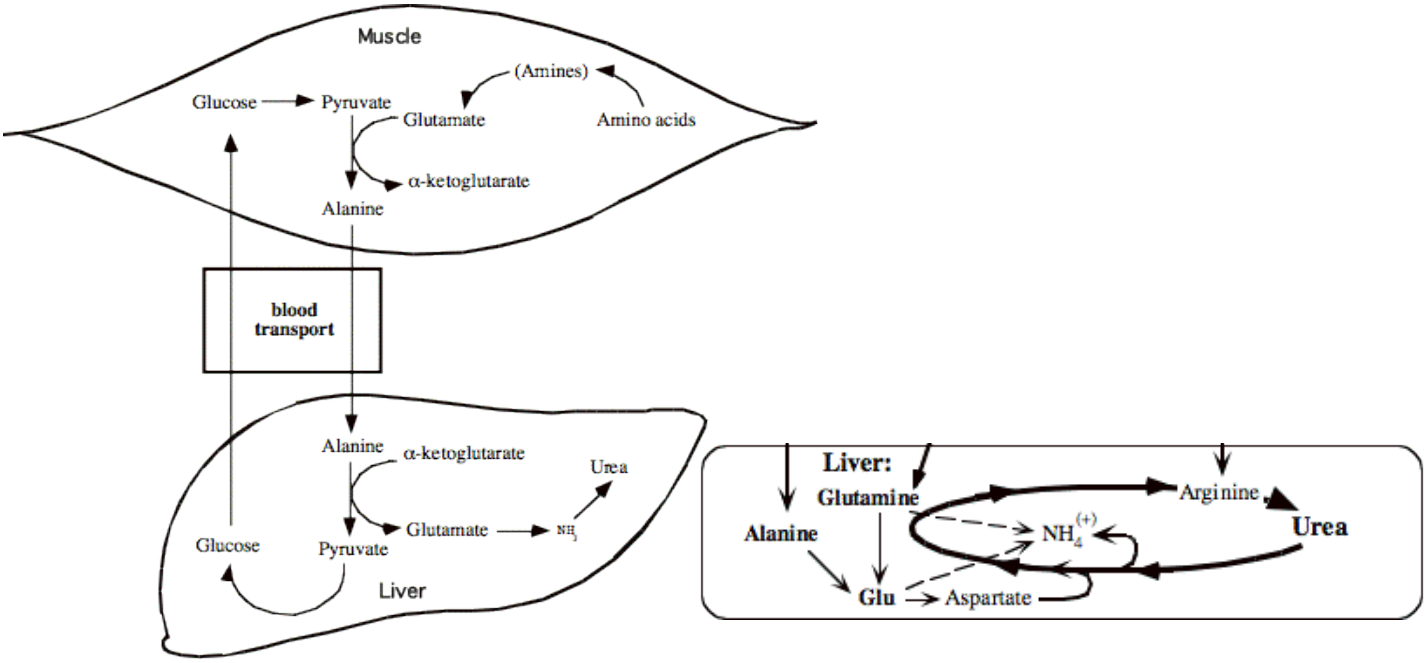
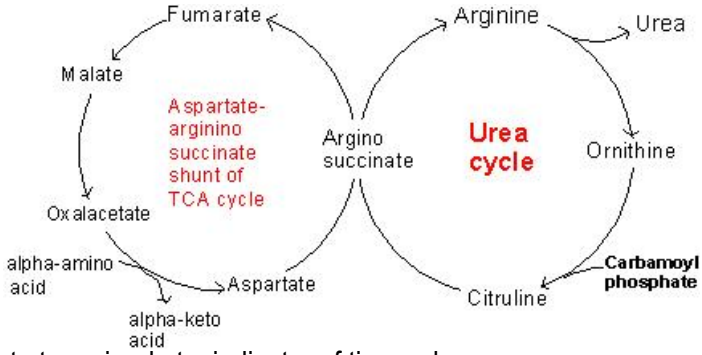
CONCEPT: AMINO ACID OXIDATION

- Glutamine synthetase makes glutamine to send to the liver (glutamate + ATP + NH_4^+ → glutamine + ADP + Pi)
- Glutamine enters the mitochondria, and is broken down into glutamate and NH_4^+ by glutaminase
- Glutamate dehydrogenase converts glutamate to α-ketoglutarate, releases NH_4^+ and reduces $NAD(P)^+$ → NAD(P)H
- Some glutamate is used to add NH_4^+ to oxaloacetate, forming aspartate
- Glucose-alanine cycle occurs in muscles only, and can send alanine to liver
    - □ Convert pyruvate to alanine via a transaminase that transfers an amino group from glutamate
    - □ In liver, alanine is converted to pyruvate by transferring the amino group to α-ketoglutarate, forming glutamate
        - Pyruvate can be used for gluconeogenesis in the liver



- Fumarate can enter the citric acid cycle, and oxaloacetate can be converted to aspartate to enter the urea cycle



- Transaminases – amino-keto to amino-keto, indicator of tissue damage
    - □ (S)GPT and (S)GOT indicate liver damage (S)CK indicate heart attack or infection
- *N*-acetylglutamate stimulates carbamoyl phosphate synthetase

□ *N*-acetylglutamate synthase – acetyl-CoA + glutamate → *N*-acetylglutamate (stimulated by R)