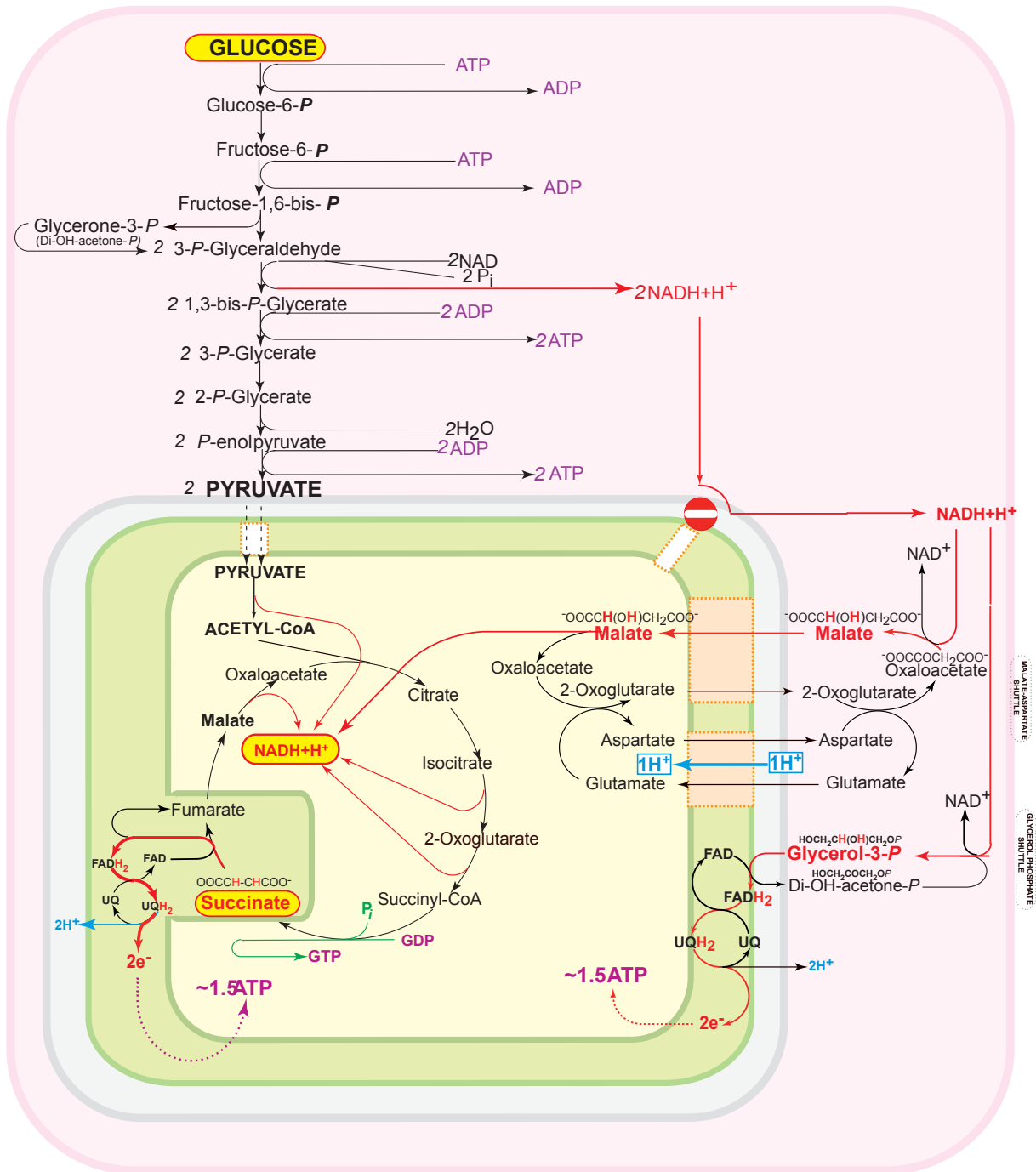


GLYCOLYSIS & TCA CYCLE- SHUTTLES



Malate-Aspartate Shuttle Operates when the NADH/NAD ratio is greater in the cytosol than in the mitochondrial matrix. Electrons are transferred from cytosolic NADH via **malate** across the the mitochondrial inner membrane and re-forms NADH in the matrix. This shuttle requires the translocation of 1 proton for each malate

Glycerol-phosphate Shuttle Operates if low ratio NADH/NAD in the cytosol - but at a cost. Electrons are transferred (via FAD) to ubiquinone at the outer surface of the mitochondrial inner membrane to give ubiquinol which remains in the membrane and feeds into the Electron Transport Chain and forms ATP. This is a pathway similar to that in which succinate is aerobically oxidised and they each result in the formation of approximately 1.5 mols of ATP