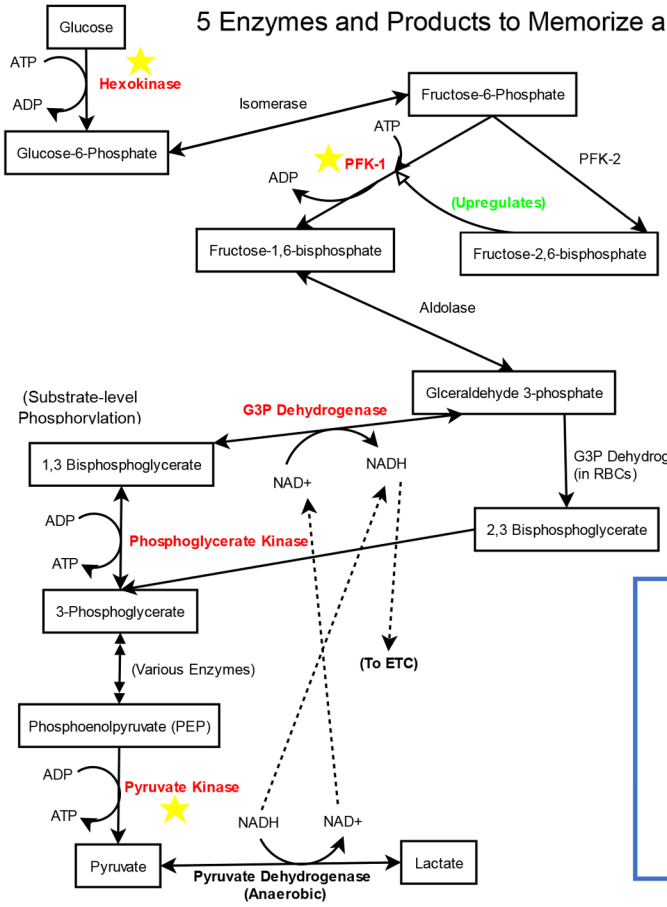
Glycolysis & Gluconeogenesis

Glycolysis

Glucose + 2ATP + 2NAD^+ + 2P_i → 2Pyruvate + 2NADH + 4ATP (2 net ATP)

5 Enzymes and Products to Memorize and 2 to understand. All Occurs intracellularly unless noted.



Irreversible Enzymes:

1) Hexokinase
2) PFK-1
3) Pyruvate Kinase

- 2 Kinases use ATP, then 2 kinases give ATP
- Dehydrogenases either reduce or oxidize **NAD^+ or NADH**

Steps to remember:

1) Hexokinase–(-ATP), Glucose trapped
2) PFK-1– (-ATP)
3) G3P DH (GAPDH)–+NADH
4) PGK–(+ATP)
5) Pyruvate Kinase–(+ATP)

Mnemonic for the 5 Steps to Remember
Help **P**eter **G**et **P**ickled **P**eppers

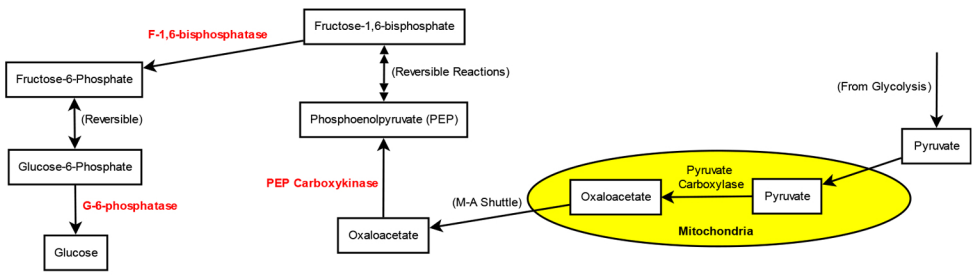
- Hexokinase in all tissues, **Glucokinase in Liver**
- Glucose-6-Phosphate inhibits Hexokinase via **feedback inhibition**

In the absence of Oxygen, **Fermentation** will take place:
Pyruvate + NADH → Lactate + NAD^+

- Via **Lactate Dehydrogenase**
- Allows NAD^+ to be replenished for continued Glycolysis

Gluconeogenesis

Glycolysis in reverse: just remember the 'inverse' reactions to the three irreversible glycolysis reactions!
Best understood in context with metabolism—Upregulated by **Glucagon**, **Epinephrine** **during Fasting**.
Downregulated by **Insulin** **during satiety** (Mostly Liver, Kidney Cortex)



Substrates for Gluconeogenesis:

- Glycerol-3-phosphate (lipids)
- Lactate
- All AA except leucine and lysine