Gluconeogenesis

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Gluconeogenesis

Gluconeogenesis (GNG) is a metabolic pathway that results in the generation of glucose from certain non-carbohydrate carbon substrates.

These substrates include :

glucogenic amino acids From breakdown of proteins (not all), breakdown of lipids (such as triglycerides, glycerol, odd-chain fatty acids (not even-chain fatty acids)

other steps in metabolism they include pyruvate and lactate.

Gluconeogenesis is one of several main mechanisms used by humans and many other animals to maintain blood glucose levels, avoiding low levels (hypoglycemia).

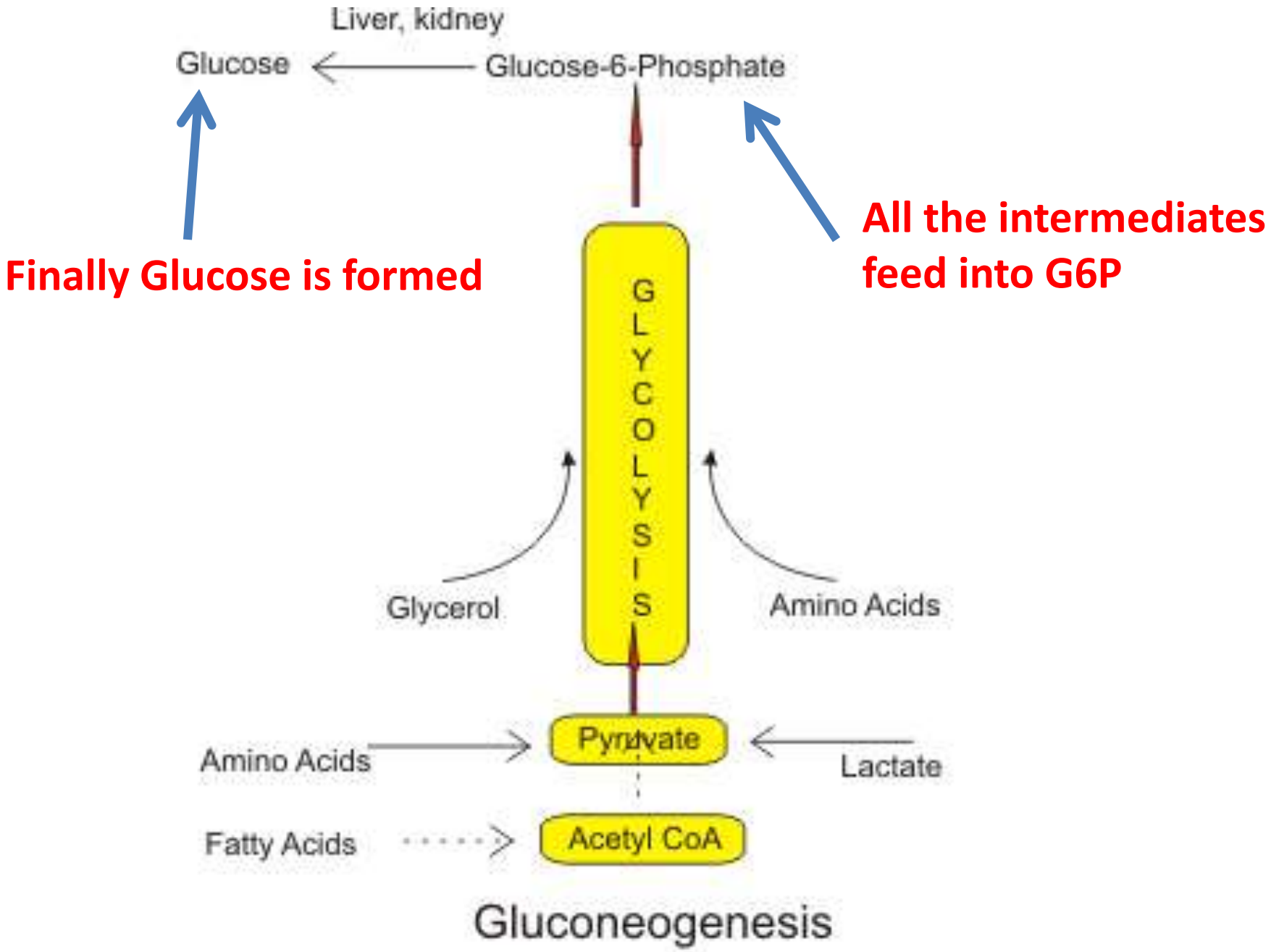
Maintaining proper blood glucose level is extremely important

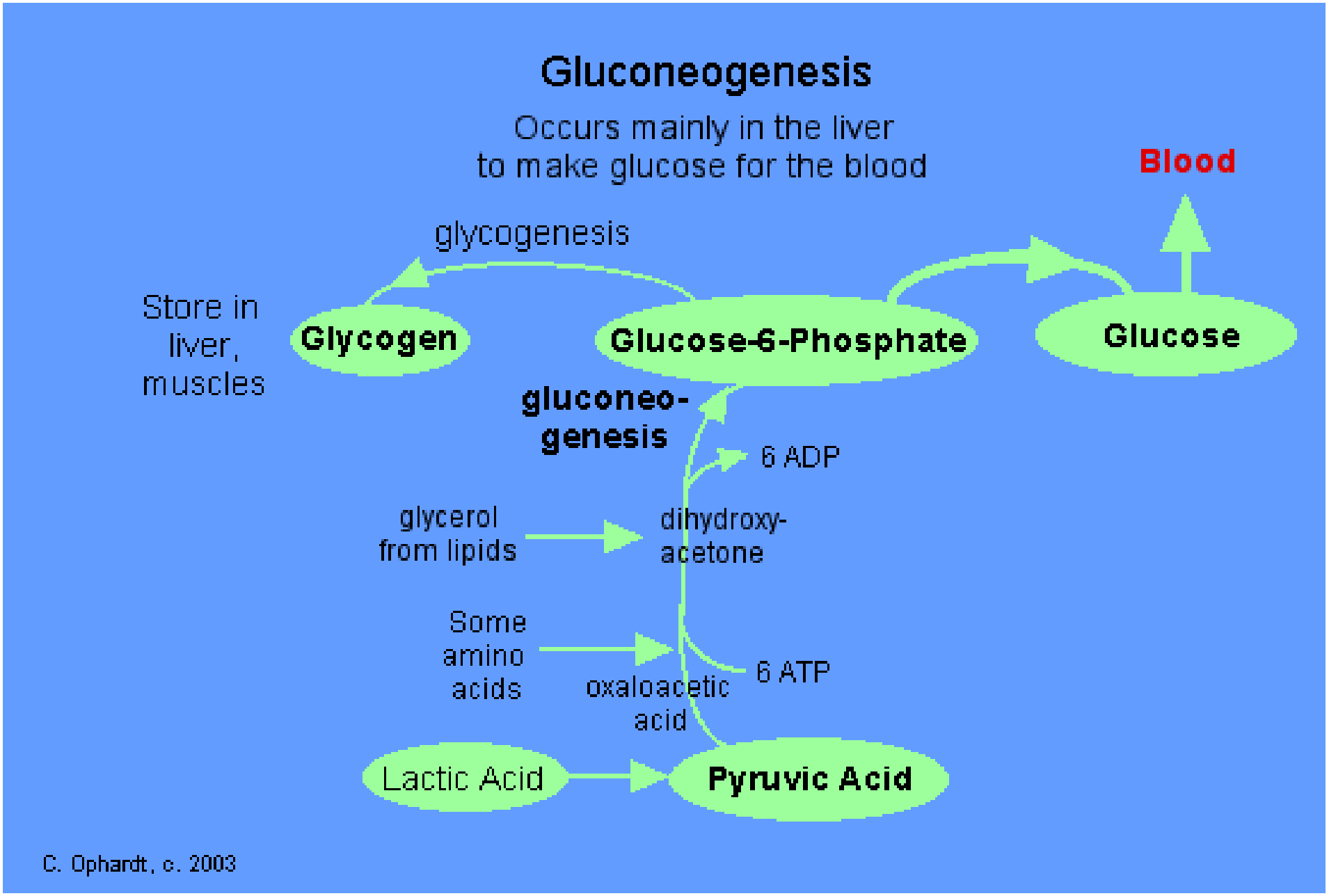
Glucose is the only fuel for Human Brain

The blood–brain barrier (BBB) is a highly selective semipermeable border that separates the circulating blood from the brain and extracellular fluid in the central nervous system

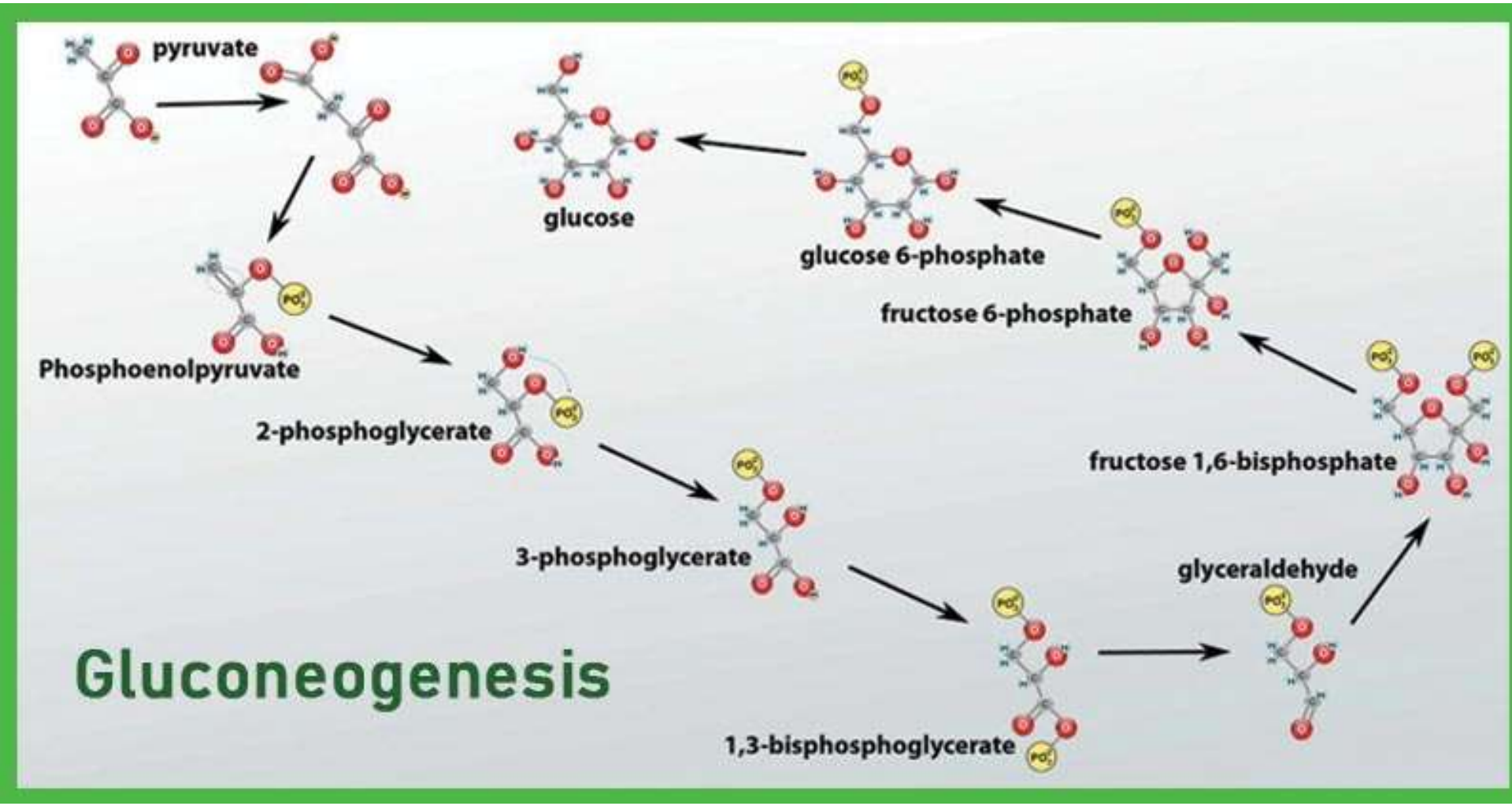
This system is very strict and allows only the passage of some molecules by passive diffusion, and selective transport of molecules such as glucose, water and amino acids that are crucial to neural function.

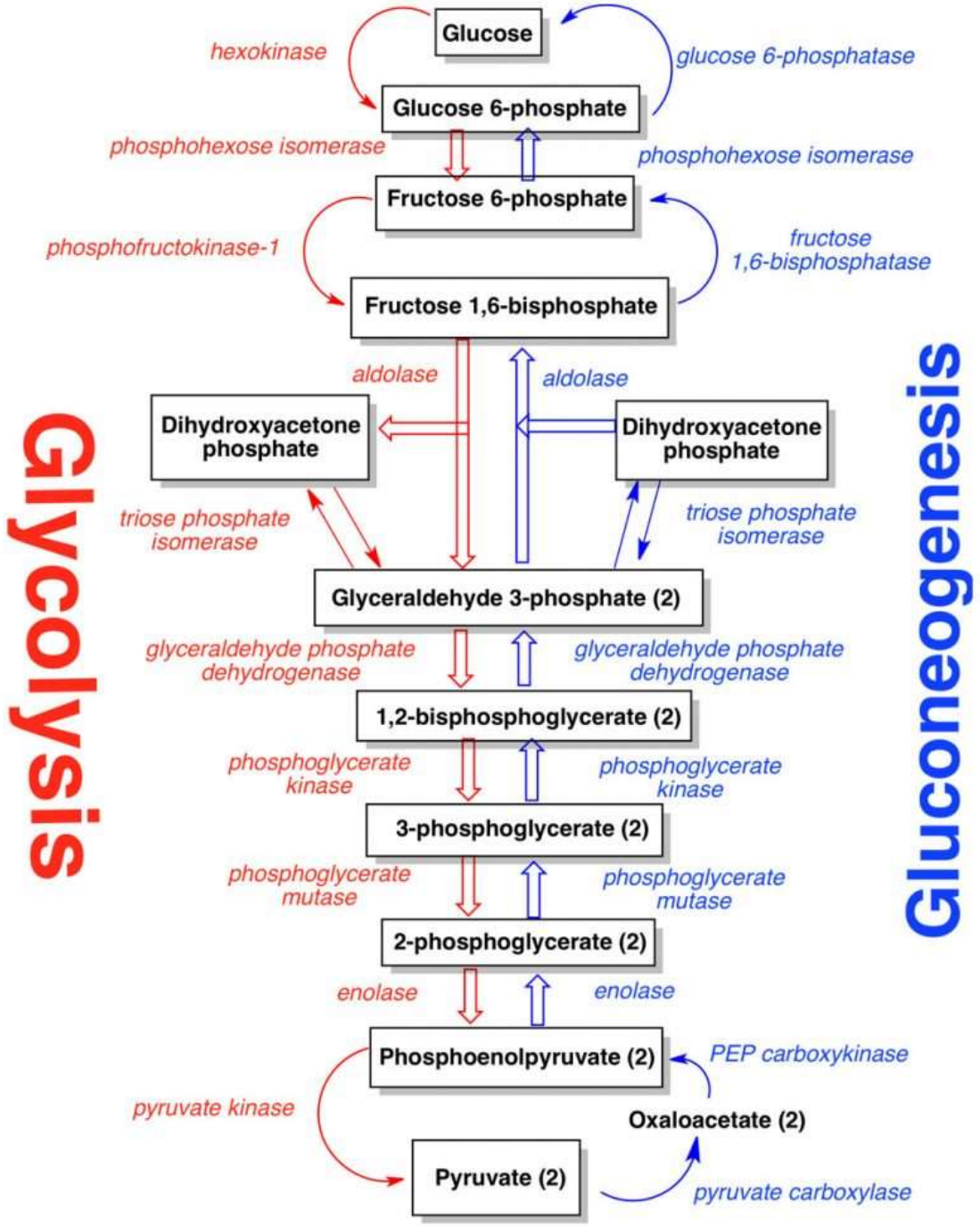
Cells of the blood-brain barrier actively transport metabolic products such as glucose across the barrier using specific transport proteins


Liver, kidney
Glucose
Glucose-6-Phosphate
Finally Glucose is formed
All the intermediates feed into G6P
GLYCOLYSIS
Glycerol
Amino Acids
Pyruvate
Amino Acids
Lactate
Fatty Acids
Acetyl CoA
Gluconeogenesis
Frank Bourphrey M.D. 2009


Gluconeogenesis
Occurs mainly in the liver
to make glucose for the blood
Blood
glycogenesis
Store in
liver,
muscles
Glycogen
Glucose-6-Phosphate
Glucose
gluconeo-
genesis
6 ADP
glycerol
from lipids
dihydroxy-
acetone
Some
amino
acids
6 ATP
oxaloacetic
acid
Lactic Acid
Pyruvic Acid
C. Ophardt, c. 2003

Steps of Gluconeogenesis





Steps of Gluconeogenesis

Reciprocal regulation of glycolysis & gluconeogenesis

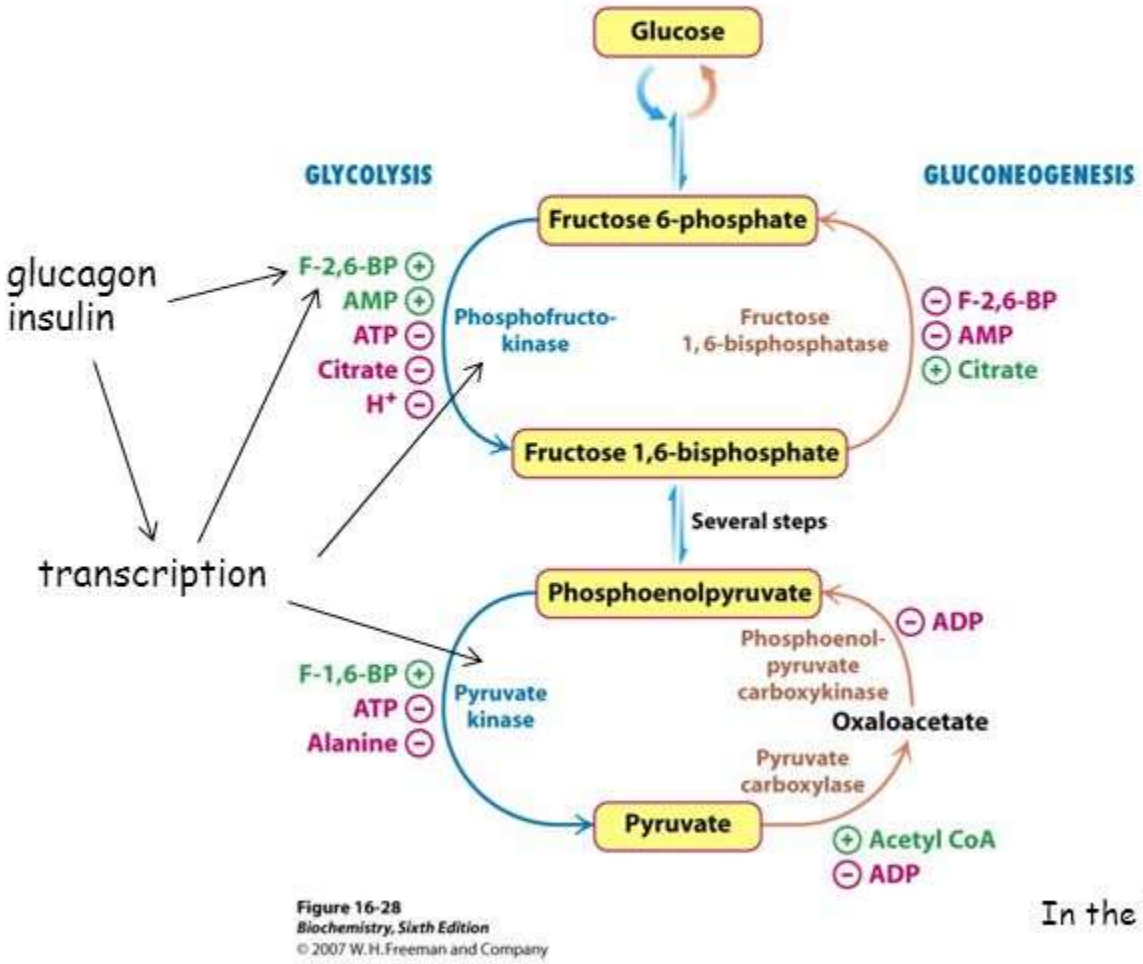


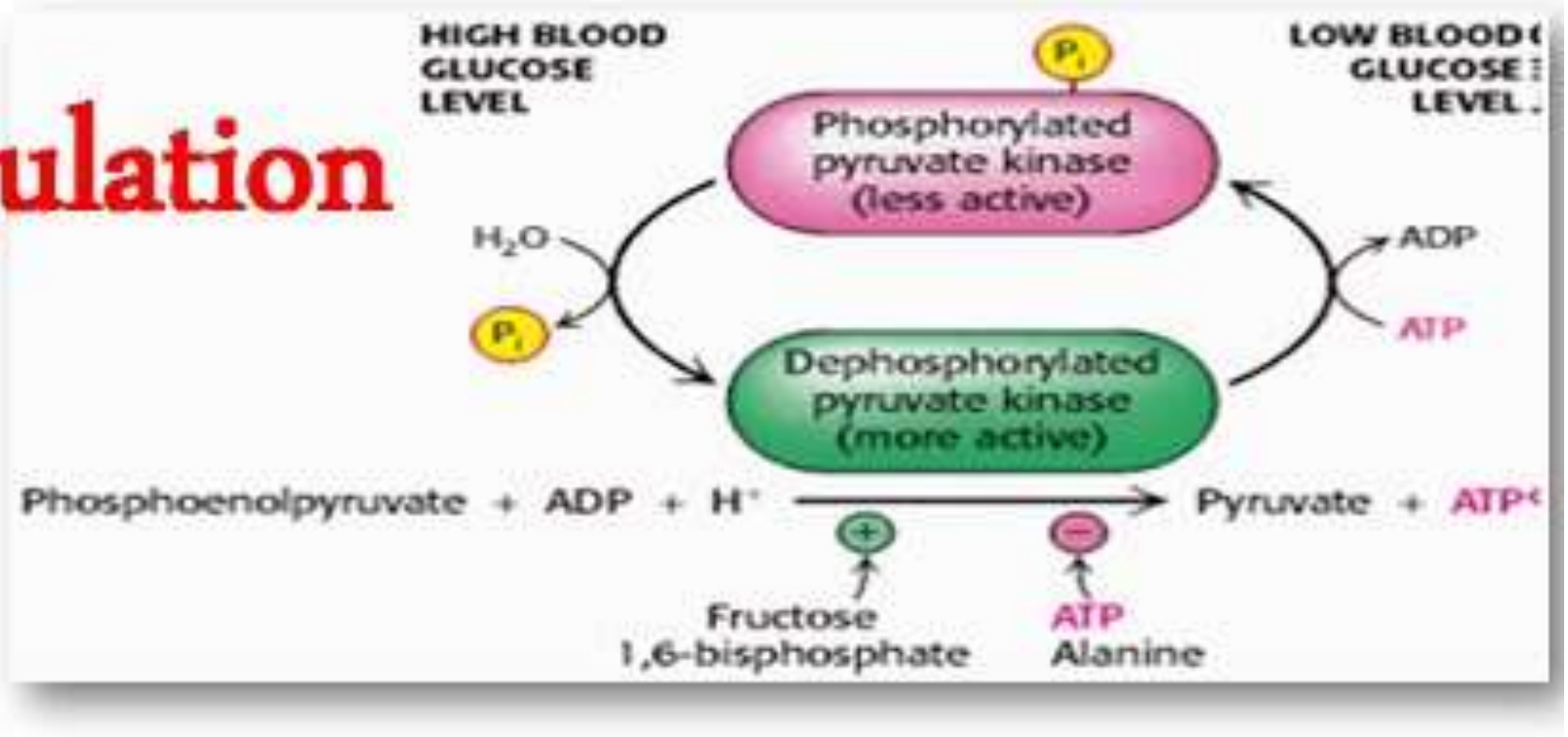
Figure 16-28
Biochemistry, Sixth Edition

- Pathways not active at same time
- Regulated by products of reaction and precursors (allostery)
- Regulated by hormones: glucagon & insulin, through F-2,6-BP
- Regulated at the transcriptional level of genes

In the liver: aim is to maintain blood glucose level

Gluconeogenesis

regulation



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