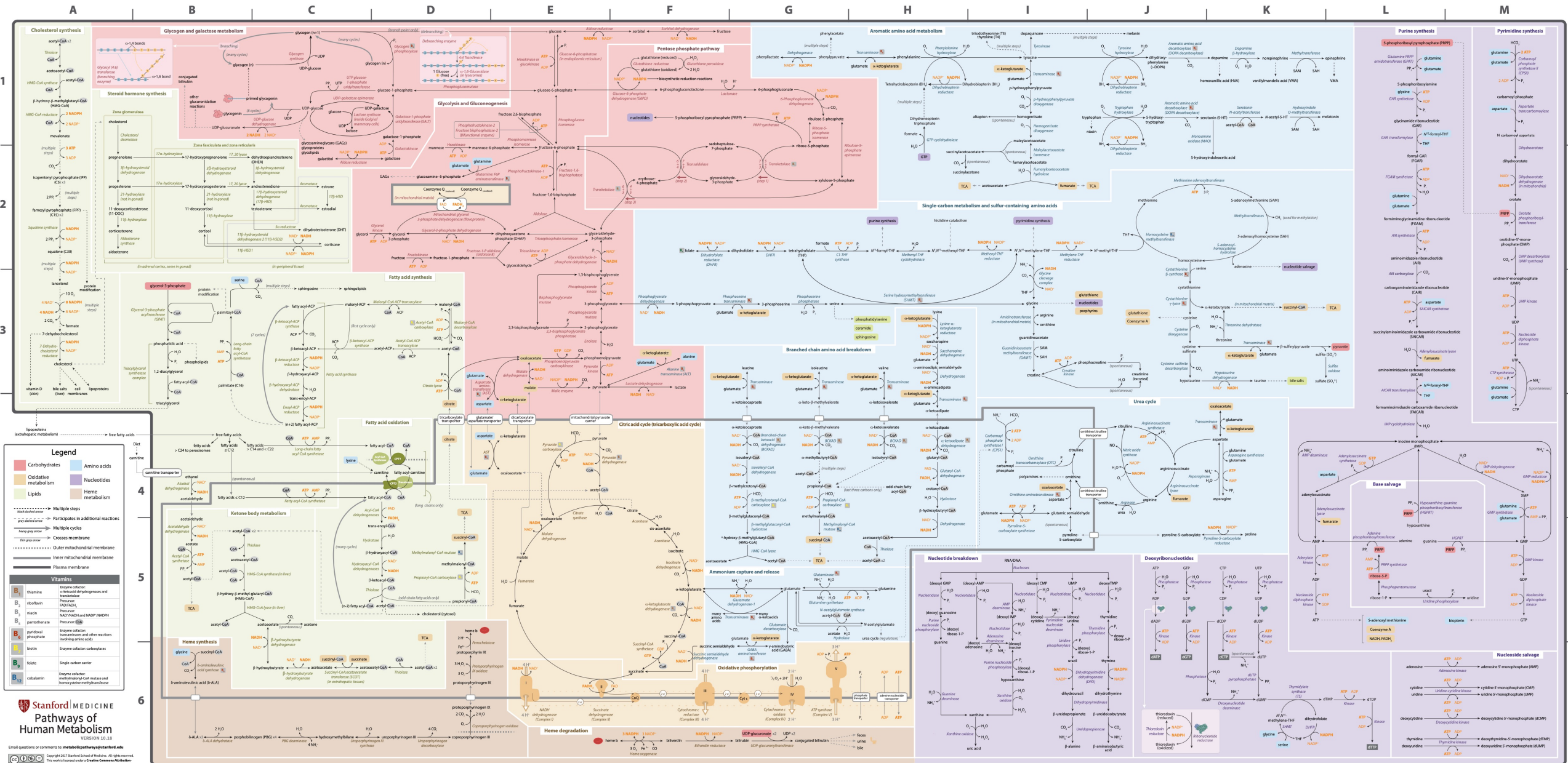


METABOLISM AND CANCER

MCM5952

2022



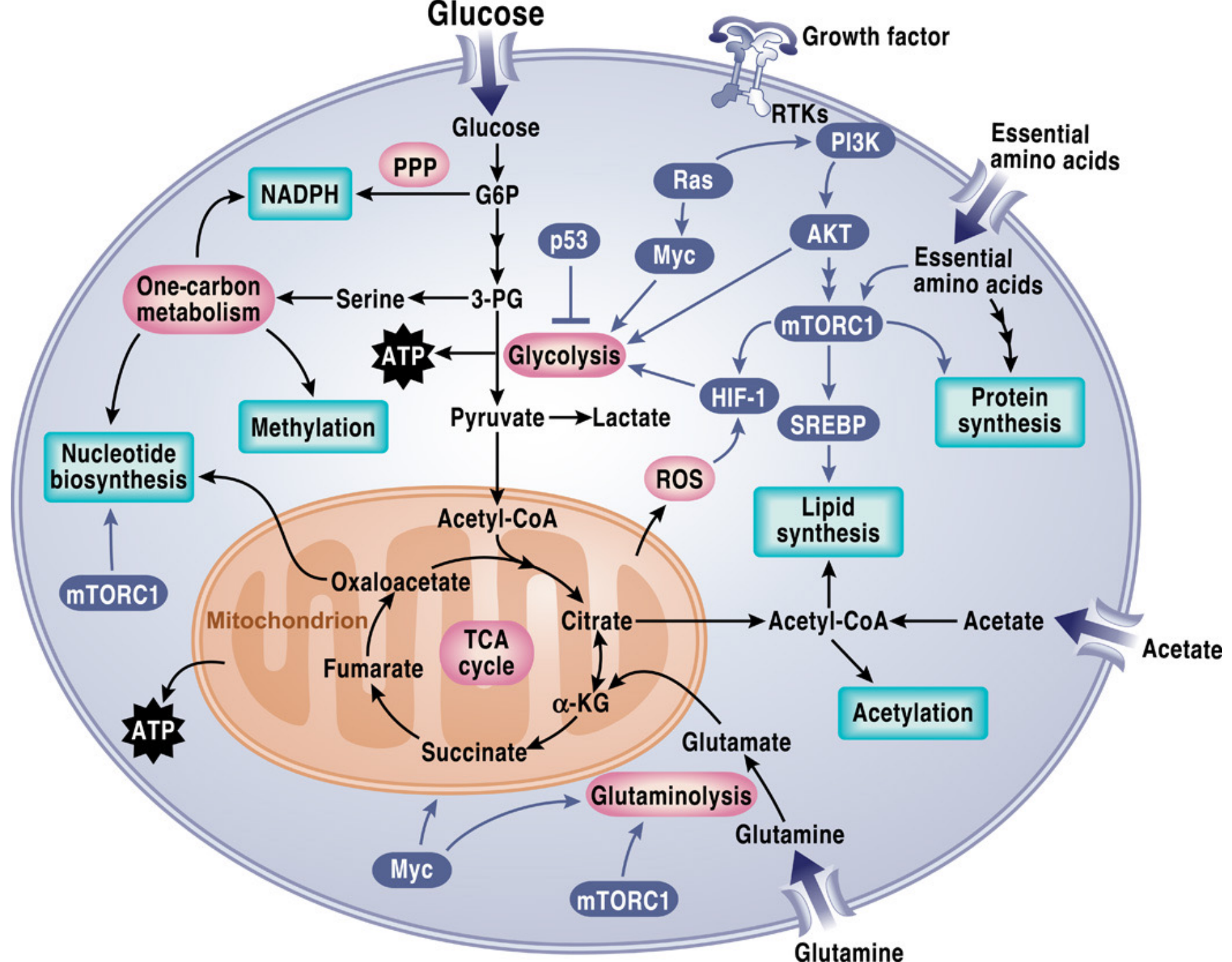
Legend

- Carbohydrates
- Amino acids
- Oxidative metabolism
- Nucleotides
- Lipids
- Heme metabolism

Multiple steps
 Participates in additional reactions
 Multiple cycles
 Outer mitochondrial membrane
 Inner mitochondrial membrane
 Plasma membrane

Vitamins	Function	
B1	Thiamine	Enzyme cofactor in several dehydrogenases and transaminases
B2	Riboflavin	Enzyme cofactor
B3	Niacin	NAD ⁺ /NADP ⁺ and NAD ⁺ /NADH
B5	Pantoic acid	Enzyme cofactor
B6	Pyridoxal phosphate	Enzyme cofactor in transamination and other reactions involving amino acids
B7	Biotin	Enzyme cofactor in carboxylation reactions
B9	Folate	Single-carbon carrier
B12	Cobalamin	Enzyme cofactor in methylmalonyl-CoA mutase and methionine synthase

Localization



Cell function and cell proliferation

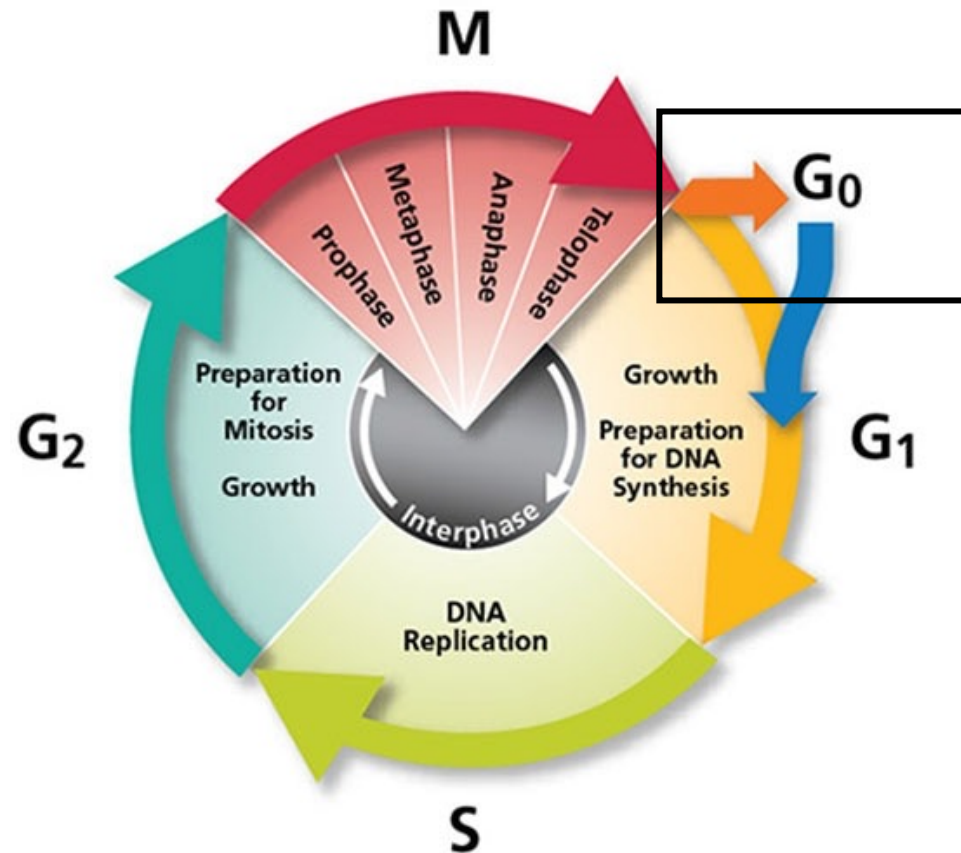
adult non proliferating cells – quiescent – function, but no proliferation

Examples:

hepatocytes, neurons, resting lymphocytes

adult proliferating cells – may also have function, but metabolism bias toward proliferation

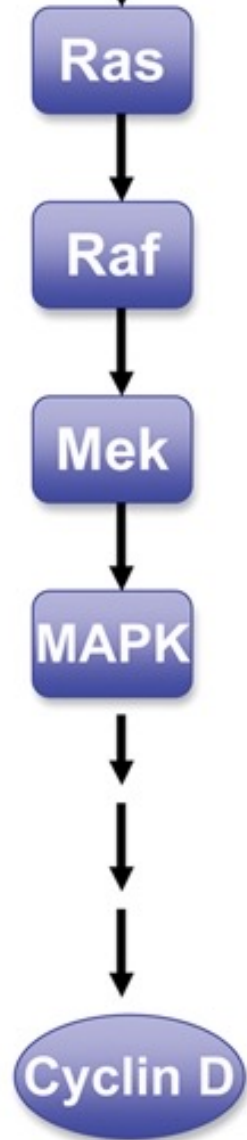
stem cells, basal layer epithelial cells, lymphocytes



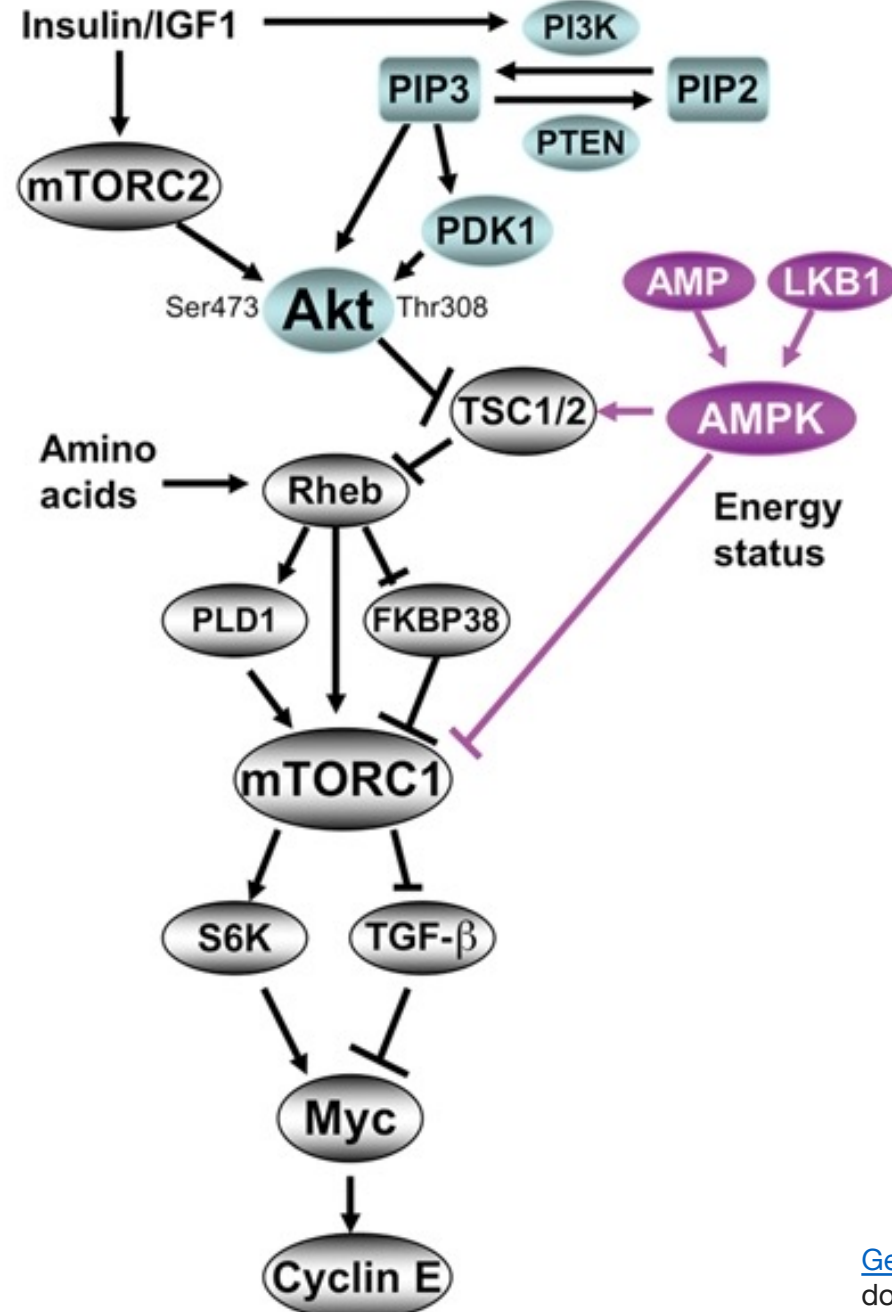
Mitogenic signals
Nutrients

A Ras Signals

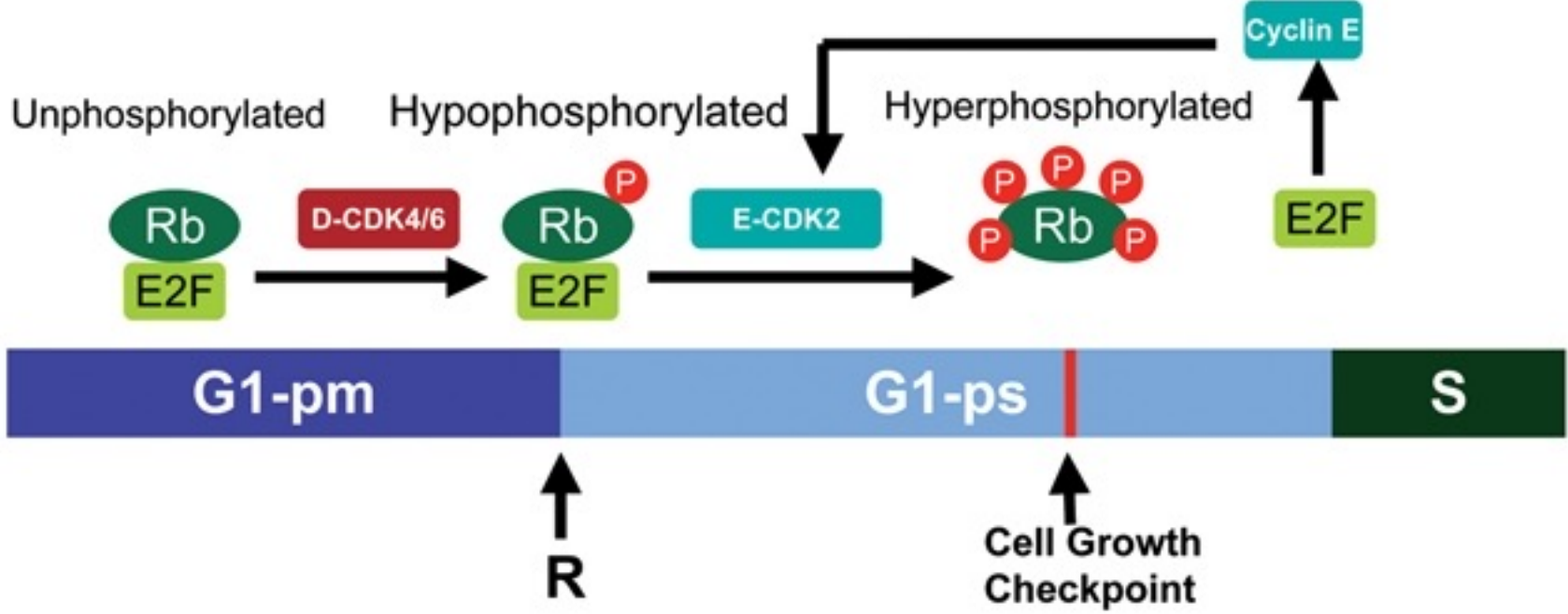
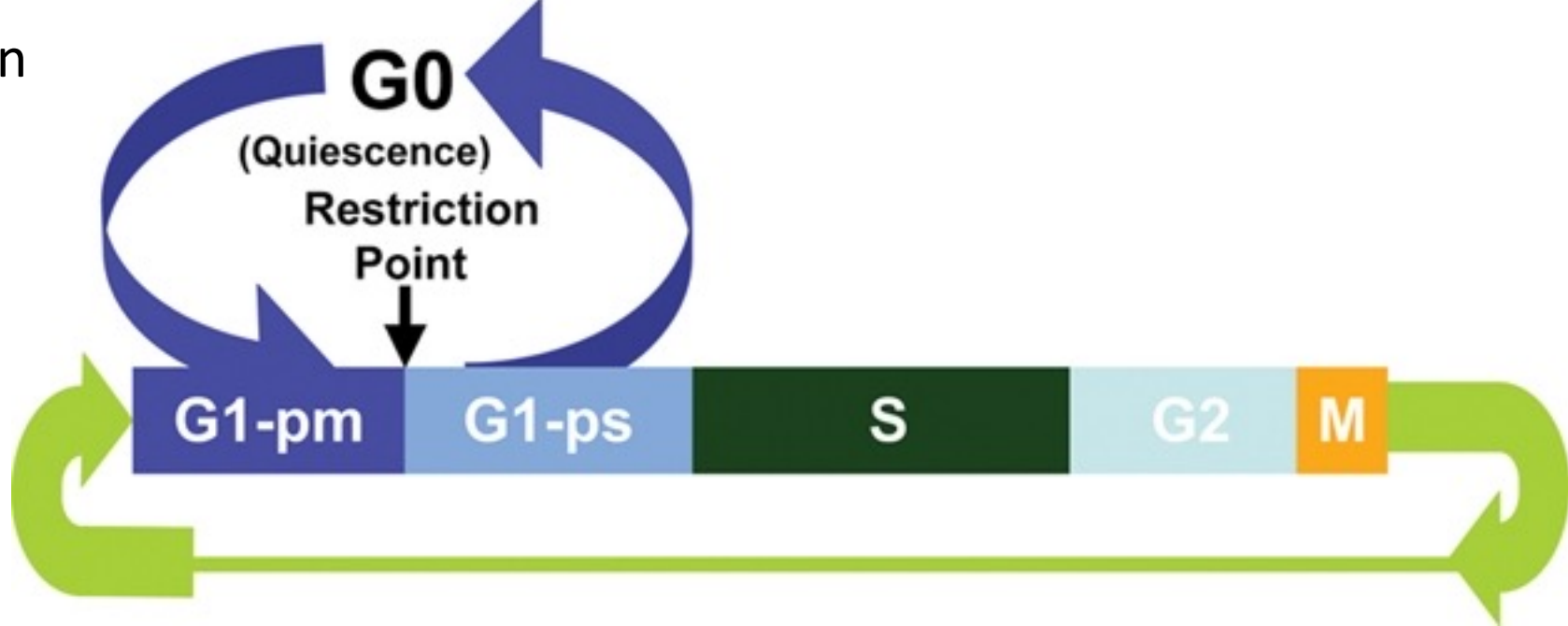
Growth factors



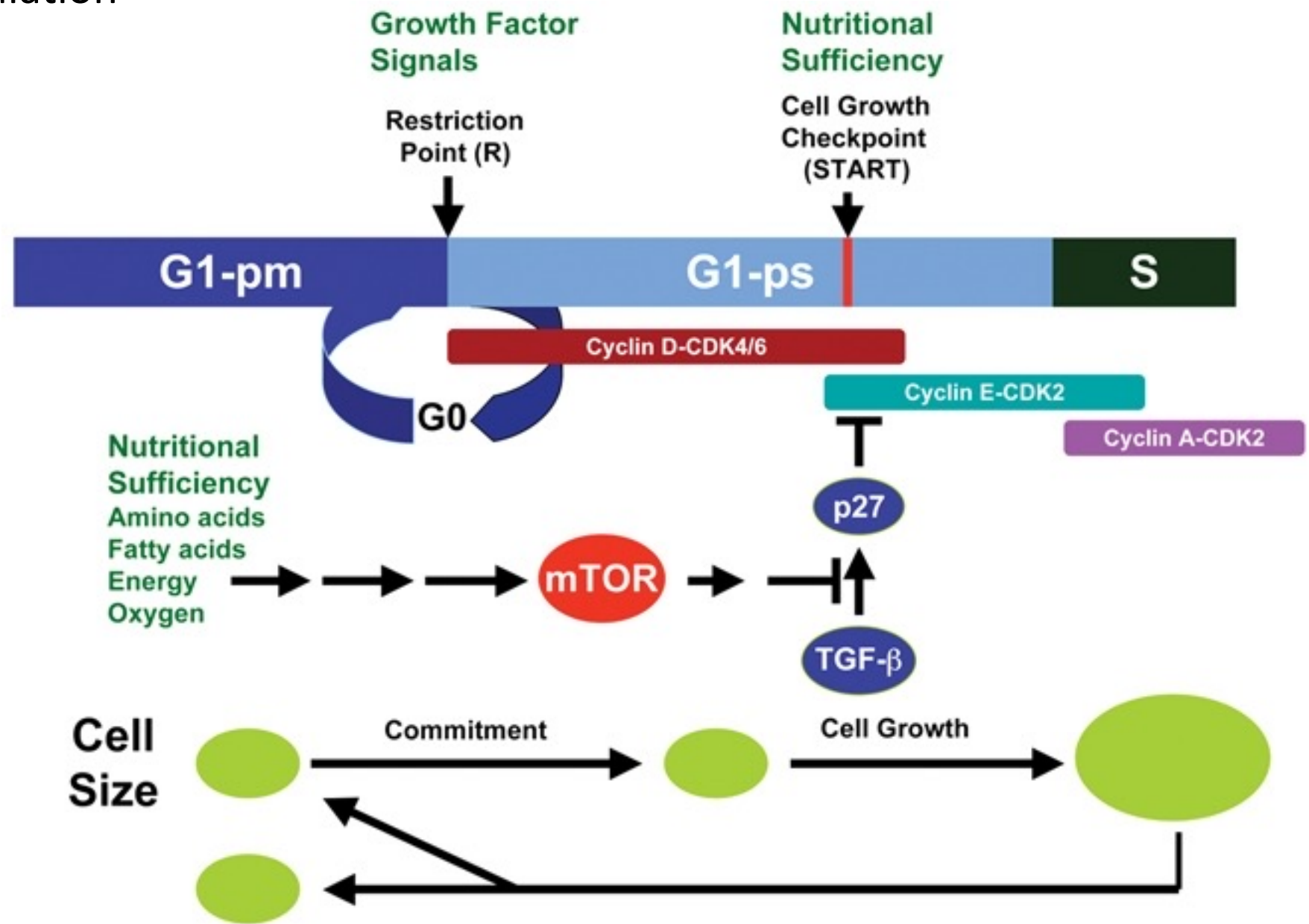
B mTOR Signals



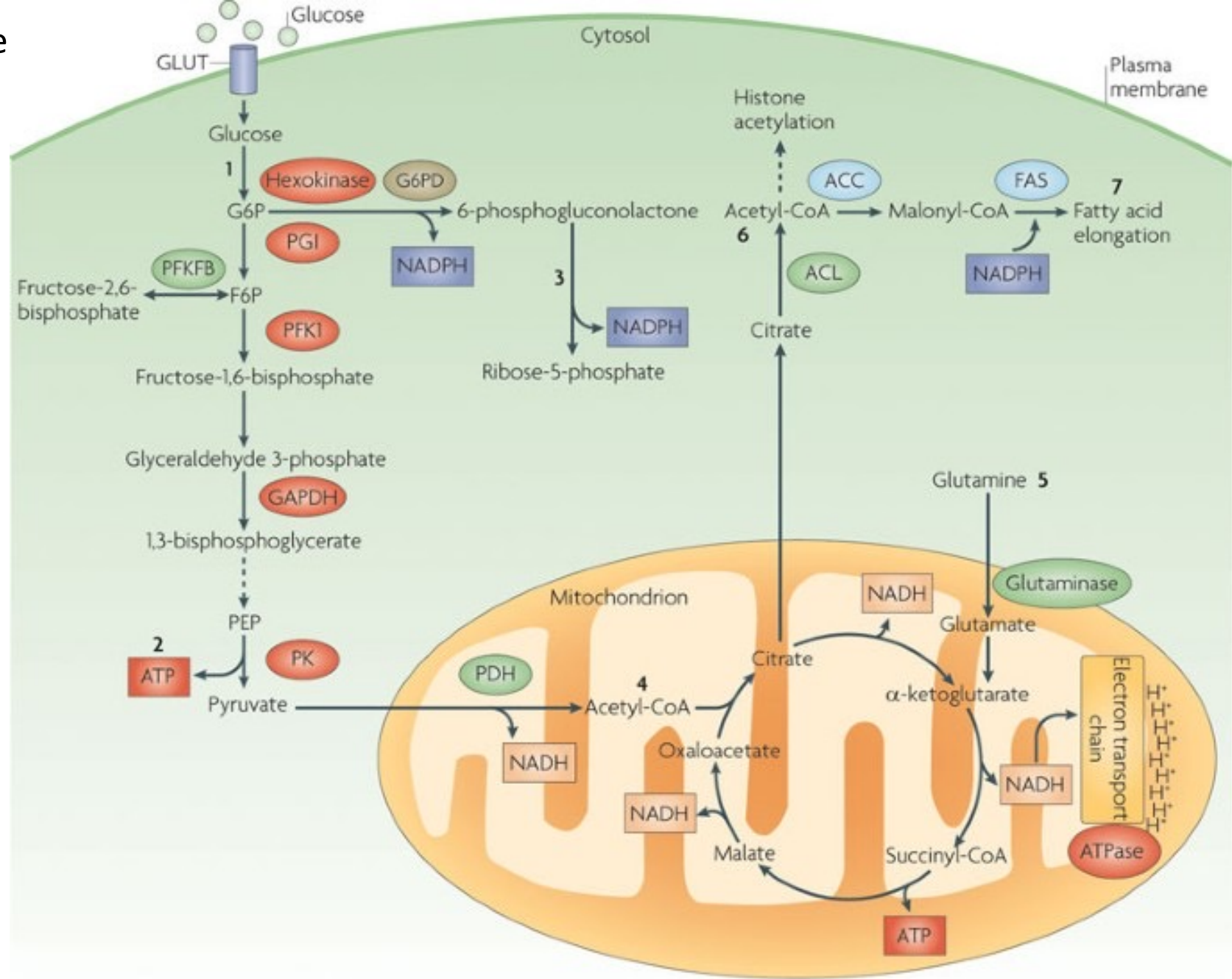
Cell Cycle regulation



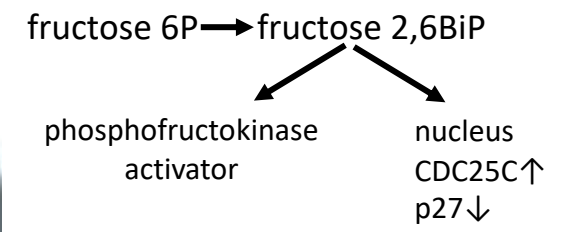
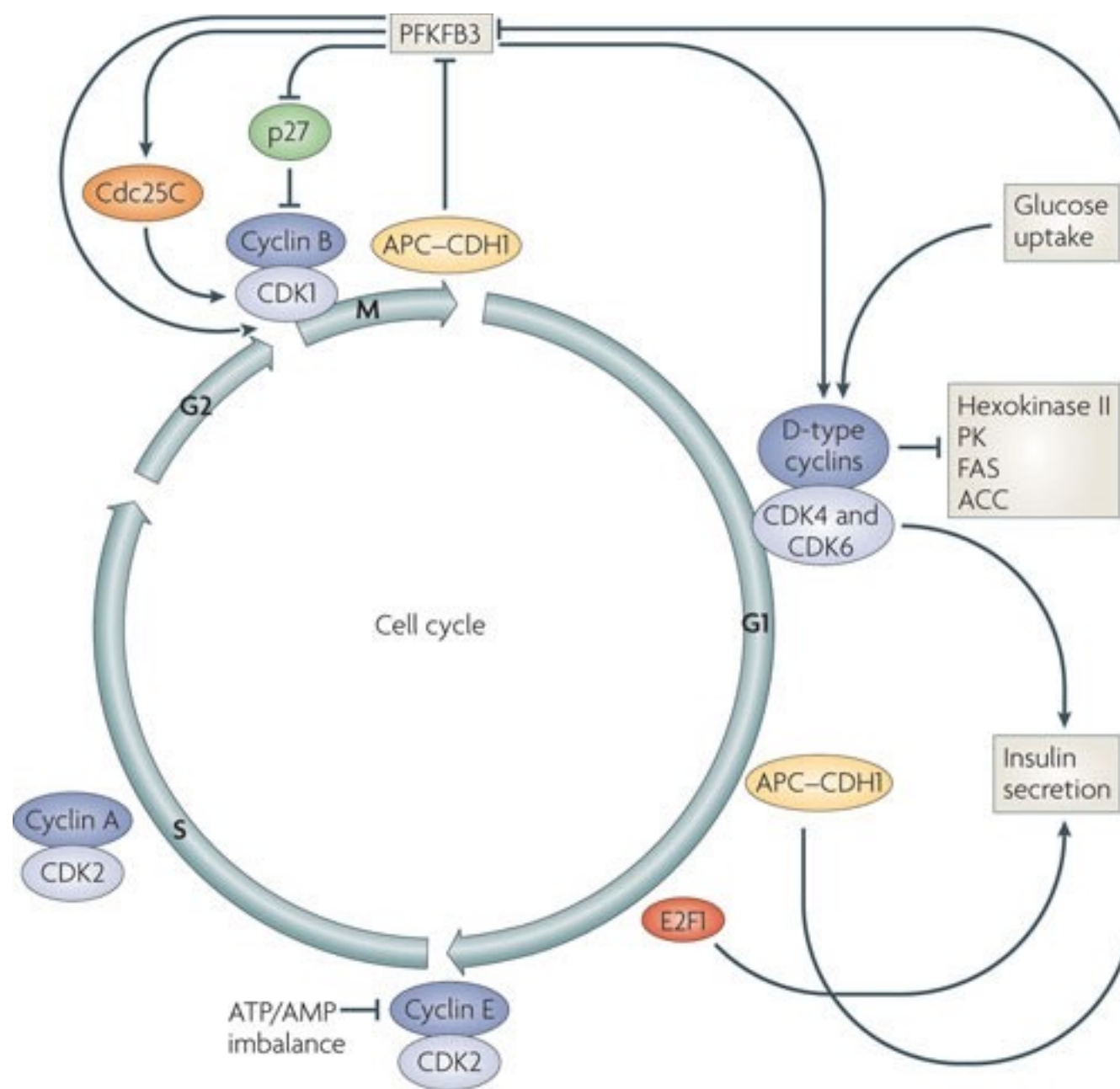
Cell Cycle regulation



Metabolism and cell cycle



Buchakjian, M., Kornbluth, S. The engine driving the ship: metabolic steering of cell proliferation and death. *Nat Rev Mol Cell Biol* 11, 715–727 (2010). <https://doi.org/10.1038/nrm2972>



Control steps in glycolysis

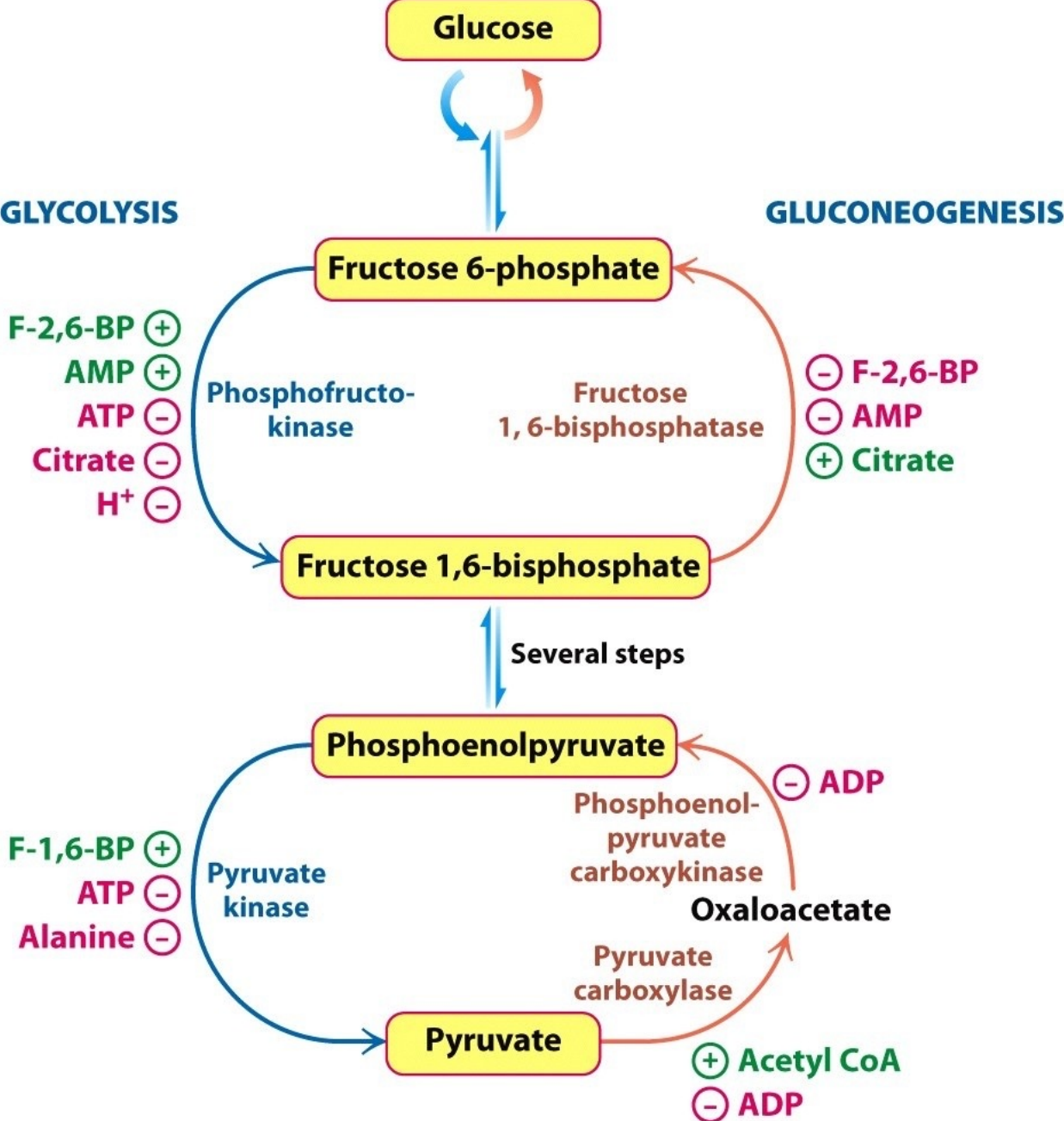
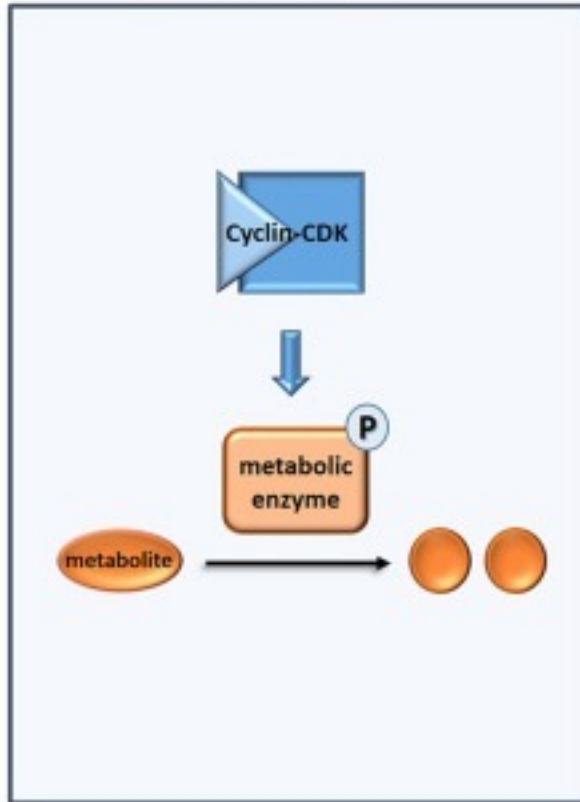


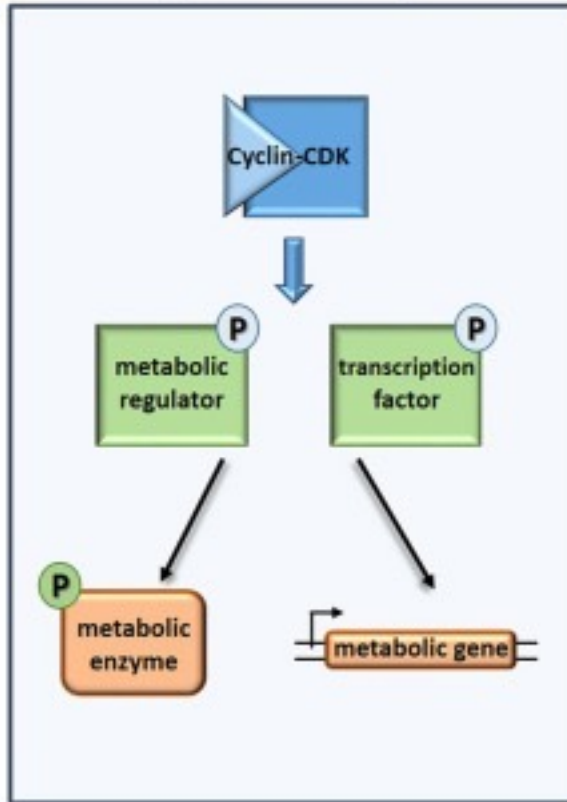
Figure 16.30
Biochemistry, Seventh Edition
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Cyclins and metabolism

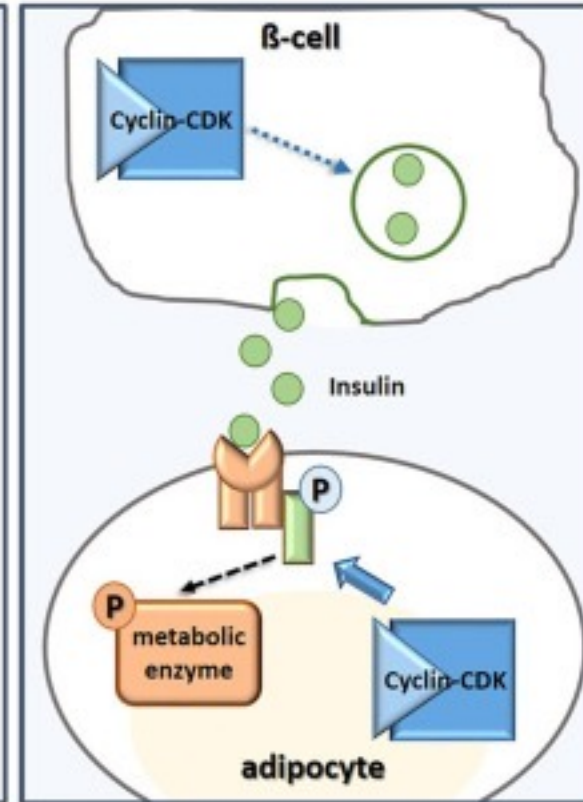
Direct phosphorylation of metabolic enzymes



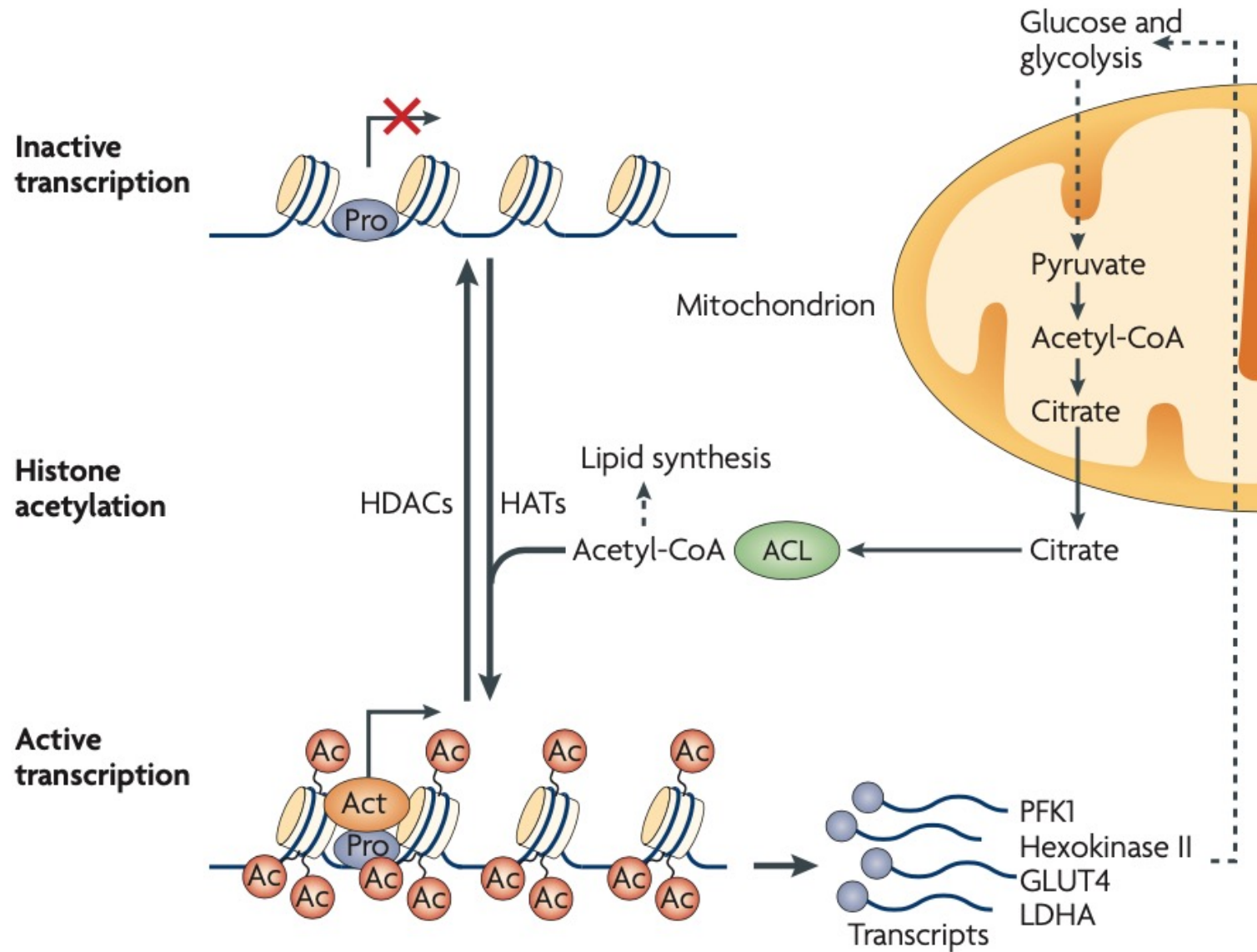
Indirect regulation of metabolism through metabolic regulators



Regulation of organismal energy metabolism



Chromatin control and metabolism



Nutrients - p53 – cell cycle control and apoptosis

