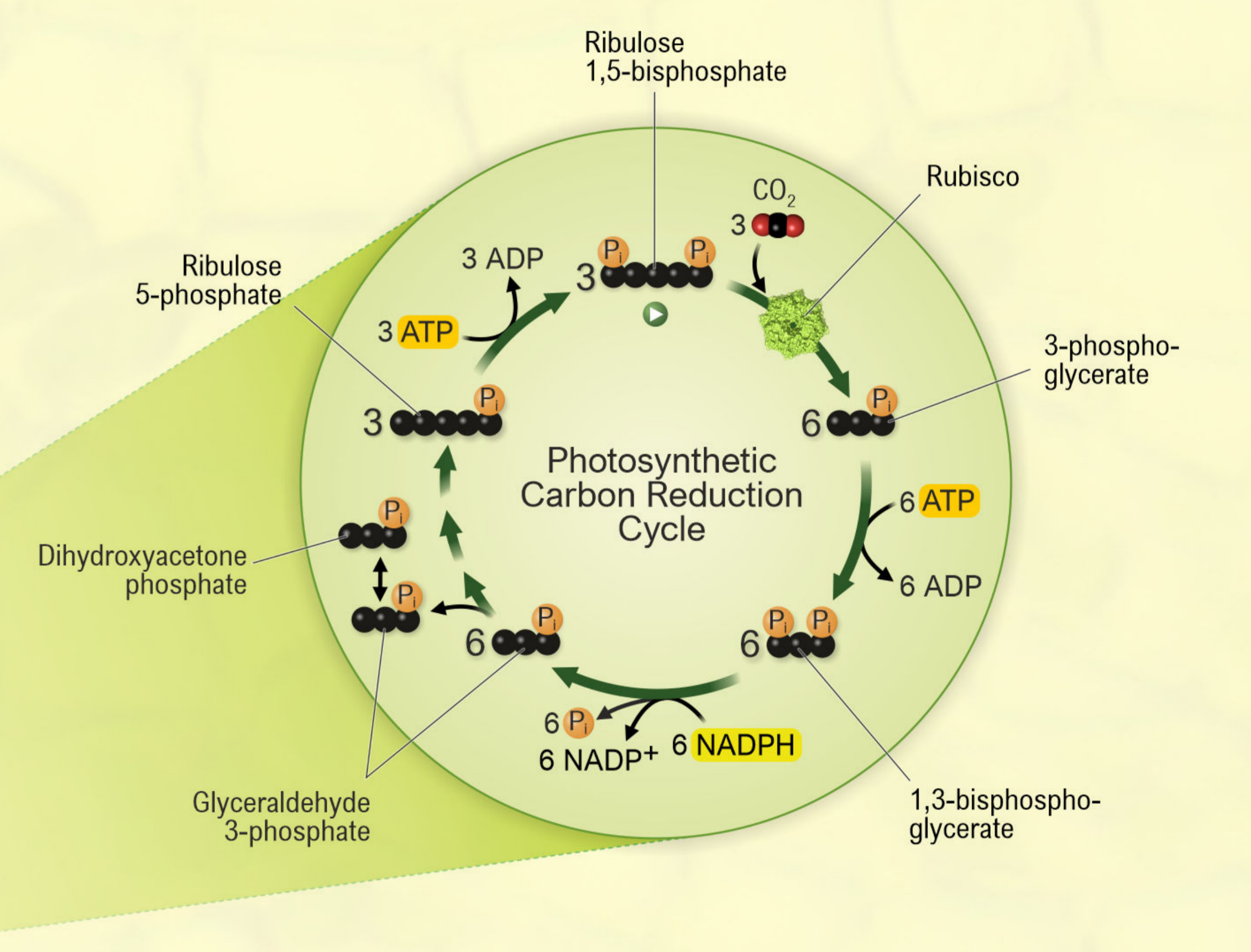
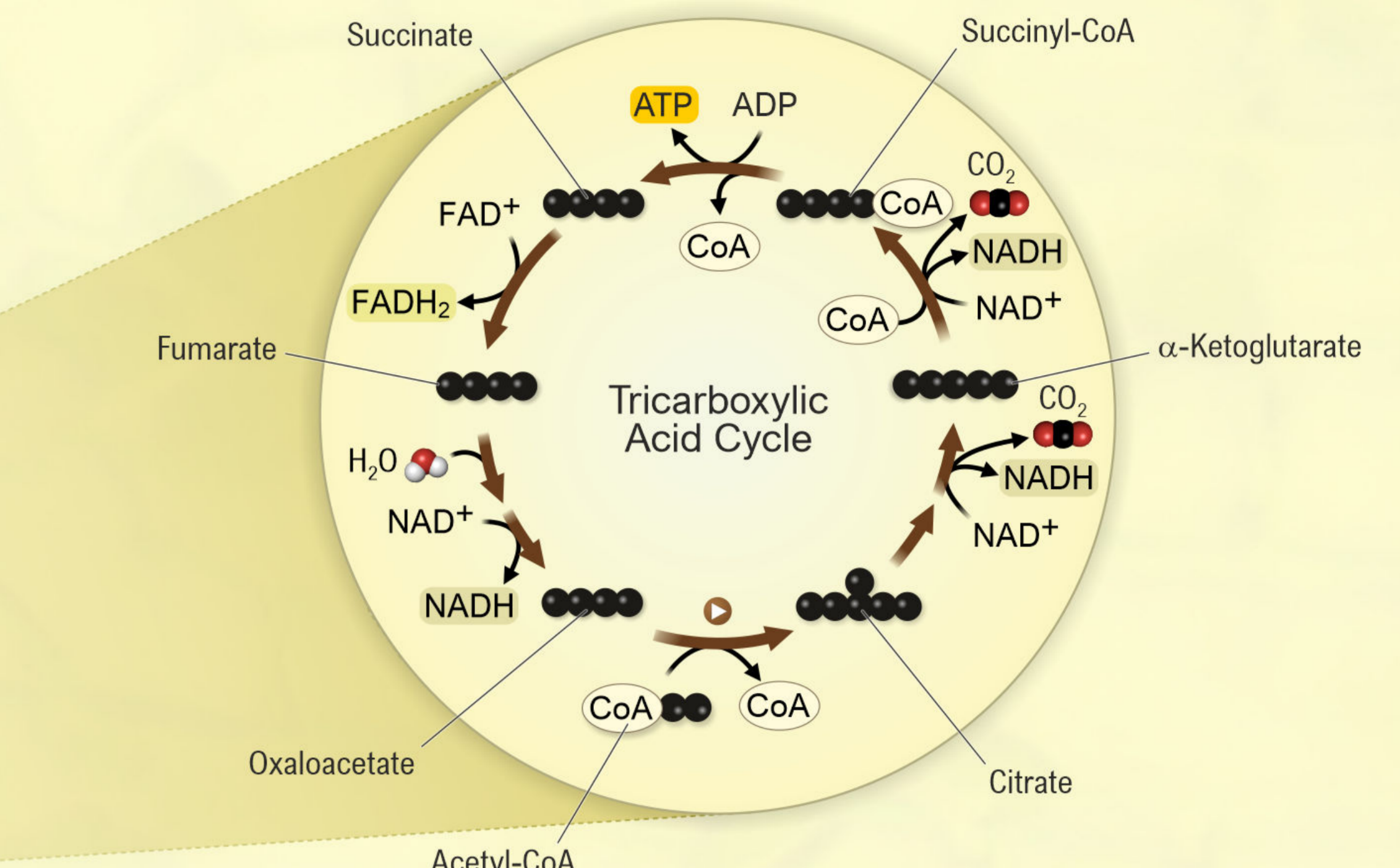
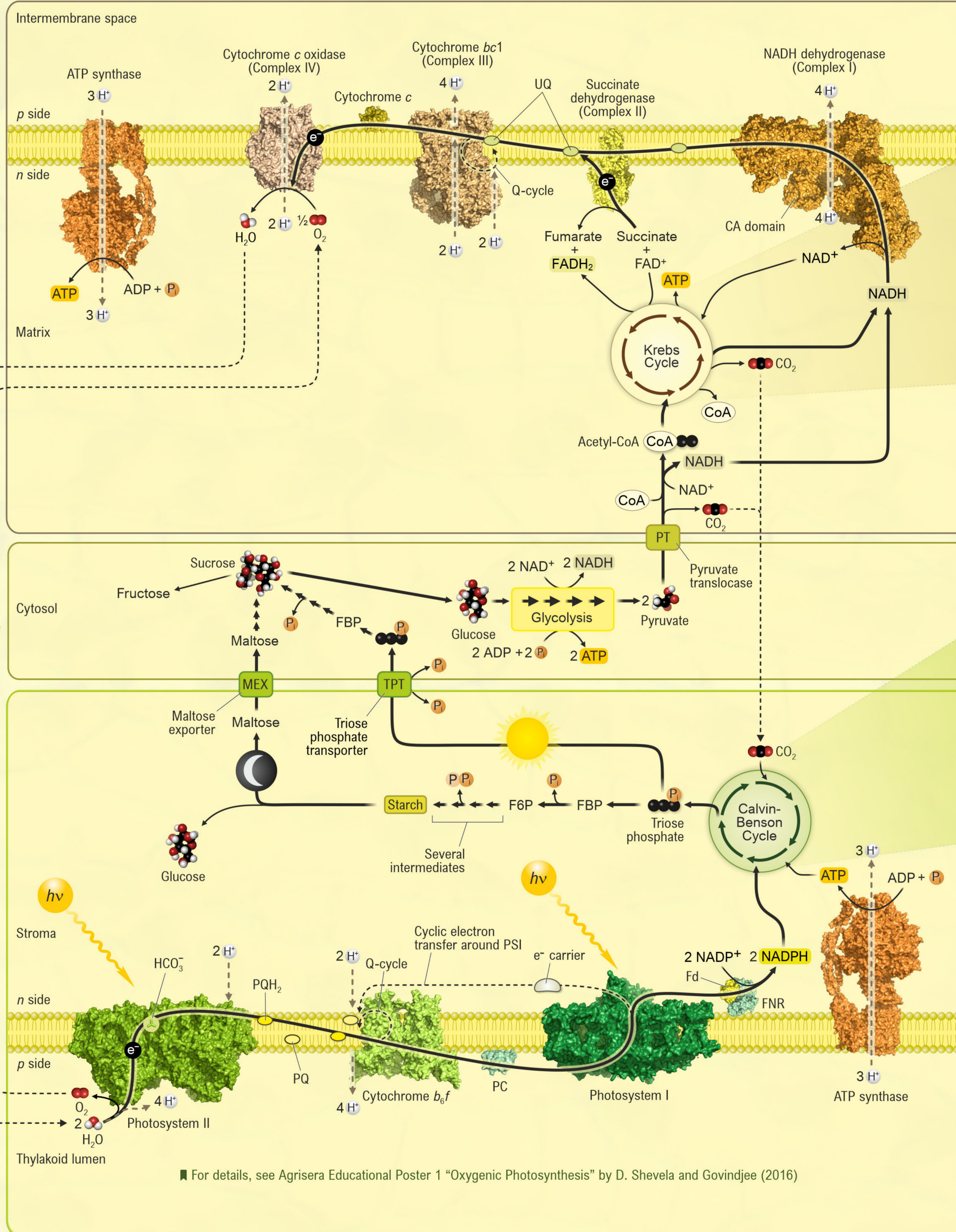
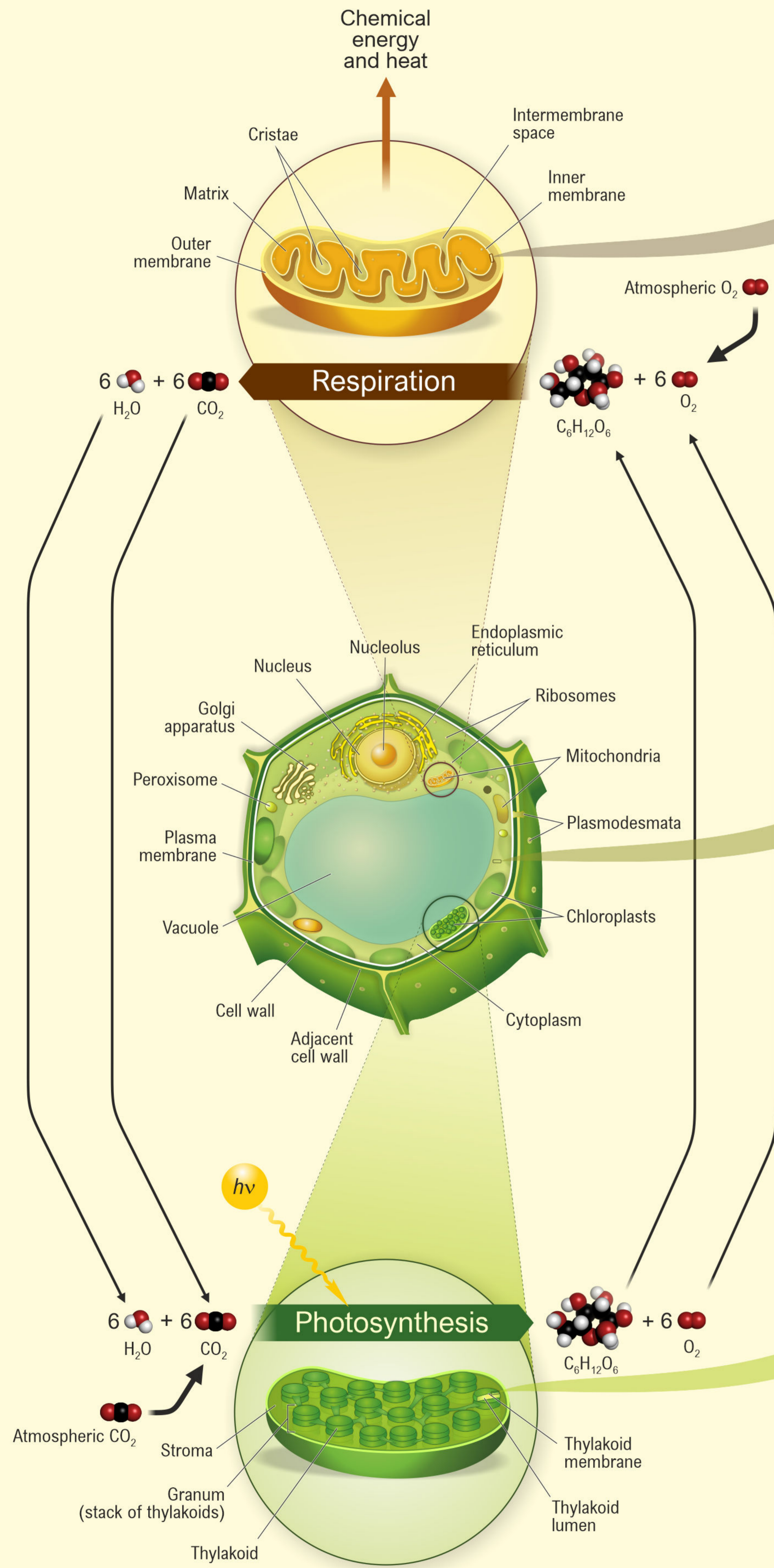


# Plant Cell: Photosynthesis and Respiration



**Photosynthesis and Respiration Poster:** Simplified representation of interconnections between photosynthesis and cellular respiration in plants. For further information, see chapters in books [1-3]. Send questions and comments to Govindjee Govindjee (gov@illinois.edu) or to Dmitry Shevela (info@scigrafik.se).

**Abbreviations:** ADP, adenosine diphosphate; ATP, adenosine triphosphate; CA, carbonic anhydrase; FAD/FADH<sub>2</sub>, flavin adenine dinucleotide (oxidized/reduced forms); FBP, fructose-1,6-bisphosphate; F6P, fructose-6-phosphate; Fd, ferredoxin; FNR, ferredoxin-NADP oxidoreductase; PQ, mobile plastoquinone; PQH<sub>2</sub>, reduced form of plastoquinone; PC, plastocyanin, a mobile copper protein; NAD<sup>+</sup>/NADH, nicotinamide adenine dinucleotide (oxidized/reduced forms); NADP<sup>+</sup>/NADPH, nicotinamide adenine dinucleotide phosphate (oxidized/reduced forms); UQ - ubiquinone pool.

**Notes:** Note that the above representation of photosynthetic and respiratory electron transfer chain complexes is not meant to imply that these complexes are necessarily in 1:1 ratio. Although 3 different cyclic electron pathways, around Photosystem I, are known to exist, we show here only one of them, which involves one or more proteins. Also note that the Calvin-Benson Cycle, shown here, is for C<sub>3</sub> plants (e.g., rice); however, C<sub>4</sub> plants (e.g., maize) have a different pathway [2,3]. Further, only "classical" oxidoreductase complexes of the respiratory electron transport chain in mitochondria are shown in the diagram. Alternative oxidases and alternative NAD(P)H dehydrogenases, which also contribute to the respiratory electron transport chain in plants are not shown here [1]. Complexes were generated using coordinates from the following PDB entries: 1ag6, 1aus, 1nek, 1vf5, 2b10, 3w5u, 3wu2, 5l8r, 6b8h, 7a23, 7jrg, and 7jro.

**Acknowledgements:** We thank Allan Rasmussen, Baishnab Charan Tripathy, Florent Waltz, Lars Olof Björn, Sandra Stirbet, and Stephen P. Long for their valuable comments and corrections, and Natalia Voronkina for the background picture of the cells. We are highly grateful to Agrisera for sponsoring the poster design, printing, and free distribution at conferences around the world.

**Citation:** Shevela D, Govindjee G (2019) Plant Cell: Photosynthesis and Respiration, *Agrisera Educational Poster* 3: doi:10.6084/m9.figshare.14794281

**References:** [1] Tcherkez G, Ghashghaie J, Eds. (2017) *Plant Respiration: Metabolic Fluxes and Carbon Balance*. Springer; [2] Blankenship RE (2021) *Molecular Mechanisms of Photosynthesis*, 3rd Edition, Wiley; [3] Shevela D, Björn LO, Govindjee G (2018) *Photosynthesis: Solar Energy for Life*. World Scientific.

**Symbols:** CoA - Coenzyme A ● - Carbon atom (C) P - Inorganic phosphate (P) PP - Pyrophosphate (PP) ☀ - Day ☾ - Night