Table 2 Estimates of minimum net photon yield of processes converting one mole of extracellular (bulk medium) inorganic carbon into one mol of carbon in carbohydrate, assuming no loss processes in the CCMs. Also indicated is the requirement for carboxysomes or pyrenoids

Process	Requirement of mol photons absorbed in converting one mol bulk phase inorganic carbon into one mol carbon in carbohydrate assuming no leakage of carbon dioxide in CCMs (unbracketted values) and with leakage equal to the rate of photosynthesis (CCM values in square brackets)	Involvement of carboxysomes or pyrenoids
No CCM (diffusive CO_2 flux from bulk medium to Rubisco, aided by parallel HCO_3^- flux in compartments containing carbonic anhydrase; PCOC)	9.96	Neither
No CCM (diffusive CO_2 flux from bulk medium to Rubisco, aided by parallel HCO_3^- flux in compartments containing carbonic anhydrase; Tartronate semialdehyde pathway	9.92	Neither
CCM with only energised step being proton pumping in thylakoid lumen for carbonic anhydrase-catalysed conversion of HCO_3^- to CO_2	9.25 [9.50]	Pyrenoids
CCM with only energised step being the extracellular conversion of HCO_3^- to CO_2 involving active proton efflux to produce acid zones, with or without extracellular carbonic anhydrase	9.5 (ATP from cyclic photo-phosphorylation) [10.0] 9.9 (ATP from respiration of photosynthate) [10.8]	Neither
CCM with only energised step being the conversion of CO_2 to HCO_3^- by NAD(P)H-PQ oxidoreductase	9.5 [10]	Carboxysomes
CCM with the only energised step being the influx of HCO_3^- at one membrane between the medium and Rubisco	9.5 (2 HCO_3 moved per ATP) [10] 10 (1 HCO_3^- moved per ATP) [11]	Carboxysomes (cyanobacteria); + or − pyrenoids in eukaryotes
CCM with only energised step being the ATP-requiring decarboxylation of oxaloacetate by PEPCK in C_4 photosynthesis	10 [11]	None