Table 2. *Energy costs of various processes in photographs*

Process	Cost	Reference
(1) ATP generation from ADP and P_i under *in vivo* conditions	55 kJ mol^{-1}	Wilson, Erecinska & Dutton (1974)
(2) NAD $(P)^+$ reduction using reducing equivalents from water	220 kJ mol^{-1}	Wilson, Erecinska & Dutton (1974)
(3) CO_2 fixation by the photo synthetic carbon reduction cycle at CO_2/O_2 ratios sufficient to supress RuBPo activity of RUBISCO; product at redox level of carbohydrate	3 ATP plus 2 NADPH; total: 605 kJ mol^{-1}	Bassham (1971)
(4) CO_2 accumulation by unicellular algal cells (by active transport of some inorganic C species) to a level sufficient to suppress RuBPo activity of RUBISCO	1 ATP (assuming minimal leakage); total 55 kJ mol^{-1}	Raven (1980); Raven & Beardall (1982b)
(5) Synthesis of cells containing 1 mol organic C from CO_2 via processes (3) and (4), including redox input to NO_3^- reduction (and other reductive synthesis) and ATP input for nutrient accumulation (K in modest amounts; P; N; but not CO_2) and for pH regulation	4 ATP for processes (3) and (4), *and* 2 ATP for biochemical and transport processes; *plus* 2 NADPH for process (3) above *and* 4/7 NADPH for NO_3^- reduction (cell C/N of 7); *total* 896 kJ mol^{-1}	Raven & Beardall (1981b); Penning de Vries, Brunsting & van Laar (1974)
(6) Synthesis of a cell wall polyhexose from CO_2 via processes (3) and (4) followed by isomerization and polymerization	4 ATP and 2 NADPH for each CO_2 converted [via processes (3) and (4)] to sugar phosphate, plus 1/6 ATP for each C in sugar phosphate polymerized to polysaccharide; *total:* 669 kJ per mol C in wall polysaccharide	Penning de Vries (1975)
(7) Synthesis of a cell wall peptidoglycan from CO_2 and NO_3^- via processes (3) and (4) and the NO_3^- assimilation step of process (5) (C/N of peptidoglycan assumed to be 5·3)	4 ATP and 2 NADPH for each CO_2 converted [via processes (3) and (4)] to carbohydrate; 0·38 ATP and 0·72 NADPH for each C (as carbohydrate) and 0·19 N (as NO_3^- converted to peptidoglycan; *total:* 838 kJ per mol C in peptidoglycan	Forrest & Walker (1971); Mandelstam & McQuillen (1973)
(8) Synthesis of cell wall lipid from CO_2 via processes (3) and (4), assuming that the cost of synthesis of 'sporopollenin' from carbohydrate is similar to that for tripalmitin	4 ATP and 2 NADPH for each CO_2 converted [via processes (3) and (4)] to carbohydrate; 0·1 NADPH and 0·04 ATP per 1·47 C as carbohydrate converted 1 C in tripalmitin; total of 2·84 NADPH and 5·84 ATP per C CO_2 converted to tripalmitin; *total:* 946 kJ per mol C in tripalmitin	Lehninger (1970); Atkinson *et al.* (1972)

Table 2. (*cont.*)

Process	Cost	Reference
(9) Protein synthesis from CO_2 via processes (3) and (4) and the NO_3^- reduction step of reaction (5) (C/N or protein assumed to be 4·6, with 1 N per 0·9 amino acid residues)	4 ATP and 2 NADPH for each CO_2 converted [*via* processes (3) and (4)] to carbohydrate; 0·98 ATP and 0·77 NADPH per C from carbohydrate and 0·22 N from nitrate coverted to protein; *total:* 883 kJ per mol C in protein	Penning de Vries *et al.* (1974)

Abbreviation: RuBPo, oxygenase activity of RUBISCO; RUBISCO, ribulose bisphosphate carboxylase oxygenase (E.C. 4.1.1.39).

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