Table 3. *Energetics of ethanol oxidation*
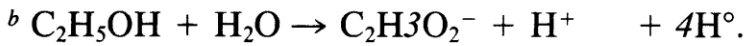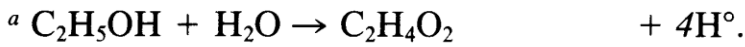
	Ethanol[a] to acetic acid	Ethanol[b] to acetate	Ethanol[c] to CO_2
Free energy dissipation[d] In transformation	−13.9 kJ	−26.7 kJ	−4.6 kJ
Number of electrons	4	4	12
In further oxidation	+9.3 kJ	+22.1 kJ	0 kJ
Number of electrons	8	8	0

[a] $C_2H_5OH + H_2O \rightarrow C_2H_4O_2$ $+ 4H°$.
[b] $C_2H_5OH + H_2O \rightarrow C_2H3O_2^- + H^+$ $+ 4H°$.
[c] $C_2H_5OH + 3H_2O \rightarrow 2CO_2$ $+ 12H°$.
[d] Free energy dissipation expressed as $\Delta G'$ (pH 7) in kJ per mole of two-carbon compound transformed. This is the energy available in oxidizing the compound with NAD^+. Each pair of electrons at this level can result in 219 kJ of energy dissipated in the electron transport chain with concomitant energy production to an extent depending on the coupling to phosphorylation. A mole of high-energy bonds $\Delta G'$ (pH 7) is worth 34.5 kJ. To convert values given in kJ to kcal, divide by 4.185.