

TABLE 4. *Estimated free energy change of selected cellular reactions*

Reaction	$-\Delta G^{\circ'}$, kJ/mol	$-\Delta G$	
		kJ/mol	kJ/mol O
<i>a</i> : Glucose + 12 O → 6 CO ₂ + 6 H ₂ O	2,880	2,808	234
<i>b</i> : Glucose + 2 ADP → lactate + 2 ATP	136	92	8
<i>c</i> : NADH ₂ + O → NAD ⁺ + H ₂ O	219	202	202
<i>d</i> : H _{out} ⁺ → H _{in} ⁺ (mitochondria)	15	18	180
<i>e</i> : ATP + H ₂ O → ADP + P _i	31	63	126

Free energy changes given are standard at pH 7 ($\Delta G^{\circ'}$), actual (ΔG), and actual per atom of oxygen associated with reaction, at 25°C. All ΔG values are negative. *Reaction a*: $\Delta G^{\circ'}$ value from Blaxter (15); ΔG calculated for cellular concentrations: 10 mM glucose, 1 mM CO₂ and 20 μ M O₂. *Reaction b*: $\Delta G^{\circ'}$ value from *reactions a* and *e*; ΔG calculated for 10 mM glucose, 2 mM lactate and ΔG ATP from *reaction e*. ΔG per O is $\Delta G/12$. *Reaction c*: values were calculated using $E^{\circ'}$ for oxygen/water couple of +815 mV and E_h of 788 mV for 20 μ M O₂ (37); an $E^{\circ'}$ for NADH/NAD couple of -320 mV and E_h of -260 mV (E_h may be as low as -320 mV in heart) (69). ΔE_h was converted to ΔG by multiplying by 2F. *Reaction d*: values quoted are median values (see text); ΔG per O is calculated on basis of 10 H⁺/O (see text). *Reaction e*: cytoplasmic ΔG for ATP has been estimated to be 65 kJ/mol in muscle (90), 63 kJ/mol in liver (113), 60–65 kJ/mol in heart (62), and 62 kJ/mol in brain (68). ΔG per O is calculated assuming ATP/O of 2.

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