

Table V. Energy requirements for polymerization and processing of macromolecules.

Process	Energy required	Reference
<i>Protein synthesis and processing^a</i>		
Activation and incorporation	4.0	Neidhardt et al., 1990
mRNA synthesis	0.2	Neidhardt et al., 1990
Proofreading	0.1	Neidhardt et al., 1990
Assembly and modification	0.006	Neidhardt et al., 1990
<i>RNA synthesis and processing^b</i>		
Discarding segments	0.38	Neidhardt et al., 1990
Modification	0.02	Neidhardt et al., 1990
<i>DNA synthesis and processing^b</i>		
Unwinding helix	1.0	Neidhardt et al., 1990
Proofreading	0.36	Neidhardt et al., 1990
Discontinuous synthesis	0.006	Neidhardt et al., 1990
Negative supercoiling	0.005	Neidhardt et al., 1990
Methylation	0.001	Neidhardt et al., 1990
<i>Membrane processes^c</i>		
Proton leakage	62.9	Maloney, 1987

Data from Neidhardt et al. (1990).

^a $\mu\text{mol ATP}/\mu\text{mol amino acid}$.

^b $\mu\text{mol ATP}/\mu\text{mol nucleotide}$.

^c $\mu\text{mol H}^+/\text{g DW h}$.