2. a. $(8\ \text{mole})(1.602 \times 10^{-19}\ C)\left(\frac{6.02 \times 10^{23}}{\text{mole}}\right)(0.17\ J/C)$

$= 1.312 \times 10^{5}\ J$

$\log[H^+] = \frac{\ln[H^+]}{2.303}$

b. $(8\ \text{mole})(8.314 \times 10^{-3}\ \frac{kJ}{\text{mole}\ K})(310\ K)(2.303)(0.7)$

$= 3.32 \times 10^{4}\ J$

c. $\frac{\frac{10^7\ J}{\text{day}}}{\frac{1.644 \times 10^5\ J}{8\ \text{mole}\ H^+}} \times \frac{1\ \text{mole NADH}}{8\ \text{mole}\ H^+} = 60.8$ mole NADH

d. $q = \Delta U - w = \left\{ \frac{2.18 \times 10^5\ J}{\text{mole NADH}} - \frac{1.64 \times 10^5\ J}{\text{mole NADH}} \times 60.8\ \frac{\text{mole NADH}}{\text{day}} \times \frac{\text{day}}{(24)(60)\ \text{min}} \times \frac{1}{10^{15}\ \text{mitochondrion}} \right\}$

$= 2.26 \times 10^{-12}\ \frac{J}{\text{mitochondrion-minute}}$

e. Voleme mitochondrion

$= 10^{-12}$ mL

$\approx 10^{-12}$ g $H_2O$

$q = (C_p)(\Delta T)(10^{-12}\ g)$

$C_p = 4.184\ J/g\text{-}K$

$\Delta T = 0.541\ ^\circ C$

f. not a problem ⇒ this amount of heat can probabley be transfered to the rest of the cell.