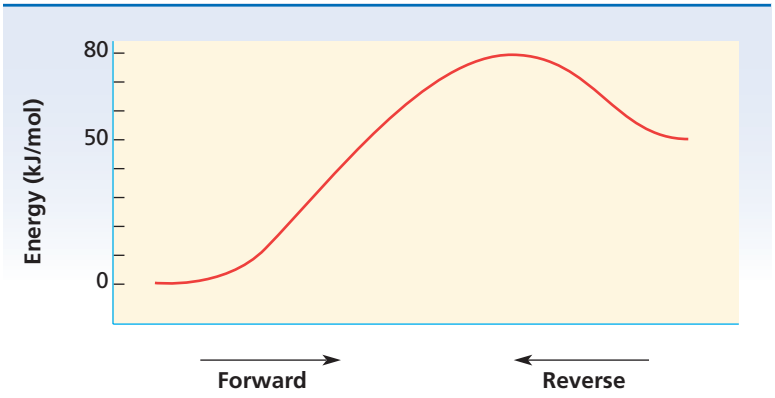
SAMPLE PROBLEM A

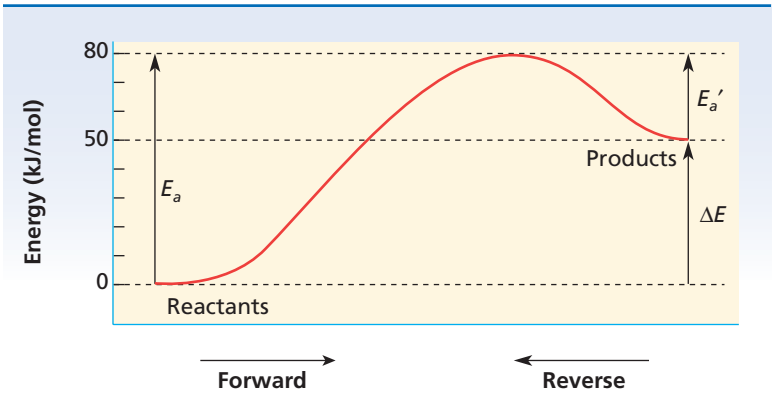
For more help, go to the *Math Tutor* at the end of this chapter.

Copy the energy diagram below, and label the reactants, products, ΔE, E_a, *and* E_a'. Determine the value of $\Delta E_{forward}$, $\Delta E_{reverse}$, E_a, and E_a'.



SOLUTION

The energy level of reactants is always at the left-hand end of such a curve, and the energy level of products is always at the right-hand end. The energy change in the reaction, ΔE, is the difference between these two energy levels. The activation energy differs in the forward and reverse directions. It is the minimum energy needed to achieve effective reaction in either direction. As E_a, it is the difference between the reactant energy level and the peak in the curve. As E_a', it is the difference between the product energy level and the peak in the curve.



$\Delta E_{forward}$ = energy of products – energy of reactants
$\Delta E_{forward}$ = 50 kJ/mol – 0 kJ/mol = +50 kJ/mol

$\Delta E_{reverse}$ = energy of reactants – energy of products
$\Delta E_{reverse}$ = 0 kJ/mol – 50 kJ/mol = – 50 kJ/mol

E_a = energy of activated complex – energy of reactants
E_a = 80 kJ/mol – 0 kJ/mol = 80 kJ/mol

E_a' = energy of activated complex – energy of products
E_a' = 80 kJ/mol – 50 kJ/mol = 30 kJ/mol