TABLE 8.1 **Binding energies and corresponding dissociation constants of different protein-ligand complexes.**

Protein	Ligand	Binding Energy (kcal/mol)	Dissociation Constant (*Kd*) (Molar)
Antibody	Antigen	−6 to −11 [54]*a	~10^{-2} to 10^{-8}
Receptor	Hormone	~−12 [42]	~10^{-9}
Enzyme	Substrate	−4 to −8 [55]	~10^{-3} to 10^{-6}
	Cofactor	−5.5 to −9.5 [42]	~10^{-4} to 10^{-7}
	Inhibitor	−10 to −15 [54]*b	~10^{-7} to 10^{-11}
	Transition state	−16 to −27 [54]*c	~10^{-12} to 10^{-20}

*a A higher value (−14 kcal/mol ($Kd \approx 10^{-10}$)) was obtained for antibodies that underwent a process called '*maturation*'. In this process, B-cell lymphocytes adapt to the invading pathogen by producing antibodies with better compatibility with the antigens produced by the pathogen.

*b A similar, yet slightly higher value of ≈ −18 kcal/mol ($Kd = 60$ fM) was measured for the binding of trypsin to pancreatic trypsin inhibitor, which is itself a protein [47].

*c Higher values have also been suggested. For example, Schramm [56] indicated an enzyme-transition state dissociation constant (*Kd*) ranging from 10^{-14} to 10^{-23} mol L^{-1}. This corresponds roughly to a binding free energy of −19 to −31 kcal/mol.