**TABLE 18.1** Reactions and Thermodynamics of Glycolysis

| Reaction | Enzyme | $\Delta G°'$ (kJ/mol) | $K_{eq}$ at 25°C | $\Delta G$ (kJ/mol) |
|---|---|---|---|---|
| $\alpha$-D-Glucose + $ATP^{4-} \rightleftharpoons$ glucose-6-phosphate$^{2-}$ + $ADP^{3-}$ + $H^+$ | Hexokinase<br>Glucokinase | −16.7 | 850 | −33.9* |
| Glucose-6-phosphate$^{2-} \rightleftharpoons$ fructose-6-phosphate$^{2-}$ | Phosphoglucoisomerase | +1.67 | 0.51 | −2.92 |
| Fructose-6-phosphate$^{2-}$ + $ATP^{4-} \rightleftharpoons$ fructose-1,6-bisphosphate$^{4-}$ + $ADP^{3-}$ + $H^+$ | Phosphofructokinase | −14.2 | 310 | −18.8 |
| Fructose-1,6-bisphosphate$^{4-} \rightleftharpoons$ dihydroxyacetone-$P^{2-}$ + glyceraldehyde-3-$P^{2-}$ | Fructose bisphosphate aldolase | +23.9 | $6.43 \times 10^{-5}$ | −0.23 |
| Dihydroxyacetone-$P^{2-} \rightleftharpoons$ glyceraldehyde-3-$P^{2-}$ | Triose phosphate isomerase | +7.56 | 0.0472 | +2.41 |
| Glyceraldehyde-3-$P^{2-}$ + $P_i^{2-}$ + $NAD^+ \rightleftharpoons$ 1,3-bisphosphoglycerate$^{4-}$ + NADH + $H^+$ | Glyceraldehyde-3-P dehydrogenase | +6.30 | 0.0786 | −1.29 |
| 1,3-Bisphosphoglycerate$^{4-}$ + $ADP^{3-} \rightleftharpoons$ 3-P-glycerate$^{3-}$ + $ATP^{4-}$ | Phosphoglycerate kinase | −18.9 | 2060 | +0.1 |
| 3-Phosphoglycerate$^{3-} \rightleftharpoons$ 2-phosphoglycerate$^{3-}$ | Phosphoglycerate mutase | +4.4 | 0.169 | +0.83 |
| 2-Phosphoglycerate$^{3-} \rightleftharpoons$ phosphoenolpyruvate$^{3-}$ + $H_2O$ | Enolase | +1.8 | 0.483 | +1.1 |
| Phosphoenolpyruvate$^{3-}$ + $ADP^{3-}$ + $H^+ \rightleftharpoons$ pyruvate$^-$ + $ATP^{4-}$ | Pyruvate kinase | −31.7 | $3.63 \times 10^5$ | −23.0 |
| Pyruvate$^-$ + NADH + $H^+ \rightleftharpoons$ lactate$^-$ + $NAD^+$ | Lactate dehydrogenase | −25.2 | $2.63 \times 10^4$ | −14.8 |

*$\Delta G$ values calculated for 310K (37°C) using the data in Table 18.2 for metabolite concentrations in erythrocytes. $\Delta G°'$ values are assumed to be the same at 25° and 37°C.