Which of the following compounds are “high energy” phosphoesters?  A. Glucose–1-phosphate B. Glucose–6-phosphate C. ATP D. ADP E. Inorganic Pyrophosphate F. Glycerol–3-phosphate

|  |  |  |
| --- | --- | --- |
|  |  | C, D & E |
|  |  | D, E & F |
|  |  | B & C |
|  |  | C |
|  |  | B, C & D |
|  |  | A, B & F |

For the reaction A → B, ΔG is 6.2 kJ/mol. For the reaction B → C, ΔG is –3.8 kJ/mol. For the overall reaction A → C, ΔG would be:

|  |  |  |
| --- | --- | --- |
|  |  | -2.4 kJ/mol |
|  |  | 10 kJ/mol |
|  |  | -10 kJ/mol |
|  |  | 2.4 kJ/mol |

For the uncoupled and coupled reactions  glucose + phosphate → glucose-6-phosphate, ΔG°' = +13.8 kJ/mol glucose + ATP → glucose-6-phosphate + ADP, ΔG°' = -16.7 kJ/mol  By how much does coupling to ATP increase the apparent equilibrium constant for the formation of glucose-6-phosphate? Given *R* = 8.315 J/mol · K. T = 298 K.

|  |  |  |
| --- | --- | --- |
|  |  | 1.2 times |
|  |  | 4.5 × 10-6 times |
|  |  | 2.2 × 105 times |
|  |  | 2.2 × 108 times |

Phosphocreatine + H2O  creatine + phosphate, ΔG° is -42.8 kJ/mol at 37°C. If the concentrations of reactants and products are 10 mM, what will be the ΔG?  Given *R* = 8.315 J/mol · K.

|  |  |  |
| --- | --- | --- |
|  |  | -54.7 kJ/mol |
|  |  | +48.74 kJ/mol |
|  |  | -36.9 kJ/mol |
|  |  | -42.1 kJ/mol |

In a study of the temperature-induced reversible denaturation of chymotrypsinogen you determine, using a van’t Hoff plot, that the enthalpy change at 54.5°C is +533 kJ/mol. What is the ΔG° and ΔS° given that the *K*eq at 54.5°C = 0.27 and *R* = 8.315 J/mol · K?

|  |  |  |
| --- | --- | --- |
|  |  | ΔG° = +3.57 kJ/mol, ΔS° = +9.72 kJ/mol · K |
|  |  | ΔG° = +059 kJ/mol, ΔS° = -9.77 kJ/mol · K |
|  |  | ΔG° = +3.57 kJ/mol, ΔS° = +1.62 kJ/mol · K |
|  |  | ΔG° = +1.55 kJ/mol, ΔS° = +1.62 kJ/mol · K |

In a study of the temperature-induced reversible denaturation of chymotrypsinogen, the slope of your van't Hoff plot is -533 kJ/mol. This means that the:

|  |  |  |
| --- | --- | --- |
|  |  | equilibrium constant for denaturation is 533 |
|  |  | free energy change, ΔG, of denaturation is -533 kJ/mol |
|  |  | enthalpy change, ΔH, of denaturation is +533 kJ/mol |
|  |  | enthalpy change, ΔH, of denaturation is -533 kJ/mol |

For the dissociation of acetic acid, CH3COOH  CH3COO- + H+, the free energy change, ΔG° = 27.26 kJ/mol. What is the free energy change, ΔG°', in the biochemical standard state? Given *R* = 8.315 J/mol · K. T = 25°C.

|  |  |  |
| --- | --- | --- |
|  |  | +27.26 kJ/mol |
|  |  | +67.20 kJ/mol |
|  |  | -12.68 kJ/mol |
|  |  | +23.91 kJ/mol |

Reactions which are enthalpically hindered but entropically favored are:

|  |  |  |
| --- | --- | --- |
|  |  | spontaneous and exergonic |
|  |  | spontaneous above T = ΔH/ΔS |
|  |  | unspontaneous and endergonic |
|  |  | spontaneous below T = ΔH/ΔS |

If the free energy change for A → 2B is ΔG1 and for 2B → C is ΔG2, then for A → C the free energy change is:

|  |  |  |
| --- | --- | --- |
|  |  | ΔG1 +ΔG2 |
|  |  | ΔG2 - ΔG1 |
|  |  | ΔG1 - ΔG2 |
|  |  | ΔG1 +2ΔG2 |

|  |  |  |
| --- | --- | --- |
|  |  | The partial dissociation of a weak acid means that most of the molecules are undissociated and more ordered. |
|  |  | The heat absorbed by the dissociation (+∆H) makes a positive contribution to -T∆S so the entropy becomes negative to maintain equilibrium and ∆G = 0. |
|  |  | Water molecules become ordered around the ions. |
|  |  | The ionic product of water, *K*w, ensures that H+ and OH- associate to form H2O and become more ordered. |

For the dissociation of acetic acid in water, CH3COOH  CH3COO- + H+, the entropy change is negative (indicating greater order in the system of acetic acid and water) even though some of the acetic acid molecules have dissociated and are less ordered (a positive entropic effect). Why is the entropy change negative?