Free Energy Problems

1) A system at chemical equilibrium
   A) consumes energy at a steady rate.
   B) releases energy at a steady rate.
   C) consumes or releases energy, depending on whether it is exergonic or endergonic.
   D) has zero kinetic energy.
   E) can do no work.

2) Which of the following shows the correct changes in thermodynamic properties for a chemical reaction in which amino acids are linked to form a protein?
   A) $+\Delta H$, $+\Delta S$, $+\Delta G$
   B) $+\Delta H$, $-\Delta S$, $-\Delta G$
   C) $+\Delta H$, $-\Delta S$, $+\Delta G$
   D) $-\Delta H$, $-\Delta S$, $+\Delta G$
   E) $-\Delta H$, $+\Delta S$, $+\Delta G$

3) When glucose monomers are joined together by glycosidic linkages to form a cellulose polymer, the changes in free energy, total energy, and entropy are as follows:
   A) $+\Delta G$, $+\Delta H$, $+\Delta S$.
   B) $+\Delta G$, $+\Delta H$, $-\Delta S$.
   C) $+\Delta G$, $-\Delta H$, $-\Delta S$.
   D) $-\Delta G$, $+\Delta H$, $+\Delta S$.
   E) $-\Delta G$, $-\Delta H$, $-\Delta S$.

4) A chemical reaction that has a positive ΔG is best described as
   A) endergonic.
   B) entropic.
   C) enthalpic.
   D) spontaneous.
   E) exergonic.

5) Which of the following best describes enthalpy (H)?
   A) the total kinetic energy of a system
   B) the heat content of a chemical system
   C) the system's entropy
   D) the cell's energy equilibrium
   E) the condition of a cell that is not able to react

6) Which of the following is *true for all exergonic reactions?*
   A) The products have more total energy than the reactants.
   B) The reaction proceeds with a net release of free energy.
   C) Some reactants will be converted to products.
   D) A net input of energy from the surroundings is required for the reactions to proceed.
   E) The reactions are nonspontaneous.

7) Which of the following reactions is most likely to be coupled to the reaction ATP + H_2O $\rightarrow$ADP + P_i (ΔG = -7.3 kcal/mol)?
   A) A + P_i $\rightarrow$ AP (ΔG = +10 kcal/mol)
   B) B + P_i $\rightarrow$ BP (ΔG = +8 kcal/mol)
   C) CP $\rightarrow$ C + P_i (ΔG = -4 kcal/mol)
   D) DP $\rightarrow$ D + P_i *(ΔG = -10 kcal/mol)*
   E) E + P_i $\rightarrow$ EP (ΔG = +5 kcal/mol)