1. Which of the following statements about bioenergetics is TRUE?
a. It focuses on the speed of biochemical reactions.
b. It studies how energy flows and transforms in living systems.
c. It deals only with enzyme mechanisms.
d. It ignores thermodynamic laws.
e. It is unrelated to metabolism.
Answer: b. It studies how energy flows and transforms in living systems.

2. According to the first law of thermodynamics:
a. Energy can be created from nothing.
b. Energy is always lost as heat.
c. The total energy in the universe remains constant.
d. Entropy of the universe decreases over time.
e. Energy cannot be converted between forms.
Answer: c. The total energy in the universe remains constant.

3. A reaction with $\Delta G < 0$ is:
a. Non-spontaneous
b. At equilibrium
c. Spontaneous
d. Endergonic
e. Impossible to occur
Answer: c. Spontaneous

4. If $\Delta G°$ is positive but the concentration ratio [products]/[reactants] is very small, the reaction inside the cell becomes:
a. More non-spontaneous
b. Spontaneous
c. At equilibrium
d. Completely stopped
e. Independent of $\Delta G°$
Answer: b. Spontaneous

5. At equilibrium:
a. $\Delta G < 0$
b. $\Delta G > 0$
c. $\Delta G = 0$
d. $\Delta G° = 0$
e. The reaction stops completely
Answer: c. $\Delta G = 0$

6. If Keq > 1, this indicates that:
a. $\Delta G°$ is positive
b. Reactants are favored

c. Products are favored
d. The reaction is non-spontaneous
e. $\Delta G = 0$
Answer: c. Products are favored

7. A catalyst affects a chemical reaction by:
a. Changing $\Delta G°$
b. Shifting the equilibrium position
c. Lowering activation energy without changing equilibrium
d. Increasing ΔG
e. Making a non-spontaneous reaction spontaneous
Answer: c. Lowering activation energy without changing equilibrium

8. When temperature increases, an endothermic reaction will:
a. Shift toward reactants
b. Shift toward products
c. Stop completely
d. Release heat
e. Become exothermic
Answer: b. Shift toward products

9. Which of the following best describes $\Delta G°'$?
a. Free energy under any conditions
b. Free energy at 0°C and 1 atm
c. Standard free energy change at pH 7
d. Free energy under non-biological conditions
e. Always equal to zero
Answer: c. Standard free energy change at pH 7

10. When [Reactants] are high and [Products] are low:
a. ΔG becomes positive
b. The reaction is at equilibrium
c. ΔG is negative and the reaction proceeds forward
d. The reaction is non-spontaneous
e. $\Delta G°$ increases
Answer: c. ΔG is negative and the reaction proceeds forward