Multiple Choice Practice FTW!

Use the following information to answer questions 4 – 6.

Reaction 1: $N_2H_4(l) + H_2(g) \rightarrow 2NH_3(g)$	$\Delta H = ?$
Reaction 2: $N_2H_4(l) + CH_4O(l) \rightarrow CH_2O(g) + N_2(g) + 3H_2(g)$	$\Delta H = -37\ kJ/mol_{rxn}$
Reaction 3: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	$\Delta H = -46\ kJ/mol_{rxn}$
Reaction 4: $CH_4O(l) \rightarrow CH_2O(g) + H_2(g)$) flip!	$\Delta H = -65\ kJ/mol_{rxn} = +65$

4. What is the enthalpy change for reaction 1?

a. $-148\ kJ/mol_{rxn}$ b. $-56\ kJ/mol_{rxn}$ (c.) $-18\ kJ/mol_{rxn}$ d. $+148\ kJ/mol_{rxn}$

$N_2H_4(l) + CH_4O(l) \rightarrow CH_2O(g) + N_2(g) + 3H_2(g)$

$N_2(g) + 3H_2(g) \rightarrow 2\,NH_3(s)$

$H_2(g) + CH_2O(g) \rightarrow CH_4O(l)$

$\Delta H = -37 - 46 + 65$

$= -83 + 65$

$= -18\ kJ/mol_{rxn}$

5. If reaction 2 were repeated at a higher temperature, how would the reaction's value for ΔG be affected?

(a.) It would become more negative because entropy is a driving force behind this reaction. $+\Delta S \Rightarrow$

b. It would become more positive because enthalpy is a driving force behind this reaction.

c. It would become more negative because the gases will be at a higher pressure. $\uparrow T \Rightarrow$ more $-\Delta G$

d. It will stay the same; temperature does not affect the value of ΔG.

6. Under what conditions would reaction 3 be thermodynamically favored?

a. It is always favored. (c.) It is only favored at low temperatures.

b. It is never favored. d. It is only favored at high temperatures.

$$2\,Al(s) + 3\,Cl_2(g) \rightarrow 2\,AlCl_3(s)$$

7. The reaction above is not thermodynamically favored under standard conditions, but it becomes thermodynamically favored as the temperature decreases toward absolute zero. Which of the following is true?

(a.) ΔS and ΔH are both negative. c. ΔS is negative, and ΔH is positive.

b. ΔS and ΔH are both positive. d. ΔS is positive, and ΔH is negative.

$$H_2O(l) \rightarrow H_2O(s)$$

8. Which of the following is true for the above reaction?

(X) The value of ΔS is positive. $-\Delta S$ (X) The value of ΔH is positive. $-\Delta H$

(X) The value of ΔG is zero. $+\Delta G$ (not fav) (X) The reaction is favored at 1.0 atm and 298 K, not at 25°C = room temp!

no right answer!

9. A chemical reaction has an equilibrium constant, K, equal to 1.0×10^{-6}. If, at a given point in the reaction, the value for the reaction quotient *Q* is determined to be 2.5×10^{-8}, what is true about Gibb's free energy at that moment?

a. ΔG = 0 b. ΔG > 0 (c.) ΔG < 0 d. The value of ΔG cannot be determined.

$K > Q$, forward favored! $\Rightarrow -\Delta G$

10. In which of the following reactions is entropy increasing?

a. $2\,SO_2(g) + O_2(g) \rightarrow 2\,SO_3(g)$

b. $CO(g) + H_2O(g) \rightarrow H_2(g) + CO_2(g)$

c. $H_2(g) + Cl_2(g) \rightarrow 2\,HCl(g)$

(d.) $2\,NO_2(g) \rightarrow 2\,NO(g) + O_2(g)$

Use the following information to answer questions 11 – 12.

When calcium chloride ($CaCl_2$) dissolves in water, the temperature of the water increases dramatically.

11. During this reaction, energy transfers from:

a. the reactants to the products.

(c.) the system to the surroundings. $\Rightarrow -\Delta H$

b. the reactants to the system.

d. the products to the surroundings.

12. Which is the primary driving factor behind this reaction? $CaCl_2 \rightarrow Ca^{2+} + 2Cl^- \;] + \Delta S$ ✓

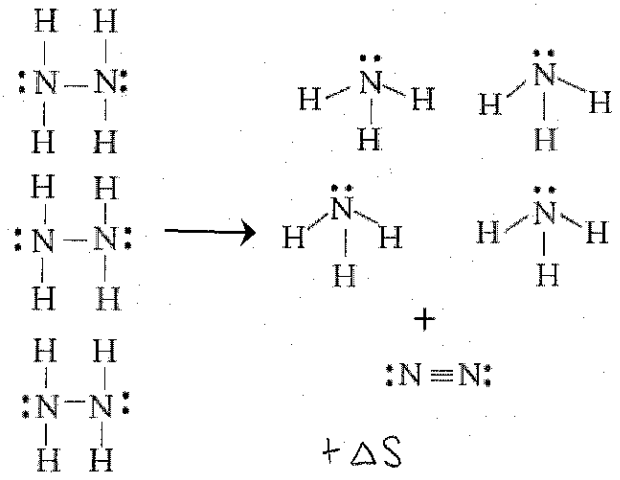
a. Entropy

(c.) Both enthalpy and entropy

b. Enthalpy

d. Neither enthalpy and entropy

13. The reaction shown in the diagram below is accompanied by a large increase in temperature. $-\Delta H$ If all molecules shown are in their gaseous state, which statement accurately describes the reaction?



(a.) It is an exothermic reaction in which entropy increases.

b. It is an exothermic reaction in which entropy decreases.

c. It is an endothermic reaction in which entropy increases.

d. It is an endothermic reaction in which entropy decreases.

14. When solid ammonium chloride, $NH_4Cl(s)$, is added to water at 25°C, it dissolves and the temperature of the solution decreases. $+\Delta H$ Which of the following is true for the values of ΔH and ΔS for the dissolving process?

	ΔH	ΔS
a.	Positive	Negative
(b.)	Positive	Positive
c.	Negative	Positive
d.	Negative	Negative

$NH_4Cl_{(s)} \rightarrow NH_{4(aq)}^{+} + Cl^-_{(aq)} \;] + \Delta S$