EXAMPLES ON CHAPTERS 1 and 2

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1)-If heat is given off by a reaction, the reaction is
a) exothermic. b) endothermic c) at equilibrium d)spontaneous.

2)- When ice melts at temperatures above 0°c it becomes more
a) ordered . , b) disordered., c) spontaneous. , d) none of these.

3)-The entropy of a substance is zero for
a) 0°c and 1 atm., solids or liquids. b) 0 K, perfect pure crystalline solids.
c) 273°k, pure liquid or solids. d) -100°C, crystalline solid elements.

4)- The best criterion for spontaneity of change in a system is
a) ΔE., b) ΔH., c) ΔG ., d) ΔS.

5)- Calcium oxide and water react in an exothermic reaction
$CaO(s) + H_2O(l) \rightarrow Ca(OH)2(s)$ DH°rxn = -64.8 kJ/mol
How much heat would be liberated when 7.15 g $CaO_{(s)}$ dropped into a beaker containing 152 g H_2O

6)-The enthalpy of combustion of acetylene C_2H_2 is
$C_2H_{2(g)} + (5/2)O_{2(g)} \rightarrow 2CO_{2(g)} + H_2O_{(l)}$ DH°rxn= -1299 kJ
calculate the enthalpy of formation of acetylene, given the following enthalpies of formation
DH°f[$CO_{2(g)}$] = -393.5 kJ/mol
DH°f[$H_2O_{(l)}$] = -285.8 kJ/m (227 kJ/mol)

7)-Which of the following species has the highest entropy (S°) at 25°C
$CH_3OH_{(l)}$ $CO_{(g)}$ $MgCO_{3(s)}$ $Ni_{(s)}$

8)-Hydrogen peroxide (H2O2) decomposes according to the equation
$H_2O_{2(l)} \rightarrow H_2O_{(l)} + ½O_{2(g)}$
From the following data calculate Kp for this reaction at 25°C
DH° = –98.2 kJ
DS° = 70.1 J/K
(7.7 ´ 1020)

9)-What is the free energy change for the reaction shown? Is this reaction spontaneous?
$SiO_{2(s)} + Pb_{(s)} \rightarrow PbO_{2(s)} + Si_{(s)}$
DG°f (PbO_2) = - 217 kJ/mol
DG°f (SiO_2) = - 856 kJ/mol
(639 kJ)

10)-The element oxygen was prepared by Joseph Priestley in 1774 by heating mercury(II) oxide

$$HgO(s) \rightarrow Hg_{(l)} + \frac{1}{2}O_2(g) \quad DH° = 90.84 \text{ kJ}$$

Use the data given below to estimate the temperature at which this reaction will become spontaneous under standard state conditions

$S°(Hg) = 76.02$ J/K· mol

$S°(O_2) = 205.0$ J/K· mol

$S°(HgO) = 70.29$ J/K· mol

(840 K)