Gibb's Free Energy Problems Worksheet - Answers

1. $\Delta G = \Delta H - T\Delta S$
$\Delta G = -136.9 - 298.15(-0.1207)$
$\Delta G = -100.9$ kJ $\quad \therefore$ Spontaneous

2. $\Delta H = \Sigma \Delta H_{prod} - \Sigma \Delta H_{react}$
$\Delta H = 2(-393.5) - 2(-110.5)$
$\Delta H = -566$ kJ

$\Delta S = \Sigma \Delta S_{prod} - \Sigma \Delta S_{react}$
$\Delta S = [2(213.785)] - [2(197.66) + 205.152]$
$\Delta S = -173.374$ J/k

$\Delta G = \Delta H - T\Delta S$
$\Delta G = -566 - 298(-0.173374)$
$\Delta G = -335$ kJ $\quad \therefore$ Spontaneous

3. $\Delta G = 0 \qquad T = \frac{\Delta H}{\Delta S} = \frac{31.0}{0.093} = 333$ k

$T > 333$ k $(60^\circ c)$

4. $\Delta H = \Sigma \Delta H_{prod} - \Sigma \Delta H_{react}$
$\Delta H = (-1273.1) - [6(-393.51) + 6(-285.830)]$
$\Delta H = 2802.94$ kJ

$\Delta S = \Sigma \Delta S_{prod} - \Sigma \Delta S_{react}$
$\Delta S = [209.2 + 6(205.0)] - [6(213.6) + 6(69.9)]$
$\Delta S = -261.8$

$\Delta G = \Delta H - T\Delta S$
$\Delta G = 2802.94 - 298(-0.2618)$
$\Delta G = 2880$ kJ $\quad \therefore$ NOT SPONTANEOUS

5. $\Delta G = \Delta H - T\Delta S$

$\Delta G = -26.7 - 298(-0.0197)$

$\Delta G = -20.8$ kJ SPONTANEOUS

6. $\Delta G = \Delta H - T\Delta S$

$-77 = -56.9 - 300\Delta S$

$\Delta S = 0.067$ kJ/k $= 67$ J/k

7. $\Delta H = \Sigma \Delta H_{prod} - \Sigma \Delta H_{react}$

$\Delta H = [2(-124.4) + -285.830] - [-31 + 2(-174.1)]$

$\Delta H = -155.43$ kJ

$\Delta S = \Sigma \Delta S_{prod} - \Sigma \Delta S_{react}$

$\Delta S = [2(140.9) + 69.9] - [122 + 2(155.6)]$

$\Delta S = -81.5$ J/k

$\Delta G = \Delta H - T\Delta S$

$\Delta G = -155.43 - 298(-0.0815)$

$\Delta G = -131.1$ kJ SPONTANEOUS

8. $\Delta G = \Delta H - T\Delta S$

$-717.5 = \Delta H - 337.1(0.2217)$

$\Delta H = -642.8$ kJ

9. $\Delta G = \Delta H - T\Delta S$

$6.771 = -5.711 - 776.5\Delta S$

$\Delta S = 0.016$ kJ/k $= 16$ J/k

10. $\Delta H = \Sigma \Delta H_{prod} - \Sigma \Delta H_{react}$

$\Delta H = [4(-436.7) + 3(-814)] - [4(-397.7) + 3(-20.6)]$

$\Delta H = -2536.2\ kJ$

$\Delta S = \Sigma \Delta S_{prod} - \Sigma \Delta S_{react}$

$\Delta S = [4(82.6) + 3(157)] - [4(143.1) + 3(205.7)]$

$\Delta S = -388.1\ J/k$

$\Delta G = \Delta H - T\Delta S$

$\Delta G = -2536.2 - 298(-0.3881)$

$\Delta G = -2420\ kJ$ SPONTANEOUS

11. $\Delta G = 0$

$\Delta G = \Delta H - T\Delta S$

$0 = -447.1 - T(-75.1)$

$T = 5.95\ k = -267°C$