14.30 at the boiling point, $\Delta G = 0 = \Delta H_{VAP} - T_b \Delta S_{VAP}$

so, $\Delta S_{VAP} = \frac{\Delta H_{VAP}}{T_b} = \frac{(82{,}900 - 49{,}000) J\ mol^{-1}}{357.8\ K} = 96\ J\ mol^{-1}\ K^{-1}$

14.35 Using Hess' Law:

	ΔH° (kJ/mol)	ΔS° (J/kmol)	ΔG° (kJ/mol)
(a)	−137.0	−120.6	−101.0
(b)	−2878.3	−433.1	−2747.9
(c)	−2855.4	−359.1	−2748.6
(d)	−1366.7	−138.5	−1325.5
(e)	−890.3	−242.6	−818.0

14.36 for an exothermic process, the reaction will be spontaneous below a certain temperature so

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ < 0$ & $T < T_0$ is spontaneous

for an endothermic process, the reaction will be spontaneous above a certain temp so $\Delta G^\circ = \Delta H^\circ - T\Delta S < 0$, & $T > T_0$

where $\Delta G^\circ = \Delta H^\circ - T_0 \Delta S^\circ = 0$ and $T_0 = \Delta H^\circ / \Delta S^\circ$

(c) $\Delta H^\circ = -84.7\ kJ/mole - (226.7\ kJ/mol + 0\ \frac{kJ}{mol} \times 2)$
$= -311.4\ kJ/mole$

the reaction is exothermic so any $T < T_0$ is spontaneous.

$\Delta S^\circ = 229.5 \frac{J}{mol\,K} - \left(200.8 \frac{J}{mol\,K} + 130.6 \frac{J}{mol\,K} \times 2\right) = -232.5\ J/Kmol$
$= -0.2325\ kJ/Kmol$

$T_0 = \frac{\Delta H^\circ}{\Delta S^\circ} = \frac{-311.4\ kJ\ mol}{-0.2325\ kJ\ K^{-1}} = 1339\ K$

as long as the reaction occurs at a $T < 1339\ K$, the reaction will be spontaneous.