E 3.1a)

$$\Delta S = \int_i^f \frac{dq_{rev}}{T} = \frac{1}{T}\int_i^f dq \quad (\text{constant temp}) = \frac{q_{rev}}{T}$$

a) $\Delta S = \frac{25.2 \times 10^3\ J}{273.15\ K} = 92\ J/K$

b) $\Delta S = \frac{25 \times 10^3\ J}{373.15\ K} = 67\ J/K$

E3.7a) a) $\Delta_{vap} S = \frac{\Delta_{vap} H}{T_b} = \frac{29.4 \times 10^3\ J/mol}{334.86\ K} = 87.8\ J/K \cdot mol$

b) Vaporization occurs reversibly: $\Delta S_{TOT} = 0$

$\Delta S_{surr} = -87.8\ J/K \cdot mol$

E 3.8a) a) $2CH_3CHO_{(g)} + O_{2(g)} \rightarrow 2CH_3COOH_{(l)}$ @ 298K

$\Delta_r S^\circ = \sum_{products} \nu S_m^\circ - \sum_{reactants} \nu S_m^\circ$

Table 2.5 & 2.7:

$\Delta_r S^\circ = 2S_m^\circ(CH_3CHOOH_{(l)}) - 2S_m^\circ(CH_3CHO_{(g)}) - S_m^\circ(O_2)$

$= 2 \cdot (159.8) - (2 \times 250.3) - 205.14)\ J K^{-1} mol^{-1}$

$= \boxed{-386.1\ J \cdot K^{-1} \cdot mol^{-1}}$

b) $2AgCl_{(s)} + Br_{2(l)} \rightarrow 2AgBr_{(s)} + Cl_{2(g)}$

$\Delta_r S_m^\circ = 2S_m^\circ(AgBr, s) + S_m^\circ(Cl_2, g) - 2S_m^\circ(AgCl, s) - S_m^\circ(Br_2, l)$

$= [2 \times 107.1 + 223.07 - 2 \times 96.2 - 152.23]\ J/K \cdot mol$

$= \boxed{92.6\ J/K \cdot mol}$

c) $Hg_{(l)} + Cl_{2(g)} \rightarrow HgCl_{2(s)}$

$\Delta_r S_m^\circ = S_m^\circ(HgCl_2, s) - S_m^\circ(Hg, l) - S_m^\circ(Cl_2, g)$

$= (146.0 - 76.02 - 223.07)\ J/K \cdot mol = \boxed{-153.1\ J/K \cdot mol}$