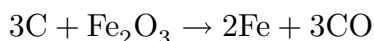

Thermodynamics

†

1. The enthalpy change at 298 K for the reaction



is $\Delta H_{298} = 485,800 \text{ J}$. Given the heat capacity data listed in the table below, calculate the corresponding enthalpy change for the reaction at 1813 K.

	a	b	c
2Fe	51.0	0.0268	0
3CO	82.8	0.0151	0
3C	33.5	0.0326	1,460,000
Fe ₂ O ₃	103.3	0.0669	1,760,000

The heat capacity at constant pressure is given by

$$C_P = a + bT - cT^{-2}$$

Answer: $\Delta H_{1813} = 398,000 \text{ J}$

2. The conversion of water to steam leads to an increase in entropy (a gas clearly has more disorder than a liquid). If the change occurs at the boiling temperature, the heat required to affect the change reversibly is the latent heat of vaporisation, which is $4.068 \times 10^4 \text{ J mol}^{-1}$. Calculate the entropy change due to vapourisation in these circumstances.

Answer: $109 \text{ J mol}^{-1} \text{ K}^{-1}$

† Question 1 is taken from A. H. Cottrell, *Introduction to Metallurgy*, published by the Institute of Materials, London, 1995. Question 2 is adapted from Buttle *et al.*, *Chemistry: a unified approach*, Butterworths, 1970.