

- Isooctane, an important constituent of petrol, has a boiling point of 99.3 °C and an enthalpy of vaporisation of 37.7 kJ mol⁻¹. What is ΔS (in J K⁻¹ mol⁻¹) for the vaporisation of isooctane?

At the boiling point, the system is at equilibrium and so $\Delta G = 0$:

$$\Delta G = \Delta H - T\Delta S = 0 \quad \text{or} \quad \Delta S = \Delta H / T$$

As $T_{\text{boiling}} = (99.3 + 273.0) \text{ K} = 372.3 \text{ K}$,

$$\Delta S = (+37.7 \times 10^3 \text{ J mol}^{-1}) / (373.2 \text{ K}) = +101 \text{ J K}^{-1} \text{ mol}^{-1}$$

Answer: +101 J K⁻¹ mol⁻¹