

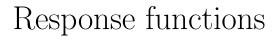
Response functions

• How is the constant volume heat capacity, C_V , defined:

• Show that $\frac{C_v}{T} = \left(\frac{\partial S}{\partial T}\right)_V$

• Is the Gibbs free energy minimised at equilibrium or maximised at equilibrium (justify your answer).

• Use your answer to to the previous question to explain why $\delta E > T\delta S - P\delta V$.





• Use the result from the previous question to show, by expanding δE using the Taylor series, that $\left(\frac{\delta^2 E}{\delta S^2}\right)_V > 0$ and $\left(\frac{\delta^2 E}{\delta V^2}\right)_S > 0$.

• Hence, show that C_v must be greater than zero

• Give the definition of the isoentropic compressibility, $\kappa_s.$

• Show that $\kappa_s = -\frac{1}{V} \left(\frac{\partial V}{\partial P}\right)_S$



- Response functions
 - Explain why the isoentropic compressibility must be positive