Reservoirs and thermodynamic potentials

- What makes reservoirs a special kind of phase?

- Give an expression for the infinitesimal $\mathrm{d}H$, where H is the enthalpy.

- What are the values of the following partial derivatives: $\left(\frac{\partial H}{\partial P}\right)_S$ and $\left(\frac{\partial H}{\partial S}\right)_P$

- Give an expression for the infinitesimal $\mathrm{d}F$, where F is the Helmholtz free energy.

- What are the values of the following partial derivatives: $\left(\frac{\partial F}{\partial V}\right)_T$ and $\left(\frac{\partial F}{\partial T}\right)_V$

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- **Gibbs free energy** The Gibbs free energy is defined as $G = H - TS$, where H is the entropy. Use what you have learnt from the video to find an expression for the infinitesimal $\mathrm{d}G$ and the values of $\left(\frac{\partial G}{\partial P}\right)_T$ and $\left(\frac{\partial G}{\partial T}\right)_P$

- **Grand potential** The Grand potential is defined as $\Omega = E - TS - \sum_i \mu_i n_i$. Use what you have learnt from the video to find an expression for the infinitesimal $\mathrm{d}G$. You will need to use an extended form of the first and second laws of thermodynamics: $\mathrm{d}E = T\mathrm{d}S - P\mathrm{d}V + \sum_i \mu_i \mathrm{d}n_i$. Use the expression you derived to find values for $\left(\frac{\partial \Omega}{\partial V}\right)$, $\left(\frac{\partial \Omega}{\partial T}\right)$ and $\left(\frac{\partial \Omega}{\partial \mu_i}\right)$