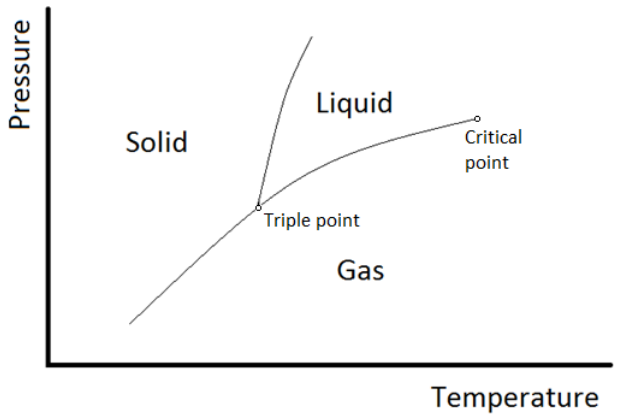
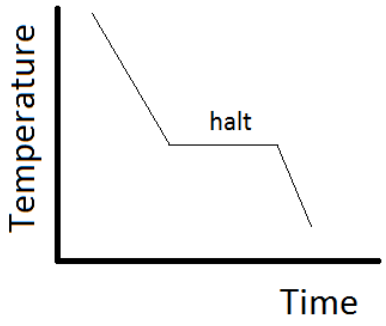
8.2: Single Component Phase Diagrams

The stability of phases can be predicted by the chemical potential, in that the most stable form of the substance will have the minimum chemical potential at the given temperature and pressure. This can be summarized in a phase diagram like the one shown below.



In this diagram, the phase boundaries can be determined by measuring the rate of cooling at constant temperature. A typical cooling curve is shown below. The temperature will decrease over time as a sample is allowed to cool. When κ_T the substance undergoes a phase change, say from liquid to solid, the temperature will stop changing while heat is extracted due to the phase change. The temperature at which the halt occurs provides one point on the boundary at the temperature of the halt and the pressure at which the cooling curve was measured.



The same data can be obtained by heating the system using a technique such as scanning calorimetry. In this experiment, heat is supplied to a sample at a constant rate, and the temperature of the sample is measured, with breaks occurring at the phase change temperatures.

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