

## 3.8: Heat Capacity is a Path Function

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### 3.8.1: Determining enthalpies from heat capacities.

The functions  $H$  and  $C_p$  are related by differentiation:

$$\left(\frac{\partial H}{\partial T}\right)_P = C_P$$

This means that we can:

1. measure  $C_p$  as a function of temperature
2. integrate this function and find  $H(T)$

However, there are problems with this approach:

1. Reference point: we have to deal with the lower limit of integration.

Ideally we start at zero Kelvin (but we cannot get there), but how do we compare one compound to the other?

2. At temperatures where there is a phase transition there is a sudden jump in enthalpy. E.g. when ice melts we have to first add the heat of fusion until all ice is gone before the temperature can go up again (assuming all is done under reversible well-equilibrated conditions).
3. At the jumps in  $H$ , the  $C_p$  is infinite.

**| It should be stressed that there *are no absolute enthalpies.***

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