

(From <http://www.chemteam.info/Thermochem/Time-Temp-Graph.html>)

Assume we are going to heat a container that has 72.0 grams of ice (no liquid water yet!) in it. To make the illustration simple, please consider that 100% of the heat applied goes into the water. There is no loss of heat into heating the container and no heat is lost to the air. Let us suppose the ice starts at minus 10.0 °C and that the pressure is always one atmosphere. We will end the example with steam at 120.0 °C.

Your task is to calculate the total heat energy (in Joules) required for the total phase change. There are five major steps to think about before this problem is completely solved. These involve either a temperature increase or a phase change.

List what you think these 5 steps are. To help you get going... imagine you are a water molecule at -10 °C and you will go through several steps and become FREE at 120 °C

- 1)
- 2)
- 3)
- 4)
- 5)

Each one of these steps you have just listed will have a calculation associated with it. Think about what constants and formulas you will need to solve the problem such as,  $Q$ , heat of fusion, heat of vaporization, moles, etc. You know how to calculate  $Q$  for a change in temperature, consult your notes on heat of fusion and heat of vaporization.

Calculate the heat (in Joules) for each of the five steps. **SHOW YOUR CALCULATIONS NEATLY ON SEPARATE PAPER.** Record your answers for each step in the spaces below.

|    |            | <u>Heat in Joules</u> |
|----|------------|-----------------------|
| 1) |            | _____                 |
| 2) |            | _____                 |
| 3) |            | _____                 |
| 4) |            | _____                 |
| 5) |            | _____                 |
| 6) | Total Heat | _____                 |

**The heating curve for water**

