# Year 11 Physics - Activity Sheet 2
# Phase Changes & Heating Curves Simulation

Thermodynamics

Module 3 - Lesson 2

## Aim

To use a simulation to observe the relationship between energy input, temperature, and phase changes for water, and to analyse the resulting heating curve quantitatively.

## Knowledge Nodes Targeted

- N1: Temp/KE Relation (Revisited during heating phases)
- N3: Specific Heat (Analysing sloped sections of the graph)
- N5: Latent Heat (Analysing flat sections of the graph, understanding phase change energy)

## ICT Resource: PhET Simulation

### Simulation: States of Matter: Basics

- **Link:** https://phet.colorado.edu/en/simulations/states-of-matter-basics
- **Setup:**
  1. Open the simulation and select the "Phase Changes" screen.
  2. Select "Water" from the top right options.
  3. Observe the initial state (solid ice, likely below 0°C). Note the particle arrangement and motion.
  4. Ensure the thermometer units are set to Celsius (°C).

### Procedure & Data Collection

- **Heating Process:**
  1. Begin adding heat using the slider at the bottom (move towards "Heat"). Try to add heat at a roughly constant rate.
  2. Observe the thermometer reading and the state/motion of the water molecules closely as heat is added.
  3. Continue adding heat until the water has turned into steam and its temperature is significantly above 100°C.
- **Observations to Focus On:**
  - At what temperatures does the phase change from solid to liquid (melting) occur?
  - At what temperatures does the phase change from liquid to gas (boiling) occur?

- What happens to the temperature reading *during* melting?
- What happens to the temperature reading *during* boiling?
- What happens to the particle motion and arrangement during heating within a single phase (ice, water, or steam)?
- What happens to the particle motion and arrangement *during* a phase change?

- **Data Analysis (for Worksheet 2 Part 1):**

1. Sketch the shape of the Temperature vs. Time/Energy graph based on your observations.
2. Label the different sections corresponding to heating the different phases and the phase changes themselves.
3. Identify where energy input increases particle kinetic energy (temperature rises) and where it increases potential energy (breaks bonds during phase change).

## Safety Notes

This is a computer simulation; no physical safety hazards are present.