Final Assignment:
Emergence of the Boltzmann probability distribution

- The task is to code a minimal simulation producing a **key** result of **statistical mechanics** and **thermodynamics**: the **Boltzmann distribution**.

- The distribution governs the probability to observe a state of a given energy. For a system at temperature T, the probability density function is

$$p(E) \propto e^{-E/k_B T}$$

  where k_B is the Boltzmann constant.

- The distribution is therefore **exponential** in E: its log plot (log y axis vs linear x-axis) is a **straight line**.

- You probe this distribution by **sampling** many **configurations** of a simple system.

Final Assignment: The system

- We consider an extremely simplified setup.
  - N particles
  - Only discrete energies
  - We disregard motion and focus on **energy exchange**
  - One minimal energy level E_0 (**ground state)**
  - Equally spaced energy levels at **constant separation** $\Delta E = E_0$
  - All energies are measured in units of E_0