Statistical Mechanics



- Individual particles
- Each one has energy levels specified by quantum mechanics.



- Gas equation of state
- P,T, and V

Iclicker

Which curve represents a gas at a higher temperature?

Where does the extra energy go?

Connection

 Continue to look at box of atoms and defined energy and heat capacity.



 Define average energy in terms of microscopic properties

Probability

- Need an expression for probability of finding particle in a particular state.
- Probabilities are normalized

 Consider small system with four particles and three energy levels.

Probability

 Consider small system with four particles and three energy levels.

Configuration 1	Configuration 2	Configuration 3

Partition Function I

Number of systems with a given energy

Ratios depend on energy differences

Partition Function II

Exponential functions have the desired properties

Boltzmann Probability Law

Partition Function III

Partition function

 Use the partition function to determine average energy

Average Energy

Average energy from partition function

Partition Function Example

Energy and heat capacity of ideal monatomic gas.