

Modes of Heat Transfer

Mechanical Engineering

One rate equation for each mode, and what actually controls it.

Three modes, plus the phase-change case that beats them all.

Mode	Rate law	Controlled by
Conduction	$Q = k A \Delta T \div L$	Material and thickness
Convection	$Q = h A \Delta T$	Fluid speed and geometry
Radiation	Q depends on T^4	Surface and temperature
Boiling or condensing	Very large h	Phase change at the wall

Radiation uses absolute temperature to the fourth power, so it only matters once things are hot.