STAT. MECH. AND THERMO. MAIN POINTS

Microscopic results:

temperature and kinetic energy
ideal gas equation of state
equipartition
Boltzmann law
distribution of molecular speeds

Photon gas:

pressure-energy density relation
energy density as a function of T
flux of radiation as a function of T
entropy density as a function of T
energy spectrum (energy density per unit angular frequency)

Zeroth law related:

temperature
thermal equilibrium
Zeroth law

First law related:

heat
specific heat
internal energy and ideal gas internal energy
ΔU, Q, W and the First Law
processes
isothermal
isobaric
adiabatic
isochoric
free expansion
heat capacities C_V, C_P, and γ

Second law related:

thermodynamic Second law
heat engines
Carnot cycle
efficiency
reversibility
entropy
entropy and heat flow
entropy changes in the five “processes” above
entropy of the ideal gas
statistical mechanical definition of entropy: $S = k \ln \Omega$
S(equilibrium state) $\geq$ S(any other state)
$\Delta S \geq 0$ for any process in an isolated system.

For a combined system, $S_{12} = S_1 + S_2$.
For S(U,V) as a function of U and V,
$\partial S/\partial U = 1/T$ and $\partial S/\partial V = P/T$.