

Review for the Final Exam

Below you will find a list of topics that you will be responsible for knowing for the Final as well as a list of topics that will not be covered. Remember that you are allowed two formula sheets for the test!

Although I've tried to cover everything, anything not explicitly mentioned is your responsibility

Everything listed on the Review Sheet for Exam 1

Everything listed on the Review Sheet for Exam 2

Chapter 8

Classical Statistics*

- Boltzmann distribution
- Density of states, $g(E)$
- Maxwell distribution of molecular speeds
- Maxwell distribution of kinetic energy
- Heat capacities of gases and solids

Quantum Statistics

- Bose-Einstein and Fermi-Dirac distribution functions
- Finding the density of states

Properties of a Fermion gas

Not included: Bose-Einstein condensation, photon gas, quantization of energy states of matter, understanding specific heats of gases

*Note: even though I will give the integrals on the exam, the math is sufficiently dense that you should spend the time you need to understand it.

Chapter 13

Particles and anti-particles

- positron and Dirac interpretation
- Feynman diagrams
 - o Rules for construction

Fundamental interactions and the classification of particles

- four fundamental forces
 - o strong, electromagnetic, weak, gravitational (be familiar with what Table 13-2 is about)
 - coupling strengths
- hadrons
 - o baryons and mesons (be familiar with what Table 13-1 is about)

Conservation laws and symmetries

- Baryon number, B (Table 13-4)
- Lepton number, L (Table 13-3)
 - o L_e

- L_μ
- L_τ
- Conserved independently
- Strangeness, S
- Isospin, \mathbf{T} and T_3
- Hypercharge, Y
- Relationships between Q, T_3 , B, S, and Y
- Parity, P
- Know what is conserved in what interaction (Table 13-5)

The Standard Model

- quarks and anti-quarks
 - charge and spin properties

Not covered: J/ψ puzzle, quantum chromodynamics, beyond the Standard Model

Chapter 14

The Sun

- Solar luminosity, solar constant
- Effective temperature, T_E
- Proton-proton cycle

Stellar evolution

- Hertzsprung-Russell diagram
- Relationships between stellar mass, luminosity, radius, and lifetime

Cataclysmic events

- Novae
- Supernovae

Final states of stars

- white dwarfs
- neutron stars and pulsars
- black holes

Not included: Active sun, stars, parallax method, galaxies, Hubble's Law, gravitation and cosmology, cosmogenesis