Swihart Ch. 8 Main Concepts

Stellar structure equations (hydrostatic equilibrium), central temperature and pressure estimates

Virial theorem, PE and thermal energy U

Average temperature of star

Conversion of PE to radiation and internal/thermal energy U

Contraction rate of star, time for contraction to present size

Nuclear fusion

Hydrogen burning (H to He), efficiency of conversion Minimum temperature for H fusion Stellar lifetime estimate from fusion considerations

Main sequence of stars

Protostar formation, H burning ignition

Mass-luminosity relation (low-mass and high-mass main sequence stars)

Evolution of low-mass star to red giant

Degenerate gas (electrons)

Fermi temperature, Fermi energy, Pauli exclusion principle
Degeneracy pressure (non-relativistic case)
White dwarf mass-radius relationship, density
Chandrasekhar mass, physical origin of mass limit
Minimum mass of H burning star (degenerate brown dwarf mass upper limit)

High-mass star evolution

Onion model of shell burning
Binding energy curve, fusion and fission, Iron limit
Type II supernovae, energy of supernova radiation and KE of ejecta

Pulsars and neutron stars

Minimum density for rotational stability

Neutron star mass-radius relation, density

Gravitational PE of neutron star and supernova energy, neutrinos

Pulsar rotational KE and energy loss rate

Black Holes

Schwarzschild radius
Gravitational redshift and time dilation