

Astro Qualifier Topic List

*This topic list covers the Spring 2012 to Spring 2015 Qualifiers

- Astrophysics Basics
 - Angles/Solid Angles
 - Flux
 - Luminosity, Eddington Luminosity
 - Magnitudes
 - Power Law
 - Standard Candles
 - Cepheid Variable Stars
 - Type Ia SNe
- Binary Systems
 - Habitable Zones
 - Masses of bodies in system
 - Orbits/Semi-major axis calculations (from parallax)
 - Radial Velocity Curves
 - Separation Distance
 - Surface gravity calculations
 - Transits (both star and planet)
 - Transit depth
 - Transit duration
 - Luminosity calculations during transit
- Cosmology
 - Composition
 - Effects of relative abundances
 - Equations of state for each component
 - Constants and their meanings
 - Cosmological redshift and how to determine age from it
 - Distances
 - Angular diameter
 - Co-moving line of sight
 - Co-moving transverse
 - Luminosity
 - Friedman Equation
 - Inflation
 - Equation of state
 - Impact on energy/momentum
 - Scale factor (including derivation)
 - Surface brightness calculations
 - Type Ia SNe
 - Calculations
 - Uncertainties
- Galaxies
 - Age-metallicity relation
 - Components (include evidence)
 - Dark matter
 - Bulge
 - Halo
 - Cold/hot ISM

- Central black hole
 - Population I/II stars
 - G-dwarf problem
 - Isophotal radius
 - Luminosity functions
 - Schechter luminosity function
 - Mass-light ratio
 - Mergers
 - Rotational velocity curves
 - Tully-Fisher Relation
 - Thin v thick disk
- Interstellar gas clouds
 - Stromgren Sphere
 - Wind speed of expanding gas clouds
- Lorentz Force
- Kepler's Laws & Mechanics
- Neutron Stars
 - GR effects
 - Magnetic field strength
- Nuclear Fusion
 - PP Chain (including rxn's and tunneling)
 - CNO cycle (including rxn's)
 - Impact of fusion on elemental abundances outside of star
 - S-process and r-process
 - He burning
 - Heavy element (C, O, Ne, Si) burning
- Planetary systems
 - Derive temperature
 - Derive period
- Pulsars
 - Types
 - Light Cylinder
 - Rotational velocity/Energy Loss
 - Magnetic Fields
 - PP Diagram
 - Period-distance relation
 - Period variability
- Quasars
 - Damped Lyman Alpha systems
 - Calculations using cosmology
- Stellar Evolution
 - Timescales
 - Evolutionary Tracks (including pre-MS)
 - Formation
 - Initial Mass Function
 - Virial Theorem & Gravitational Energy
 - Lifetime estimates
- Stellar Structure
 - 4 equations
 - Polytropes

- Hydro-static equilibrium calculations
 - Equations of State
- Radiative Transport
 - Plane-parallel approximation
 - Derive zeroth and first moments
 - Grey Atmosphere approximation
 - Optically thin v optically thick
 - Rosseland Mean Opacity
 - Source Functions, etc.
 - Semi-infinite gas clouds
- Synchrotron Radiation
- Telescope Optics
 - Focal Length
 - Diffraction Limit
 - Quantum efficiency
 - CCD's
- Virial Theorem
 - Derive Jeans mass
 - Derive central temp of star
- 21 cm H-I Line
 - Temperature of Interstellar Medium
 - Optical Density
 - Radiative Transport