

S381 Exam Questions Summary 2002-2006

	2002	2003	2004	2005	2006
	Part A	Part A	Part A	Part A	Part A
1	Fusion rates	H and He burning regimes	Process in the core of stars	Mass determination in binaries	Apparent magnitudes
2	Reaching main sequence	R-process and S-process	Redshift and distance relation	Black body radiation, Planck function	Basic astrophysics
3	Compact star radii	Post MS evolutionary phases	Cooling of star forming clouds	Wave function, Schrödinger equation	Kelvin-Helmholtz and other times
4	Mass accretion compactness	Shakura-Sunyaev accretion	Evolution of isolated white dwarf	Hydrogen burning in stellar evolution	White dwarf properties
5	Large fraction are binary stars	CV orbital and disc speeds	Convection and radiation gradient	Nuclei: s- and r-processes	Conservative mass transfer
6	Soft X-ray binaries	CV steady state disc properties	Mass transfer semidetached bin	Definition of viscosity	Accretion disk properties
7	Importance of quasars	Synchrotron and self-Compton	Effect of boundary layer	Steady-state accretion systems	X-ray binary properties
8	Flux of standard candles	Definition of quasar fuzz	Exploit what in Dop tomography	X-ray detections and novae	Unification and properties of AGN
9	Emission from approaching jets	Evolution of quasar luminosity	Synchrotron and self-Compton	Electron emission types	Selection effects, Malmquist bias
10	Accretion energy efficiency	X-ray binaries compared to AGN	Selection effects, Malmquist bias	Galaxy types and properties	Redshifts and frequencies
	Part B	Part B	Part B	Part B	Part B
11	Kelvin-Helmholtz time	Mean molecular weight calculations for MS stars	Energy sources in each phase of stellar evolution	White dwarfs: Chandrasekhar mass, luminosity, radius	Energy sources in each phase of stellar evolution
12	Effect of reaction rates in the CN cycle	Gamow window and the energy of the Gamow peak	Mass defect calculations for hydrogen and helium burning	Gamow energy for p+d collision, probability of p+d in solar core	Cloud properties and collapse due to self-gravity
13	Roche lobe radius and orbital separation	Eddington luminosity and Eddington accretion rates	Semidetached systems with white dwarf and neutron star accretors	Roche lobe radius, overflow mechanism, conservative transfer	Roche potential in semidetached and contact binary systems
14	Accretion onto white dwarfs	Temperature/radiation/radius relations for accreting discs	Speeds in Shakura-Sunyaev discs, supersonic discs, viscous diffusion	Steady-state Keplerian accretion disc calculations	Temperature/radius relations for Shakura-Sunyaev discs
15	Tidal disruption by black holes	Forbidden lines, and number densities	Brightness boosting by relativistic jets close to AGN line of sight	AGN broad line regions: origin, line/continuum flux variation lag	Effect of inclination angle on view of BLR and NLR in Seyferts
16	SED features of radio loud quasar and thermal non-thermal parts	Gravitational lensing and Einstein rings	Colour and features of starburst, Markarian and Zwicky galaxies	Flux limited surveys, Malmquist bias and selection effects	SED features of radio loud quasar and thermal non-thermal parts
	Part C	Part C	Part C	Part C	Part C
17	Homologous contraction and scaling relations in star formation	Mass limits between stars and brown dwarfs, i.e. electron degeneracy calculations	Distance and parallax, flux and luminosity, absorption lines and effective temperature	H transitions and wavelengths, mass ratio, orbital period and speed from H β spectra	Astrophysical calculations: mass ratio, orbital period and speed from H α spectra
18	Geometrically thin, optically thick, Keplerian accretion discs in steady state	Four types of outburst in cataclysmic variables, various calculations	Proton fusion, Gamow energy, reduced mass, fusion rates, proton lifetimes	Opacity and its causes, relevance to stellar convection in hot and cool stars and CNO cycle	Fractional mass defects, core hydrogen and helium burning phases and processes
19	Properties, differences, samples and unification of Seyfert 1 and Seyfert 2 galaxies	Radio galaxies and quasars as probes to determine cosmological parameters	Shakura-Sunyaev accretion discs: various calculations	Fictitious eclipsing dwarf nova observed by eclipse mapping techniques in outburst	Geometrically thin, optically thick, Keplerian accretion discs in steady state
20	Nature and effects of electron degeneracy in MS stars, white dwarfs and cataclysmic variables	Behaviour of magnetic CVs and protostars related to rotational and orbital phenomena	FWHM relation to broad/narrow AGN emission, origin of broad lines and relation to unification	AGN: Eddington limit, BH mass limit calcs, accretion, tidal disruption, core, jet, lobes, Doppler boosting	Central black holes in AGN: accretion, Eddington limit, mass limit, luminosity, tidal disruption