

ASTRONOMY: STARS & GALAXIES

EXAM 2 REVIEW SHEET

THE INTERSTELLAR MEDIUM

Giant molecular clouds (cold & dense), H II regions, hot gas (highly ionized – C IV, N V, O VI, etc.)
Molecules – H₂ most common, followed by CO – most complex ones contain C
Dust – composition, extinction, reddening, polarization
21-cm H I line
reflection nebulae – usually bluer than illuminating star

STAR FORMATION

Speed of formation versus initial stellar mass
Protostellar disks, Herbig-Haro objects
Debris disks, β Pictoris, “Vega-like” stars
Observing disks with coronagraphs
Disk mineralogy from IR emission of the dust

MATURE STARS

Evolution a “war” between gravity & pressure
ANY change in the conditions inside a star changes its structure & evolution
Stars begin a mostly H, some He, small amounts of other stuff
The elements heavier than H & He were produced in the interiors of the star
Most stars spend most of their lives as MS stars
Core H-burning \Rightarrow shell H-burning \Rightarrow core He-burning \Rightarrow shell He-burning
He-burning starts explosively (He-flash) in lower-mass stars
Cepheid variables – light curves, P-L relation, instability strip

STAR DEATH

AGB stars – He and H burning shells (NO question on details of thermal pulsing!)
Planetary nebulae
White dwarfs – degenerate electron gas – Chandrasekhar Limit – “cooling curves”
Novae
Type I versus Type II supernovae
Supernova 1987A in the LMC as a test of supernova models
Pulsars – pulsating radio sources (sometimes other wavelengths) – magnetized rotating neutron star
Black holes – event horizon, Schwarzschild radius
“fuel efficiency” of nuclear fusion greatest for H, decreases toward Fe, negative at higher masses
Successively heavier fuels last shorter & shorter times as L(core) increases & efficiency decreases

RELATIVITY & BLACK HOLES

Time dilation, length contraction, mass “growth”
2 postulates of Special relativity
simultaneity
general relativity & gravity
Black holes – formation, “structure”, size criteria