

MATERIAL COVERED: Everything since Exam 1, including: the Big Bang; the life of a star; black holes.

Cosmology I: The Big Bang

Hubble's law	cosmological redshift	Doppler shift	The Big Bang
10^{-43} second	3 minutes	13.7 billion years	fundamental forces
inflation	$E = mc^2$	electrons & quarks	antimatter
quarks → protons & neutrons		protons & neutrons → helium	
75 % hydrogen / 25 % helium		the cosmic abundance of helium	
the cosmic microwave background radiation			

The life of a star

the formation of a star	gravitational collapse	nuclear fusion	the core
surface temperature	luminosity	apparent magnitude	HR diagram
main sequence star	the mass of a star	the Sun as a star	H → He
He → C	red giant	white dwarf	planetary nebula
iron in the core	nova	supernova (white dwarf & massive star)	
Chandrasekhar limit ($1.4 M_{\text{Sun}}$)		neutron star / pulsar	$2 - 3 M_{\text{Sun}}$

Black holes

singularity	event horizon	warped space & time	'spaghettification'
evidence for black holes	Cygnus X-1	quasars	Schwarzschild radius