

## Exam 3 Review

### Chapter 19

#### Vocabulary

Stellar Nurseries	Protostar	Evolutionary Track
Protostellar Disk	Hayashi Track	T Tauri
Zero-Age Main Sequence	Failed Stars	Brown Dwarfs
Cocoon Nebulae	Bipolar Flow	Herbig-Haro
Shock Wave	Star Clusters	Open Cluster
Association	Globular Cluster	

- Know that billions of stars have lived and died in the universe up to now
- Know what is meant by a stellar nursery
- Know that the first step in stellar birth is the collapse of a cloud of gas
- Know how gravity and heat affect a cloud in space
- Know how rotation and a magnetic field could keep a cloud from collapsing
- Know what has to be done to form a model of star formation
- Know the basics of what happens to form a star (stage 1 – 7, but you don't need to know them by number)
- Know that the cloud starts to fragment
- Know that as the cloud shrinks the only place where the temperature goes up is at the center
- Know why the cloud stops collapsing and know what is meant by a protostar
- Know that now the star has shrunk down further and the temperature keeps increasing
- Know what is meant by the evolutionary track
- Know what a protostellar disk is
- Know what the Hayashi track is
- Know that the T Tauri phase is
- Know that it takes a temperature of 10 million K to ignite the fuel in the core and become a real star
- Know that if the star is about  $1 M_{\text{sun}}$  it will live for about 10 billion years
- Know what is meant by the zero-age main sequence
- Know that mass drives all aspects of a star's life
- Know that composition can affect the temperature inside a protostar and therefore affect the star's life
- Know that once a star reaches the main sequence it will not change its position on the main sequence
- Understand that not all fragments become stars and know what they are called
- Know how big a fragment must be to ignite the hydrogen fuel
- Know that we use radio telescopes to look at the gas around an emission nebula to see how it is contracting
- Understand that M 20 has areas in different stages of star birth
- Know that we need to use infrared to see some of the things that are going on inside the clouds where stars are born
- Know what is meant by the term cocoon nebula
- Know that protostars exhibit strong winds
- Know what is meant by bipolar flow

- Know what the team of Herbig and Haro discovered
- Know possible triggers to start cloud collapse: supernova shock wave, solar wind from nearby hot stars, spiral density waves in a spiral galaxy, or galactic collisions
- Know what a star cluster is
- Know the difference between an open cluster, an association, and a globular cluster is
- Understand what may happen to a cluster over time

## Chapter 20

### Vocabulary

Core Hydrogen Burning	Hydrostatic Equilibrium	Hydrogen Shell Burning
Subgiant Stage	Red Giant Star	Red Giant Branch
Triple Alpha Process	Electron Degeneracy	Helium Flash
Asymptotic Giant Branch	Planetary Nebula	White Dwarf
Black Dwarf	Main Sequence Turnoff	Roche Lobe
Mass Transfer Binaries	Semidetached	Contact Binaries

- Know that we can't see the life of a star because of the time constraints
- Know what is meant by core hydrogen burning and hydrostatic equilibrium
- Know that as a star gets older it gets brighter
- Know that everything about a star is controlled by its mass
- Know how long our Sun is thought to live
- Know what hydrogen fuses in to
- Know what happens to the temperature in the core when it shrinks
- Know what the hydrogen shell burning is
- Understand what is meant by the term subgiant
- Know what is meant by the term red giant star
- Know what is meant by the term triple alpha process
- Understand electron degeneracy
- Know what the helium flash is and why it happens
- Know what helium fuses in to
- Know what the asymptotic giant branch is
- Know that our Sun is not massive enough to ignite the carbon fuel
- Know what a planetary nebula is and why it forms
- Know what a white dwarf is
- Know what is meant by a naked white dwarf
- Know what causes a black dwarf
- Know that stars between the masses of  $2.5 - 8 M_{\text{sun}}$  will not have a helium flash
- Know that for stars more massive than  $12 M_{\text{sun}}$  they will end their lives as a supernova
- Know why we look at clusters of stars when studying the evolution of stars
- Understand what is meant by main sequence turnoff and what the significance is
- Understand how the evolution of binaries may be different than single stars
- Know what is meant by the Roche lobe
- Know what the Lagrangian point is

- Know how mass transfer binaries evolve differently from others
- Know the difference between semidetached and contact binaries

## Chapter 21

### Vocabulary

Recurrent Novae	Fusion	Fission
Photodisintegration	Neutronization	Neutron Degeneracy
Core Collapse Supernova	Progenitor	Type I Supernova
Type II Supernova	Chandrasekhar Limit	Supernova Remnant
Isotopes	Stellar Nucleosynthesis	Helium Capture
Neutron Capture	S-Process	R-Process
Nova		

- Know what a nova is and how a recurrent nova occurs
- Know that an  $8 M_{\text{sun}}$  star will never burn carbon
- Know that high mass stars will have many layers inside them
- Know that the last element produced in a star is iron
- Know what fusion does in the star
- Know the difference between fusion and fission
- Know that when a star has a significant amount of iron in the core it will go supernova
- Understand what photodisintegration is and how it affects the star
- Know what neutronization is
- Know that the neutrinos carry off energy from the star
- Know how neutron degeneracy affects the collapse of the core and the fate of the star
- Know what is meant by the progenitor star
- Know that a star will become a supernova only once in its life
- Know the difference between a Type I and Type II supernovae
- Understand what the Chandrasekhar limit is and how it comes into play with Type I supernovae
- Know the difference in the amount of hydrogen in the spectra of a Type I and Type II supernovae
- Know what a supernova remnant is
- Know what the Crab Nebula is
- Know that we have not seen a supernova in our galaxy since the invention of the telescope
- Know what an isotope of an element is
- Know how different elements come together to form new elements
- Know helium forms
- Know what is meant by helium capture
- Understand that in extreme heat the big elements will break down into lighter elements
- Understand that to make atoms more massive than iron you will have neutron capture occurring

- Know that everything between iron and including bismuth is formed by the S-process
- Know that the universe recycles everything and that we are recycled material