



Review Exam 2



Key questions

- What is it so hard to make fusion happen on Earth?
- Detection of what proves that the Sun is powered by nuclear fusion?
- Why is the Sun yellow colored?
- What is a blackbody?
- The hotter/cooler a blackbody at a constant radius, what happens to the object's color, brightness, and energy output?
- Why do further objects look dimmer?



Key questions

- How does luminosity (absolute brightness) depend on a star's radius?
- What does the spectrum of the Sun look like? Why?
- Why does different elements have a distinct spectrum?
- What is the HR diagram?
- What are the axes?
- What is the main sequence?
- What is the characteristic of stars on the main sequence?



Key questions

- Where are the giants/supergiants/white dwarfs on the HR diagram, roughly?
- How can a cool star be bright?
- The Sun will be on the main sequence for another 6 billion years. How will it change (luminosity and size) during that time?
- During the next 6 billion years what will happen to the Earth due to the Sun?
- What is the greenhouse effect?
- Name two possible mitigation techniques for the Sun's evolution over the next 6 billion years.



Key questions

- In 6 billion years the Sun moves off the main sequence. What is happening in the core? Where does it move on the HR diagram?
- The Sun becomes a red giant. What is happening in the core? Around the core? Where is it on the HR diagram?
- Why are we uncertain of what will happen to the Earth (swallowed?) when the Sun turns into a red giant, assuming the Earth isn't moved?



Key questions

- In about 7.7 billion years, the Sun will turn into a Horizontal Branch star (a blue star). What is happening in the core? What is happening around the core?
- In about 7.8 billion years, the Sun will turn into an Asymptotic Giant Branch star (a red star). What is happening in the core? What is happening around the core?
- The last stage of our Sun will be a planetary nebula and a white dwarf. What happens to the Sun's envelope?



Key questions

- What keeps a white dwarf from collapsing?
- What is the maximum mass of a white dwarf?
- What are the layers of the Sun now?
- What is a sunspot? Why is it dark? Compare the temperature to the Sun's surface. What makes sunspots?
- What is the sunspot cycle? What causes it?
- What is convection on the Sun's surface?
- What is an aurora?
- What is a solar flare?
- What is a CME?



Key questions

- Why don't most CMEs hit the Earth?
- The most dangerous CMEs have magnetic fields that are opposite the Earth's. Why does that make a difference?
- What are some effects of a CME impact on the Earth?
- What is the best mitigation technique for a CME event?
- Is there any correlation between space weather and the Earth?



Key questions

- Compare the luminosity of a massive star and a low-mass star on the main sequence. Compare the time it takes to evolve.
- A massive star has much more hydrogen fuel in it, yet it lives much less time on the main sequence. Why?
- Briefly explain the core and layers in a massive star as it evolves off the main sequence. What does it look like?



Key questions

- At the end a massive star has a pure iron core, and it will collapse. It is too heavy for electron degeneracy and it collapses how quickly/fast?
- What happens to the electrons and the protons in the core as it collapses?
- What happens to the envelope of the star when the core collapses?
- The rebound of the envelope is not enough to cause a supernova by itself. What energy input kicks the explosion?



Key questions

- Why are we star stuff?
- What triggers a supernova? What happens right before the collapse? What happens right after?
- A core collapse is one type of supernova. What is another?
- What is the death distance for a supernova? Roughly..
- What are some effects on the Earth of a nearby supernova?
- Could you breathe Earth's first atmosphere?



Key questions

- Where did the oxygen in our atmosphere come from?
- What is ozone? Why is it (when in the stratosphere) good for life?
- What are some effects on life on Earth when the ozone layer is damaged?
- What made the Crab Nebula?
- Why was supernova 1987A interesting to astronomers?
- But how long since we had a visible supernova in our Galaxy?



Key questions

- Any supernova candidates nearby?
- What is the evidence of nearby supernova explosions (Earth evidence)?
- What are mitigation techniques for nearby supernova?
- What supports a neutron star from collapsing?
- What is a pulsar? Why doesn't all supernova remnants hold a pulsar?
- What is a magnetar?
- What happens if the core of a supernova is more than 3 solar masses?



Key questions

- What would happen to the Earth if the Sun became a black hole?
- How is the event horizon change with the mass of the black hole?
- What are the end states of 1, 5, 10, and 50 solar mass stars?
- What is a gamma-ray? Particle? Light?
- Why do we have to go to space to detect gamma rays?
- How were Gamma-Ray Bursts first detected?



Key questions

- What is the distribution of GRBs on the sky?
Uniform? Lumped? Skewed?
- What do we think is the origin of long time GRBs?
- What do we think is the origin of short time GRBs?
- What is the main reason GRBs are so bright?
- What causes the jet in a hypernova?



Key questions

- What is the common feature (i.e. mechanism) for both long and short time GRBs?
- What are some affects of a nearby GRB on the Earth?
- What is Eta Carinae? WR 104? Which one might be pointed at us?



Key questions

- Why are neutron star/neutron star or black hole/neutron star mergers a less dangerous type of GRB?
- Which extinction event may have been caused by a GRB? What were some of the effects?
- GRB mitigation?
- The speed of what is a measured constant regardless of your movement?
- How is time/length/mass affected when you observe someone moving with respect to you? Why is it relative?
- How does your local time/length/mass change when you move at high speeds?



Key questions

- Given that Einstein's theory of general relativity is a better theory of gravity than Newton's, when something falls off a building, why does it fall? What is gravity in this case?
- How does a massive object affect space-time?
- How does a massive object affect time and light?
- What is a black hole in Einstein's GR theory?
- Black holes are simple. What three properties do they have?
- Why are black holes with accretion disks so bright? Why is a black hole without an accretion disk so dim?
- What is a black hole's event horizon? A Schwarzschild radius? How do they change with mass?