

Things to know:

This meant as a guide to what you should know. I make no guarantees that this material will be on the test, or that there won't be additional material on the test.

How do you measure distances to stars?

What are the definitions of parallax and light year?

Know the concept of the cosmic calendar and the basic sequence of events including the formation of the Milky Way, the formation of the Sun and the busy events of December 31st.

Your cosmic address

What are the ages of the universe, of our galaxy, of the Sun?

How distant is the nearest star, nearest galaxy, most distant galaxies? How big is our galaxy and solar system?

Newton's three laws of Motion

Newton's law of Universal Gravitation

What is the wavelength and frequency of a light wave?

What is an atom, ion and molecule?

What is a photon and what is the energy of a photon?

What is a blackbody?

What is the difference between a reflecting and refracting telescope?

What are two advantages of putting a telescope into space?

How is energy produced in the Sun? What is nuclear fusion?

How does core of the Sun act as a thermostat?

How does that energy get out of the Sun?

What is a photosphere?

What is the main sequence?

Know the HR diagram!!!!!!

What is the sequence of spectral types with decreasing mass and temperature (OBAFGKM)? Which stars are the most common?

What is a brown dwarf?

Where do star form?

What are protostars and pre-main sequence stars? How long does each phase last?

What is the source energy for a protostars, a pre-main sequence star, and a main sequence star?

What is a low mass, intermediate mass and high mass stars? What type of star is the Sun?

How long will the Sun spend on the main sequence? How does the lifetime of a star on the main sequence change with the mass of a star?

What are the basic steps of stellar evolution for low and high mass stars after the stars run out of Hydrogen in their cores and leave the main sequence.
Approximately how long does each phase last, how does the luminosity change with time?

Where are the red giants on the HR diagram? Super giants? White dwarfs?
Helium flash? Main sequence turn-off? Helium burning (or horizontal branch)?

Different types of nuclear “burning” (i.e. nuclear fusion) such as proton-proton chain, CNO cycle, helium burning (you don’t need to know the steps of the CNO cycle but you do need to know what CNO stands for!).

Where did Hydrogen and Helium come from and where do the heavier elements come from?

What are white dwarfs, neutron stars and black holes and how do they form?

What kind of pressure supports a normal star (thermal) and what kind of pressure supports a white dwarf and neutron star?

What are the two types of supernova?

What is the interstellar medium and what is it made of?

What are planetary nebulae and supernova remnants?

What are dark clouds and what causes them?

Cosmic recycling – how does it work and how does it enrich the interstellar medium? Does all the mass get returned into the interstellar medium?

What are the components of a spiral galaxy? (i.e. bulge and halo (aka the spheroidal components), disk with spiral arms)

What are spiral arms?

Why do spiral galaxies tend to look blue and elliptical galaxies look red?

Know Hubble's tuning fork and the classification of galaxies by their morphology, in particular, the difference between an elliptical galaxy, spiral galaxy, and barred spiral galaxy.

What is Hubble's law and why does it mean the universe is expanding?

How do you use Hubble's law to measure the age of the universe?

What are standard candles?

What are the rungs of the cosmic distance ladder (don't forget Cepheids and White Dwarf Supernova!!!)?

What is dark matter and how do we know it exists?

What is the difference between a blackbody, dark cloud and dark matter?

What percentage of the mass of a galaxy cluster is in stars, hot gas and dark matter?

How are elliptical galaxies formed through collisions of Galaxies?

What are AGNs and Quasars? What is their energy source?

What is the difference between a blackbody, dark cloud and dark matter?

How does dark matter create cosmic structure?

What does it mean that the universe is isotropic?

What is the cosmic web?

What are voids? (there is no dark matter in voids!!).

Be able to recognize in an inertial reference frames.

The speed of light is the same for all inertial reference frames.

What unusual distortions in time and space are experienced when one moves at speeds near the speed of light?

What is gravity in Einstein's general theory of relativity?

What is all matter made of (what are leptons, baryons, quarks)?

What is the evidence for the big bang?

What is the cosmic microwave background? In what direction of the sky is it located?

When, where, and why was the cosmic microwave background radiation released?

What is critical density? Is the universe closed, open, coasting or accelerating?

The future of the universe – what happens to stars, galaxies, black holes, white dwarfs, neutron stars and baryons in the future?

What is Hawking radiation and how do black holes evaporate?

What is SETI? How might we find civilizations on planets orbiting stars other than the Sun?

What is twin paradox and how does it make it possible for people to travel to the stars?

How do we detect stars around other planets?

What are the habitable zones around stars?

What are the hallmarks of a good scientific theory?