What You Should Know About "Stars With More Than 8 Solar Masses"!

1.) What are two main ways stars that are larger than eight solar masses differ from stars that are smaller than eight solar masses (and I'm not counting their size as one way!)? (they burn faster and hotter and live shorter lives)

2.) In order from the outside in, what are the atom types that carry on fusion *outside* the core of a star that has proceeded all the way up to having an iron core (there should be seven elements listed)? (H, He,C, O, Ne, Mg, Si)

3.) For a star that is twenty times more massive than the sun, how long will it fuse:

a.) hydrogen to make helium in its core? (10 million years)

b.) the production of iron in its core? (1 day)

4.) When a large star begins to run out of fuel at the iron producing stage:

a.) What happens to the core? (gravity takes over and core collapses)

b.) Photon energies begin to break atoms into their elementary components when the core reaches what temperature? (10 billion degrees Kelvin)

c.) What is the density of the core at this point (it has something to do with Nimitz sized aircraft carriers)? (1000 Nimitz class aircraft carriers compressed to the size of a marble)

5.) How long does the collapse take? (half a second)

6.) What stops the implosion if the core is between 1.4 and 1.9 solar masses? (neutrons jammed up against neutrons)

7.) As the neutrons jam in, muons interacting with the outer shell cause it to blow outward.

a.) What is this process called? (a supernova)

b.) What is the ejected shell called? (a supernova remnant)

8.) When a star supernovas, how much energy does it give off in terms of it's total lifetime? (100 times)

9.) In 1054, what two cultures observed a supernova? (native American Indians and the Chinese)

10.) For how long was the supernova alluded to in #7 visible during the day? (two weeks)

11.) What causes the outer shell of the star to blow outward during a supernova? (note: according to Sterl, it isn't the neutron rebound that blows a star, it's muon emission during collapse that interacts with the outer shell that blows it outward)

12.) Explain the process by which Be, Li and B are produced? (spallation, where protons are knocked out of carbon atoms during supernova due to high energy impacts)

13.) What is the largest element producable in large quantities in the core of large stars? (iron)

14.) What is the name of the process whereby elements larger than iron are produced during (or just after) supernovas? (r-process—note that the "r" stands for "rapid")

15.) The abundance of what sub-atomic particle is crucial to the production of larger-than-iron element during and just after supernovas? (neutrons)

16.) Which kind of radioactive decay is crucial to the production of larger-than-iron elements during and just after supernovas? When this decay occurs inside an atom, what happens to the atom involved? (beta decay where a neutron becomes a proton)

17.) There are five elements that are larger-than-iron that can be produced inside large stars during their lifetime (that is, NOT when they die). What is the name of the process that allows this to happen and how does it differ from the process that creates larger-than-iron elements during a supernova? (s-process, for the slow accumulation of neutrons that later beta decay, forming new elements)

18.) What characteristic allows certain stars to exhibit strontium spectral lines that are millions of times greater than expected in type A stars that have little or no convection currents in them (due to their association with a binary partner)? (don't do if we didn't cover in class)

19.) Barium spectral lines are observed some stars that have white dwarf partners. Who came up with the explanation of what's going on? (don't do if we didn't cover in class)