Quiz 6

1)Which of the following is closest in mass to a white dwarf?
A)Jupiter
B) the Moon
* C) the Sun
D) Earth

2)Why is there an upper limit to the mass of a white dwarf?
A)The more massive the white dwarf, the higher its temperature and hence the greater its degeneracy pressure. At about 1.4 solar masses, the temperature becomes so high that all matter effectively melts, even individual subatomic particles.
B)White dwarfs come only from stars smaller than 1.4 solar masses.
* C)The more massive the white dwarf, the greater the degeneracy pressure and the faster the speeds of its electrons. Near 1.4 solar masses, the speeds of the electrons approach the speed of light, so more mass cannot be added without breaking the degeneracy pressure.
D)The upper limit to the masses of white dwarfs was determined through observations of white dwarfs, but no one knows why the limit exists.

3)What is the ultimate fate of an isolated white dwarf?
A)As gravity overwhelms the electron degeneracy pressure, it will explode as a supernova.
* B)It will cool down and become a cold black dwarf.
C)As gravity overwhelms the electron degeneracy pressure, it will become a neutron star.
D)As gravity overwhelms the electron degeneracy pressure, it will explode as a nova.
E)The electron degeneracy pressure will eventually overwhelm gravity and the white dwarf will slowly evaporate.

4)Suppose a white dwarf is gaining mass because of accretion in a binary system. What happens if the mass someday reaches the 1.4-solar-mass limit?
A)The white dwarf immediately collapses into a black hole, disappearing from view.
B)The white dwarf, which is made mostly of carbon, suddenly becomes much hotter in temperature and therefore is able to begin fusing the carbon. This turns the white dwarf back into a star supported against gravity by ordinary pressure.
C)A white dwarf can never gain enough mass to reach the limit because a strong stellar wind prevents the material from reaching it in the first place.
* D)The white dwarf undergoes a catastrophic collapse, leading to a type of supernova that is somewhat different from that which occurs in a massive star but is comparable in energy.

5)Which of the following statements about novae is not true?
A)When a star system undergoes a nova, it brightens considerably, but not as much as a star system undergoing a supernova.
* B)Our Sun will probably undergo at least one nova when it becomes a white dwarf about 5 billion years from now.
C)A nova involves fusion taking place on the surface of a white dwarf.
D)A star system that undergoes a nova may have another nova sometime in the future.
E)The word nova means "new star" and originally referred to stars that suddenly appeared in the sky, then disappeared again after a few weeks or months.

6)How does a 1.2-solar-mass white dwarf compare to a 1.0-solar-mass white dwarf?
A)It has a higher surface temperature.
B)It has a lower surface temperature.
* C)It has a smaller radius.
D)It is supported by neutron, rather than electron, degeneracy pressure.
E)It has a larger radius.

7)Observationally, how can we tell the difference between a white-dwarf supernova and a massive-star supernova?
A)The light of a white-dwarf supernova fades steadily, while the light of a massive-star supernova brightens for many weeks.
B)A massive-star supernova is brighter than a white-dwarf supernova.
* C)The spectrum of a massive-star supernova shows prominent hydrogen lines, while the spectrum of a white-dwarf supernova does not.
D)We cannot yet tell the difference between a massive-star supernova and a white-dwarf supernova.
E)A massive-star supernova happens only once, while a white-dwarf supernova can repeat periodically.

8)Which of the following is closest in size (radius) to a neutron star?
A)a basketball
B)a football stadium
* C)a city
D)the earth
E)the Sun

9)What causes the radio pulses of a pulsar?
* A)As the star spins, beams of radio radiation sweep through space. If one of the beams crosses the earth, we observe a pulse.
B)A black hole near the star absorbs energy and re-emits it as radio waves.
C)The star's orbiting companion periodically eclipses the radio waves emitted by the main pulsar.
D)The star vibrates.
E)The star undergoes periodic explosions of nuclear fusion that generate radio emission.

10)What is the ultimate fate of an isolated pulsar?
A)The neutron degeneracy pressure will eventually overwhelm gravity and the pulsar will slowly evaporate.
B)It will spin ever faster, becoming a millisecond pulsar.
C)As gravity overwhelms the neutron degeneracy pressure, it will explode as a supernova.
* D)It will slow down, the magnetic field will weaken, and it will become invisible.
E)As gravity overwhelms the neutron degeneracy pressure, it will become a white dwarf.