ASTRO 130, Spring 2020 Homework on Chapter 17
Name: _____ Date: _____

1. Why are the majority of stars in the sky in the main-sequence phase of their lives?
   A) This is the longest-lasting phase in each star's life.
   B) Most stars die at the end of the main-sequence phase.
   C) This is the only phase that is common to all stars.
   D) Most stars in the sky were created at about the same time, so they are all in the same phase of their lives.

2. What makes a red giant star so large?
   A) The helium-rich core has expanded, pushing the outer layers of the star outward.
   B) The star has many times more mass than the Sun.
   C) Red giants are rapid rotators, and centrifugal force pushes the surface of the star outward.
   D) The hydrogen-burning shell is heating the envelope and making it expand.

3. Why does it require higher gas temperatures in the core of a star to produce nuclear fusion of helium compared to that required for hydrogen?
   A) Higher speeds are needed between two He atoms to overcome the shielding effect of the 2 electrons around the nucleus compared to the 1 electron per nucleus of H.
   B) The He nuclei need to be moving faster to avoid the more numerous and faster H nuclei with which they can combine with no energy generation.
   C) Higher collision speeds are needed to overcome the extra electrostatic repulsion between doubly charged He nuclei.
   D) Higher atomic speeds are required to strip off 2 electrons per helium atom rather than 1 electron per atom for hydrogen before fusion can take place.

4. The ^{12}C and ^{16}O, which now form part of living matter, were part of the cold, dark nebula from which the Sun formed. How did they get there?
   A) They were part of the original Big Bang and thus part of everything formed since then.
   B) They were formed by earlier generations of stars while they were on the main sequence.
   C) They were formed by earlier generations of stars while they were in their horizontal branch phase.
   D) They were formed by cosmic rays heating and fusing He in the interstellar medium.

5. Stars that have ejected a planetary nebula go on to become
   A) red giants.
   B) white dwarfs.
   C) protostars.
   D) supernovae.

6. A white dwarf star is supported from collapse under gravity by
   A) degenerate-electron pressure in the compact interior.
   B) centrifugal force due to rapid rotation.
   C) pressure of the gas, heated by nuclear fusion reactions in a shell around its core.
   D) pressure of the gas, heated by nuclear fusion reactions in its core.

7. A Type II supernova is the
   A) explosion of a single massive star after silicon burning has produced a core of iron nuclei.
   B) explosion of a red giant star as a result of the helium flash in the core.
   C) collapse of a blue supergiant star to form a black hole.
   D) explosion of a white dwarf in a binary star system after mass has been transferred to it from its companion.

8. It is now thought that most elements in the universe heavier than iron in the periodic table
   A) are produced by the nuclear reactions in the central cores of high-mass stars a few hundred years before the star explodes into a supernova.
   B) were produced in the Big Bang explosion at the beginning of our universe.
   C) are produced by the successive capture of high-speed neutrons within low-mass star cores because neutrons are uncharged and can approach other nuclei without electrostatic repulsion.
   D) are produced by nuclear reactions in the shock wave regions surrounding supernova explosions and from merging neutron stars.

9. What “safety valve” operates in the gas of normal (nondegenerate) stars?
   A) If the star gets too big, it will collapse into a black hole.
   B) If the stellar gas is suddenly heated, it will expand and cool.
   C) If the pressure gets too high, electrons will combine with protons to relieve the pressure.
   D) If thermonuclear reactions proceed too quickly, the star will run out of fuel before anything drastic happens.