Astro 130, Fall 2014, Chapter 26, 26.1-26-5
Name: _____ Date: _____

1. Newton reached the conclusion that the universe must consist of an infinite expanse of stars because
   A) he was unable to detect the movement of stars around a common center, which his theory required for stability against collapse in a finite universe.
   B) he reasoned that a finite number of stars would eventually fall together under their mutual gravity.
   C) of his religious conviction that the creator would create nothing less than an infinite universe.
   D) he and his colleagues had observed the uniform distribution of stars all over the sky.

2. Which two parameters representing observations of distant objects in the universe are related in the Hubble law?
   A) the luminosity of a star and its distance from the center of the galaxy
   B) the distance to the object and the redshift of its light
   C) the mass of a distant object and its velocity away from our galaxy
   D) the mass of an object and its luminosity

3. The expansion of the universe means that
   A) as time goes by, galaxies move away from each other through empty space.
   B) as time goes by, space itself expands carrying the galaxies along with it.
   C) each object in the universe expands its size.
   D) the light from distant galaxies is Doppler shifted as the galaxies move away from us.

4. Because of the general expansion of space, all distant galaxies appear to be moving away from us, with speeds that increase with distance from our galaxy. An observer in one of these distant galaxies would apparently see
   A) all galaxies on one side of the observer moving toward her and all galaxies on the other side moving away from her; the more distant the galaxy, the faster its motion.
   B) all galaxies moving away from her, the more distant galaxies moving faster.
   C) all galaxies moving away from her, with closer galaxies moving faster.
   D) all galaxies moving toward her, with more distant galaxies moving faster.

5. What causes cosmological redshift of photons that reach us from distant galaxies?
   A) The photons have moved from high gravitational field regions toward lower fields, thereby becoming reddened.
   B) The photons were emitted from the galaxies much earlier in time when the overall temperature of matter was much lower. Hence, the observed photons are redder, the farther away from Earth that they were produced.
   C) The photons have traveled across space that has been expanding and their wavelengths have expanded with it, becoming redder.
   D) The photons were emitted by objects that were moving rapidly away from us, and thereby have been reddened by the Doppler effect.

6. In the expansion of the universe, the expansion takes place
   A) only between objects separated by a vacuum; as a result, our bodies do not expand but Earth-Moon system does.
   B) primarily in the huge voids between clusters of galaxies: "small" objects like galaxies or Earth do not expand.
   C) only over distances about the size of a galaxy or larger; consequently, our galaxy expands but the solar system does not.
   D) between all objects, even between the atoms in our bodies, although the expansion of a person is too small to be measured reliably.

7. What is it that keeps localized regions of space, such as things upon Earth, planetary systems, star clusters, and whole galaxies, from participating in the general expansion of the universe?
   A) their locations in places where irregularities in the chaotic Big Bang explosion permitted matter to condense
   B) the mutual gravity between objects in these systems
   C) the powerful and all-pervading gravity from the central supermassive black holes of galaxies, which holds everything in place within the galaxies
   D) the centrifugal force produced by their motion around a massive central object (e.g., the Sun, supermassive black holes, etc.)

8. What is the general meaning of the cosmological principle?
   A) There is no unique time in our universe; it has always looked the way it is now and will always do so.
   B) We do not occupy a special location in space, because the universe is the same everywhere, on average.
   C) The universe appears to be expanding outward, but this is because of our motion as we descend into a super-duper massive black hole which has distorted space to produce the illusion of general "expansion."
   D) We occupy a very special location near the original location of the Big Bang, because everything appears to be moving away from this location as the universe expands.

9. We believe the cosmic singularity which began the universe occurred 13.7 billion years ago. This means that
   A) the present distance (comoving radial distance) to the most distant objects whose light reaches us is 13.7 billion light years.
   B) the present distance (comoving radial distance) to the most distant objects whose light reaches us is more than 13.7 billion light years.
   C) all objects we can see are now less than 13.7 billion light years distant.
   D) the universe is 13.7 billion light years in radius.

10. Astronomer A claims that the Hubble constant is 84 km/s/Mpc, whereas astronomer B claims that it is 63 km/s/Mpc. The age of the universe calculated by astronomer A would be
   A) 2/3 of that calculated by astronomer B.
   B) 3/4 of that calculated by astronomer B.
   C) 1.25 times that calculated by astronomer B.
   D) 1.33 times that calculated by astronomer B.

11. Why does the observable universe have an "edge"?
   A) because there are so many galaxies in the universe that every line of sight eventually hits a galaxy, stopping us from seeing any farther
   B) because the density of neutrinos at the "edge" is so large that photons cannot pass through, preventing us from seeing beyond this point
   C) because absorbing matter prevents us from seeing out past a certain distance
   D) because we cannot see any farther than the distance that light has traveled over the lifetime of the universe

12. Good evidence for an original big bang, which “created” our universe, comes from
    A) the very high flux of 21-cm radio energy, coming from the atomic hydrogen atoms produced in the explosion.
    B) the rapid motions of some nearby stars, such as Barnard's Star.
    C) the amount of gas and dust in the solar neighborhood.
    D) a background “glow” of microwaves, with blackbody temperature of about 3 K.

13. The 2.7 K Cosmic Microwave Background radiation comes from
    A) the combined radiation of all the distant galaxies.
    B) clouds of hot gases in clusters of galaxies.
    C) radioactivity within Earth.
    D) the decoupling of radiation and matter in the early universe.

14. The cosmic microwave background radiation is not uniform over the sky—it is slightly hotter toward the constellation Leo and slightly cooler in the opposite direction, toward Aquarius. Why?
    A) The background radiation really is uniform; the observed difference is due to Earth's motion through the universe.
    B) That is the way the universe began—hotter in one direction and cooler in the other.
    C) The difference is probably a statistical fluctuation, and therefore not real.
    D) Earth is slightly off-center in the universe, so one side of the universe is a bit closer and the other side is a bit farther away.