Here are sample multiple choice questions for Chapters 15-18

Name___________________________________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) How can we see through the interstellar medium? 1) ______
   A) by observing in high-energy wavelengths such as X rays and long wavelengths of light such as radio waves
   B) by observing only the brightest visible sources
   C) by using telescopes above the earth’s atmosphere
   D) by using only the biggest telescopes
   E) We cannot see through the interstellar medium.

2) Compared with our Sun, most stars in our galaxy’s halo are 2) ______
   A) young, red, and dim and have fewer heavy elements.
   B) old, red, and bright and have fewer heavy elements.
   C) young, blue, and bright and have much more heavy element material.
   D) old, red, and dim and have much more heavy element material.
   E) old, red, and dim and have fewer heavy elements.

3) If we could see our own galaxy from 2 million light-years away, it would appear 3) ______
   A) to fill the sky with widely spaced stars.
   B) as a faintly glowing band of light stretching all the way around the sky.
   C) like a single, dim star.
   D) to be a flattened disk with a central bulge and spiral arms.

4) Why are we unlikely to find Earth-like planets around halo stars in the Galaxy? 4) ______
   A) Halo stars do not have enough mass to hold onto planets.
   B) Planets around stars are known to be extremely rare.
   C) Halo stars formed in an environment where there were few heavy elements to create rocky planets.
   D) Any such planets would have been ejected long ago by galactic mergers.
   E) Halo stars formed in a different way from disk stars.

5) If Hubble’s constant is 75 km/s/Mpc (kilometers per second per megaparsec), then how fast would we expect a galaxy 10 megaparsecs away to be moving? (Assume the motion is due only to Hubble’s law.) 5) ______
   A) toward us at 750 km/s
   B) away from us at 75 km/s
   C) away from us at 750 km/s
   D) away from us at 750,000 km/s
6) Why are Cepheid variables important?
   A) Cepheids are a type of young galaxy that helps us understand how galaxies form.
   B) Cepheids are pulsating variable stars, and their pulsation periods are directly related to
      their true luminosities. Hence, we can use Cepheids as "standard candles" for distance
      measurements.
   C) Cepheid variables are stars that vary in brightness because they harbor a black hole.
   D) Cepheids are supermassive stars that are on the verge of becoming supernovae and
      therefore allow us to choose candidates to watch if we hope to observe a supernova in the
      near future.

7) The most basic difference between elliptical galaxies and spiral galaxies is that
   A) elliptical galaxies have a spheroidal component (of stars distributed spherically about the
      galactic center), and spiral galaxies do not.
   B) elliptical galaxies lack anything resembling the disk of a spiral galaxy.
   C) elliptical galaxies lack anything resembling the halo of a spiral galaxy.
   D) elliptical galaxies are very old and spiral galaxies are very young.

8) Current estimates place the age of the universe at about
   A) 14 trillion years.   B) 14 million years.
   C) 14 billion years.   D) 14 thousand years.

9) How was Edwin Hubble able to use his discovery of a Cepheid in Andromeda to prove that the
   "spiral nebulae" were actually entire galaxies?
   A) He used main-sequence fitting to determine the distance to Andromeda and show that it
      was far outside the Milky Way Galaxy.
   B) He measured the stellar parallax of the Cepheid in Andromeda, was able to determine the
      distance to it, and showed that it was far outside the Milky Way Galaxy.
   C) Since a Cepheid is a type of luminous galaxy, when he found it in Andromeda he was able
      to prove that Andromeda was a separate galaxy from the Milky Way.
   D) From the period-luminosity relation for Cepheids, he was able to determine the distance
      to Andromeda and show that it was far outside the Milky Way Galaxy.
   E) There are no Cepheids in the Milky Way, so his discovery proved that it had to be in
      another galaxy.

10) Suppose an elliptical galaxy is so far away that we cannot see even its brightest stars
    individually. Which of the following techniques could allow us to measure its distance?
    A) We could use radar ranging.
    B) We could use Cepheid variables as standard candles.
    C) We could use a white-dwarf supernova as a standard candle.
    D) We could apply the Tully-Fisher relation.

11) The unusually bright centers found in some galaxies are called
    A) supermassive black holes.   B) starbursts.
    C) halos.   D) active galactic nuclei.
12) One possible explanation for a galaxy’s type invokes the angular momentum of the protogalactic cloud from which it formed. Suppose a galaxy forms from a protogalactic cloud with a lot of angular momentum. Assuming its type has not changed due to other interactions, we’d expect this galaxy to be

A) a torn and incoherent galaxy.  
B) an elliptical galaxy.  
C) a spiral galaxy.  
D) an irregular galaxy.

13) The flat rotation curves of spiral galaxies tell us that they contain a lot of dark matter. Do they tell us anything about where the dark matter is located within the galaxy?

A) Yes, they tell us that dark matter is spread uniformly throughout the galactic disk.  
B) No, we cannot determine anything about the location of dark matter from the rotation curve.  
C) Yes, they tell us that the dark matter is mostly located at large distances from the galactic center; that is, out in the halo that surrounds the disk.  
D) Yes, they tell us that the mass is concentrated near the center of the galaxy.

14) A large mass-to-light ratio for a galaxy indicates that

A) on average, each solar mass of matter in the galaxy emits less light than our Sun.  
B) on average, each solar mass of matter in the galaxy emits more light than our Sun.  
C) the galaxy is not very massive.  
D) the galaxy is very massive.  
E) most stars in the galaxy are more massive than our Sun.

15) According to the Big Bang theory, how many forces—and which ones—operated in the universe during the GUT era?

A) 2: gravity and a single force that later became the strong, weak, and electromagnetic forces  
B) 3: gravity, the strong force, and the electroweak force  
C) 1 force that represented the unification of all four forces that operate today  
D) 2: the strong force and the electroweak force

16) In principle, if we could see all the way to the cosmological horizon, we could see the Big Bang taking place. However, our view is blocked for times prior to about 380,000 years after the Big Bang. Why?

A) Before that time, the gas in the universe was dense and ionized and thus did not allow light to travel freely.  
B) 380,000 years after the Big Bang marks the time when stars were first born, and thus began to shine the light by which we can see the universe.  
C) Before that time, the universe was dark, so there was no light to illuminate anything.  
D) Before that time, the universe was too crowded with stars.

17) Red and orange stars are found evenly spread throughout the galactic disk, but blue stars are typically found

A) only near star-forming regions.  
B) in the halo.  
C) also evenly spread throughout the galactic disk.  
D) only in the central bulge.
18) Gravitational lensing occurs when
   A) massive objects bend light beams that are passing nearby.
   B) telescope lenses are distorted by gravity.
   C) dark matter builds up in a particular region of space, leading to a very dense region and an extremely high mass-to-light ratio.
   D) massive objects cause more distant objects to appear much larger than they should and we can observe the distant objects with better resolution.

19) The disk component of a spiral galaxy includes which of the following parts?
   A) bulge
   B) spiral arms
   C) globular clusters
   D) halo
   E) all of the above

20) Which of the following is evidence for supermassive black holes in active galaxies?
   A) the discovery of powerful jets coming from a compact core
   B) quasars emit approximately equal power at all wavelengths from infrared to gamma rays
   C) rapid changes in the luminosity of the galaxy nucleus
   D) very high speed orbital motions around galactic nuclei
   E) all of the above