University of Mississippi
ASTR 101, Spring 2013

Name: _____

Final Exam

For each multiple-choice question circle the letter next to your choice of answer (do not write the letter next to the question).

(1) Are the stars you see in the sky at night with the naked eye inside our own galaxy?
a. Yes, all of them are inside our galaxy.
b. No, each of those stars is inside its own galaxy.
c. A few are, but most of them belong to different galaxies.
d. No, those stars are not inside our galaxy, they orbit around it.

(2) Approximately how long after the beginning of the universe did the first stars and galaxies form?
a. A few seconds.
b. A few minutes.
c. 300,000 years.
d. Several hundred million years.

(3) What is the most common and successful method to search for extrasolar planets?
a. Look for variations in the way their host star moves.
b. Listen for radio waves emitted by the possible planets.
c. Check for anomalies in the temperature and luminosity of a star.
d. Look at the highest-resolution photographs from the Hubble Telescope.

(4) Is there dark matter inside our galaxy?
a. No, dark matter is what black holes are made of.
b. No, dark matter is only present in other type of galaxies.
c. We don't have enough evidence yet either way.
d. Yes, from the speed at which stars move around the center.

(5) How did people first figure out how far the Andromeda galaxy is?
a. By watching a supernova explosion inside it.
b. By finding its velocity and using Hubble's law.
c. By using the parallax method and the HR diagram.
d. By spotting bright Cepheid variable stars in it.

(6) Based on our present knowledge, how long do we think the universe has existed?
a. 13,700 years.
b. 13.7 million years.
c. 13.7 billion years.
d. 13,700 billion years.

(7) Why do we believe that the universe is expanding?
a. Because of the spiral shape of many galaxies.
b. Because the sizes of many galaxies seem to be increasing.
c. Because we were closer to the Andromeda galaxy in the past.
d. Because all distant galaxies appear to be moving away from us.

(8) Suppose we see a supernova 2 million light years away. Which one of the following would it be in?
a. The Solar System.
b. The Milky Way.
c. The Local Group.
d. The Virgo Cluster.

(9) What are the main types of normal galaxies?
a. Visible, infrared, and ultraviolet.
b. Spiral, elliptical, and irregular.
c. Main sequence, giant, and dwarf.
d. Visual, eclipsing, and spectroscopic.

(10) Which of the following is an example of a spiral galaxy?
a. The Andromeda galaxy.
b. The Large Magellanic Cloud.
c. Cygnus X-1.
d. The Oort Cloud.

(11) What are the Magellanic Clouds?
a. Smaller clouds of dust near the Trapezium inside the Orion nebula.
b. Two small irregular galaxies orbiting our galaxy.
c. Large clouds of gas and dust near the center of the Milky Way.
d. The two largest galaxies in the Local Group.

(12) What is an extrasolar planet?
a. A planet that does not orbit around a star.
b. A planet that has an extra star (it orbits around two stars).
c. A planet that is outside the solar system (it does not orbit our Sun).
d. A planet that used to orbit the Sun but has now left our galaxy.

(13) Why did ordinary atoms form only some time after the Big Bang?
a. Because it took that long for the universe to cool down enough.
b. Because before then protons and electrons repelled each other.
c. Because there have to be stars for atoms to be able to form.
d. Because before that time there was no matter in the universe.

(14) What is the evidence for dark matter in distant galaxy clusters?
a. The X-rays we get from the space between galaxies.
b. The speed at which galaxies move around the center.
c. The lensing of distant images produced by the cluster.
d. All of the above.

(15) How do the planets we have discovered so far around other stars differ from the solar ones?
a. Most of them are larger than the solar planets.
b. Most of them are smaller than the solar planets.
c. They don't all revolve in the same direction around their star.
d. Most of them are wandering in space, instead of orbiting a star.

(16) In cosmology, it is considered approximately correct to assume that the universe
a. Has always been at the same temperature.
b. Will eventually stop expanding and recollapse.
c. Contains dark energy, but no dark matter.
d. Looks the same everywhere and in all directions.

(17) What observational fact is the main evidence we have for the Big Bang model?
a. The cosmic microwave background.
b. The existence of dark matter.
c. The age of the globular clusters in our galaxy.
d. The high temperatures in the cores of many galaxies.

(18) What does the halo of our galaxy contain?
a. Only young, recently formed hot stars.
b. No stars or star clusters, just lots of gas and dust.
c. Mainly old stars and globular clusters.
d. Both young and old stars, as well as gas and dust.

(19) A news article describes a planet detected around a star 20 million light years away. Would that be reasonable?
a. No, we believe that there are no galaxies at that distance from us.
b. No, at that distance we cannot see individual stars so we cannot detect extrasolar planets.
c. Yes, we have detected planets as far away as billions of light years.
d. Yes, but at that distance we need to use the eclipsing method rather than direct imaging.

(20) Why can't we see what is near the center of our galaxy with regular optical telescopes?
a. Because it is so far away that light has not had time to reach us yet.
b. Because at night we are not facing the right direction to point our telescopes there.
c. Because there is too much gas and dust there for visible light to go through.
d. Because we see so many stars there that we don't know which one to look at.

(21) What does the "M" in M31, the Andromeda galaxy, stand for?
a. It indicates that the main type of stars it contains are M stars.
b. The name "Messier", for the person who made a catalog of astronomical objects.
c. The word "Medium", as in medium-sized astronomical object.
d. The name "Massachusetts", for the location of the telescope that discovered it.

(22) What is the Big Bang?
a. The explosion out of which a galaxy is born.
b. The explosion at the end of the life of a galaxy.
c. The event that started the expansion of the universe.
d. The event we witness when a star falls into a black hole.

(23) What is the difference between dark matter and dark energy?
a. Dark matter is matter that fell into a black hole, dark energy travels at the speed of light.
b. Dark matter tends to slow down the expansion of the universe, dark energy speeds it up.
c. Dark matter absorbs all types of light, dark energy only specific wavelengths.
d. Nothing, they are two expressions for the same concept.

(24) What is the Local Group?
a. A large globular cluster, the nearest one to the Sun.
b. A small set of about 20 galaxies, including ours.
c. A large cluster of galaxies about 60 million light years away.
d. A small open cluster of stars to which the Sun belongs.

(25) According to current ideas, what is the universe composed of, approximately?
a. 95% regular matter, 5% dark matter.
b. 10% regular matter, 90% dark energy.
c. 5% regular matter, 5% dark energy, 90% dark matter.
d. 4% regular matter, 22% dark matter, 74% dark energy.

(26) What is the Milky Way?
a. The path followed by the Sun in its motion around the galactic center.
b. The galaxy that the Solar System and the stars around us are located in.
c. A distant galaxy which can be seen in the constellation of Sagittarius.
d. A bright reflection nebula contained in the Large Magellanic Cloud.

(27) Why would we see a wobble in the motion of a star that has planets around it?
a. Because of the magnetic field produced by the planets.
b. Because the presence of planets is what makes the star twinkle.
c. Because the star feels a gravitational pull from the planets.
d. Because of the explosions that occur when those planets collide.

(28) Which two quantities are related according to Hubble's law?
a. A galaxy's speed and its distance.
b. A galaxy's distance and its brightness.
c. A galaxy's brightness and its rotation.
d. A galaxy's rotation and its speed.

(29) How many stars are in our galaxy?
a. One.
b. A few hundreds.
c. A few hundreds of thousands.
d. About 100 billion.

(30) Which of the following is a reason to find out how much dark matter there is in the universe?
a. To determine how long the Sun will keep shining.
b. To determine whether the Earth will be hit by a dark matter cloud.
c. To determine if we can use it as fuel for our spacecraft.
d. To determine whether the universe will keep expanding forever.

(31) Have astronomers located all the galaxies in the observable universe?
a. No, there are way too many and only a few sections of the sky have been studied in detail.
b. No, no galaxy other than our own has actually been seen so far.
c. We are close, we expect that within the next couple of years all locations will be mapped.
d. Yes, a full survey of all observable galaxies has just been completed.

(32) The fact that the universe is expanding means that
a. Distant planets in the solar system are moving away from us.
b. Distant galaxies are moving away from us.
c. Distant stars in our galaxy are moving away from us.
d. All of the above.

(33) What appears to be the most likely scenario for the future of the universe?
a. It will eventually recollapse away to a point.
b. It will eventually all fall into a single black hole.
c. It will probably keep expanding forever.
d. It will keep expanding and contracting in cycles.

(34) Where is the center of the universe?
a. At the center of the Milky Way.
b. Near the middle of the Virgo cluster.
c. There is no center, if our current ideas are correct.
d. We don't know exactly, but probably near the Great Attractor.

(35) What is cosmology?
a. The study of the solar system and its planets.
b. The study of how our galaxy formed and evolved.
c. The study of the evolution of the whole universe.
d. The study of how stars form and evolve.

(36) Which of the following is one way to find out the distances to some the farthest galaxies in the universe?
a. Use the main-sequence fitting method.
b. Look for variable stars such as Cepheids in them.
c. Send a signal, and record the time it takes for it to come back.
d. Find the speed at which they move away, and use Hubble's law.

(37) Do we know of any stars other than the Sun that have more than one planet around them?
a. No, the solar system may be unique in this regard.
b. Yes, we know many two examples of multi-planet systems.
c. Yes, all known extrasolar planetary systems have several planets.
d. With current techniques, we can't tell if we are seeing one or more planets.

(38) Does the Sun orbit around anything?
a. Yes, the Earth.
b. Yes, the center of our galaxy.
c. Yes, the center of the universe.
d. No, planets orbit around the Sun.

(39) How far from the center of our galaxy are we?
a. About 4 light years.
b. About 28,000 light years.
c. About 2 million light years.
d. About 25 billion light years.

(40) What do we call dark matter?
a. Thick, dark clouds of interstellar gas and dust that obscure the view.
b. Clusters of black holes, which absorb all the light going through them.
c. Any matter which we cannot see and only seems to have a gravitational effect.
d. Intergalactic clouds of dust responsible for the fact that the sky is dark at night.

For each short-answer question provide an answer that is no more than 3 lines long (a 1-line answer is ok, if complete).

(1) Suppose the positions of the Sun, Earth and Moon are as in the drawing. What phase is the Moon in?

(2) In the same situation as in question 1, at what time of the day/night would you be able to see the Moon in the sky?

(3) What is the main difference between comets and asteroids?

(4) What are "shooting stars"?

(5) How do we find the distances to the nearest stars (other than the Sun)?

(6) Name two differences between Terrestrial and Jovian planets.

(7) What is the main thing you would change in a telescope to improve its ability to produce sharp images?

(8) Why are white-dwarf supernovas (type Ia) very useful in astronomy and cosmology?

(9) Why can an atom absorb or emit only photons of certain specific wavelengths?

(10) What is the difference between red light and blue light?

(11) How do we know that light is made of waves?

(12) What is the difference between a geocentric and a heliocentric model of the solar system?

(13) Which Solar System planets were known long before telescopes were invented?

(14) State what the HR diagram is, and name one reason why it is useful.

(15) Why do all planets move approximately along the ecliptic, as seen from Earth?

(16) How do we know that the Earth moves around the Sun and not the other way around?

(17) What is the difference between how stars and planets move on the Celestial Sphere?

(18) Why is the daytime sky blue?

(19) What changes inside the Sun are responsible for the energy it produces?

(20) Taking gravity fully into account, is the shape of a planet's orbit in the Solar System exactly an ellipse? Explain.

(21 – Bonus question) How useful did you think the textbook was for this course?
- ○ I often used it to study and it helped me understand the subject.
- ○ I sometimes used it, but the lecture notes and summaries were usually enough.
- ○ I never used it, other than looking up homework questions.
- ○ Other: _____