

## ASTR 130 MIDTERM EXAM PREP AND REVIEW QUESTIONS

The midterm exam (Monday, November 3, 2008; 75 minutes) will cover all lectures and all assigned reading to date in the Laboratory Manual and the Edmund Mag-5 Atlas. You are assumed to be familiar with all the lecture notes (available on the course webpage), the Manual material for Labs 1 through 3, together with relevant material in the Appendices, and the material covered on the Collab weekly review quizzes. You are not expected to know material in the "supplementary" lecture note webpages.

The exam will be objective (true/false, multiple choice). You must answer questions on a scantron (bubble) sheet. **Be sure to bring a #2 pencil with you.**

You should bring your skywheels to the exam; you can use them throughout, but you cannot use any other notes, the Manual, or the Atlas.

For anyone interested, I will hold an **informal exam review** in the Astronomy Dept conference room (205 Astronomy Building) at 7 PM, Sunday, November 2.

### REVIEW QUESTIONS

[These questions are intended to help you review the material presented in class and prepare for the midterm exam. They are a little harder than typical of the midterm itself. The best approach is to first study the material, then attempt this "quiz" without referring to the manual, class webpages, or your notes, then review the areas where you had trouble. You can use your skywheel while taking the quiz, since that will be allowed during the exams. For all questions involving observations of the sky, assume you are in Charlottesville unless otherwise stated.]

In what constellation is the star Vega? Altair? Polaris?

(T/F) The zodiac is the group of constellations located within about  $5^\circ$  of the celestial equator.

Which is brighter: a first magnitude star or a fourth magnitude star? There are [more, fewer] stars of magnitude 7 than of magnitude 3.

Which of the following is a circumpolar constellation? A) Pegasus; B) Delphinus; C) Cassiopeia; D) Aquila; E) Aries.

Terminology/definitions to know:

Meridian

Zenith

Precession

Horizon plane

Transit

To add visual interest, stage productions and movies often show a full Moon near the horizon. At what times of night can this occur in real life?

Which planet is the most frequent cause of UFO reports? Why?

From what location on the Earth are all parts of the celestial sphere visible for at least some time during the year? A) the equator; B) the South pole; C) the North pole; D) Charlottesville. [Method: sketch the celestial sphere, the Earth and the horizon plane for the various locations.]

(T/F) You can easily cover the apparent disk of the Sun with your index finger held at arm's length.

Why is the planet Venus never visible at midnight?

In which constellation could you find the Zenith as viewed from Charlottesville? A) Aquarius; B) Andromeda; C) Ursa Minor; D) Sagittarius; E) none of the above.

(T/F) The Zenith remains fixed in the same constellation during a given night.

If the Sun is exactly at the Autumnal Equinox today, approximately how many degrees will it be away from the A.E. in one week? A) 0; B) 1; C) 7; D) 20; E) 90.

If a star is exactly at the Autumnal Equinox today, approximately how many degrees will it be away from the A.E. in one week? A) 0; B) 1; C) 7; D) 20; E) 90.

Is there a place on the Earth's surface where the planets are never visible at any time of year? [*Hint: how near to the ecliptic plane do you expect the planets to be, and what is the relation between the ecliptic and the equator?*]

(T/F) Polaris is near the North Celestial Pole now and always will be.

Why does even a small telescope reveal many more stars than are visible to the naked eye?

What are CCDs, and how are they used by astronomers?

What fraction of the celestial sphere always lies above your local horizon plane? A) depends on your latitude; B) about 5%; C) 50%; D) 100%.

In a new Tom Hanks "Castaway" sequel, the hero finds the latitude of his lonely island by determining the maximum altitude of the full Moon at the time of the Vernal Equinox. Is this possible without having tables of the Moon's coordinates? [*Hint: what declination will the Moon have in this situation?*]

What, physically, is the Milky Way?

Sagittarius is the most southerly of the constellations of the Zodiac. At about what time of night would you expect to see Sagittarius rise over the Eastern horizon on the 25th of December? A) 6 pm; B) 9 pm; C) midnight; D) 3 am; E) Sag. would never be visible.

The "waxing gibbous" phase of the Moon occurs just before full Moon. At what time of day will the Moon rise in this phase? At what time of day does a "first quarter" Moon rise? [*Method: sketch a diagram of the Sun, Earth, Moon's orbit, and the day/night regions on both the Earth & the Moon.*]

Suppose the Moon is in its "crescent" phase. If you were standing on the Moon's surface and could see the Earth in the sky, what phase would the Earth show?

Why, historically, was the invention of photography so important to astronomers?

What is the Sun's location on 21 March and in which direction is it moving with respect to the celestial equator?

You find an unusual object with your telescope and believe it is a new asteroid. What test could you apply to be sure it isn't merely a faint star?

On what day of the year is the declination of the Sun the largest?

A 16-in telescope collects how much more light than an 8-in telescope? A) twice as much; B) four times as much; C) 16 times as much; D) the same.

(T/F) A "constellation" is a physical grouping of stars all of which lie near each other in 3-dimensional space.

What do astronomers mean by "seeing"? How do you measure seeing with your 8-in telescopes?

In what way is the Moon's surface representative of other solar system objects with solid surfaces? A) dominated by impact geology; B) extensive oceans; C) extensive polar caps; D) frozen hydrogen surface.

Which star will be visible in Charlottesville on a given night for a longer time, one with a DEC of  $-30^\circ$  or one with a DEC of  $+30^\circ$ ?

You have three eyepieces with focal lengths of 200, 100, and 20 mm to use with your telescope, which has a focal length of 1800 mm. Which eyepiece will give you an image with 90 power magnification? Which eyepiece will give you the largest "field of view"?

A friend points out a constellation just now rising over the trees in the northeast. It is most likely to be A) Capricorn; B) Ursa Major; C) Scorpio; D) Aquila.

Which type of telescope mounting allows you to follow a star across the sky by moving only in one axis? A) Equatorial; B) Alt-Azimuth.

Which of the ten brightest astronomical objects moves fastest with respect to the "fixed star reference frame" from one night to the next?

What is "dark time" and why is it more valuable to astronomers than "bright time"?

Under what circumstances will the planet Venus appear in the constellation Cygnus?

What is the difference between "terrestrial" planets and "jovian" planets?

What is the "lookback effect"? Give an example.

Why do you need an eyepiece to view an astronomical object through a telescope?

(T/F) Astronomers use the term "seeing" to refer to the transparency of the atmosphere.

If a planet like Jupiter is at "opposition", where in the sky will it appear with respect to the Sun? At about what time of night will it rise above the eastern horizon?

Why is Mars brightest when it is at opposition?

What is the principal difference between a refracting and reflecting telescope? Which is the favored design for large modern telescopes and why?

Why is it harder to discern the color of faint astronomical targets than bright targets?

What are the differences and similarities between telescopes and binoculars?

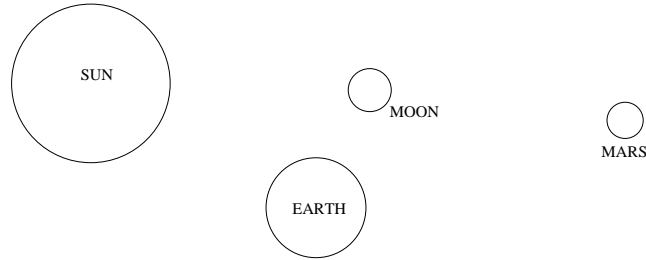
If you could see the stars in the daytime, in which direction with respect to the stars would the Sun appear to move from one day to the next? A) north; B) south; C) east; D) west.

Make a rough sketch of the optical elements and light path of the Schmidt-Cassegrain telescopes you use in the labs. What is the purpose of the "additional" lens in the system?

(T/F) The pinkish glow associated with some nebulae is produced by hot hydrogen gas.

You are observing a planet with a 40 mm eyepiece, which yields a magnification of 100x. What should you do to increase the magnification?

Below is a crude diagram (not to scale!) of the Solar System viewed from above the north pole of the Earth. Mark the location on the Earth where people are now experiencing sunset. For these observers, which object, the Moon or Mars, will rise first above the eastern horizon? Draw in on the diagram an arrowhead to show the direction in which the Earth is moving around the Sun. Mark the approximate positions of the Earth and Mars 4 months later.



(T/F) Most stars have absolute magnitudes which are brighter than their apparent magnitudes. (This question is equivalent to asking whether most stars are more distant than 10 parsecs from us.)

(T/F) Star formation was confined to only the earliest eras of the universe and is not continuing today.

(T/F) A hotter star on the “main sequence” is also a more luminous star.

(T/F) "Globular star clusters" were used historically as a key tracer of the structure of our Galaxy.

If our Galaxy were strictly spherical and transparent, how would the appearance of the night sky differ from the way it looks now?

How many times less flux does a 13th mag star produce than a 3rd magnitude star? A) 10 times less; B) 13 times less; C) 100 times less; D) 10,000 times less.

(T/F) Temperatures of stars cannot be determined without obtaining an actual physical sample of their constituents.

What is the difference between M13 and M31? (Hint: review Lab 2.)

The Sun is a A) white dwarf; B) main sequence star; C) red giant star; D) supergiant.

Why is the “winter” Milky Way less conspicuous than the “summer” Milky Way? A) weather worse; B) looking toward center of galaxy; C) looking toward outskirts of galaxy; D) stars are colder then and less bright.

Rank stars with the following colors in order from hottest to coolest: yellow, blue, red.

Where did most of the important elements in biological compounds (like carbon and oxygen) originate?

In which direction do you expect to see the most stars? A) toward the Galactic Pole; B) in the plane of the Galaxy.

In which direction do you expect to see the most external galaxies? A) toward the Galactic Pole; B) in the plane of the Galaxy.

What is interstellar “dust”? Where can you see it most conspicuously? How did it affect (historically) our understanding of the structure of our Galaxy?

(T/F) The most important role played by “dust” in the formation of new stars is that it acts as a refrigerant for interstellar gas.

What is a “planetary” nebula? Are such objects part of our Solar System?

What do the following constellations have in common? Perseus, Cassiopeia, Cygnus, Aquila, Sagittarius. [If you can’t answer offhand, look at a skywheel.]

What is a "red giant" star? How is a red giant related to a "main sequence" star? How does its temperature and radius compare to the Sun's? Give an example.

(T/F) Stars evolve because they eventually run out of nuclear fuel.

(T/F) A useful catalog of extended objects related to stellar evolution (e.g. clusters and nebulae) was compiled by comet hunter Charles Messier.

(T/F) The peak wavelength of the electromagnetic spectrum of a star is related to its temperature.

What are the Pleiades and the Hyades? Why are they, and objects like them, important to deciphering the evolution of stars?

Why would you expect that the difference between the apparent and absolute magnitudes of the Sun is larger than for any other visible star?

Is the Sun near the center of our Galaxy? How do we know?

How do “variable” stars help astronomers determine the structure of the universe?

How is the photoelectric effect involved in the functioning of film and electronic detectors? ?

What is a Hertzsprung-Russell diagram and why is it important?