

ASTR 1230 MIDTERM EXAM PREP AND REVIEW QUESTIONS

The midterm exam (Monday, October 31, 2011; 75 minutes) will cover all lectures and all assigned reading to date. 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 classroom (265 Astronomy Building) at 4 PM, Sunday, October 30.

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. (Actual midterm questions will be formulated as multiple choice or true/false.) 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 to help answer any question, 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° 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

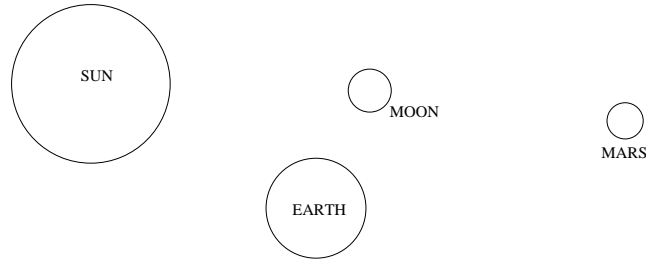
Horizon plane

Transit

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

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.]

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.



On what day of the year is the Sun at its most northerly position?

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

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

(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?

The "north galactic pole" is in the constellation Coma Berencias. At what time of year is this area near the zenith at midnight (and hence visible for the longest period during the night)? A) Early December; B) Early April; C) Early June; D) Early September.

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

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 could never be seen 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?*]

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.

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

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 professional tables of the Moon's coordinates? [Hint: what declination will the Moon have in this situation?]

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?

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.

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

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

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 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.

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?

You are observing a planet with a 40 mm eyepiece, which yields a magnification of 100x. What should you do to increase the magnification to 200x?

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?

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.

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

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

What are some important differences between "terrestrial" planets and "jovian" planets?

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.

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

If the Moon is 90° away from the Sun in the sky, in what phase is it? A) new; B) first or last quarter; C) full; D) early or late crescent.

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? When will it "transit"?

Why is Mars brightest when it is at opposition?

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

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?

How do comets differ from asteroids?

(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 or nearer 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 more massive star on the main sequence is cooler than a less massive star.

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

How many times less flux does a 13th mag star produce than an 8th magnitude star? A) 10 times less; B) 13 times less; C) 100 times less; D) 10,000 times less.

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

Which phase of stellar evolution (listed in the previous question) is the longest lived?

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?

(T/F) An 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, Auriga, Gemini. [If you can't answer offhand, look at a skywheel.]

What is a Hertzsprung-Russell (or "color-magnitude") diagram and why is it important?

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) An important catalog of extended objects related to stellar evolution (e.g. clusters and nebulae) was compiled by comet hunter Charles Messier.

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?

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

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

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

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?

What, physically, is the Milky Way?

What is the significance of the “gaps” visible in the Milky Way on a dark, clear night?

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?

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.

What is the “lookback effect”? Give an example.

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

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

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

What is "dark current" in a CCD detector? Why does it hinder astronomical observations, and what needs to be done to suppress it?