Astronomy 101 Exam 1 Form A

Name: _____

Lab section number: _____

(In the format "M0**". See back page; if you get this wrong you may not get your exam back!)

Multiple Choice	Celestial Sphere	Zodiac	Seasons	Moon		**Total**
/ 40	/ 12	/ 12	/ 12	/ 12		**/ 88**

Instructions:

- Exam time: 80 minutes
- Please put bags under your seats to allow proctors to move around the room.
- You may use one page of notes that you handwrote yourself, or wrote with a stylus and printed. No electronic devices or things written by others are allowed.
- This exam has ten multiple-choice questions worth four points each, followed by four free-response questions worth 12 points each.
- We will deduct one point for each incorrect answer on the multiple choice segment, so that blind guessing will neither increase nor decrease your score.
- We will award substantial partial credit for free-response answers if you show valid reasoning or insight, even if your answer is not correct.
- If you have a question, raise your hand, and a proctor will assist you.
- Do not attempt to communicate with anyone other than teaching staff during the exam.

Good luck!

Lab Schedule

Section	Time	Instructor
M024	Monday 8:00-9:20	Sierra
M003	Monday 9:30-10:50	Keisi
M004	Monday 11:00-12:20	Keisi
M005	Monday 12:45-2:05	Nada
M006	Monday 2:15-3:35	Sierra
M007	Monday 3:45-5:05	Sierra
M008	Monday 5:15-6:35	Nada
M009	Monday 6:45-8:05	Sierra
M019	Monday 8:15-9:35 pm	Dylan
M027	Tuesday 3:30-4:50	Byron
M028	Tuesday 5:00-6:20	Byron
M029	Tuesday 6:30-7:50	Chad
M030	Tuesday 8:00-9:20 pm	Chad
M025	Wednesday 8:00-9:20	Nada
M011	Wednesday 9:30-10:50	Keisi
M012	Wednesday 11:00-12:20	Keisi
M013	Wednesday 12:45-2:05	Byron
M014	Wednesday 2:15-3:35	Byron
M015	Wednesday 3:45-5:05	Lindsay
M016	Wednesday 5:15-6:35	Lindsay
M017	Wednesday 6:45-8:05	Dylan
M018	Wednesday 8:15-9:35 pm	Dylan
M019	Thursday 5:00-6:20	Chandler
M020	Thursday 6:30-7:50	Chad
M031	Thursday 8:00-9:20 pm	Chad
M026	Friday 8:00-9:20	Chandler
M021	Friday 9:30-10:50	Lindsay
M022	Friday 11:00-12:20	Chandler
M023	Friday 12:45-2:05	Chandler

1. A *circumpolar star* is one that doesn't rise or set, but is always above the horizon.

   What location on Earth would see more circumpolar stars?

   (A) The South Pole (latitude 90° S)
   (B) Quito, Ecuador (on the Equator; latitude 0°)
   (C) Sevastopol, Ukraine (latitude 44° N, similar to Syracuse)
   (D) Nuuk, Greenland (latitude 64° N, just south of the Arctic Circle)
   (E) All of these would have the same number of circumpolar stars

2. What physical motion causes the Sun to line up with different constellations in the Zodiac at different times?

   (A) The rotation of Earth on its axis
   (B) The revolution of the constellations of the Zodiac around Earth
   (C) The revolution of the celestial sphere that the stars are attached to
   (D) The tilt of Earth's axis combined with the revolution of Earth around the Sun
   (E) The revolution of Earth around the Sun

3. An observer sees Gemini high in the sky at midnight.

   How long will that observer need to wait before Gemini is behind the Sun?

   (A) About twelve hours
   (B) About one day
   (C) About six months
   (D) About two hours
   (E) About one month

4. What physical motion causes the stars and Sun to rise and set each day?

   (A) The tilt of Earth's axis combined with the revolution of Earth around the Sun
   (B) The revolution of the constellations of the Zodiac around Earth
   (C) The revolution of Earth around the Sun
   (D) The revolution of the celestial sphere that the stars are attached to
   (E) The rotation of Earth on its axis

5. The phase of the Moon today is a new moon.

   How long will it be before the moon is a waxing half moon?

   (A) About a day
   (B) About a month
   (C) About a week
   (D) About a year
   (E) It depends on your latitude

6. What real motion causes the seasons?

   (A) The rotation of Earth on its axis
   (B) The revolution of the celestial sphere that the stars are attached to
   (C) The tilt of Earth's axis combined with the revolution of Earth around the Sun
   (D) The revolution of the constellations of the Zodiac around Earth
   (E) The revolution of Earth around the Sun combined with the fact that Earth's orbit is closer to the Sun in June than in December

7. Suppose an observer in Syracuse is looking East and watching the Sun rise. In which direction will it move after it rises?

   (A) It will move higher in the sky and to the observer's left (to the north)
   (B) It will move to the observer's right (southward)
   (C) It will move higher in the sky, but not move left or right.
   (D) It will move to the observer's left (northward)
   (E) It will move higher in the sky and to the observer's right (to the south)

8. What advantage did the Copernican heliocentric (or Sun-centered) model of the Solar System have over the Ptolemaic geocentric (or Earth-centered) model?

   (A) The heliocentric model allowed astronomers to predict the solstices and equinoxes.
   (B) The heliocentric model allowed astronomers to calculate the phases of the Moon more precisely.
   (C) The heliocentric model allowed more accurate calculations of the positions of the planets.
   (D) The heliocentric model provided a simple explanation for the retrograde motion of the planets.
   (E) None of the above

9. Syracuse is located at latitude 43° N; Tucson is located at latitude 32° N, further to the south.

   Which of the following is true?

   (A) On the December solstice at noon, an observer in Syracuse will see the Sun higher in the sky than an observer in Tucson will.

   (B) Tucson will have more hours of daylight than Syracuse in June.

   (C) An observer in Tucson will see Polaris higher in the sky than an observer in Syracuse.

   (D) Tucson will have more hours of daylight than Syracuse in December.

   (E) On the June solstice at noon, an observer in Syracuse will see the Sun higher in the sky than an observer in Tucson will.

10. What fraction of the Moon's entire surface is lit by sunlight at any given time?

    (A) More than half of it when the Moon is waxing, but less than half of it when it is waning

    (B) Almost all of it

    (C) Less than half of it

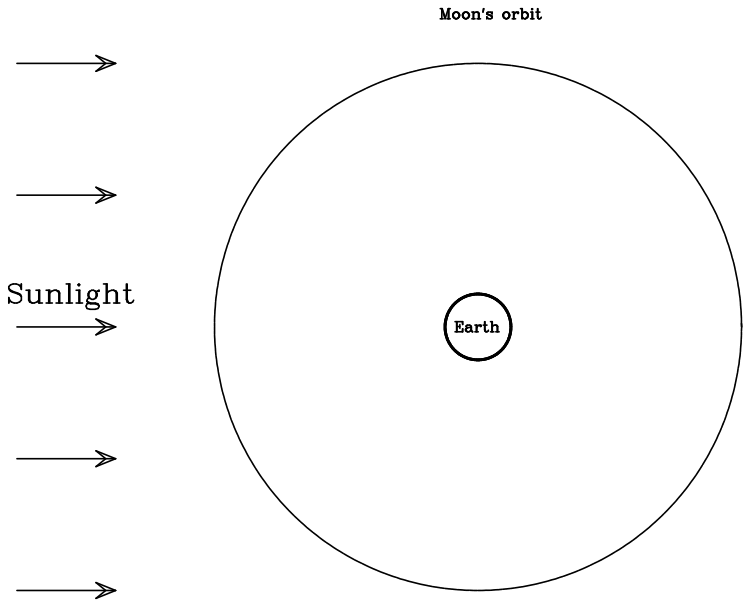
    (D) Half of it

    (E) More than half of it during a full or gibbous moon, but less than half during a new or crescent moon

Free-Response Question 1

Here is an image, taken by an astronaut from the surface of the Moon, that shows the Earth rising over the horizon of the Moon.

Next to it is a blank diagram showing the Moon's orbit around the Earth.



a) Draw the Moon on this diagram showing where the Moon could be for astronauts standing on its surface to see this "phase of the Earth". *(Hint: The Earth has phases for the same reason that the Moon does. This question may seem unusual, but if you think clearly about the diagrams you drew of the moon phases and the reason for the phases, it is straightforward!)*

b) As seen from Earth, what would the phase of the Moon be at this time?

Free-Response Question 2

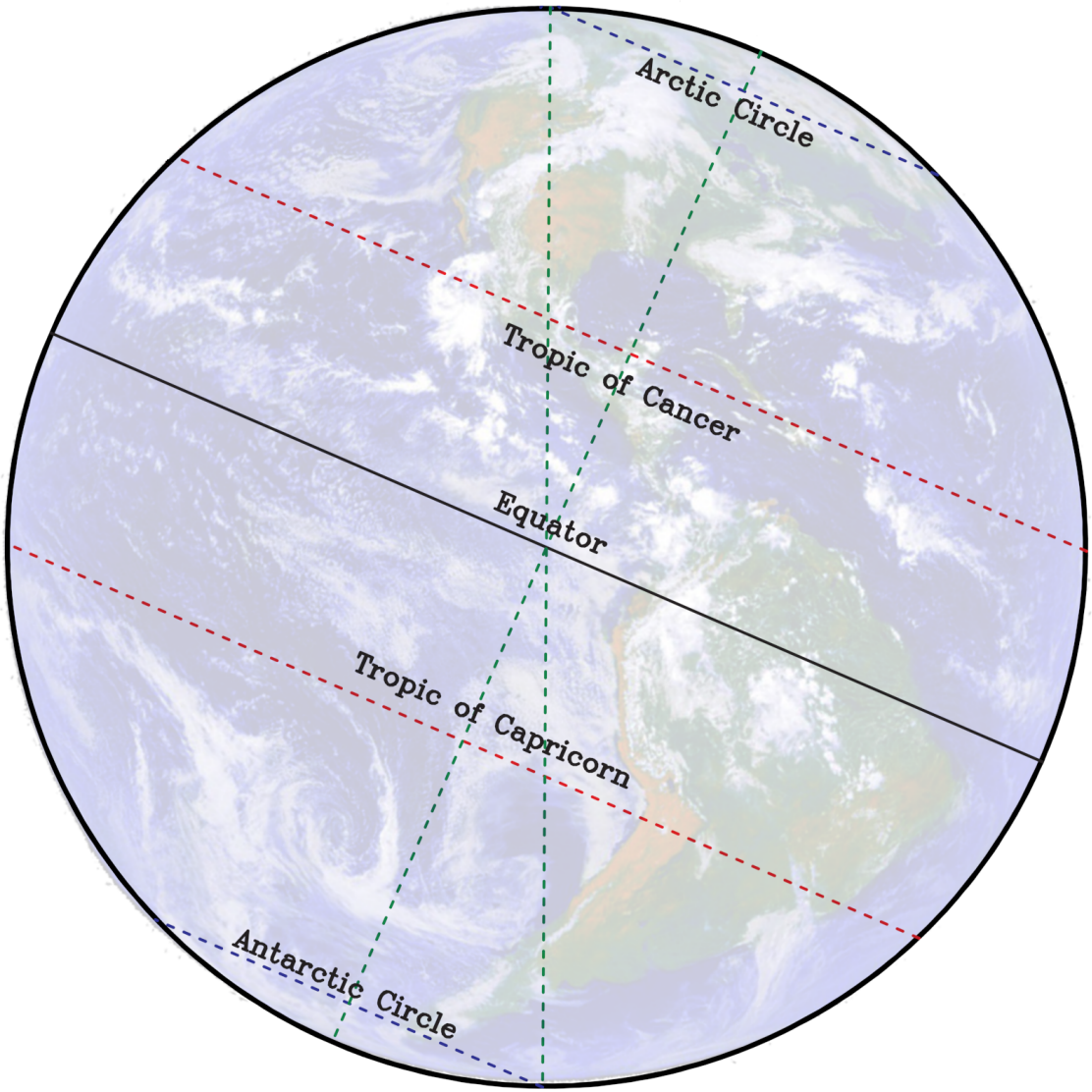
Suppose someone is standing in Svalbard, Norway (78° N, well north of the Arctic Circle) on the June solstice at noon.

a) Annotate the diagram on the next page with the following:

- Arrows showing the direction sunlight is coming from
- A stick figure showing your observer at noon, and then twelve hours later at "midnight".

b) Where would your observer look to see the Sun at noon? (If they cannot see the Sun at noon, tell why.)

c) Where would your observer look to see the Sun at midnight, twelve hours later? (If they cannot see the Sun at midnight, tell why.)

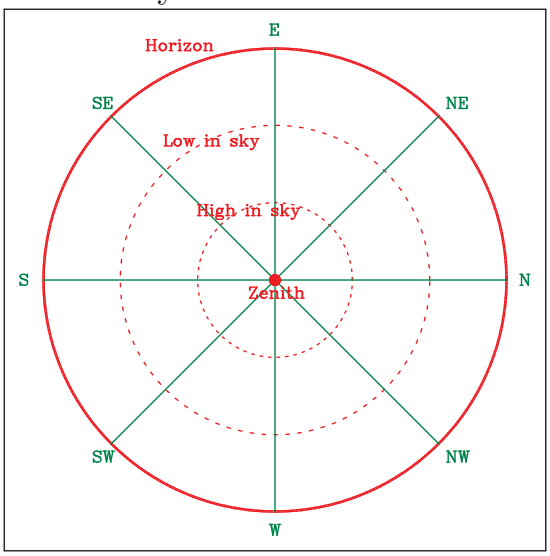

Arctic Circle
Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle

Free-Response Question 3

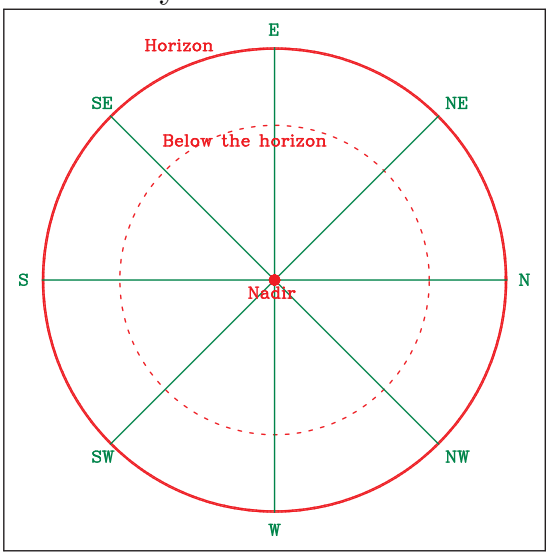
Suppose you see a certain star just barely above the northern horizon at 6 PM in Syracuse.

a) Draw the path that this star would make during one day on the diagram below. Then label where on this path the star could be seen at midnight.

Sky Above Horizon



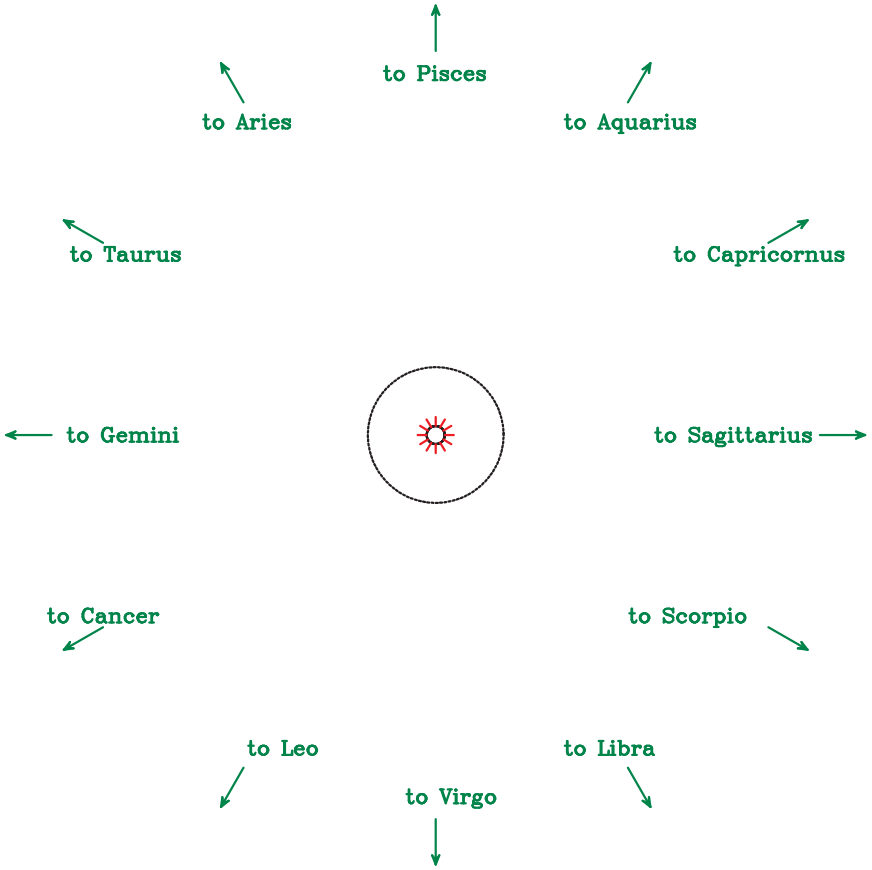
Sky Below Horizon



b) Describe in words how someone standing on the South Pole would see this star move during a day. If they wouldn't see it at all, briefly explain why.

Free-Response Question 4

Here is a blank diagram of the Zodiac around the orbit of the Earth.



a) A person observes the sky at midnight on a day when the constellation Sagittarius is highest in the sky. Draw where Earth would be on that day, and a stick figure representing an observer at midnight on that day.

b) What constellation in the Zodiac would be just rising at midnight at that time?

c) Six hours later, what constellation would be highest in the sky?

d) Three months later, what time of day would an observer find Sagittarius highest in the sky?

This page left blank for you to draw diagrams on or to use as a horizon.