

The Heavens and the Earth
Fall 2018 Test 1
No calculators; exam time: 50 min.
Exam, Form: A

Name: _____

Student Number: _____

TA: _____

Date: _____

Section 1. Matching of scientific terms and concepts (5 pts.)

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|---------------------|---|
| _____ inconceivable | (a) movement or the ability to move from one place to another |
| _____ locomotion | (b) an ancient Roman or Greek measure of length, about 185 meters |
| _____ corroborate | (c) (of an angle) less than 90 deg. |
| _____ endow | (d) the point in the sky or celestial sphere directly above an observer |
| _____ brevity | (e) the fourth brightest star in the sky, and the brightest in the constellation Bootes |
| _____ meridian | (f) used to emphasize how completely different two or more things are |
| _____ admissible | (g) take (something) for one's own use, typically without the owner's permission |
| _____ diametrical | (h) (of an angle) more than 90 deg. and less than 180 deg. |
| _____ zenith | (i) existing, happening, or done at the same time |
| _____ passive | (j) accepting or allowing what happens or what others do, without active response or resistance |
| _____ void | (k) confirm or give support to (a statement, theory, or finding) |
| _____ continuous | (l) provide with a quality, ability, or asset |
| _____ concurrent | (m) a circle passing through the celestial poles and the zenith of a given place on the earth's surface |
| _____ arcturus | (n) forming an unbroken whole; without interruption |
| _____ obtuse | (o) completely empty |
| _____ stade | (p) acceptable or valid |
| _____ pole | (q) not capable of being imagined or grasped mentally; unbelievable |
| _____ pasch | (r) either of the two points at which the axis of a sphere intersects its surface |
| _____ appropriate | (s) the feast of passover |
| _____ acute | (t) concise and exact use of words in writing or speech |

Section 2. Multiple choice (17 pts.)

1. When did Aristotle live and work?
 - (a) around 1000 B.C., the time of King David's reign
 - (b) in the 4th century B.C., around the time that Nehemiah rebuilt the temple in Jerusalem
 - (c) in the 2nd century B.C., around the time of the Bar Kochba revolt against the Roman empire
 - (d) in the 1st century A.D., around the time of the Apostle Paul's missionary journeys
 - (e) in the 7th century A.D., around the time of the death of the prophet Muhammad
2. Which of the following was taught by the Pythagoreans?
 - (a) the earth is flat
 - (b) the earth below us is infinite
 - (c) the earth floats like wood on top of a fluid
 - (d) the earth rotates about a central fire, since fire is the most precious thing
 - (e) the earth is motionless because of its indifference to forces in any particular direction
3. On what grounds does Aristotle argue against the "indifference" explanation of the immobility of the earth, proposed by Anaximander?
 - (a) it is false, since shining objects placed atop the mast of a ship appear to sink below the horizon
 - (b) it cannot explain the progression and retrogression of the planets
 - (c) it could equally well explain the existence of fire, rather than earth, at the center of the world
 - (d) because it cannot answer the question: if the earth is supported by water, then what is supporting the water?
4. According to Aristotle, the heavenly body having the simplest motion is
 - (a) the celestial sphere containing the fixed stars
 - (b) Jupiter
 - (c) Mars
 - (d) Venus
 - (e) the sun
 - (f) the moon
5. Which of the following did Aristotle *not* use as an argument for the eternity of the heavens?
 - (a) the ancients, too believed in immortal things, such as the gods.
 - (b) the heavens are pure aether, and thus experience no generation or decay
 - (c) the (circular) motion of the heavens is natural for a sphere and hence eternal
 - (d) people have been observing the motion of the heavens for all of recorded time
 - (e) actually, Aristotle used all of these as arguments for the eternity of the heavens.
6. Within what branch of theoretical philosophy did Ptolemy situate astronomy?
 - (a) engineering
 - (b) theology
 - (c) mathematics
 - (d) physics
 - (e) rhetoric

7. If the earth were shaped like a bowl, instead of a sphere, then
- (a) all observers in the bowl would see the sun rise simultaneously.
 - (b) observers on the west end of the bowl would see the sun rise before those on the east end.
 - (c) observers on the east end of the bowl would see the sun rise before those on the west end.
 - (d) observers on the north end of the bowl would see the sun rise before those on the south end.
 - (e) observers on the south end of the bowl would see the sun rise before those on the north end.
8. Observer M stands in Milwaukee, N stands 50 miles due north of Milwaukee, and W stands 50 miles due west of Milwaukee. Which of the these observers will observe Polaris (the North star) at the same height (above the horizon) on a particular night?
- (a) M and N
 - (b) M and W
 - (c) all of them
 - (d) none of them
9. Approximately how many degrees above the horizon will the sun be at noon on the summer solstice for an observer standing in Milwaukee (44 degrees north latitude)?
- (a) 55
 - (b) 60
 - (c) 65
 - (d) 70
 - (e) 90
10. Approximately how many degrees wide (degrees of celestial longitude) is each zodiacal sign?
- (a) 1
 - (b) 12
 - (c) 30
 - (d) 180
 - (e) 360
11. The sidereal month is approximately how many days long?
- (a) 15
 - (b) 27
 - (c) 30
 - (d) 36
 - (e) 365
12. What is the traditional date of the *conception* of Jesus (the Annunciation)?
- (a) the autumnal equinox (Sep. 25 on the Julian calendar)
 - (b) the vernal equinox (March. 25 on the Julian calendar)
 - (c) the summer solstice (June. 25 on the Julian calendar)
 - (d) the winter solstice (Dec. 25 on the Julian calendar)
 - (e) none of the above

13. If the moon is in its second quarter (half moon) when the sun is entering cancer, then which sign is the moon entering?
- (a) aries
 - (b) gemini
 - (c) libra
 - (d) capricorn
 - (e) aquarius
14. An old man hobbles up to you and, pointing a gnarled finger at your chest, raises a bushy eyebrow and whispers through rotting teeth that you should "Beware the Ides of March!" To what day in March is he referring?
- (a) the new moon at the beginning of March
 - (b) the first quarter moon
 - (c) the full moon
 - (d) the waning gibbous moon
 - (e) none of the above
15. On the autumnal equinox, you stand watching the sun set into the western horizon. The waxing crescent moon, still above the horizon, has its horns pointed
- (a) northward
 - (b) upwards
 - (c) southward
 - (d) downward
16. Consider a new moon in June and a new moon in December. Which of these will achieve the highest altitude at culmination (when it passes across your local meridian)?
- (a) the June full moon
 - (b) the December full moon
 - (c) the June and December full moons will probably reach the same altitude
 - (d) it depends on the year
17. Suppose the circumference of the earth is approximately 24,000 miles. Two cities on the equator lie 240 miles apart. What is the approximate difference in their longitudes?
- (a) 1.8 degrees
 - (b) 3.6 degrees
 - (c) 7.2 degrees
 - (d) 36 degrees
 - (e) 72 degrees

Section 3. Easter problem (3 pts.)

Answer the following question.

1. Suppose that on a particular year, a full moon occurs on Tuesday, March 19. On what day and date will Easter fall? (Hint: March has 31 days)

Section 4. Waldseemüller's Cosmography (6 pts.)

1. Clearly and unambiguously label the items listed below in Fig. 1.
 - (a) the earth
 - (b) the north star (Polaris)
 - (c) the celestial equator
 - (d) the ecliptic
 - (e) the axis of the zodiac
 - (f) the equinoctial colure
 - (g) the tropic of Capricorn
 - (h) the antarctic circle
 - (i) the constellation Aquarius
 - (j) the (approximate) constellation in which the sun is located today
 - (k) the (approximate) constellation in which the moon is located today
 - (l) when viewed from above the north star, in which way does the celestial sphere rotate—clockwise or counterclockwise?

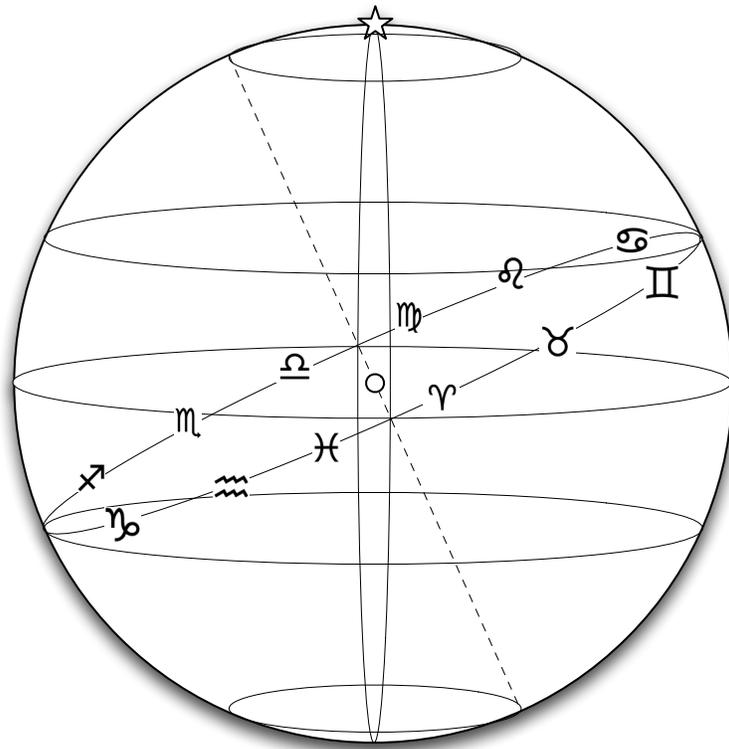


Figure 1: The celestial sphere, based on Martin Waldseemüller's *Introduction to Cosmography*