Exam I Review Questions

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1 The Night Sky

1.1 Relative Sizes, Powers of 10, and Units

1. How many orders of magnitude does "100 times" correspond to?

   (a) 10 (b) 100 (c) 1 (d) 2

2. T or F. The video "Powers of 10" has nothing to do with cosmology.

3. T or F. The nearest star to the Sun is about 10 times farther away than Pluto.

4. We can express the average distance between the Earth and Sun in miles (9.3×10^7 miles), but it is more convenient to use the unit called the _____.

   (a) meter (b) km (c) light year (d) astronomical unit (e) parsec

5. How many orders of magnitude are there between the size of a tree and the size of Pluto's orbit?

   (a) 0 (b) 2 (c) 10 (d) 12

6. How many orders of magnitude are there between the size of Pluto's orbit and the scale of superclusters?

   (a) 1 (b) 5 (c) 12 (d) 15

7. (2pt) Answer at least two of the following from the "Powers of 10" video.

   (a) the largest scale shown, in meters. _____
   (b) the smallest scale shown, in meters. _____
   (c) the ratio of the largest to the smallest scale. _____
   (d) the thing that was about 2 light-seconds across? _____

8. (2pts) Put these objects in order from smallest to largest: ___ ___ ___ ___ ___ ___

   (a) a cluster of galaxies
   (b) the Milky Way
   (c) human being
   (d) Earth
   (e) a supercluster of galaxies
   (f) a neutron star

9. (2pts) Put these things in order from smallest to largest: ___ ___ ___ ___ ___ ___

   (a) the distance between stars
   (b) a supercluster of galaxies
   (c) radius of Neptune's orbit
   (d) human being
   (e) distance to Sun
   (f) Cosmic Microwave Background

10. What unit is most convenient for measuring distances between planets?

    (a) the meter (b) the kilometer (c) the Astronomical unit (d) the light-year

11. The mass of the Sun is about 10^{27} tons, and that of the Earth is about 10^{22} tons. By how many orders of magnitude do these masses differ?

    (a) 100,000 (B) a million (C) 1000 (D) 2 (E) 5

12. What is the average distance in miles between the Sun and Earth using scientific notation?

    (a) 9.3×10^{7} (B) 9.3×10^{6} (C) 9×10^{5} (D) 9×10^{6} (E) 93,000,000.0

13. What unit is the most practical for measuring distances between galaxies?

    (a) the astronomical unit (AU)
    (b) the parcsec (pc)
    (c) the light year (LY)
    (d) the kilometer (km)
    (e) the megaparsec (Mpc)

14. What unit is the most practical for measuring distances between planets in the solar system?

    (a) AU (b) pc (b) LY (b) km (b) Mpc

15. What unit is the most practical for measuring distances to nearby stars?

    (a) the light year
    (b) the Astronomical Unit
    (c) the micrometer
    (d) the kilometer
    (e) the meter

16. The height of an adult human is about 10^{x} meters, where x = _____

    (a) -2 (b) 0 (c) 1 (d) 2 (e) 5

17. Write this number in scientific notation: 2,540,000 = _____

18. Write this number in scientific notation: 93×10^{6} = _____

1.2 Naked Eye Universe, Constellations

19. T or F. All of the constellation names originated with the ancient Greeks (roughly 600-0 BC).

20. T or F. Other than the Milky Way, no galaxies are visible to the naked eye from Earth.

21. T or F. Some stars belong to two or more asterisms.

22. T or F. The time to go from Full Moon to third quarter is about 1 week.

23. The Moon rises at about 6 pm when it is in its _____ phase.

24. The four extra minutes in the solar day compared to the sidereal day are due to our _____ around the Sun.

25. (1pt) Name one of the asterisms in the Constellation Taurus.

26. Which constellation contains the asterism known as the "Big Dipper"?

    (a) Ursa Minor (b) Ursa Major (c) Canis Minor (d) Canis Major (e) Orion

27. Which of these planets is always fainter than Sirius?

    (a) Mercury (b) Venus (c) Mars (d) Jupiter (e) Saturn

28. The *Big Dipper* is a(n) _____ located in the _____ called *Ursa Major*.

    (a) constellation, sky
    (b) constellation, asterism
    (c) asterism, constellation
    (d) asterism, star cluster

29. Which planet is the brightest as seen from Earth? (Don't include Earth, and just consider maximum brightnesses.)

30. What is the brightest star in the nighttime sky? _____

31. What is the brightest star in the sky? _____

32. Ancient skywatchers concluded that the stars were attached to a _____ _____, a canopy of stars resembling an astronomical painting.

    (a) celestial sphere
    (b) night sky
    (c) daytime sky
    (d) astronomical twilight

33. How many constellations are there?

    (a) 23 (b)6500 (c) 78 (d) 88 (e) 90

34. What is the name of the planetarium program that Pinkney keeps telling you to get?

    _____

1.3 Celestial Sphere, Navigation, Seasons, Coordinates

35. A _____ _____ is a model of the sky that can show rising and setting motions but it fails to represent the distances to stars.

    (a) cardinal pointer
    (b) night sky
    (c) celestial equator
    (d) astronomical twilight
    (e) celestial sphere

36. If one travels along a line of equal latitude, they will change

    (a) the azimuth of objects rising and setting (b) the times of an objects rising, setting, and transiting (c) the altitude of objects (d) the angle at which objects rise (e) the angle at which objects set

37. If one travels along a line of equal longitude, they change everything *except*

    (a) the azimuth of objects rising and setting (b) the time at which most object rise and set (c) the time at which an object transits (d) the angle at which objects rise (e) the altitude of objects transiting

38. Which of these is not directly linked to *precession*?

    (a) continuously changing coordinates of stars (b) Earth's wobbling spin axis (c) vernal equinox shifting W by $50''$ per year (d) lunar phases (e) different pole stars in the past

39. The name of the point directly overhead is the

    (a) celestial sphere (b) celestial equator (c) zenith (d) nadir (e) celestial meridian

40. A projection of the line of longitude on which you stand onto the celestial sphere would be your

    (a) celestial sphere (b) celestial equator (c) zenith (d) nadir (e) celestial meridian

41. A line that includes the south cardinal point on your horizon and the point overhead is your celestial

(a) meridian (b) equator (c) zenith (d) nadir (e) sphere

42. Imagine viewing the Sun from ONU and seeing it above the western horizon. In which way will it move in the hour to come?

(a) down and to the right (b) straight down (c) down and to the left (d) up and to the right (e) up and to the left

43. Imagine viewing the Sun from ONU and seeing it above the eastern horizon. In which way will it move in the hour to come?

(a) down and to the right (b) straight down (c) down and to the left (d) up and to the right (e) up and to the left

44. The annual oscillation of average temperatures which we call seasons is caused by two main factors: 1) the varying directness of the Suns rays at noon, and 2)

(a) the varying distance of the Earth from the Sun
(b) the varying length of daylight hours
(c) the varying distance of the Moon from the Earth
(d) the varying tilt of the Earth relative to the ecliptic
(e) the changing orientation of the Earth-Moon line of nodes

45. Imagine standing on the Earth's equator and viewing the Sun above the western horizon. In which way will it move in the hour to come?

(a) down and to the right (b) straight down (c) down and to the left (d) up and to the right (e) up and to the left

46. At which latitude on Earth do stars and planets appear to rise perpendicular to the horizon?

(a) 90° S (b) 90° N or 90° S (c) 45° N (d) 0°

47. The countries north of 23.5° latitude receive the most energy from the Sun around June 21 because that is when

(a) the Sun is closest to Earth (b) the sunlight is most direct (c) the length of daytime is longer (d) *both (b) and (c)* (e) none of the above

48. (2pts) The Northern Hemisphere receives the most energy from the Sun on June 20 or 21 because that is when _____. (Circle all that apply.)

(a) the Sun is closest to Earth (b) the Sun burns the hottest (c) the sunlight is most direct (d) the length of daytime is longer (e) the cloud tops are most reflective

49. (2pts) Precession of the equinoxes leads to _____. (Circle more than one.)

    (a) the change of stellar coordinates with time
    (b) the blue color of the sky
    (c) the changing separation of Polaris from the North Celestial Pole
    (d) the daily tides
    (e) the westward motion of the vernal equinox

50. The location - independent coordinate system based on the celestial equator has the coordinates

    (a) Right Ascension and Altitude (b) Altitude and Azimuth (c) Azimuth and Declination (d) Right Ascension and Declination (e) Up-down and side-to-side

51. The location-dependent line on the celestial sphere which is used to define the altitude-azimuth coordinate system is the:

    (a) prime meridian (b) central meridian (c) celestial equator (d) ecliptic (e) horizon

52. At which latitude on Earth do stars appear to move parallel to the **celestial equator**?

    (a) 90° S (b) 90° N or 90° S (c) 45° N (d) 0° (e) All latitudes

53. A circumpolar star, as seen from the Northern hemisphere,

    (a) rotates counterclockwise about the North Celestial Pole (b) rises once per day (c) sets only once per day (d) rotates clockwise about the N. C. Pole (e) makes a strait star-trail.

54. The Celestial globe correctly models the angular separations between stars, but it fails to model _____.

    (a) the height of stars above the horizon (b) the distances to stars (c) the altitude of stars (d) the right ascension of stars (e) the azimuth of stars.

55. At least how many coordinates must be given to specify the position of a star on the celestial sphere?

    (a) 0 (b) 1 (c)2 (d) 3 (e) 4.0

56. The equatorial (or "celestial") coordinate system has its declination zeropoint on the celestial equator and its right ascension zeropoint on the

(a) north celestial pole (b) vernal equinox (c) autumnal equinox (d) celestial meridian (e) Greenwich line of longitude

57. The projection of lines of longitude onto the Celestial Sphere are lines of equal _____.

(a) Declination (b) azimuth (c) right ascension (d) altitude (e) arclength

58. You are lost in the woods and you see that Polaris is 40° away from the *zenith*. From this you can tell that you are

(a) south of the equator (b) at latitude 50° N (c) at latitude 40° N (d) 40° West of Greenwich (e) 50° from the North magnetic pole.

59. You are lost in the woods and you see that Polaris is 30° away from the horizon. From this you can tell that you are

(a) south of the equator (b) at latitude 60° N (c) at latitude 30° N (d) 30° West of Greenwich (e) 60° from the North celestial pole.

60. The Moons of which planet were used as a timepiece by Ole' Roemer?

(a) Jupiter (b)Saturn (c)the morning star (d)Mercury (e)Mars

61. Right ascension is measured on a scale from 0 to _____hours.

(a) 360 (b)180 (c)24 (d)12 (e)90

62. Declination is measured on a scale from _____degrees.

(a) 0 to 180 (b) -90 to 90 (c) 0 to 90 (d) 0 to 360 (e) 1 to 100

63. The equation of time tells you

(a) the difference between your time and Universal Time (b) what the time "back home" is (c) the difference between apparent solar time and mean solar time (d) the difference between mean solar time and sidereal time (e) your time zone, given your longitude.

64. Our current calendar is based on the

(a) sidereal year (b) Good Year (c) tropical year (d) anomalistic year (e) Far Side

65. The leap year system was developed because

(a) Caesar wanted to keep his country on its toes (b) Pope Gregory wanted to keep his country on its toes (c) there is not an integer number of days in the year (d) the length of the year is *exactly* 365.25 solar days (e) February was hurtin' for days

66. On which latitude on Earth do stars and planets appear to rise perpendicular to the horizon?

    (a) 90° S (b) 90° N or 90° S (c) 45° N (d) 0°

67. The coordinates which depend on your location and use the horizon as a reference point are _____.

    (a) Right Ascension and Altitude (b) Altitude and Azimuth (c) Azimuth and Declination (d) Right ascension and Declination

68. Right Ascension is measured on a scale from 0 to _____ hours.

    (a) 360 (b) 60 (c) 24 (d) 12 (e) infinity

69. What are the altitude and azimuth of a star or planet which has a declination of 0° and is just rising in the East?

    (a) 0 and 90 degrees (b) 90 and 180 degrees (c) 0 and 180 degrees (d) 10 and 0 degrees

70. What do we call the path of the Sun along the celestial sphere?

    (a) the celestial equant (b) the ecliptic (c) the celestial equator (d) the celestial meridian (e) the prime meridian

71. If your latitude is 30°N, then stars with a declination greater than _____would be circumpolar.

    (a) 30° (b) -30° (c) 60° (d) -60° (e) 45°

72. Which long-period phenomenon is caused by the pull of the Moon and Sun on the Earth's equatorial bulge?

    (a) tug of war (b) lunar tides (c) precession (d) eclipses (e) earthquakes

73. The Earth is about how many times larger than the Moon (in diameter)?

    (a) 4 (b) 10 (c) 45 (d) 110 (e) 400

74. Lunar eclipses only occur during the hours surrounding the moment of

    (a) New Moon (b) 1st quarter (c) Full Moon (d) 3rd quarter (e) waxing gibbous

75. What conditions will lead to an annular solar eclipse? (Each choice is a lunar phase, a position on the sky, and the Moon's position in its orbit.)

    (a) new moon crossing celestial equator during apogee

(b) full moon crossing celestial equator during perigee

(c) full moon crossing ecliptic during perigee

(d) new moon crossing ecliptic during perigee

(e) new moon crossing ecliptic during apogee

76. At about what time does the moon rise when its phase is new moon?

(a) 6 am (b)12 pm (c) 6 pm (d) 12 am (midnight) (e)9 am

77. Which is longer, the sidereal month (time it takes Moon to line up with the stars) or the synodic month (time to line up with the Sun)?

(a) sidereal (b) synodic (c) celestial (d) a and b are the same
(e) the Moon does not rotate!

78. How does the Moon's orbital plane relate to the plane containing the Earth's orbit around the Sun?

(a) they are coincident (the same)

(b) they are parallel

(c) they intersect at a 5° angle

(d) they intersect with a 23.5° angle

(e) they are perpendicular

79. (2pts) Viewed from the Northern Hemisphere, a circumpolar star _____. (Circle more than one.)

(a) circles CCW about Polaris

(b) rises and sets only once per day

(c) never rises or sets

(d) circles CW about Polaris

(e) *proves* that the Earth is rotating

80. What is the angle between the S cardinal point and your zenith?

_____

81. On which days of the year is the length of the day 12 hours for virtually all latitudes? (Give the names of those days or the approximate dates.)

_____ _____

82. How many arcseconds in a degree?

_____

83. In what units is right ascension measured?

    _____

84. What range of declinations does the Sun cover throughout the year?

    _____

85. About how many degrees does the Sun move each day relative to the stars?

    _____

86. What is the declination of the NCP?

    _____

87. For people on the north pole, the entire horizon has a declination of _____ degrees.

88. How many constellations are there in the entire celestial sphere?

    _____

89. Which constellation contains both the Pleiades and a bull asterism?

    _____

1.4 Historical Astronomy

90. The most accurate model used by the Greeks to explain planetary motion was that of:

    (a) Aristotle.
    (b) Pythagoras.
    (c) Hipparchus.
    (d) Ptolemy.
    (e) Erastothenes.

    (a) Tenochtitlan (b) Caracol (c) Stonehenge (d) Montezuma's revenge (e) the Colloseum

91. The astronomical observatory/temple built by the Mayan's is called

    (a) the Big Horn Medicine Wheel
    (b) Caracol
    (c) Stonehenge
    (d) the Colloseum
    (e) Quetzaquatl

92. T or F. It was the Chinese who provided critical ancient records of supernovae and comets.

93. T or F. Like the Sun and the Moon, the planets usually move from west to east (rel to the stars) from one day to the next.

94. T or F. Aristarchus's heliocentric view was shared by the majority of Greek philosophers.

95. T or F. Galileo's observations of stellar parallax were proof Copernicus was correct.

96. Eratosthenes reasoned that the ratio of 7.2° to 360° is the same as the ratio of the distance between Syene and Alexandria to the _____ .

    (a) radius of the Earth (b) circumference of the Earth (c) distance to the Moon (d) diameter of the Earth (e) distance between the Earth's poles

97. Which culture thought Ptolemy was the "greatest" and built on his work after 200 AD?

    (a) Chinese (b) Mayan (c) Babylonian (d) Arab (e) Greek

98. The heliocentric model was actually first proposed by:

    (a) Aristotle. (b) Archimedes. (c) Aristarchus. (d) Alexander the Great. (e) Hipparchus.

99. The apparent change in position of an object caused by the motion of the observer is called _____

    (a) parallax (b) syzygy (c) betelgeuse (d) parsec (e) feedback

100. The Ptolemaic model of the universe:

    (a) explained and predicted the motions of the planets with deferents and epicycles.
    (b) is the basis of our modern cosmology.
    (c) could not account for the stellar parallax observed by Hipparchus.
    (d) describes the orbits of the planets as being ellipses, not circles.
    (e) always kept Mars and Mercury between the Earth and Sun.

101. Which of these was NOT a part of Ptolemy's model?

    (a) Mercury must always lie roughly between the Earth and Sun.
    (b) It was geocentric.
    (c) Eastward motion of the planet was along the deferent.
    (d) Retrograde motion of the planet utilized the epicycle.
    (e) Both Venus and Jupiter would be brightest at opposition.

102. The inferior planets differ from the superior ones in that

    (a) they are limited in their angular separation from the Sun
    (b) they twinkle
    (c) they vary in brightness
    (d) they are actually in motion around the Sun

(e) they show no retrograde motion

103. Which of the statements below is part of both the Ptolemaic and Copernican models?

(a) The Earth orbits the Sun once a year.

(b) The Sun lies in the center of the Cosmos.

(c) The Moon orbits the Earth once a month.

(d) Epicycles are needed to explain retrograde motion of the planets.

(e) Venus' epicycle must always lie between us and the Sun.

104. On which of these assumptions do Ptolemy and Copernicus agree?

(a) The Earth must be the center of all motion in the Cosmos.

(b) All orbits must be perfect circles.

(c) The Sun was bigger than the Earth.

(d) Venus must always stay between us and the Sun.

(e) The Sun must orbit us, but the planets do orbit the Sun.

105. A fundamental difference between the Greeks (600-0 BC) and previous civilizations was the notion that the universe

(a) was big (b) was contained in a celestial sphere (c) could be completely understood (d) influenced our daily lives (e) had both fixed and wandering stars

106. The early astrophysicist who understood that the underlying cause of the elliptical orbits and falling apples is gravity was

(a) Copernicus (b) Tycho Brahe (c) Kepler (d) Galileo (e) Newton

107. The early astronomer who disproved the Ptolemaic system and was punished by the church was

(a) Tycho Brahe (b)Copernicus (c)Kepler (d) Galileo (e)Newton

108. The early astronomer who agonized over perfect (regular) solids while his mother sold drugs was

(a) Tycho Brahe (b)Pythagorus (c)Kepler (d) Galileo (e)Newton

109. Galileo disproved the Ptolemaic system by observing

(a) Moons around Jupiter (b) Sunspots (c) Gibbous phases of Venus (d) our cratered Moon

110. The ancient people credited with creating the astrology used today is

(a) the Babylonians (b) the Chinese (c) the Plains indians (d) the Polynesians

111. The "calendar" made out of rock slabs which is located on the British Isles is called

(a) Big Horn Medicine Wheel (b) Caracol (c) Stonehenge (d) Buckminster Abbey

112. The work of the ancient Greeks was not forgotten during the dark ages largely because of the

(a) Babylonians (b) Islamic peoples (c) Native Americans (d) Egyptians (e) Mayans

113. The ancient astronomer who first argued that the Earth could not be moving because of the abscence of stellar parallax was

(a) Aristotle (b)Hipparcus (c)Hippopotamus (d)Ptolemy (e)Pythagoras

114. The ancient Greek who first believed that the heavens produced sounds was

(a) Thales (b) Aristarchus (c) Philolaus (d) Pythagoras

115. The ancient Greek who made careful observations and discovered precession was

(a) Aristarchus (b) Hipparchus (c) Ptolemy (d) Plato

116. Although this ancient Greek did not invent the epicyle and deferent, he used them to explain the motions of planets

(a) Aristarchus (b) Hipparchus (c) Ptolemy (d) Plato

117. The main reason why Copernicus' solar system disagreed with observations was _____.

(a) it was a geocentric model (b) it was a heliocentric model (c) it used ellipses (d) it used circular deferents and epicycles

118. Tycho Brahe made meticulous observations of the planets, but _____ used his data to discover that the planets orbitted in ellipses with the Sun at one focus.

(a) Ptolemy (b) Galileo (c) Kepler (d) Newton (e) Copernicus

119. When a planet moves eastward, it is called direct, or "prograde" motion, when a planet moves westward, it is called _____ motion.

120. Name one "inferior" planet. _____.

121. Y or N. Do inferior planets exhibit retrograde motion?

122. Ole Roemer estimated the speed of light by watching the moons of _____.

123. Back in 1639 astronomers first attempted measuring the Astronomical Unit by observing the _____ of Venus.

124. The modern way of measuring the AU involves bouncing radar off of _____.

125. Which concept was NOT a part of Kepler's Laws of Planetary Motion?

(a) All planetary orbits are ellipses.

(b) The square of the planet's period is equal to the cube of its average distance.

(c) A planet must move fastest in its orbit at perihelion.

(d) Epicycles are needed to explain the varying brightnesses of the planets.

(e) The line that connects the Sun to Mercury sweeps out the same area in a month as does the line connecting us to the Sun.

126. Kepler's 1st law of planetary motion states that

(a) planets orbit the Sun clockwise

(b) orbits are non-circular

(c) orbits are elliptical with the Sun at one focus

(d) planets go faster with distance away from the Sun

(e) planets spin in the same direction that they orbit

127. Upon which point do Copernicus and Kepler disagree?

(a) The Moon orbits the Earth.

(b) The Earth orbits the Sun.

(c) Retrograde motion occurs when one planet overtakes another.

(d) The orbits of the planets are ellipses, with one focus at the Sun.

(e) Venus will appear as a crescent when she retrogrades between us and the Sun.

128. Which of these was not seen telescopically by Galileo?

(a) sunspots

(b) Venus' phase cycle

(c) Four moons around Jupiter

(d) stellar parallax

(e) Craters and mare on the Moon

129. The observation of Galileo that disproved the Ptolemaic model was

(a) the Sun has spots

(b) Jupiter has its own satellites

(c) the Milky Way resolves into stars

(d) Venus goes through a complete cycle of phases

130. Although Tycho came up with his own model of the Solar System, his most important contribution to the heliocentric revolution was

(a) his collaboration with Galileo (b) his meticulous observations of the planets (c) as a political lobbyist (d) financial backing of Kepler

1.5 Figures

131. (5pts) Draw a celestial sphere below for an observer at latitude 80 °N. Show the following:

i horizon (make it horizontal)

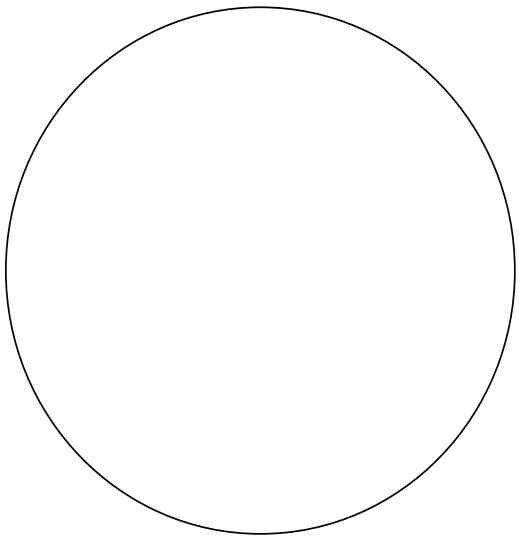
ii NCP and SCP

iii celestial equator (CE)

iv the Sun at noon on summer solstice

v N, S, E, and W

vi nadir and zenith



132. (4 pts) Use Figure 1 below for the following. Assume that the half-lit body represents the Earth and the large circle is the Sun. (The figure is not to scale.)

(a) Draw a point representing the Moon during a solar eclipse. Label it A.

(b) Draw a point representing the Moon during an total lunar eclipse. Label it B.

(c) Draw a point representing the Moon during an penumbral lunar eclipse. Label it C.

(d) Draw a point representing the Moon during a time when no lunar or solar eclipses are occurring. Label it D.

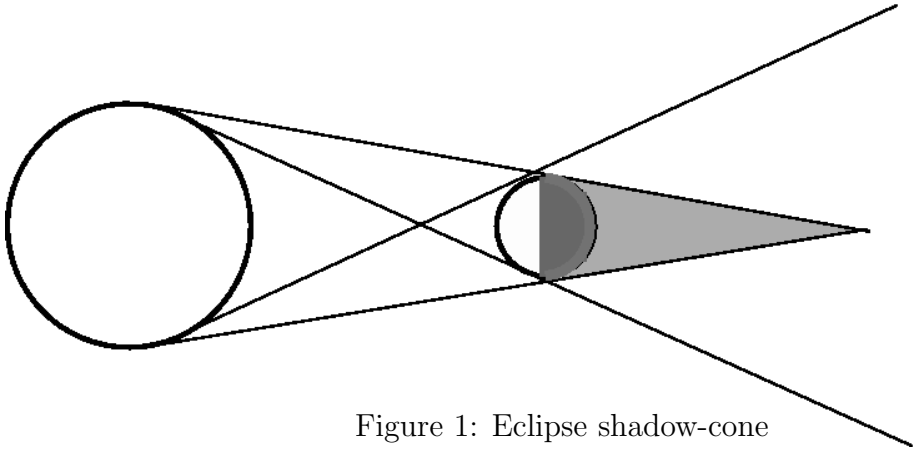


Figure 1: Eclipse shadow-cone

133. (4 pts) Use Figure 2 below to answer the following questions.

(a) Circle the Moon position which would exist during a solar eclipse. Label it "a".

(b) Write the time under observer # 2?

(c) Circle the Moon which is just setting at noon? Label it "c".

(d) Which phase would anyone on Earth observe when the Moon is in position "F" (e.g., waxing crescent, waning crescent, waxing gibbous, waning gibbous)?

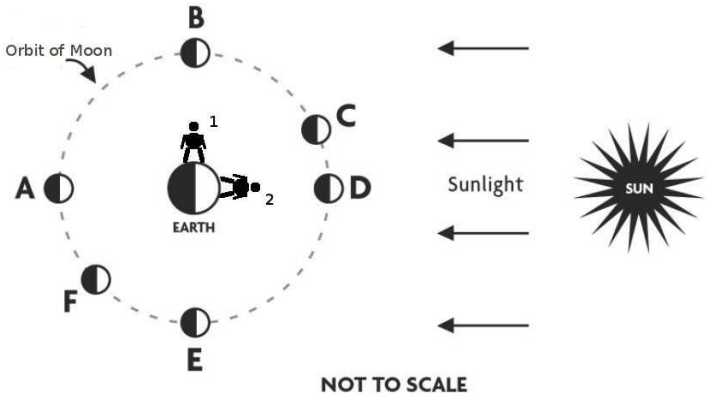


Figure 2: Moon Phases