Exam I Review Questions

Dr. J. Pinkney

1 The Night Sky

1.1 Relative Sizes, Powers of 10, and Units

1. In Chapter 1, each picture was how many times larger than the previous?

   (a) 10 (b) 100 (c) 5 (d) 500

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

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

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

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

5. 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

6. 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

7. 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

8. (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? _____

9. (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

10. (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

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

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

12. 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

13. 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

1. 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)

2. 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

3. 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

4. (1pts) How does the parallax angle p of a star depend on the distance D to the star?

   (a) the bigger D the bigger p (b) the bigger D the smaller p (c) no dependence

5. (1pt) How does the parallax angle p depend on the size of the baseline B?

   (a) the bigger B the bigger p (b) the bigger B the smaller p (c) no dependence

6. The formula $d = \frac{1}{p}$ gives the distance measured in _____ to an object with a parallax angle measured in arcseconds.

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

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

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

9. Write this number in scientific notation: 93×10^6 = _____

1.2 Naked Eye Universe, Constellations

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

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

3. (1pt) Name one of the asterisms in the Constellation Taurus.

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

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

5. Name a planet that is brighter than Sirius. _____.

6. 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

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

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

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

10. 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

11. How many constellations are there?

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

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

13. 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

1.3 Celestial Sphere, Navigation, Seasons, Coordinates

1. The path that the Sun takes relative to the stars, as seen from Earth is the _____.

2. The Earth's equatorial plane is tilted by _____ degrees relative to its orbital plane.

3. Although the Sun is 400 times bigger than the Moon in diameter, the Moon can still cover it up during a solar eclipse because the Sun is also _____.

4. The Earth rotates about 1° further in order to line up with the Sun than to line up with a distant star. Hence, the _____ _____ is longer than the _____
   (Use 5 words total.)

5. The Moon and Sun subtend an angle of 1/2 degree. How many arcminutes is this? _____

6. Which hypothetical planet would have the most severe seasons?

    (a) one with axis tilt = 0°
    (b) one with axis tilt = 20°

(c) one with axis tilt = 30°

(d) one with axis tilt = 40°

(e) one with axis tilt = 80°

7. How would increasing the eccentricity (non-circularity) of a planet's orbit influence the severity of its seasons?

   (a) one hemisphere gets more extreme seasons, the other less

   (b) both hemispheres get more exteme seasons

   (c) both hemispheres get less exteme seasons

   (d) there must be some change, but it would depend on when perihelion happened

   (e) no change

8. Fall begins the moment the Sun crosses the point in the sky called the _____

   (a) vernal equinox b) summer solstice c) autumnal equinox d) winter solstice e) North Celestial Pole

9. One can estimate their latitude on the Earth from the

   (a) spin of the Earth

   (b) the tilt of the Earth's spin axis

   (c) the altitude of the North celestial pole (Polaris)

   (d) the altitude of the Big Dipper (Ursa Major)

   (e) the azimuth of the ecliptic

10. (2pts) At a given moment, which marks or features on the celestial sphere will fall on different constellations for observers on different continents of the Earth (i.e., which marks are "location dependent")? (Circle all that apply.)

    (a) celestial meridian

    (b) ecliptic

    (c) north celestial pole

    (d) celestial equator

    (e) zenith

11. (2pts) Which marks or features on the celestial sphere will fall on the same constellations for observers on different continents of the Earth (i.e., which marks are "location independent")? (Circle all that apply.)

    (a) celestial meridian

    (b) ecliptic

    (c) north celestial pole

(d) celestial equator

(e) vernal equinox

12. Right ascension is defined to be zero hours at one of the intersections of the _____ with the _____.

13. Declination is defined to be zero all along the _____ _____.

14. Altitude is defined to be zero all along an observer's _____.

15. Lines of equal longitude and latitude on the Earth project onto lines of _____, respectively, on the sky.

    (a) azimuth and declinaton

    (b) declination and right ascension

    (c) right ascension and declination

    (d) azimuth and altitude

16. 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

17. 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

18. 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

19. The point in the sky directly overhead is called the _____.

20. The point in the sky directly beneath our feet is called the _____.

21. The name of the point directly overhead is the

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

22. 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

23. 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

24. 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

25. 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

26. 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

27. 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°

28. 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

29. The Northern Hemisphere receives the most energy from the Sun on June 21 or 22 because

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

30. 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

31. 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

32. 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.

33. 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.

34. 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

35. 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

36. (T or F) The position of (Alt., Az.) = (45° , 180°) will appear the same for a stargazer in New York and California.

37. (T or F) The position of (RA, DEC) = (18 hrs, 80°) will appear the same for a stargazer in New York and California.

38. (T or F) The zodiacal constellations (Gemini, Aquarius, etc.) are all centered on the celestial equator.

39. 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

40. 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.

41. You are lost in the woods and you see that Polaris is 40°away from the *horizon*. 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.

42. 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.

43. 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

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

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

45. 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

46. 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.

47. Our current calendar is based on the

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

48. 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

49. 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°

50. 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

51. 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

52. 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

53. 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°

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

_____

55. 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.)

_____ _____

56. How many arcseconds in a degree?

_____

57. In what units is right ascension measured?

_____

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

_____

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

_____

60. What is the declination of the NCP?

_____

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

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

_____

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

_____

1.4 Historical Astronomy

1. 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.

2. The "calendar" made out of rock slabs which is located on the British Isles (UK) is called

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

3. 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

4. Not including Earth, how many planets were identified by ancient (pre-telescope) astronomers?

   (a) none b) two c) three d) five e) eight

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

6. 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.

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

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

9. (T or F) Changes in the brightness of our planets are imperceptible.

10. 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

11. 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

12. The heliocentric model was actually first proposed by:

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

13. 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.

14. 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.

15. 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

16. 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.

17. 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.

18. 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

19. 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

20. 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

21. The early astronomer who agonized over perfect solids while his mother sold drugs was

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

22. Galileo disproved the Ptolemaic system by observing

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

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

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

24. 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

25. 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

26. 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

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

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

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

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

29. 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

30. 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 orbits

31. 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

32. The idea that the Earth is not the center of anything is called the _____.

    (a) anthropic principle b) Copernican principle c) Occam's Razor d) Uncertainty principle e) Correspondence principle

33. Aristotle and Ptolemy both favored the _____ view of the solar system.

    (a) geocentric b) heliocenter c) fixed d) Tychonic e) Aristarchus

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

35. Name one "inferior" planet. _____.

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

37. Who did not publish his model of the solar system until his death in 1543.

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

39. Back in 1761 astronomers first attempted measuring the Astronomical Unit by observing the _____ of Venus.

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

41. 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.

42. 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.

43. 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

44. 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

45. 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

2 Light and spectroscopy

1. Which of these properties for waves on a string are measured in length units (e.g., meters, mm, etc)? (Circle more than one.)

    (a) speed (b) frequency (c) amplitude (d) wavelength (e) polarization

2. Which type of electromagnetic radiation has the longest wavelength?

    (a) Radio (b) visible (c) ultraviolet (d) infrared
    (e) gamma rays

3. What are the colors contained in white light, ordered from low to high frequency? (First letter only. Give at least six colors.)

4. Which type of electromagnetic radiation has the lowest frequency?

   (a) Radio (b) visible (c) ultraviolet (d) infrared (e) gamma rays

5. Which type of electromagnetic radiation has the highest frequency?

   (a) Radio (b) visible (c) ultraviolet (d) infrared
   (e) gamma rays

6. Name a behavior of light which is characteristic of waves but not particles.

   _____

7. Which of these is a type of electromagnetic radiation which is harmful to living tissues? (Circle one)

   (a) gamma rays b) infrared c) radio d) visible light e) cosmic rays

8. The temperature of an ideal blackbody can be measured from the _____ its spectrum.

   (a) emission lines in
   (b) absorption lines in
   (c) peak intensity of
   (d) wavelength of peak intensity for
   (e) width of absorption lines in

9. The pitch of a train horn will drop as the train passes because of the _____ effect.

10. The spectrum of a star moving away from us will be _____ compared to a similar star at rest.

    (a) redshifted
    (b) blueshifted
    (c) neither redshifted or blueshifted
    (d) brighter
    (e) dimmer

11. The spectrum of a star moving toward us will be _____ compared to a similar star at rest.

    (a) redshifted
    (b) blueshifted

(c) neither redshifted or blueshifted

(d) brighter

(e) dimmer

12. The amount of radiation leaving a blackbody depends on temperature raised to the _____ power.

    (a) 1st (b) 2nd (c) 3rd (d) 4th (e) 5th

13. Varying the current flowing through a lightbulb will change the filaments temperature and allow one to demonstrate _____.

    (a) Wien's law (b) Stefan's Law (c) Kirchoff's laws (d) Wien's law and Stefan's law (e) Newton's law

14. If a continuous spectrum is shined through a cool gas, the spectrum that comes out is

    (a) brighter

    (b) still a continuous spectrum

    (c) an emission line spectrum

    (d) an absorption line spectrum

15. If a gas is "excited" with electricity, it is most likely to produce a

    (a) spectrum completely in the infrared

    (b) still a continuous spectrum

    (c) an emission line spectrum

    (d) an absorption line spectrum

16. Kirchoff's laws describe how three types of _____ are formed.

17. The physics experiment that shined photons of light on a metal slab to release electrons was called the _____ _____.

18. The simplest atom is that of the element _____, which has one proton and one _____.

19. T or F The emission lines of hydrogen have a series of wavelengths that can be fit by a fairly simple mathematical equation.

3 Miscellaneous

1. What process can be simplified into these three steps: Observation, Theory, and Prediction? The _____ _____.

2. (1pt) What are two qualities of a good theory?

   _____

   _____.

3. Which of these was **not** the title of a subsection in Chapter 1?

   (a) Earth's Orbital Motion

   (b) Planet formation

   (c) Our place in Space

   (d) Scientific Theory and the Scientific Method

   (e) The Obvious View

4. Name two of the three steps in the scientific method. _____ and _____