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Name:_____ Class:_____ Date:_____

Chapter 01 - Here and Now

1. How many centimeters are there in one kilometer?
   a. 100
   b. 1000
   c. 10,000
   d. 100,000
   e. 1×10^6

ANSWER: d

2. Scientific notation is used in science because
   a. it makes it easy to write big or small numbers.
   b. all astronomical distances are expressed in metric units.
   c. it makes conversions between units easy.
   d. All of the other choices are correct.

ANSWER: a

3. The average distance from Earth to the Sun is
   a. 1 lee.
   b. 1 million km.
   c. 1 million miles.
   d. 1 billion km.
   e. 1 AU.

ANSWER: e

4. The Sun is
   a. a star which generates its own energy.
   b. 1 AU from Earth.
   c. visible by its own light emission.
   d. All of the other choices are correct.

ANSWER: d

5. The diameter of a typical star (the Sun) is approximately ____ times larger than the diameter of a typical planet (the Earth).
   a. 10
   b. 100
   c. 1000
   d. 10,000
   e. 100,000

ANSWER: b

6. A typical galaxy like our Milky Way galaxy contains
   a. primarily planets.
   b. gas only.
   c. stars (some with planets), gas, and dust.
   d. a single star and planets.

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e. thousands of superclusters.

ANSWER: c

7. The radius of the Moon's orbit is about ____ times larger than the radius of Earth.
   a. 0.6
   b. 6
   c. 60
   d. 600
   e. 6000

ANSWER: c

8. Choose the best answer. The Milky Way Galaxy
   a. is part of a cluster of a few dozen galaxies.
   b. is about 200 ly in diameter.
   c. is the largest known object in the universe.
   d. is part of a cluster of a few dozen galaxies, is about 200 ly in diameter, and is the largest known object in the universe
   e. is part of a cluster of a few dozen galaxies and is the largest known object in the universe

ANSWER: a

9. 2.9×10^7 is the same as
   a. 2.9 thousand.
   b. 29 thousand.
   c. 290 thousand.
   d. 2.9 million.
   e. 29 million.

ANSWER: e

10. 1.65 billion is the same as
   a. 1.65×10^{12}.
   b. 1.65×10^{9}.
   c. 1.65×10^{6}.
   d. 1.65×10^{5}.
   e. 1.65×10^{3}.

ANSWER: b

11. Arrange the following distances in order from smallest to largest.
I. Kilometer
II. Light-year
III. Yard
IV. Astronomical unit
   a. I, II, III, IV
   b. IV, III, II, I

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c. III, I, IV, II
d. II, I, IV, III
e. III, I, II, IV

ANSWER: c

12. If distance is speed × time and light takes 1.3 seconds to travel from the Moon to Earth and 8 minutes to travel from the Sun to Earth, which of the following statements is true?
a. The Sun is 6.2 times further from Earth than the Moon.
b. The Sun is 10 times further from Earth than the Moon.
c. The Sun is 0.16 times further Earth than the Moon
d. The Sun is 0.10 times further from Earth than the Moon.
e. The Sun is 370 times further from Earth than the Moon.

ANSWER: e

13. If distance is speed × time and light takes 8 minutes to travel from the Sun to Earth and over 4 hours to travel from the Sun to the planet Neptune, what is the distance from the Sun to Neptune?
a. 5 AU
b. 30 AU
c. 30 ly
d. 5 ly
e. 0.6 ly

ANSWER: b

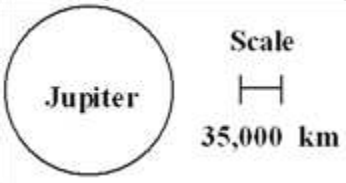
14. Using the scale in the diagram below, what is the diameter of Mercury?



a. about 240 km
b. about 2400 km
c. about 24,000 km
d. about 240,000 km
e. about 2.4×10^6 km

ANSWER: b

15. Using the scale in the diagram below, what is the diameter of Jupiter?



a. about 7.0×10^4 km
b. about 7.0×10^5 km

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c. about 1.4×10^4 km

d. about 1.4×10^5 km

e. about 3.5×10^6 km

ANSWER: d

16. Earth has a radius of about 6400 km, the Sun has a radius of about 7.0×10^5 km, and a rubber ball has a radius of 6.4 cm. If you were to construct a scale model of the solar system using the rubber ball to represent Earth, what is the radius of a ball needed to represent the Sun in your model?

a. 7.0×10^5 cm

b. 7.0 cm

c. 700 cm

d. 70 cm

e. 7000 cm

ANSWER: c

17. The speed of light is 3.0×10^5 km/s, and it takes 1.3 s for light to travel from the Moon to Earth. From this information, what is the distance to the Moon?

a. 390,000 km

b. 230,000 km

c. 3.9 km

d. 2.3 km

e. 4.3×10^5 km

ANSWER: a

18. If the distance to the nearest star is 4.2 ly, then

a. the star is 4.2 million AU away.

b. the light we see left the star 4.2 years ago.

c. the star must have formed 4.2 billion years ago.

d. the star must be very young.

e. the star must be very old.

ANSWER: b

19. The Milky Way Galaxy is

a. a spiral galaxy.

b. part of a cluster of galaxies that contains a few dozen galaxies.

c. over 100,000 ly in diameter.

d. All of the other choices are correct.

ANSWER: d

20. If the Earth were represented as a basketball (˜10 in. in diameter) and the Moon as a baseball (˜3 in. in diameter) then, to order of magnitude, what size would best represent the diameter of the Sun?

a. 10 ft

b. 100 ft

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c. 1000 ft
d. 10000 ft

ANSWER: b

21. Which sequence is correct when ordered by increasing size?
a. Earth, Solar System, Milky Way Galaxy, clusters of galaxies
b. Solar System, Earth, galaxy clusters, Milky Way Galaxy
c. Earth, Milky Way Galaxy, Solar System, galaxy clusters
d. Galaxy clusters, Solar System, Milky Way Galaxy, Earth

ANSWER: a

22. How is a planet different than a star?
a. Planets are larger than stars.
b. Planets reflect light while stars produce their own light.
c. Stars move faster in the sky than planets.
d. Planets are brighter than stars.

ANSWER: b

23. If the distance from the Sun to the Earth is represented by roughly 15 m, then the distance from Earth to the Moon on the same scale would be
a. about 30 m.
b. about 10 m.
c. about 1 m.
d. small than your hand.

ANSWER: d

24. Assume the size of the Sun is represented by a baseball with the Earth is about 15 m (150 million km or 8 light minutes) away. How far away, to scale, would the nearest stars to the Sun be? Choose the closest answer.
a. about the distance between New York and Boston (330 km)
b. 100 m away
c. about the distance across the United States from New York to Los Angeles (4300 km)
d. about the distance across 50 football fields (50 × 100 m)

ANSWER: c

25. The average distance from Earth to the Sun is
a. 1 ly.
b. 1 million km.
c. 1 million miles.
d. 1 billion km.
e. 150 million km.

ANSWER: e

26. Assume a 100-yard football field represents the 14-billion-year history of the universe with one end as the origin and the other end representing the present. The existence of human beings will extend from ____ to the present "goal line."

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a. the 50-yard line
b. the 5-yard line
c. the one-yard line
d. the one-inch line

ANSWER: d

27. Which of these is NOT a common misconception?
a. A light year is a unit of time.
b. Stars look like disks when seen through a telescope
c. A galaxy is a star plus its planets.
d. All of the other choices are misconceptions.

ANSWER: d

28. 64,200,000,000 is equal to
a. 6.42×10^{7}.
b. 6.42×10^{-7}.
c. 6.42×10^{10}.
d. 6.42×10^{-10}.
e. $1.0 \times 10^{64.2}$.

ANSWER: c

29. A solar system contains
a. primarily planets.
b. large amounts of gas and dust but very few stars.
c. large amounts of gas, dust, and stars.
d. a single star and planets.
e. thousands of superclusters.

ANSWER: d

30. 3.0×10^{5} times 1.5×10^{9} is equal to
a. 4.5×10^{45}.
b. 4.5×10^{14}.
c. 2.0×10^{4}.
d. 2.0×10^{14}.
e. 2.0×10^{45}.

ANSWER: b

31. 4.4×10^{6} divided by 8.8×10^{10} is equal to
a. 5.0×10^{-5}.
b. 5.0×10^{-4}.

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c. 5.0×10^4.

d. 3.9×10^{17}.

e. 3.9×10^{16}.

ANSWER: a

32. If the light takes 8 minutes to reach Earth from the Sun and the nearest star is 4.3 ly from the Sun, what is the distance from the Sun to the nearest star in astronomical units?

a. 37.6 AU

b. 1.7 AU

c. 214 AU

d. 238,000 AU

e. 1.5×10^{11} AU

ANSWER: d

33. Which of the following is the largest?

a. the diameter of Earth

b. the diameter of the Moon

c. the diameter of the Sun

d. the diameter of Jupiter

e. the distance from Earth to the Sun

ANSWER: e

34. In units of yards, how far from the Big Bang is the Recombination period, when the gas becomes transparent to light?

a. much, much less than a yard

b. about a yard

c. about 5 yards

d. about 10 yards

ANSWER: a

35. Order the following from earliest to most recent.
I. Big Bang
II. Age of quasars
III. First humans
IV. Cambrian explosion
V. Formation of the solar system
VI. First life
VII. Recombination Period

a. I, II, VII, IV, V, VI, III

b. I, VI, VII, II, V, IV, III

c. I, VI, V, VII, III, II, IV

d. I, VII, II, V, VI, IV, III

ANSWER: d

36. Which unit best represents a field of view in Chapter 1?

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a. seconds
b. square centimeters
c. Celsius
d. kilometers

ANSWER: d

37. Which color best represents space as drawn in this chapters' figures?
a. blue
b. white
c. black
d. red

ANSWER: c

38. Which is the shorter time unit: a light-second, a light-minute, or a light-year?
a. light-second
b. light-minute
c. light-year
d. None of the other choices are correct.

ANSWER: d

39. If light travels 63,000 AU in 1 year at 3×10^8 m/s, which of these best represents the unit of a light-year?
a. 63,000 AU
b. 3×10^8 m/s
c. 1 year
d. All of the other choices are correct.

ANSWER: a

40. How long does light take to reach us from Proxima Centuri?
a. 4.2 ly
b. 4.2 years
c. 8.4 AU
d. 8.4 km

ANSWER: b

41. How fast does light travel from Proxima Centuri to Earth?
a. 4.2 ly
b. 4.2 years
c. 3×10^8 m/s
d. None of the other choices are correct.

ANSWER: c

42. Which shape best describes how stars look when seen through a telescope?
a. five-point star

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b. disk
c. point
d. seven-point star

ANSWER: c

43. Earth is located about _____ of the way out from the center of the Milky Way Galaxy.
a. 1/2
b. 1/3
c. 2/3
d. 3/2

ANSWER: c

44. Which of the following order from largest to smallest is incorrect?
a. void, supercluster, star
b. filament, planet, asteroid
c. wall, star, planet
d. void, solar system, cluster

ANSWER: d

45. Which is the correct order for the following steps used in the scientific method?
I. Conclude
II. Analyze
III. Gather evidence
IV. Test
V. Hypothesize
VI. Establish laws
a. VI, V, III, II, IV, I
b. III, IV, II, V, VI, I
c. V, III, IV, II, I, VI
d. III, V, IV, II, I, VI

ANSWER: c

46. If the field of view (FOV) in Figure 1-1 is 50 ft and the distance is widened by a factor of 100, how large is the FOV in Figure 1-2? Choose the best answer.
a. 1 mile
b. 5000 ft
c. 1 square mile
d. 5000 square feet

ANSWER: b

47. By how much is the FOV (field of view) enlarged from Figure 1 to Figure 3?
a. 100
b. 1×10^5
c. 1000
d. 10,000

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ANSWER: d

48. According to the text, the Sun is a very _____ star.
    a. typical
    b. atypical
    c. unique
    d. abnormal

ANSWER: a

49. Figure 1-11 is an example of a/an _____. Choose the best answer.
    a. image
    b. picture
    c. artistic rendering
    d. line drawing

ANSWER: c

50. Which of the following is an incorrect ordering of the planets' distances from the Sun, from nearest to furthest?
    a. Mercury, Venus, Uranus, Neptune
    b. Earth, Mars, Jupiter, Saturn
    c. Venus, Mars, Jupiter, Neptune
    d. Earth, Venus, Jupiter, Uranus

ANSWER: d

51. Which of the following is ordered correctly from smallest to largest planet?
    a. Neptune, Saturn, Moon, Earth
    b. Venus, Mercury, Jupiter, Saturn
    c. Mars, Earth, Saturn, Jupiter
    d. Uranus, Saturn, Venus, Earth

ANSWER: c

52. The name of the average distance from Earth to the Sun is one _____.
ANSWER: astronomical unit

53. Light takes about 8 minutes to travel from the Sun to Earth and about 40 minutes to travel from the Sun to Jupiter. Jupiter is about _____ AU from the Sun.
ANSWER: five

54. A(n) _____ is the largest known structure in the universe.
ANSWER: filament wall

55. A(n) _____ is the distance that light travels in one year.
ANSWER: light-year

56. The number 52,600,000,000 would be written in scientific notation as _____.
ANSWER: 5.26×10^{10}

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57. The _____ contains a large amount of gas and dust and a great number of stars, and our Sun is one of those stars.
ANSWER: Milky Way Galaxy

58. A(n) _____ is a collection of billions of stars.
ANSWER: galaxy

59. _____ is the closest star to Earth.
ANSWER: Sun

60. The scientific method is a _____ by which scientists form hypotheses and test them against evidence gathered by observation or experiment.
ANSWER: process

61. In the mnemonic, *My Very Educated Mother Just Served Us Noodles,* _____ refers to Mars.
ANSWER: Mother

62. _____ is the closest planet to the Sun.
ANSWER: Mercury

63. _____ is the smallest planet in the solar system.
ANSWER: Mercury

64. The average distance from Earth to the Sun is 1 AU.
a. True
b. False
ANSWER: True

65. The nearest star is 1 ly from the solar system.
a. True
b. False
ANSWER: False

66. A light-year is the distance light travels in one year.
a. True
b. False
ANSWER: True

67. A kilometer contains 1 million meters.
a. True
b. False
ANSWER: False

68. The Sun is a star in the Milky Way Galaxy.
a. True

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b. False

ANSWER: True

69. The metric system is a decimal system.
a. True
b. False

ANSWER: True

70. 3.42×10^7 km is the same as 3.42×10^4 m.
a. True
b. False

ANSWER: False

71. The numbers 9.81×10^5 and 981,000 are equivalent.
a. True
b. False

ANSWER: True

72. An astronomical unit is larger than a light-year.
a. True
b. False

ANSWER: False

73. A supercluster refers to a large group of stars within the Milky Way.
a. True
b. False

ANSWER: False

74. The Milky Way and the Milky Way Galaxy are the same thing.
a. True
b. False

ANSWER: False

75. Our Sun was born in a spiral arm.
a. True
b. False

ANSWER: True

76. Life began on land.
a. True
b. False

ANSWER: False

77. Life and human life are the same thing.

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a. True
b. False

ANSWER: False

78. The scientific method is a simple, mechanical way of grinding facts into understanding.
a. True
b. False

ANSWER: False

79. The relative distance between the planets increase with distance from the Sun.
a. True
b. False

ANSWER: True

80. The Moon is a large moon compared to the size of its host planet.
a. True
b. False

ANSWER: True

81. The Milky Way Galaxy is alone, that is, not a part of a group or cluster.
a. True
b. False

ANSWER: False

82. The Big Bang is a point in space.
a. True
b. False

ANSWER: False

83. The solar system is larger than the Milky Way Galaxy.
a. True
b. False

ANSWER: False

84. The name of our planetary system orbiting our Sun is called the Milky Way Galaxy.
a. True
b. False

ANSWER: False

85. Our universe is the planets orbiting the Sun, the Sun, and all the asteroids and comets in between and around our system.
a. True
b. False

ANSWER: False

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86. Why would the English system of units be more useful if a foot contained 10 inches?

ANSWER: Because our number system is base-10, having units based on 10 simplifies calculations. Fractions could be expressed in decimal notation. Prefixes could be used, such as milli-, centi-, kilo- to express lengths of varying orders of magnitudes.

87. Why do we measure some distances in astronomy in light-years and some in astronomical units?

ANSWER: Consider using millimeters to describe the distance between New York and California, 3,920,000,000 millimeters. This distance is correct, but it is far more convenient to state the distance as 3920 kilometers. Distances in astronomy are huge when compared to distances we measure on Earth. It is simpler and more convenient to use larger distance units for discussion and calculations.

88. From what you know about astronomical units and light-years, how would you define a light-minute?

ANSWER: A light-minute is the distance light travels in a minute, or $(3.0 \times 10^8$ m/s)(60 s) = 18×10^6 km.

89. "I live 20 minutes from Center City." How is this statement similar to giving astronomical distances in light-years?

ANSWER: Twenty minutes is a measurement of time. In this case, the person speaking is referring to the time it takes to travel from City Center to home. If someone says an object is a distance of a certain number of light years, this is correct. Light-years is a measurement of distance. It is a common misperception that a light-year is a unit of time, because it has the word “year.”

90. Describe the difference between a solar system and a galaxy.

ANSWER: A solar system consists of a star, or possibly a binary star system, surrounded by orbiting objects such as planets, asteroids, and comets. A galaxy is a collection of many millions or billions of stars, many of which are members of solar systems.

91. Considering that the Sun is about 1/100 AU in diameter and a typical planet like Earth is 1/10,000 AU, discuss whether or not our Solar System is crowded or empty.

ANSWER: The Sun and planets make up only a tiny fraction of the volume of the Solar System, so it is relatively empty.

92. Briefly describe the scientific method.

ANSWER: The scientific method is a process scientists use to better understand the natural world. It is a combination of many ways of analyzing information, finding relationships, and creating new ideas. Scientists use insight and ingenuity to form, test, revise, and possibly discard hypotheses, in the quest to gain a fundamental understanding of nature.

93. Draw a schematic (not to scale) diagram showing the Sun, the Earth circling around it, and the other seven planets with labels for each orbit.

ANSWER: Diagram should show the Sun and the eight planets in order: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

94. Assume a textbook shows a diagram of the solar system on, say, a standard notebook-sized sheet. The orbits of eight planets are sketched around the Sun at the center. The planets and orbits are drawn large enough that features like continents on Earth or the rings of Saturn are clearly visible. The Sun is drawn large enough that sunspots are clearly visible. Discuss what is wrong or right with this diagram.

ANSWER: The diagram is correct in that there are eight planets orbiting the Sun. It is incorrect in several ways. One, if the Sun and planets were drawn to scale, it would be impossible to make out surface features of the Sun or Earth, or the rings of Saturn. Two, although the planets orbit the Sun, the orbits are not perfect circles but ellipses.

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95. Is the scientific method a hypothesis? How do you know?
ANSWER: No, the scientific method is a process of which a hypothesis is one piece.

96. Draw a schematic (not to scale) of the Milky Way Galaxy face on so that you see the spiral arms. Label the spiral arms. Now draw a schematic (not to scale) of the Milky Way Galaxy edge-on, and locate and label the disk.
ANSWER: Arms are shown in the face-on figure, usually two grand spiral arms (even though the MWG has spurs). Edge-on, the MWG appears like a quarter and we see the outer rim of the arms, which we refer to as the disk.

97. Draw a schematic (not to scale) of filaments, walls, and voids, labeling each.
ANSWER: The drawing should look like soap bubbles.

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