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Life in the Universe, 4e **(Bennett)**
Chapter 2 The Science of Life in the Universe

1) The possibility of extraterrestrial life was first considered
A) after the invention of the telescope
B) only during the past few decades
C) thousands of years ago during ancient times
D) at the turn of the 20th century
Answer: C

2) Historical evidence suggests that the methods of modern science were originated by the
A) Mayans
B) Egyptians
C) Greeks
D) Babylonians
Answer: C

3) Most ancient cultures believed that the Earth was
A) spherical and moving through space
B) flat and moving through space
C) spherical and motionless
D) flat and motionless
Answer: D

4) The astronomical object in our sky which plays the most fundamental role in our lives is the
A) Sun
B) Moon
C) nearest star
D) most massive planet in our solar system, Jupiter
Answer: A

5) The astronomical object in our sky which is directly connected to the tides is the
A) Sun
B) Moon
C) nearest star
D) most massive planet in our solar system, Jupiter
Answer: B

6) Careful observations of the sky by ancient cultures served the practical purpose of
A) keeping track of time
B) improving night vision
C) religious worship
D) keeping track of the changing position of the Earth around the Sun
Answer: A

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7) The first detailed astronomical observations were made by the
A) Mayans
B) Egyptians
C) Chinese
D) Babylonians
Answer: C

8) The first ancient civilization able to predict eclipses were the
A) Mayans
B) Egyptians
C) Chinese
D) Babylonians
Answer: D

9) The origins of Greek science can be traced back to the philosopher
A) Plato
B) Thales
C) Aristotle
D) Anaximander
Answer: B

10) The Greek approach to understanding the universe relied mostly on
A) observations
B) experiments
C) thought and intuition
D) preconceived ideas
Answer: C

11) Which of the following was NOT a contribution made by the Greeks in the development of modern science?
A) The willingness to challenging new ideas
B) The use of mathematics to explore new ideas
C) The willingness to discard ideas if they didn't work
D) The willingness to prove preconceived ideas
Answer: D

12) In science, conceptual representations of observed phenomena are referred to as
A) facts
B) hypotheses
C) models
D) beliefs
Answer: C

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13) The circular shape of the Earth's shadow on the Moon during a lunar eclipse suggested to the Greeks that the Earth was
A) cylindrical in shape
B) at the center of the Universe
C) flat
D) spherical in shape
Answer: D

14) The geocentric model of the Greeks consisted of a
A) flat Earth at the center of the universe surrounded by a dome-shaped sky
B) flat Earth at the center of the universe surrounded by a celestial sphere
C) spherical Earth at the center of the universe surrounded by a dome-shaped sky
D) spherical Earth at the center of the universe surrounded by a celestial sphere
Answer: D

15) Which of the following is NOT a planet visible to the naked eye?
A) Saturn
B) Neptune
C) Mercury
D) Jupiter
Answer: B

16) The seven days of the week are related to the
A) Sun, Moon and five naked eye planets
B) seven brightest stars in the sky
C) seven planets known at the end of the 19^{th} century
D) seven most prominent constellations that the Sun, Moon and planets pass through
Answer: A

17) Most of the time, planets are observed to
A) be stationary with respect to background stars
B) move eastward with respect to background stars
C) move due south with respect to background stars
D) move westward with respect to background stars
Answer: B

18) Apparent retrograde motion occurs when a planet appears to
A) be stationary with respect to background stars
B) move eastward with respect to background stars
C) move due north with respect to background stars
D) move westward with respect to background stars
Answer: D

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19) The Ptolemaic model has planets moving in
A) elliptical orbits about the Sun
B) a simple circle about the Earth
C) a simple circle about the Sun
D) small circles, the centers of which move in a larger circle about the Earth
Answer: D

20) In the Ptolemaic model, retrograde motion is due to
A) relative motion between the Earth and another planet in its orbit
B) the Earth reversing the direction of its orbit about the Sun
C) a planet moving backwards in its smaller circular circle, the center of which moves in a larger circular orbit around the Earth
D) a planet reversing the direction of its orbit about the Sun
Answer: C

21) The first person to suggest that the Earth moved around the Sun was
A) Aristarchus
B) Newton
C) Copernicus
D) Galileo
Answer: A

22) In the heliocentric (Sun-centered) model, apparent retrograde motion is due to
A) relative motion between the Earth and another planet in its orbit
B) the Earth reversing the direction of its orbit about the Sun
C) a planet moving in a small circle, the center of which moves in a larger circle about the Earth
D) a planet reversing the direction of its orbit about the Sun
Answer: A

23) Stellar parallax is the apparent
A) shift in position of nearby stars as the Earth moves around the Sun
B) westward motion of a planet with respect to the background stars
C) shift in position of nearby stars as the Sun moves about the center of the galaxy
D) shift in position of nearby stars as the Earth rotates on its axis
Answer: A

24) Stellar parallax provides concrete proof that the
A) Earth rotates on its axis
B) Earth is roughly spherical
C) Earth moves around the Sun
D) Moon moves around the Earth
Answer: C

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25) Which Greek school of thought suggested that life elsewhere in the universe might be common?
A) the Aristotelians
B) the Platonists
C) the stoicists
D) the atomists
Answer: D

26) Which Greek school of thought believed that life on Earth was unique?
A) the Aristotelians
B) the Platonists
C) the stoicists
D) the atomists
Answer: A

27) Copernicus
A) provided strong observational evidence that the Earth moved about the Sun
B) proved that the orbital shapes of the planets were ellipses and not circles
C) was the first person to suggest the Earth moved around the Sun
D) revived Aristarchus's suggestion of a Sun-centered solar system and described it mathematically
Answer: D

28) One fundamental consequence of the Copernican model which many people had difficulty accepting at the time it was proposed was that the Earth
A) must be moving through space
B) was rotating on its axis
C) must be stationary in space
D) must be smaller than the Sun
Answer: A

29) Even though the heliocentric model of Copernicus had many advantages over the Ptolemaic model, it suffered from the assumption that the
A) planets moved in ellipses about the Sun
B) planets moved in perfect circles about the Sun
C) planets moved in perfect circles about the Earth
D) Earth was not rotating on its axis
Answer: B

30) Tycho Brahe
A) developed a theory of gravity to explain the motions of the planets
B) obtained the first observational evidence suggesting the Earth moved about the Sun
C) showed that the orbits of the planets were ellipses and not circles
D) made detailed measurements of the motions of the planets in the sky
Answer: D

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31) Johannes Kepler
A) developed a theory of gravity to explain the motions of the planets
B) obtained the first observational evidence suggesting the Earth moved about the Sun
C) made detailed measurements of the motions of the planets in the sky
D) showed that the orbits of the planets were ellipses and not circles
Answer: D

32) Kepler's First Law of planetary motion states that
A) an imaginary line joining the Sun and planet sweeps out equal areas in equal times
B) the further a planet is from the Sun, the faster it moves in its orbit
C) the orbits of planets are ellipses
D) the further a planet is from the Sun, the slower it moves in its orbit
Answer: C

33) A planet is closest to the Sun in its elliptical orbit when it is at
A) perigee
B) aphelion
C) apogee
D) perihelion
Answer: D

34) A planet is furthest from the Sun in its elliptical orbit when it is at
A) apogee
B) aphelion
C) perigee
D) perihelion
Answer: B

35) The semi-major axis, *a,* of an elliptical planetary orbit is equal to the
A) width of the ellipse
B) distance between the planet and the Sun at perihelion
C) average distance between the planet and the Sun
D) distance between the planets and the Sun at aphelion
Answer: C

36) Kepler's Second Law of planetary motion states that
A) an imaginary line joining the Sun and planet sweeps out equal areas in equal times
B) the further a planet is from the Sun, the faster it moves in its orbit
C) the further a planet is from the Sun, the slower it moves in its orbit
D) the orbits of planets are ellipses
Answer: A

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37) According to Kepler's Second Law of planetary motion, a planet moves fastest in its orbit when it is
A) undergoing retrograde motion
B) in between perihelion and aphelion
C) at perihelion
D) at aphelion
Answer: C

38) Kepler's Third Law of planetary motion states that
A) the further a planet is from the Sun, the faster it moves in its orbit
B) an imaginary line joining the Sun and planet sweeps out equal areas in equal times
C) the further a planet is from the Sun, the slower it moves in its orbit
D) the orbits of planets are ellipses
Answer: C

39) The astronomical unit (AU) is defined to be equal to the
A) average distance between the Earth and Sun
B) average distance between the Sun and the planet Pluto
C) distance between the Sun and the nearest star
D) diameter of the Earth
Answer: A

40) Galileo Galilei
A) developed a theory of gravity to explain the motions of the planets
B) obtained the first observational evidence suggesting the Earth moved about the Sun
C) showed that the orbits of the planets were ellipses and not circles
D) made detailed measurements of the motions of the planets in the sky
Answer: B

41) The observations of sunspots on the Sun and craters on the Moon by Galileo contradicted the commonly held belief that the universe was
A) spherical
B) unchanging
C) infinite
D) perfect
Answer: D

42) The discovery of a supernova by Tycho Brahe in 1572 contradicted the commonly held belief that the universe was
A) unchanging
B) spherical
C) infinite
D) perfect
Answer: A

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43) The discovery of four moons in orbit about Jupiter by Galileo suggested that
A) the Earth moved about Jupiter
B) the Earth moved about the Sun
C) Jupiter moved about the Sun
D) bodies could stay in orbit about a moving Jupiter
Answer: D

44) Galileo discovered that Venus goes through a cycle of phases like the Moon. This suggested that
A) Venus moved about the Sun
B) Venus moved about the Earth
C) the Sun moved about the Earth
D) the Earth moved about the Sun
Answer: A

45) Asteroid 13681 Monty Python has an orbit with a semi-major axis, *a,* of 2.99 AU. According to Kepler's 3rd Law, what is its orbital period?
A) 2.08 years
B) 2.99 years
C) 6.34 years
D) 5.17 years
Answer: D

46) The recently dwarf planet Eris has an orbital period about the Sun, *P,* of 557 years. According to Kepler's 3rd Law, what is the semi-major axis, *a,* of its orbit?
A) 55.7 AU
B) 38.4 AU
C) 72.1 AU
D) 67.7 AU
Answer: D

47) What is the relationship between Newton's three laws and Kepler's three laws?
A) Newton's laws can be derived from Kepler's laws
B) Newton's laws and Kepler's laws are identical
C) Kepler's laws are general and apply to any motion, while Newton's laws apply only to planetary motion in the solar system
D) Newton's laws are general and apply to any motion, while Kepler's laws apply only to planetary motion in the solar system
Answer: D

48) Newton's 1st Law of Motion states that
A) action and reaction are equal and opposite
B) force equals mass times acceleration
C) an object moves at a constant velocity unless a force acts
D) the force of gravity decreases with increasing distance
Answer: C

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49) Newton's 2nd Law of Motion states that
A) action and reaction are equal and opposite
B) force equals mass times acceleration
C) an object moves at a constant velocity unless a force acts
D) the force of gravity decreases with increasing distance
Answer: B

50) Newton's 3rd Law of Motion states that
A) action and reaction are equal and opposite
B) force equals mass times acceleration
C) an object moves at a constant velocity unless a force acts
D) the force of gravity decreases with increasing distance
Answer: A

51) In the scientific method a hypothesis is another name for
A) an observation
B) an educated guess
C) a test
D) a theory
Answer: B

52) In the scientific method, what immediately follows a prediction?
A) a hypothesis
B) an observation
C) a question
D) a test
Answer: D

53) An astronomer surveying the sky toward a random region of the sky finds, by chance, the most distant galaxy ever detected. This is an example of
A) nonscience
B) discovery science
C) hypothesis-driven science
D) pseudoscience
Answer: B

54) A scientist intuitively believes that a higher power must be present in the universe. However, she can provide no experimental data to support her belief. This is an example of
A) pseudoscience
B) hypothesis-driven science
C) nonscience
D) discovery science
Answer: C

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55) A person claims to have been abducted by aliens and subjected to painful medical procedures that left scarring. However, he refuses to allow interested scientists to study his scars. This is an example of
A) hypothesis-driven science
B) discovery science
C) nonscience
D) pseudoscience
Answer: D

56) A scientist tries to determine why a particular car is getting a much lower gas mileage than claimed by the manufacturer by systematically designing experiments to test possible causes for the problem. This is an example of
A) discovery science
B) nonscience
C) hypothesis-driven science
D) pseudoscience
Answer: C

57) Modern science attempts to seek explanations for phenomena that are based on
A) new subjective laws that are yet to be confirmed experimentally
B) intuitive expectations
C) the views of leading scientists
D) the known laws of nature
Answer: D

58) If a scientific model generates a prediction that is not confirmed experimentally,
A) the experimental data must be modified to be consistent with the model
B) it must be initially revised and eventually abandoned if it continues to be inconsistent with experiments
C) it must be assumed that there are errors in the experiment
D) it must immediately be abandoned
Answer: B

59) Occam's Razor states that if we have two models that agree equally well with observations, we choose the one that
A) is simplest
B) is most complex
C) has been around the longest
D) is accepted by most scientists
Answer: A

60) A scientific model is considered valid if it is consistent with
A) a single observation by an individual scientist
B) the opinions of experts in the field
C) repeated observations made by an individual scientist
D) independent observations made by different scientists
Answer: D

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61) The general pattern of thought that is accepted by the majority of scientists at a particular point in time is referred to as a
A) methodology
B) theory
C) paradigm
D) consensus
Answer: C

62) Scientists always try to
A) be as subjective as possible
B) be as objective as possible
C) disagree with the current paradigm of the time
D) agree with the current paradigm of the time
Answer: B

63) Scientific models supported by a large, compelling body of evidence are referred to as
A) facts
B) ideas
C) theories
D) hypotheses
Answer: C

64) In science, the tendency of an experiment to produce a particular result is referred to as
A) a deviation
B) bias
C) an error
D) an uncertainty
Answer: B

65) In science, a range of possible values resulting from a measurement is referred to as
A) a deviation
B) bias
C) an error
D) an uncertainty
Answer: D

66) In science, an unexpected change in a series of measurements is referred to as
A) a deviation
B) bias
C) an error
D) an uncertainty
Answer: A

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67) In science, the difference between a measured value and its true value referred to as
A) a deviation
B) bias
C) an error
D) an uncertainty
Answer: C

68) Two asteroids are found at the same distance from the Sun. However, one asteroid is twice as massive the other. According to Newton's Universal Law of Gravitation the force of gravity exerted by the Sun and the more massive asteroid is
A) twice as large as the force exerted on the less massive asteroid
B) four times as large as the force exerted on the less massive asteroid
C) half as large as the force exerted on the less massive asteroid
D) exactly the same as the force exerted on the less massive asteroid
Answer: A

69) Two asteroids have identical masses. However, one asteroid is twice as far from the Sun than the other. According to Newton's Universal Law of Gravitation the force of gravity exerted by the Sun on the more distant asteroid is
A) the same size as the force exerted on the closer asteroid
B) one-quarter of the size of the force exerted on the closer asteroid
C) twice as large as the force exerted on the closer asteroid
D) one-half of the size of the force exerted on the closer asteroid
Answer: B

70) What was one of the first observations that hinted at limitations in Newton's theory of gravity?
A) deviations in the motion of the planet Uranus in the sky
B) deviations in the motion of the planet Mercury in the sky
C) shifts in position of stars close to the Sun during solar eclipses
D) failure to explain why all objects fall at the same rate in a gravitational field
Answer: B

71) How are Newton's and Einstein's theories of gravity related?
A) Newton's theory applies only to planetary motion while Einstein's theory applies only to black holes
B) Einstein's theory is an approximation of Newton's theory
C) the two theories are identical
D) Newton's theory is an approximation of Einstein's theory
Answer: D

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72) Which of the following observations is explained by Einstein's General Theory of Relativity but NOT Newton's Universal Law of Gravitation?
A) how gravity acts at a distance
B) planets periodically undergo apparent retrograde motion
C) all objects fall to Earth at the same rate
D) planets move faster in their orbits when they are closer to the Sun
Answer: A

73) In Einstein's General Theory of Relativity, gravity is explained as
A) action at a distance
B) the curvature of spacetime
C) a basic component of the atom
D) a force-carrying particle called the graviton
Answer: B

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