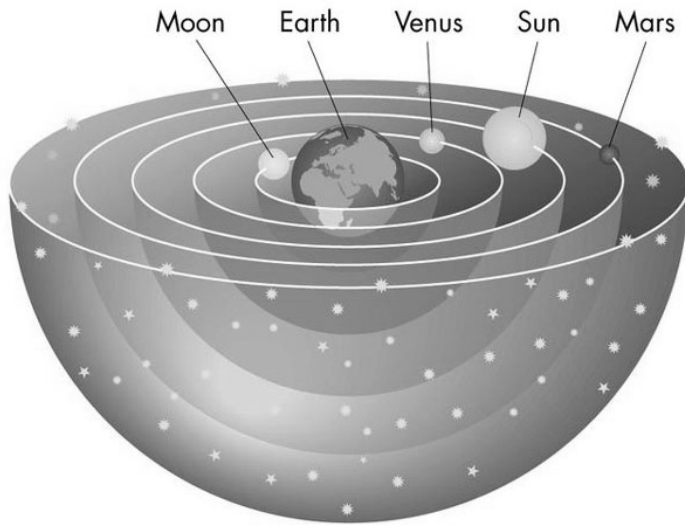


SPACE SCIENCE

- Which type of light is used to observe young stars being born?
 - visible
 - ultraviolet
 - gamma-ray
 - infrared
- Stars are probably being born in regions rich in
 - dust and gas.
 - red giants.
 - globular clusters.
 - heavy elements.
- Which has retrograde rotation?
 - Mars
 - The Moon
 - Earth
 - Venus
- Why does Mars have such a thin (low-density) atmosphere?
 - Because Mars' low mass means that much of the atmosphere had escape velocity from the planet.
 - Because of the extremely high surface temperature of Mars.
 - Because Mars' atmosphere is composed of nitrogen and oxygen.
 - Because Mars' atmosphere is composed mostly of CO_2 .
- About half of the heating of Jupiter's atmosphere is due to energy coming up from lower depths. What is the source of this energy?
 - It is caused by the rapid rotation of the planet, which causes intense heating through friction between the atmosphere and the ground.
 - It is sunlight which is reflected from low-lying cloud layers.
 - Jupiter is actually like a small star, with nuclear energy being generated deep in its core.
 - It is due to heat in the interior, left over from the release of gravitational energy when Jupiter formed.
- The Cassini/Huygens space probe has landed on the surface of Titan. Why are we so interested in this moon of Saturn?
 - Because after Earth's Moon, it is the next closest moon to which we can travel.
 - To obtain rock samples for age dating.
 - Because the surface of Titan appears to have oceans of water interspersed with rocky continents, just like on Earth.
 - It has an atmosphere with many similarities to Earth's.
- What is a major reason for the high level of interest in near-Earth asteroids?
 - This is the most numerous type of asteroid in the solar system.
 - We want to know if any of them will hit the Earth anytime soon.
 - These are thought to be fragments of the cataclysm that originally formed our Moon.
 - These are thought to be far older than any other asteroids.
- The surface of Venus has not been seen with telescopes on the Earth due to
 - interplanetary dust.
 - the glare of the nearby Sun.
 - the great distance between the Earth and Venus.
 - clouds on Venus.
- Impact craters are produced
 - only on the Moon and on Mercury.
 - only during the initial formation of the Solar System.
 - by volcanic activity on the geologically active planets.
 - at a (currently) steady rate on all exposed solid surfaces in the Solar System.
- What is currently the major source of the Sun's energy?
 - Conversion of helium to iron through the proton-proton reaction.
 - Gravitational contraction.
 - Angular momentum.
 - Conversion of hydrogen to helium through the proton-proton reaction.

11. Examine the diagram of the solar system below. Which of the following astronomers held and promoted this view of the solar system?



- (1) Aristarchus
 - (2) Ptolemy
 - (3) Copernicus
 - (4) Tycho Brahe
12. Which of the following is evidence that Jupiter's composition is rich in hydrogen?
- (1) Its large mass
 - (2) Its large size
 - (3) Its low density
 - (4) Its distance from the Sun
13. The atmosphere of Venus is composed primarily of:
- (1) carbon dioxide
 - (2) sulphur dioxide
 - (3) sulphuric acid
 - (4) nitrogen
14. Why do Mercury and the Moon lack an atmosphere?
- (1) They formed after all the gas had been used up.
 - (2) They are so cold that all their gases have frozen into deposits below their surface.

- (3) They formed before the solar nebula had captured any gas.
- (4) They are so small that their gravity is too weak to retain an atmosphere.

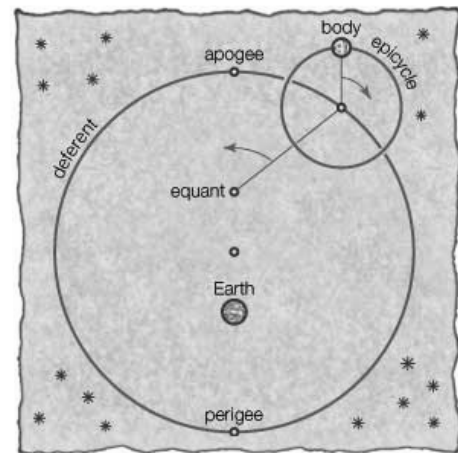
15. The core of a comet is composed of:

- (1) molten iron.
- (2) frozen gases and ice.
- (3) liquid hydrogen.
- (4) uranium.

16. Why are most asteroids not spherical?

- (1) Their gravity is too weak to pull them into a sphere.
- (2) The Sun's gravity distorts them.
- (3) Strong magnetic fields in their molten core make them lumpy.
- (4) The statement is false. Nearly all asteroids are spherical.

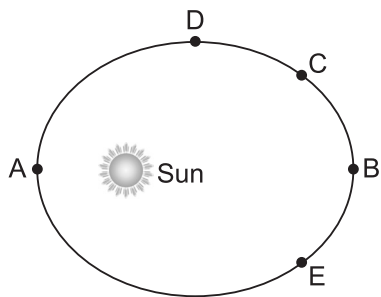
17. What is the following diagram developed by Ptolemy attempting to explain?



- (1) Geocentric model with stellar parallax
- (2) Heliocentric model
- (3) Geocentric model with the retrograde motion of Mars
- (4) How the relative distance of the earth can be determined

18. What causes meteor showers
- (1) The breakup of an asteroid in our upper atmosphere.
 - (2) Bursts of particles ejected from the Sun.
 - (3) A comet being captured into orbit around the Earth.
 - (4) The Earth passing through the tail of debris left by a comet.
19. Which of the following show evidence of volcanic activity?
- (1) Venus
 - (2) Mars
 - (3) Moon
 - (4) All of these
20. If the earth is $1/4^{\text{th}}$ of its present distance from the Sun, the duration of the year would be
- (1) $1/4$ of the present year
 - (2) $1/6$ of the present year
 - (3) $1/8$ of the present year
 - (4) $1/16$ of the present year
21. What kind of life do NASA scientists think they might find on Mars?
- (1) Bacterial
 - (2) Viral
 - (3) Algae
 - (4) Fungi
22. Quasars are at the _____ of the galaxies.
- (1) head
 - (2) legs
 - (3) hands
 - (4) heart
23. Kepler was the first astronomer to fit planetary orbits to
- (1) Circles
 - (2) Epicycles
 - (3) Heliocentric models
 - (4) Ellipses
24. Kepler's second law regarding constancy of areal velocity of a planet is a consequence of the law of conservation of
- (1) energy
 - (2) angular momentum
 - (3) linear momentum
 - (4) acceleration
25. A geostationary satellite is orbiting the earth at a height of $6R$ above the surface of the earth, R being the radius of the earth. The time period of another satellite at a height of $2.5 R$ from the surface of earth is
- (1) $6\sqrt{2}$ hr
 - (2) 6 hr
 - (3) $5\sqrt{2}$ hr
 - (4) 10 hr
26. The distance of Neptune and Saturn from the sun are nearly 10^{13} m and 10^{12} m respectively. Assuming that they move in circular orbits, their periodic times would be in the ratio of
- (1) 10
 - (2) 100
 - (3) $10\sqrt{10}$
 - (4) 1000
27. A planet moves around the sun. At a point A, it is closest from the Sun at a distance d_1 and has a speed v_1 . At another point B, when it is farthest from the sun at a distance d_2 , its speed will be
- (1) $\frac{d_1 v_1}{d_2}$
 - (2) $\frac{d_2 v_1}{d_1}$
 - (3) $\frac{d_1^2 v_1}{d_2^2}$
 - (4) $\frac{d_2^2 v_1}{d_1^2}$
28. Imagine a light planet revolving around a very massive star in a circular orbit of radius R with a period of revolution T . If the gravitational force of attraction between the planet and the star is proportional to $R^{-\frac{1}{2}}$ then
- (1) $T^2 \propto R^2$
 - (2) $T^2 \propto R^{\frac{7}{2}}$
 - (3) $T^2 \propto R^{\frac{3}{2}}$
 - (4) $T^2 \propto R^3$

29. The planet mercury is revolving in an elliptical orbit around the sun as shown in figure. The kinetic energy of mercury will be greater at



- (1) A (2) B
(3) C (4) D
30. Hubble's Law enables astronomers to estimate the distance to a galaxy if they can determine the galaxy's
- (1) velocity of recession
 - (2) mass
 - (3) spectral type
 - (4) temperature
31. Modern cosmology supposes that the Universe came from a "big bang" event about 13 billion years ago. Evidence for this is
- (1) the uniformity of the abundance of hydrogen and helium.
 - (2) the cosmic background radiation.
 - (3) the Hubble expansion.
 - (4) all of these
32. The age of a star cluster can be deduced from
- (1) the turn-off point of stars on its main sequence.
 - (2) the number of stars it contains.
 - (3) its radial velocity.
 - (4) its location in the Milky Way galaxy.
33. Hubble classified galaxies by their appearance. Which of the following types of galaxies do NOT fall on Hubble's tuning fork diagram?

- (1) Peculiar galaxies
- (2) Spiral galaxies
- (3) Elliptical galaxies
- (4) Barred spiral galaxies

34. For main sequence stars, the general rule is: the higher the surface temperature, the

- (1) less luminous are the stars.
- (2) more numerous are the stars.
- (3) greater the masses of the stars.
- (4) more common are binary stars.

35. Most stars are composed of

- (1) about 1/4 hydrogen and 3/4 helium.
- (2) mostly iron in their core.
- (3) about 3/4 hydrogen and 1/4 helium.
- (4) equal parts hydrogen and helium.

36. The ecliptic plane is

- (1) the plane in which the Comets orbit the Sun.
- (2) the plane in which the Planets orbit the Sun.
- (3) the plane in which the Moon orbits the Earth.
- (4) the plane in which the satellite Dactyl orbits the asteroid Ida.

37. The terrestrial planets are rocky because

- (1) the Sun converted all the hydrogen and helium in the inner Solar System into iron and nickel.
- (2) the Sun's gravity drew primarily heavy elements into the inner part of the early Solar System.
- (3) once planetesimals formed, the rocky ones drifted inward and the icy ones moved outward in the Solar System.
- (4) only rocky material was able to condense in the hot inner parts of the early solar nebula.

38. Star counting in the disk of the Milky Way galaxy cannot be used to locate the centre because
- (1) the stars do not extend all the way to the centre.
 - (2) interstellar dust obscures all but the nearest stars.
 - (3) the stars are not uniformly distributed in the disk.
 - (4) there are too many stars to be counted.
39. If an alien astronomer in a distant galaxy looks at the galaxies it can see, it will observe that
- (1) half of the galaxies are moving away and half of them are moving toward it.
 - (2) other galaxies are stationary.
 - (3) other galaxies are moving away from it.
 - (4) other galaxies are moving toward it.
40. In about 5 billion years, the sun will become
- (1) a supernova
 - (2) a black hole
 - (3) a red giant
 - (4) a neutron star

INTERACTIVE SECTION

41. In 2007, Voyager 2 crossed the heliosheath boundary and into the vast region at the edge of our solar system where the solar wind runs up against the thin gas between the stars. What did this crossing confirm about the shape of our solar system?
- (1) It's squashed
 - (2) It's round
 - (3) It's like a donut
 - (4) It's a horseshoe shape
42. To weigh roughly two-thirds less than what you do on Earth, which planet would you be on?
- (1) Uranus
 - (2) Mars
 - (3) Venus
 - (4) Jupiter
43. Stars which can be seen all times and all night are called
- (1) evergreen stars
 - (2) forever stars
 - (3) ubiquitous
 - (4) circumpolar stars
44. What is "...a celestial object that orbits the Sun and has a spherical shape but does not dominate its orbit?"
- (1) Asteroid
 - (2) Comet
 - (3) Dwarf Planet
 - (4) Meteor
45. What two components describe a Red Giant star compared to other types of stars?
- (1) Big and Hot
 - (2) Small and Hot
 - (3) Big and Cold
 - (4) Small and Cold
46. This forms when the core of the star is "swallowed" by its own gravity.
- (1) Black Hole
 - (2) Red Giant
 - (3) Nebula
 - (4) Neutron Star
47. Where are stars born?
- (1) Nebula
 - (2) Black Hole
 - (3) Supernova
 - (4) Neutron Star
48. The direction that light shifts towards in the visible spectrum when a galaxy moves away from Earth?
- (1) Blue Shift
 - (2) Green Shift
 - (3) Red Shift
 - (4) Yellow Shift

49. What type of star forms after a Supernova explosion? In this star, the centre collapses so that protons and electrons combine to form neutrons. The star is so very, very dense that one teaspoon on Earth would weigh 1 billion tons.
- (1) Red Super Giant (2) Red Giant
(3) Nebula (4) Neutron Star
50. You look up and see a blue-coloured star. Which temperature best represents the temperature of the star you are seeing?
- (1) 3,000°C (2) 7,000°C
(3) 10,000°C (4) 25,000°C
51. It is the brightness of stars in the night sky as they appear from Earth.
- (1) Luminosity (2) Apparent Magnitude
(3) Solar Mass (4) Absolute Magnitude
52. It is the gleaming, white halo that surrounds a sun and extends millions of kilometres into space.
- (1) Photosphere (2) Corona
(3) Solar Flare (4) Convective Zone
53. The star Proxima Centauri is 4.01×10^{13} km from Earth. If 1 Light Year is 9.46×10^{12} km, what is the distance to Proxima Centauri in Light Years?
- (1) 4.24 Light Years
(2) 30.64 Light Years
(3) 49.56 Light Years
(4) 13.47 Light Years
54. During the lifetime of a star, why does a star become very large and red?
- (1) It is running out of hydrogen fuel
(2) Its core is expanding
(3) It is experiencing uncontrolled nuclear reactions in its core
(4) It is reaching 25,000°C on its edge
55. What is “...the apparent looping motion of a planet in the night sky so the planet appears to move east to west rather than its normal west to east motion?”
- (1) Gravitational Force
(2) Celestial Sphere
(3) Retrograde Motion
(4) Azimuth and Altitude
56. Our Universe consists of only about 4% atoms. How much of it is Dark Matter and Dark Energy?
- (1) 80% Dark Matter, 16% Dark Energy
(2) 74% Dark Energy, 22% Dark Matter
(3) 94% Dark Energy, 2% Dark Matter
(4) 90% Dark Energy, 4% Dark Matter
57. Star life phases that can occur during a massive star’s life (100x the sun), after the supernova.
- (1) Black Hole and Neutron Star
(2) Black Hole and White Dwarf
(3) White Dwarf and Red Supergiant
(4) Red Supergiant and Big Bang
58. Astronomers have decided that, rather than being a planet, Pluto is really just a large member of the
- (1) Asteroid belt
(2) Kuiper belt
(3) Oort cloud
(4) Moon system around Neptune
59. At 10 million light years galaxies visible are the
- (1) Comet
(2) Debris
(3) Andromeda galaxy
(4) Local group
60. Based on the frequency with which we see comets from Earth, astronomers estimate the total number of comets in the solar system to be
- (1) 1 billion (2) 10 billion
(3) 100 billion (4) 1 trillion



END OF THE EXAM