

TEST 6

Instructions:

Read each question carefully before answering.

Write you name, initials and student numbber in the appropriate boxes.

WRITE YOUR TEST NUMBER IN THE 'OTHER DATA' BOXES ON THE FORM

Mark the appropriate box from A to D for each question.

1. What is a barred spiral galaxy?
 - A. A galaxy with a bar extending across an entire diameter and the arms starting at various positions along the bar.
 - B. A galaxy with a bar through the nuclear bulge, and the spiral arms starting from the ends of the bar.
 - C. A galaxy in which the arms form straight bars instead of curved lines.
 - D. A spiral galaxy with a straight bar instead of a nuclear bulge.

2. What process makes an emission nebula glow?
 - A. Electric currents in ionized neon gas.
 - B. Electrons descending toward the ground state in hydrogen atoms.
 - C. High-energy electrons spiraling along magnetic field lines.
 - D. Free electrons emitting light as they pass close to positively charged ions.

3. Europa, one of the Galilean satellites of Jupiter, has a surface consisting of
 - A. an icy crust showing two interlocking types of terrain, one ancient and heavily cratered, the other younger with systems of parallel grooves.
 - B. rock, heavily cratered like the highlands of our Moon.
 - C. an ancient, icy crust covered with numerous craters; no surface cracks or groove belts which would indicate internal activity.
 - D. a relatively young, icy crust covered with a network of streaks and cracks, and only a few impact craters.

4. The gas and ion tail of a comet
 - A. always trails along the orbital path, being left behind by the comet.
 - B. always lies in the ecliptic plane, since a comet is a part of the solar system.
 - C. is always blown away from the comet in the anti-Sun direction by the solar wind.
 - D. lies between the comet and the Sun, because of gravitational attraction.

5. What does a spiral galaxy look like when seen edge-on?
 - A. A thick, flat line.
 - B. A thick line curved into a spiral shape.
 - C. Round but without spiral arms because they are hidden.
 - D. A thick, flat line with a bulge in the center.

6. A particular star is brighter as seen through a blue filter than through a yellow filter. Which of the following surface temperatures is possible for this star? (See Fig. 10-1, Kaufmann & Comins, *Discovering the Universe*, 5th Ed.)
- A. 6,000 K.
 - B. 4,500 K.
 - C. 3,000 K.
 - D. 12,000 K.
7. The word chromosphere refers to
- A. a layer in the Sun's atmosphere.
 - B. a dense, spherical interstellar cloud of glowing gas.
 - C. a layer in the Earth's atmosphere, just below the ionosphere.
 - D. a light-emitting region just outside the event horizon of a black hole.
8. Which two quantities are shown to be related to one another in Hubble's Law?
- A. Distance and brightness.
 - B. Distance and recession velocity.
 - C. Brightness and recession velocity.
 - D. Brightness and the width of the 21-cm radio emission line of hydrogen.
9. The characteristics of an open cluster of stars are
- A. a few hundred members, often very young and still embedded in the gas and dust from which they were formed.
 - B. a few dozen members, the remnant of a globular cluster of stars from which most of the members have escaped.
 - C. hundreds of thousands of members, all very old, and no or very little interstellar gas and dust.
 - D. many thousand members, of different ages.
10. A particular galaxy has a nuclear region of more-or-less uniform brightness from which long lanes of stars curve outwards. What type of galaxy is this?
- A. Quasar
 - B. Irregular
 - C. Elliptical
 - D. Spiral
11. Who developed the "tuning-fork" diagram connecting the different shapes of elliptical and spiral galaxies?
- A. Stephen Hawking.
 - B. Martin Schwarzschild.
 - C. Ejnar Hertzsprung.
 - D. Edwin Hubble.

12. The rotation curve of a galaxy is a graph showing the galaxy's speed of rotation at different distances from the center. The observed rotation curve in the OUTER PARTS of a typical large spiral galaxy
- A. decreases suddenly to zero at the outer edge of the visible galaxy.
 - B. increases drastically with increasing distance from the center.
 - C. is quite flat (roughly the same speed at all distances).
 - D. decreases smoothly with increasing distance from the center.
13. Why do the larger craters on the Moon have central peaks?
- A. Debris falling from the crater walls has collected at the center of the crater floor.
 - B. The impact cracked the crust, and lava flowed into the center of the crater.
 - C. The incoming projectile was large enough that it was not destroyed, and remained to form the central peak.
 - D. The crater floor rebounded upward after the initial compression.
14. The Hertzsprung-Russell diagram is a plot of
- A. absolute magnitude (or intrinsic brightness) against temperature of a group of stars.
 - B. apparent brightness against distance for stars near to the Sun.
 - C. luminosity against mass of a group of stars.
 - D. apparent brightness against intrinsic brightness of a group of stars.
15. Which of the following statements is most likely to be true, when discussing galactic motions and interactions?
- A. The universe is composed of one giant galaxy of which all observed stars are members, thus, the question of interaction between galaxies is irrelevant.
 - B. Galaxies are so widely separated that they never interact or collide.
 - C. Galaxies are so closely packed in the universe that they are always interacting with one another.
 - D. Galaxies occasionally collide with one another, particularly within clusters of galaxies.
16. A planetary nebula is
- A. a contracting spherical cloud of gas surrounding a newly formed star in which planets are forming.
 - B. an expanding gas shell surrounding a hot white dwarf star.
 - C. a disk-shaped nebula of dust and gas, photographed around a relatively young star, from which planets will eventually form.
 - D. the nebula caused by the supernova explosion of a massive star.
17. To an astronomer, what is a "standard candle"?
- A. An accurately defined brightness scale for stars and galaxies, such as the magnitude scale.
 - B. A standard light source that is placed in a telescope, to which the brightness of stars and other objects can be compared.
 - C. Any galaxy whose redshift has been measured accurately.
 - D. Any type of object whose absolute magnitude is known.

18. The primary evidence for the expanding universe concept is
- A. the redshift of light from distant galaxies, which increases with distance of the galaxy from Earth.
 - B. the slow increase in the Earth-Moon separation with time, about 4 cm per year.
 - C. the discovery of black holes in binary stars.
 - D. observation of supernova explosions.
19. The rotation periods of Jupiter and Saturn are
- A. long, on the order of several days.
 - B. very long, several weeks, because of their great size and mass.
 - C. very short, on the order of 1 hour.
 - D. relatively short, on the order of 10 hours.
20. What is the solar wind?
- A. The constant flux of photons from the Sun's visible surface.
 - B. The circulation of gases between the equator and the poles of the Sun.
 - C. The storm of waves and vortices on the Sun's surface generated by a solar flare.
 - D. The Sun's outer atmosphere streaming out into space.
21. The space between stars is known to contain
- A. dust and gas, both atomic and molecular.
 - B. variable amounts of gas but no dust, which only forms in planetary systems near stars.
 - C. large quantities of dust that absorb light, but no gas, either atomic or molecular.
 - D. a perfect vacuum.
22. Which is the lowest layer in the Earth's atmosphere?
- A. The troposphere.
 - B. The stratosphere.
 - C. The thermosphere.
 - D. The magnetosphere.
23. The characteristics of red supergiant stars are
- A. brightness of 10,000 Suns and a diameter of about Mars' orbit.
 - B. brightness of the Sun and size of about Mercury's orbit.
 - C. brightness of about 1 million Suns and a diameter of the whole solar system.
 - D. brightness of about 10,000 Suns and a diameter of 1/10 of that of the Sun.
24. What is a dwarf star?
- A. Any star which is significantly smaller than a giant or supergiant star.
 - B. A star of about the same size (diameter) as the Earth.
 - C. A large, planetary object, such as Jupiter.
 - D. A main sequence star.

25. The reddish color of Mars is probably due to
- A. the glow from the very high temperature surface on the sunlit parts of Mars.
 - B. vegetation turning red in the Martian autumn.
 - C. sulfur compounds thrown out by active volcanoes.
 - D. iron oxides such as rust.
26. Star formation takes place in
- A. giant molecular clouds.
 - B. H II regions.
 - C. hot, turbulent gas thrown out in a supernova explosion.
 - D. blue reflection nebulae.
27. The difference in the brightness of a star as seen through two different colored filters, for example blue and yellow, is directly related to which stellar property?
- A. Luminosity.
 - B. Surface temperature.
 - C. Radius.
 - D. Distance from Earth.
28. What is the basic shape of a spiral galaxy?
- A. A round, flat disk with long lanes of stars that curve outwards from a round, nuclear region of uniform brightness.
 - B. A round, flat disk with long lanes of stars that curve outwards right from the center of the galaxy.
 - C. A round, thin disk of uniform brightness with its edges bent up and down into a spiral shape.
 - D. Approximately spherical with long lanes of dark dust clouds curving through it in a spiral pattern.
29. Protostars are
- A. old stars, contracting after using up all of their available hydrogen fuel.
 - B. stars made almost entirely out of protons.
 - C. very young objects, still contracting before becoming true stars.
 - D. objects with masses less than about 0.08 solar masses, which do not have enough mass to become true stars.
30. How do spiral galaxies rotate?
- A. The arms lead the rotation (point forwards).
 - B. We don't know; they rotate too slowly for us to have seen any motion in the time since galaxies were discovered.
 - C. The arms trail the rotation (point back).
 - D. They don't rotate; if they did the spiral pattern would soon disappear.

31. The magnetosphere of Jupiter is
- A. a narrow layer in Jupiter's atmosphere, just above the cloud tops, in which intense electric currents flow and generate the planet's magnetic field.
 - B. a region of charged particles extending along the orbit of the satellite Io, forming a ring around Jupiter.
 - C. a large region outside Jupiter occupied by its magnetic field and filled with high-energy charged particles.
 - D. the magnetized hydrogen in the inner regions of Jupiter just outside the solid core, where the planet's magnetic field is produced.
32. For which objects in the universe has the Hubble relation been shown to hold experimentally?
- A. Distant galaxies.
 - B. Stars in the near neighborhood of the Sun, in our Galaxy.
 - C. Stars in the distant spiral arms of our Galaxy.
 - D. Galaxies in the Local Group, in the near vicinity of the Milky Way.
33. What would happen if the Andromeda galaxy (a spiral about the same size as ours) collided with our own Milky Way Galaxy?
- A. All of the gas and dust clouds and a great many of the stars would collide with each other, stopping both galaxies and creating a galactic merger.
 - B. The two galaxies would shatter or even explode, essentially destroying their stars and any life forms that there may have been (including us).
 - C. The two galaxies would pass through each other almost unchanged, with essentially no interactions at all.
 - D. The two galaxies would pass through each other, with the stars sailing past each other unharmed but the interstellar gas and dust clouds would collide.
34. The general shape of the Galilean moons of Jupiter is
- A. approximately spherical, but with significantly shorter equatorial diameters than polar diameters (prolate shape).
 - B. almost perfectly spherical.
 - C. irregular, rounded surfaces.
 - D. approximately spherical, but with significant flattening of the polar axes, (oblate shape).
35. A star in the lower left part of the Hertzsprung-Russell diagram, compared to a star in the middle of the diagram, is
- A. larger.
 - B. brighter.
 - C. cooler.
 - D. smaller.
36. The Magellanic clouds seen from the southern hemisphere are examples of what type of objects?
- A. Irregular galaxies.
 - B. Supernova remnants.
 - C. Spiral galaxies.
 - D. Planetary nebulae.

37. The Orion Nebula is
- A. a red supergiant star.
 - B. a supernova remnant (material thrown out by an exploding star).
 - C. a large interstellar gas and dust cloud containing young stars.
 - D. a spiral galaxy in the constellation Orion.
38. The explosion of a supernova appears to leave behind
- A. a rapidly expanding shell of gas and a central neutron star.
 - B. a rapidly rotating shell of gas, dust and radiation, but no central object.
 - C. a rapidly expanding shell of gas and a compact white dwarf star at its center.
 - D. nothing; the explosion changes all the matter completely into energy which then radiates into space at the speed of light.
39. One particular feature of the solar corona is
- A. its variation with time over periods of a few minutes.
 - B. its very cold temperature.
 - C. its very high temperature.
 - D. its very uniform density and structure.
40. The Kuiper belt is
- A. a spherical distribution of distant comets around the Sun, extending out about 50,000 AU.
 - B. a flat or donut-shaped distribution of distant comets around the Sun, extending out about 500 AU.
 - C. a random distribution of short-period comets extending from inside the orbit of Jupiter to approximately the orbit of Neptune.
 - D. another name for the asteroid belt.
41. Measurements suggest that light first arrived at Earth from the Cassiopeia A supernova about 300 years ago and that this supernova is about 10,000 light years away from Earth. When did the explosion actually occur?
- A. It is not possible to say when it occurred from the information given.
 - B. 10,300 years ago, or about 8300 BC.
 - C. 9,700 years ago, or about 7700 BC.
 - D. 300 years ago, or about 1700 AD.
42. There are many reasons why a multi-day hiking trip on foot through the Valles Marineris on Mars would not be advisable, at least not without suitable protection. Which of the following conditions would NOT be a concern?
- A. The possibility of dust storms.
 - B. High levels of ultraviolet radiation.
 - C. Oppressively high atmospheric pressure.
 - D. The predominantly carbon dioxide atmosphere.

43. Where have some scientists hypothesized that they have found direct evidence for life, either contemporary or ancient, beyond the Earth (although the hypothesis has been strongly disputed by many other scientists)?
- A. In "orange soil" found on the Moon.
 - B. In a meteorite composed of ancient Martian rock.
 - C. In the "soil" (regolith) at the Viking 2 landing site on Mars.
 - D. In spectra of the dark deposits along fissures in the ice of Jupiter's satellite, Europa.
44. All of the boundaries of the major moving tectonic plates on the Earth's surface are coincident with
- A. regions where ocean depths are greatest.
 - B. the occurrence of major auroral activity.
 - C. the edges of the continental shelves around the major continents.
 - D. the positions of maximum earthquake occurrence.
45. What is an elliptical galaxy?
- A. Any galaxy with an elliptical halo when observed at radio wavelengths.
 - B. A galaxy with an elliptical outline and a smooth distribution of brightness (no spiral arms).
 - C. A spiral galaxy seen from an angle, giving it an elliptical profile.
 - D. A spiral galaxy with an elliptically shaped nuclear bulge and the spiral arms starting from the ends of the ellipse.

Answer Key

Session 2 Test, October 9, 2000
Dr Michael Burton

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1. B
2. B
3. D
4. C
5. D
6. D
7. A
8. B
9. A
10. D
11. D
12. C
13. D
14. A
15. D
16. B
17. D

18. A
19. D
20. D
21. A
22. A
23. A
24. D
25. D
26. A
27. B
28. A
29. C
30. C
31. C
32. A
33. D
34. B
35. D
36. A
37. C
38. A
39. C
40. B
41. B

42. C

43. B

44. D

45. B