

TEST 7

Instructions

Read each question carefully before answering.

Write your name, initials and student number in the appropriate boxes on the answer form.

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

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

You have 1 hour for this Test.

1. What process provides the power for the Sun?
 A. The emission of neutrinos.
 B. The fusion of helium into carbon.
 C. The fission of uranium to form lead.
 D. The fusion of hydrogen into helium.

2. What is an elliptical galaxy?
 A. A galaxy with an elliptical outline and a smooth distribution of brightness (no spiral arms).
 B. A spiral galaxy seen from an angle, giving it an elliptical profile.
 C. A spiral galaxy with an elliptically shaped nuclear bulge and the spiral arms starting from the ends of the ellipse.
 D. Any galaxy with an elliptical halo when observed at radio wavelengths.

3. Eclipses of the Moon can only occur
 A. at Full Moon.
 B. in the spring and fall seasons, when the Sun is on the ecliptic plane.
 C. at New Moon.
 D. in June and December, when the Sun is near the solstices.

4. Black holes are so named because
 A. they emit a perfect blackbody spectrum.
 B. all of their electromagnetic radiation is gravitationally redshifted to the infrared, leaving no light in the optical region.
 C. their only spectral lines are in the radio and infrared.
 D. no light or any other electromagnetic radiation can escape from inside them.

5. In the eighteenth century, Sir William Herschel used star counts in different regions of the sky along the Milky Way to estimate the position of the center of the Milky Way. He incorrectly concluded that the Sun was close to that center. The reason for this erroneous conclusion was
- A. that Herschel counted all "stars" in each star field, and included many galaxies were outside our Galaxy, thus confusing the distribution.
 - B. that the redshift of the more distant stars made them invisible to Herschel.
 - C. that emissions from hot hydrogen gas clouds served to hide the more distant stars, localizing his search.
 - D. the large quantity of absorbing dust between stars, which obscured the more distant regions of the Galaxy.
6. Where has water been detected upon Mars?
- A. As a liquid in under-surface lakes and rivers.
 - B. In permafrost and polar icecaps, and as water vapor in the atmosphere.
 - C. Only as atmospheric water vapor, never condensing out as clouds, liquid water or solid ice.
 - D. As a liquid flowing along the numerous flood valleys and meandering stream beds.
7. The measured diameter of the core of Halley's comet is about
- A. 100 m.
 - B. 10 km.
 - C. 10^6 km.
 - D. 10^7 km.
8. How did Comet Shoemaker-Levy 9 achieve lasting fame?
- A. It just missed the Earth, passing between the Moon and the Earth.
 - B. It became the first comet to be visited by spacecraft.
 - C. It exploded after passing too close to the Sun.
 - D. It crashed into Jupiter.
9. The total time that the Sun will spend converting hydrogen to helium in its core is
- A. about 10 billion years (10^{10} years).
 - B. at least 200 billion years (2×10^{11}) years.
 - C. about 4.5 million years.
 - D. about 1 million years.
10. What is the Local Group?
- A. A cluster of about 30 galaxies of which the Milky Way is a member.
 - B. The stars which occupy the same spiral arm as the Sun.
 - C. A group of about 100 stars within 20 light-years of the Sun, which appear to have been formed at about the same time from similar material.
 - D. A group of galaxies clustered around the Andromeda Galaxy M31, apparently gravitationally bound to it but separate from the Milky Way.

11. The astronomical event that is now thought to have occurred some 65 million years ago resulting in the death of a large fraction of all living species and leaving a layer of clay containing an enhanced concentration of a rare metal, iridium, in the geological record in rocks throughout the Earth was
- A. an extraordinary solar eruption or flare.
 - B. a very large volcanic eruption on Earth.
 - C. a supernova which exploded relatively close to the solar system.
 - D. the impact upon the Earth of an asteroid.
12. Which of the planets fits the following description: "Cool, solid surface with an atmosphere of N_2 and O_2 , and H_2O clouds"?
- A. Venus
 - B. Earth
 - C. Mercury
 - D. Mars
13. The space between stars is known to contain
- A. dust and gas, both atomic and molecular.
 - B. large quantities of dust that absorb light, but no gas, either atomic or molecular.
 - C. a perfect vacuum.
 - D. variable amounts of gas but no dust, which only forms in planetary systems near stars.
14. In the modern theory of crustal motion on the Earth's surface, the process of sea floor spreading is described as
- A. the rotation of plates around axes that remain stationary on the Earth causing plate-edge collisions.
 - B. the motion of plates away from mid-oceanic ridges and toward continental boundaries.
 - C. the northward motion of some plates and the southward motion of others, causing earthquakes where they slide past each other.
 - D. the motion of plates toward mid-oceanic ridges and away from continental boundaries.
15. The major volcanoes on Mars have formed
- A. in mountain belts where the planet's surface is being stressed as it is bent and subducted back into the mantle.
 - B. over individual stationary "hot-spots" in the underlying molten mantle.
 - C. on long, interconnected ridges where magma, rising from the mantle, is pushing the crust apart.
 - D. where shrinkage of the crust during cooling early in the planet's history has wrinkled the surface.

16. "Standard candles," which are important for finding distances to remote galaxies, are
- A. heat sources used for calibrating infra-red observations of galaxies.
 - B. stars and other objects of known intrinsic brightness.
 - C. standard bars of known length with which the size of a galaxy can be measured.
 - D. standard laboratory light sources with which the brightness of a galaxy can be compared.
17. What is the solar wind?
- A. The circulation of gases between the equator and the poles of the Sun.
 - B. The storm of waves and vortices on the Sun's surface generated by a solar flare.
 - C. The constant flux of photons from the Sun's visible surface.
 - D. The Sun's outer atmosphere streaming out into space.
18. Sunspots are
- A. the shadows of cool, dark curtains of matter, hanging above the solar surface.
 - B. cooler, darker regions on the Sun's surface.
 - C. hotter, deeper regions in the Sun's atmosphere.
 - D. cooler regions of the Sun's high corona.
19. Only a few of the largest asteroids appear to be spherical. Why do you think this is?
- A. Self-gravity was sufficient to pull them into this shape during their early history.
 - B. They solidified from spherical gas clouds in their early history and retained this shape.
 - C. The visible outer atmospheres of these large asteroids are spherical even though the underlying surfaces are irregular.
 - D. Repeated collisions with other asteroids have worn them down to spheres.
20. What appears to be the relationship between the surface of Europa and its interior?
- A. A frozen ocean with one small, irregular "continent" and several mountain peaks rises above the ice.
 - B. A light, rocky surface and crust "floats" on a denser but partially molten layer of rock.
 - C. A solid surface of ice overlies a layer of water or slush.
 - D. A solid ice crust extends from the surface to the rocky mantle.
21. What method is used to determine the distances of very remote galaxies?
- A. Measurement of the apparent brightness and period of Cepheid variable stars within the galaxies.
 - B. Use of their spectral red shifts and the Hubble law.
 - C. Measurement of the angular size of the galaxy and an assumption about the actual physical size of the galaxy.
 - D. Comparison of their apparent and absolute magnitudes.

22. What useful purpose did RR Lyrae stars serve for Harlow Shapley in locating the galactic center?
- A. They emit copious amounts of infrared radiation, and are thus visible through interstellar dust which obscured visible light.
 - B. They are concentrated in the galactic center and so defined its direction.
 - C. Their brightness variations allowed accurate distances to be measured.
 - D. They are important spiral arm tracers, and thus defined the shape of the galaxy.
23. One of the consequences of the collision of two galaxies appears to be
- A. the disappearance of one of them into the central black hole of the other.
 - B. a very large explosion, similar to but much larger than a supernova.
 - C. almost nothing, since stars are widely separated in each galaxy and the probability of star-star collisions is very small.
 - D. a burst of vigorous star birth.
24. The overall distribution of galaxies through space is now found to be
- A. galaxies distributed uniformly throughout space, out to the furthest distances.
 - B. galaxies concentrated on the surface of huge open spaces or voids, like soap bubbles.
 - C. galaxies clustered together in several high-density centers, with very little matter linking them together.
 - D. galaxies concentrated around one position in space, presumably the original site of the Big Bang.
25. The Milky Way is an example of which type of galaxy?
- A. Lenticular, S0 type.
 - B. Irregular.
 - C. Spiral.
 - D. Elliptical.
26. Most asteroids
- A. are spherical and ice-coated, and hence are light-colored and shiny.
 - B. have irregular shape, are covered with very light-colored dust, reflecting sunlight well.
 - C. are dark and spherical in shape, with many craters on their surfaces.
 - D. are dark, irregular in shape and heavily cratered.
27. What characteristic of Jupiter's satellite, Io, makes it different from any other known satellite in the solar system?
- A. It has geyser-like plumes of nitrogen gas.
 - B. Its surface is broken into heavily cratered and lightly cratered regions in a pattern similar to plate tectonics.
 - C. It has a permanent, dense atmosphere.
 - D. It is volcanically active.

28. Interstellar matter obscures our view of the disk of our Galaxy
- A. most at radio wavelengths, where hydrogen absorbs radio waves efficiently, and least at optical wavelengths.
 - B. more-or-less equally at all wavelengths, from radio waves to light waves.
 - C. more at optical wavelengths, less in the infrared, and not at all at radio wavelengths.
 - D. very little at any wavelength.
29. How many "tidal bulges" are there on the Earth, due to the Moon's gravitational pull?
- A. One, on the side of the Earth facing away from the Moon.
 - B. Two, one facing (almost) directly toward the Moon and one (almost) directly away from the Moon.
 - C. One, facing (almost) directly toward the Moon.
 - D. Four, one facing (almost) directly toward the Moon and the other three at 90° intervals from this one.
30. How is the length of a star's lifetime related to the mass of the star?
- A. Lower-mass stars run through their lives faster and have shorter lifetimes.
 - B. The lifetimes of stars are too long to measure, so it is not known how (or if) their lifetimes depend on mass.
 - C. Higher-mass stars run through their lives faster and have shorter lifetimes.
 - D. A star's lifetime does not depend on its mass.
31. Where on the Hertzsprung-Russell diagram do most local stars in our Universe congregate?
- A. On the main sequence, where stars are generating energy by fusion reactions.
 - B. In the giants area, where most stars spend the longest time of their lives.
 - C. In the white dwarf area, the "graveyard" of stars.
 - D. In the supergiant area, where the most massive stars spend a significant time.
32. What point defines the end of the pre-main-sequence phase of a star's life and the start of the main-sequence phase?
- A. Nuclear reactions begin in its core.
 - B. It begins to expand and become a red giant.
 - C. Convection begins in its interior.
 - D. It stops accreting mass from the interstellar cloud.
33. Infrared stars within the Orion Nebula are examples of which stage of stellar evolution?
- A. Red giant.
 - B. Supernova remnants.
 - C. Protostar and young star.
 - D. Planetary nebula.

34. A planetary nebula is
- A. an expanding gas shell surrounding a hot white dwarf star.
 - B. the nebula caused by the supernova explosion of a massive star.
 - C. a disk-shaped nebula of dust and gas, photographed around a relatively young star, from which planets will eventually form.
 - D. a contracting spherical cloud of gas surrounding a newly formed star in which planets are forming.
35. Tomorrow's weather forecast for someone standing on the surface of Jupiter is
- A. overcast, possible rain with snow at higher elevations.
 - B. the question is meaningless, since there is no solid surface upon which to stand.
 - C. sunny, possible thin, high cloud.
 - D. sunny and clear, since Jupiter has no atmosphere in which clouds can form.
36. The smooth surfaces of the lunar maria were most likely caused by
- A. water flowing into the basins and allowing sediments to settle over their surfaces.
 - B. dust storms that smoothed the surface.
 - C. lava flows in the early history of the Moon.
 - D. volcanic ash that rained upon the surfaces of the basins in ancient times.
37. The dimensions of the disk of our Milky Way Galaxy are
- A. diameter 100,000 light-years; thickness, 2000 light-years.
 - B. diameter 28,000 light-years; thickness 2000 light-years.
 - C. diameter 2000 light-years; thickness, 100,000 light-years.
 - D. diameter 10,000 light-years; thickness, 28,000 light-years.
38. The primary evidence for the expanding universe concept is
- A. observation of supernova explosions.
 - B. the discovery of black holes in binary stars.
 - C. the redshift of light from distant galaxies, which increases with distance of the galaxy from Earth.
 - D. the slow increase in the Earth-Moon separation with time, about 4 cm per year.
39. What are the characteristic features on the visible surface of Jupiter?
- A. Large volcanoes and a long, deep rift valley.
 - B. A Bluish-green, almost featureless, cloud layer.
 - C. Light and dark bands of clouds parallel to the equator.
 - D. A bluish tint with high, white clouds and dark storms.
40. The next stage in a star's life after the main sequence phase is
- A. the red giant phase.
 - B. the horizontal branch phase.
 - C. a protostar.
 - D. death (i.e., either a supernova or a white dwarf).

41. Why do the spiral arms show up so clearly in spiral galaxies?
- A. Stars are spread uniformly over the galaxy but the dust forms a spiral pattern, absorbing starlight; the spiral arms are the dust-free regions between the dust lanes.
 - B. Stars are spread almost uniformly over the galaxy (outside the nuclear bulge), but the brightest stars occur only in the spiral arms, making the arms stand out.
 - C. The number of stars in the arms is several times larger than in the regions between, so they stand out brightly.
 - D. Stars occur only in the spiral arms (and the nuclear bulge), with essentially none between the arms, making the arms stand out brightly.
42. The surface of Europa, one of the Galilean moons of Jupiter, appears to be covered with
- A. rugged mountain ranges and ancient volcanoes.
 - B. many ancient craters and maria.
 - C. a smooth layer of ice, crossed by many cracks.
 - D. dark areas of older crust separated by lighter, grooved terrain.
43. The Great Red Spot is
- A. the colored polar cap of Jupiter.
 - B. a temporary storm in Jupiter's atmosphere, lasting a few months.
 - C. the top of a massive mountain penetrating through Jupiter's clouds.
 - D. a large, long-lived storm system in Jupiter's atmosphere.
44. What is the cellular granulation pattern seen on the visible surface of the Sun?
- A. The cells are the base of a circulation pattern that extends from the photosphere to the outer corona.
 - B. The cells are the tops of rising blobs of hot gas in the Sun's convective interior.
 - C. The cells are regions of nuclear energy generation in the Sun's photosphere.
 - D. Each cell is a region of stronger magnetic field, which compresses and heats the gas within it.
45. The most likely places where stars and planetary systems are forming in the universe are
- A. in the centers of galaxies.
 - B. in nebulae composed of gas and dust.
 - C. in the rarified space between galaxies.
 - D. in regions surrounding quasars.

Answer Key

GENS 4001 Astronomy
Session 1 Test, May 2002
Dr Michael Burton

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

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

41. B

42. C

43. D

44. B

45. B