

Name _____

Section _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) This is version C of the exam. Please fill in (C) 1) _____
A) This is WRONG
B) This is WRONG
C) This is the CORRECT answer
D) This is WRONG
E) This is WRONG
- 2) Why is Saturn almost as big as Jupiter, despite its smaller mass? 2) _____
A) Jupiter's greater mass compresses it more, thus increasing its density.
B) Saturn is further from the Sun, thus cooler, and therefore less compact.
C) Saturn has a larger proportion of hydrogen and helium than Jupiter, and is therefore less dense.
D) Jupiter's strong magnetic field constrains its size.
E) Saturn's rings make the planet look bigger.
- 3) What is the source of the material that causes meteor showers? 3) _____
A) Near-Earth asteroids disintegrate as they enter Earth's atmosphere, creating hundreds of bright meteors that appear to radiate from a single location in the sky.
B) The nuclei of comets gradually disintegrate and spread out along the comet's orbital path. When the Earth passes through the orbit of a comet, we are bombarded by sand-sized particles which cause a meteor shower.
C) Asteroid impacts elsewhere in the solar system throw sand-sized particles into space, and occasionally the Earth passes through a cloud of these particles, which burn up in our atmosphere and cause a meteor shower.
D) The nuclei of comets disintegrate as they enter Earth's atmosphere, creating hundreds of bright meteors that appear to radiate from a central location in the sky.
E) Near-Earth asteroids gradually disintegrate and spread out along their orbital path. When the Earth passes through the orbit of an asteroid, we are bombarded by sand-sized particles which cause a meteor shower.
- 4) Which of the following is/are true? 4) _____
A) Titan is the only outer solar system moon with a thick atmosphere
B) Titan is the only outer solar system moon with evidence for recent geologic activity
C) Titan's atmosphere is composed mostly of hydrocarbons
D) Titan is the only moon in the solar system with bodies of liquid hydrocarbons on its surface
E) A and D
- 5) Which of the following moons is NOT one of the Galilean moons? 5) _____
A) Callisto
B) Ganymede
C) Dione
D) Io
E) Europa

- 6) The *belts* and *zones* of Jupiter are 6) _____
- A) alternating regions of charged particles in Jupiter's magnetic field.
 - B) cyclonic and anticyclonic storms.
 - C) regions of the plasma torus created by ions from Io's volcanoes
 - D) names for the layers of gaseous and metallic hydrogen deep within the planet.
 - E) alternating bands of rising and falling air at different latitudes.
- 7) What would happen to Jupiter if we could somehow double its mass? 7) _____
- A) It would become a star, with nuclear fusion in its core.
 - B) Its density would stay about the same and its volume would double.
 - C) Its density would increase but its diameter would barely change.
 - D) Its density would decrease and its diameter would double.
- 8) Why are there no impact craters on the surface of Io? 8) _____
- A) Io's thick atmosphere obscures the view of the craters.
 - B) Any craters that existed have been eroded through the strong winds on Io's surface
 - C) Jupiter's strong gravity attracted the planetesimals more strongly than Io and thus none landed on its surface.
 - D) It is too small to have been hit during the Late Heavy Bombardment
 - E) Io did have impact craters but they have all been buried in lava flows.
- 9) Our current best observations show that Pluto has 9) _____
- A) no satellites.
 - B) one medium sized satellite and two small satellites.
 - C) two medium-sized satellites.
 - D) one large satellite.
 - E) one large satellite and three small satellites.
- 10) Kirkwood gaps are observed in the main asteroid belt, including at the position(s) where: 10) _____
- A) asteroids would orbit with a period half that of Jupiter
 - B) asteroids would orbit with a period twice that of Jupiter
 - C) asteroids would orbit with a period twice that of Mars
 - D) A and B
 - E) A and C
- 11) Why isn't there a planet where the asteroid belt is located? 11) _____
- A) Resonance with Jupiter prevented material from collecting together to form a planet.
 - B) A planet once formed here, but it was broken apart by a catastrophic collision.
 - C) The temperature in this portion of the solar nebula was just right to prevent rock from sticking together.
 - D) There was too much rocky material to form a terrestrial planet, but not enough gaseous material to form a jovian planet.
 - E) There was not enough material in this part of the solar nebula to form a planet.

- 12) Where do most short-period comets come from, and how do we know? 12) _____
- A) The Kuiper belt; short period comets tend to come from random directions indicating a spherical distribution of comets called the Kuiper belt.
 - B) The Oort cloud; short period comets tend to be in the plane of the solar system, just like the Oort cloud.
 - C) The Kuiper belt; short period comets tend to be in the plane of the solar system, just like the Kuiper belt.
 - D) The asteroid belt; short period comets have orbital periods similar to asteroids like Vesta, and are found in the plane of the solar system just like the asteroid belt.
 - E) The Oort cloud; short period comets tend to come from random directions indicating a spherical distribution of comets called the Oort cloud.
- 13) How do scientists know that the majority of meteorites come from the asteroid belt? 13) _____
- A) Collisions are common in the asteroid belt, and we can track the fragments from their source asteroid to the Earth, where they become meteorites.
 - B) The spectra of some meteorites are similar to the spectra of asteroids in the asteroid belt.
 - C) The asteroid belt is the only possible source of meteorites, therefore they must originate there.
 - D) High levels of Iridium have been detected in both asteroids and meteorites, therefore meteorites come from the asteroid belt.
 - E) Bubbles of gas trapped in the crystals within meteorites are identical to the gases trapped in asteroids.
- 14) Where is the crater from the impact that is believed to be responsible for the mass extinction of dinosaurs 65 million years ago? 14) _____
- A) Meteor Crater in Arizona.
 - B) Chicxulub Crater, Yucatan Peninsula in Mexico.
 - C) Crater Lake, Oregon
 - D) Tunguska, Siberia.
 - E) Quebec, Canada.
- 15) What about asteroids makes them stand out in sky surveys searching for them? 15) _____
- A) They reflect enough of the sun's light to make them brighter than most background stars
 - B) Asteroids emit pulsed radiation
 - C) Asteroids have large angular sizes.
 - D) Asteroids have substantial motion relative to the background stars
 - E) Asteroids emit a lot of their own radiation
- 16) Why do Uranus and Neptune have blue methane clouds but Jupiter and Saturn do not? 16) _____
- A) The greater gravitational force of Jupiter and Saturn prevents the methane from rising to the upper edges of the atmosphere.
 - B) Methane reacts with the abundant ammonia clouds in Jupiter and Saturn and is removed from the atmosphere.
 - C) The relatively slow rotation of Uranus and Neptune allows methane to migrate to higher levels in the atmosphere and condense into clouds.
 - D) Methane does not condense into ice in the warmer atmospheric temperatures of Jupiter and Saturn.
 - E) Methane did not exist in the solar nebula at the radii of Jupiter and Saturn when the planets formed.

- 17) How do astronomers think Jupiter generates its internal heat? 17) _____
 A) radioactive decay
 B) internal friction due to its high rotation rate
 C) by contracting, changing gravitational potential energy into thermal energy
 D) nuclear fusion in the core
 E) chemical processes
- 18) Planetary rings are 18) _____
 A) composed of a large number of individual particles that orbit their planet in accord with Kepler's third law.
 B) known to exist for all of the jovian planets.
 C) orbiting in the equatorial plane of their planet.
 D) nearer to their planet than any of the planet's large moons.
 E) all of the above
- 19) The mass of Saturn's rings is 2×10^{19} kg. What is the ratio of this mass to that of a 200 km diameter spherical moon made entirely of water-ice (density $\sim 1 \text{ g/cm}^3$)? That is, what is $M_{\text{rings}} : M_{\text{icy moon}}$? 19) _____
 A) 0.2 : 1 B) 50 : 1 C) 1 : 1 D) 5 : 1 E) 0.5 : 1
- 20) Moons cause/contribute to which of the following? 20) _____
 A) gravitational effects at ring edges as the moons pass by.
 B) gaps between rings.
 C) ring material.
 D) stability of particles within rings.
 E) Moons contribute to all of the above.
- 21) Pluto's extremely cold ($\sim 40 \text{ K}$) *surface* is composed of: 21) _____
 A) nitrogen, methane, and carbon monoxide ices, which sublime into an atmosphere near perihelion
 B) roughly half ices and half rocky materials
 C) nitrogen, methane, and carbon monoxide ices, which always remain frozen
 D) mainly water ice, which always remains frozen
 E) mainly water ice, which sublimates into an atmosphere near perihelion
- 22) A comet of mass m impacts the earth (mass M , radius R) at the minimum impact speed. What is the expression for the total energy released in the impact? 22) _____
 A) $0.5 * m * (2GM/R)$
 B) $m * v$
 C) $0.6 * G(M^2)/R$
 D) $GMm/(R^2)$
 E) $0.5 * m / (R^3)$
- 23) How are planetary rings made? 23) _____
 A) From the dismantling of small moons by impacts
 B) From fragments of planets ejected by impacts
 C) From accretion within the solar nebula at the same time the planets formed
 D) From the capture of asteroid fragments
 E) From dust grains that escape from passing comets

- 24) When will the next major impact occur on Earth? 24) _____
A) Hundreds of millennia in the future.
B) Major impacts can no longer occur since the period of heavy bombardment is over.
C) December 2012.
D) Hundreds of millennia after the last major impact.
E) Could be any time. The probability of impact is the same next year as it is for any later year.
- 25) What is the *Cassini division* of Saturn's rings? 25) _____
A) the widest ring of Saturn, located between two large ring gaps
B) the imaginary circle marking the halfway point of Saturn's rings
C) a large gap, visible from Earth, produced by an orbital resonance with the moon Mimas
D) a dark ring, visible from Earth, composed of dark, dusty particles
E) the most opaque ring of Saturn, made of highly reflective ice particles
- 26) Where are the *Trojan asteroids* located? 26) _____
A) surrounding Jupiter
B) in the center of the asteroid belt
C) along Jupiter's orbit, 60° ahead of and behind Jupiter
D) on orbits that cross Earth's orbit
E) on orbits that cross Mars's orbit
- 27) Which is the least likely cause of death? 27) _____
A) Being hit by a small meteorite.
B) Being hit in the head by a bullet.
C) Starvation during global winter caused by a major impact.
D) Driving while intoxicated, without wearing seatbelts.
E) Caught in the blastwave of a meteorite exploding above a populated city.
- 28) We were first able to accurately measure the diameter of Pluto from: 28) _____
A) a Voyager flyby in the late 1980s
B) radar observations made by the Arecibo telescope
C) Hubble Space Telescope images that resolved Pluto's disk
D) a New Horizons flyby in the 1990s
E) brightness measurements made during mutual eclipses of Pluto and Charon
- 29) Which of the following characteristics *would not* necessarily suggest that a rock we found is a meteorite. 29) _____
A) It has a fusion crust
B) It contains rare earth elements such as Iridium
C) It has different elemental composition than earth
D) It is highly processed
E) It contains solidified spherical droplets

Answer Key

Testname: ASTRO102_EXAM3_FORMC

- 1) C
- 2) A
- 3) B
- 4) E
- 5) C
- 6) E
- 7) C
- 8) E
- 9) B
- 10) A
- 11) A
- 12) C
- 13) B
- 14) B
- 15) D
- 16) D
- 17) C
- 18) E
- 19) D
- 20) E
- 21) A
- 22) A
- 23) A
- 24) E
- 25) C
- 26) C
- 27) A
- 28) E
- 29) D