ASTRONOMY 1010 **Exam 3** **November 16, 2007**

Name_____

Please write and mark your name and student number in the Scantron answer sheet. FILL THE BUBBLE IN THE "TEST FORM" BOX CORRESPONDING TO YOUR TEST VERSION (listed as an alphabet prefix to the page number at the bottom). Mark all answers in the Scantron sheet. When you are done, please turn in your Scantron answer sheet. You may keep your copy of the test.

Each multiple choice question carries 6 points. Each TRUE/FALSE question carries 3 points. For the TRUE/FALSE questions, answer (A) for TRUE and (B) for FLASE. Some questions may require calculations to determine the answer and you may use the space provided in this paper to work these out, but you need not turn this work in. You may not use your notes, textbook, cell phones, neighbor, or any other source to help your work on this test.

Good Luck!

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

1) Which two properties are most important in determining the surface temperature of a planet?
   A) size and distance from the Sun
   B) distance from the Sun and atmosphere
   C) internal temperature and atmosphere
   D) size and chemical composition
   E) size and atmosphere

2) *Valles Marineris* is a(n)
   A) extensive plain on Mars.
   B) large canyon on Mars.
   C) huge series of cliffs on Mercury.
   D) large valley on the Moon.
   E) large canyon on Venus.

3) Which of the following does *not* provide evidence that Mars once had flowing water?
   A) the presence of vast canals discovered in the late 1800s by Giovanni Schiaparelli and mapped by Percival Lowell
   B) rocks of many different types jumbled together, as would occur if there had once been a great flood in the region, found by the *Mars Pathfinder*
   C) the presence of impact craters that appear to have formed in mud
   D) some very old craters that appear to have been eroded by rain
   E) the presence of what looks like dried–up riverbeds

4) Which of the following show evidence of ancient river beds?
   A) Mars
   B) the Moon
   C) Venus
   D) Mercury
   E) all of the above

5) Which of the following correctly describes the meaning of *albedo*?
A) The higher the albedo, the more light the surface emits.
B) The higher the albedo, the more light the surface absorbs.
C) The higher the albedo, the more light the surface reflects, and the less it absorbs.
D) The lower the albedo, the more light the surface reflects, and the less it absorbs.
E) The higher the albedo, the more light the atmosphere absorbs.

6) Why does Mars have more extreme seasons than Earth?
A) because it has a larger axis tilt
B) because it has more carbon dioxide in its atmosphere
C) because it is farther from the Sun
D) because it has a more eccentric orbit
E) all of the above

7) Where is most of the water on Mars?
A) distributed evenly throughout its atmosphere
B) in its clouds
C) in its polar caps and subsurface ground ice
D) in deep underground deposits
E) frozen on the peaks of its tall volcanoes

8) Why is Mars red?
A) Its surface is made of ices that absorb blue light.
B) Its surface rocks were rusted by oxygen.
C) Its surface is made of ices that absorb red light.
D) It is made primarily of red clay.
E) Its atmosphere scatters blue light more effectively than red light.

9) Why do jovian planets bulge around the equator, that is, have a "squashed" appearance?
A) Their large systems of moons and rings gravitationally attract the mass around the equator more.
B) Their rapid rotation flings the mass near the equator outward.
C) Their internal heat sources exert a pressure against the sides of the planets.
D) They are much more massive than the terrestrial planets.
E) all of the above

10) How do astronomers think Jupiter generates its internal heat?
A) internal friction due to its high rotation rate
B) chemical processes
C) radioactive decay
D) by contracting, changing gravitational potential energy into thermal energy
E) nuclear fusion in the core

11) Why is Jupiter denser than Saturn?
A) The extra mass of Jupiter compresses its interior to a greater extent than that of Saturn.
B) Its core is much larger than Saturn's.
C) It is made of a different composition than Saturn, including a higher proportion of hydrogen compounds and rocks.
D) It has a greater proportion of helium to hydrogen compared to Saturn.
E) It is unknown why this is so.

12) How do astronomers think Saturn generates its internal heat?
A) radioactive decay
B) internal friction due to its high rotation rate
C) nuclear fusion in the core
D) by raining dense helium droplets from higher to lower altitudes, resembling the process of differentiation
E) chemical processes

13) What is Jupiter's Great Red Spot?
A) a large mountain peak poking up above the clouds
B) a long–lived, high–pressure storm
C) a hurricane that comes and goes on Jupiter
D) the place where Jupiter's aurora is most visible
E) the place where reddish particles from Io impact Jupiter's surface

14) Why do Uranus and Neptune have blue methane clouds but Jupiter and Saturn do not?
A) The relatively slow rotation of Uranus and Neptune allows methane to migrate to higher levels in the atmosphere and condense into clouds.
B) Methane did not exist in the solar nebula at the radii of Jupiter and Saturn when the planets formed.
C) Methane does not condense into ice in the warmer atmospheric temperatures of Jupiter and Saturn.
D) The greater gravitational force of Jupiter and Saturn prevents the methane from rising to the upper edges of the atmosphere.
E) Methane reacts with the abundant ammonia clouds in Jupiter and Saturn.

15) Why are there no impact craters on the surface of Io?
A) Jupiter's strong gravity attracted the planetesimals more strongly than Io and thus none landed on its surface.
B) It is too small to have been bombarded by planetesimals in the early solar system.
C) Io did have impact craters but they have all been buried in lava flows.
D) Io's thick atmosphere obscures the view of the craters.
E) Any craters that existed have been eroded through the strong winds on Io's surface.

16) What is the most important reason why an icy moon is more likely to be geologically active than a rocky moon of the same size?
A) Ice is less rigid than rock.
B) Ice has a lower melting point than rock.
C) Ice contains more radioactive elements than rock.
D) Ice is less dense than rock.
E) Ice is affected by tidal forces to a greater extent than rock.

17) What mechanism is most responsible for generating the internal heat of Io that drives the volcanic activity?
A) differentiation
B) accretion
C) bombardment
D) radioactive decay
E) tidal heating

18) Which moon has the most substantial atmosphere?
A) Ganymede B) Io C) Mimas D) Titan E) Europa

19) Which of the following statements about Titan is *not* true?
A) Its atmosphere is mostly nitrogen.
B) Its temperature is too cold for liquid water to exist.
C) Its surface is hidden from view by its thick atmosphere.
D) It may have an ocean of liquid ethane.
E) It is the coldest moon in the solar system.

20) Why do astronomers believe Triton may have been a planet that was captured by Neptune?
A) It has an atmosphere and a measurable greenhouse effect.
B) It is colder than any other moon or planet.
C) It undergoes seasonal changes.
D) It is too large to have been formed in the jovian nebula that formed Neptune.
E) It orbits Neptune in the opposite direction of Neptune's rotation.

21) The youngest surface in the Solar System can be found on
A) Earth B) Titan C) Callisto D) Io E) Venus

22) Why are Saturn's rings so thin?
A) The "gap" moons shepherd the particles and maintain its thin profile.
B) Any particle in the ring with an orbital tilt would collide with other ring particles, flattening its orbit
C) The current thinness is a short–lived phenomenon that is special to this time.
D) Solar radiation pressure keeps particles pressed into the rings.
E) Saturn's gravity prevents particles from migrating upwards out of the rings.

23) What is the *Cassini division* of Saturn's rings?
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) the most opaque ring of Saturn, made of highly reflective ice particles
E) a dark ring, visible from Earth, composed of dark, dusty particles

24) Which of the jovian planets have rings?
A) Jupiter
B) Uranus
C) Neptune
D) Saturn
E) all of the above

25) Which of the following planets *cannot* be seen with the naked eye?
A) Neptune B) Jupiter C) Saturn D) Mars E) Venus

26) Among Solar System planets, Jupiter has the strongest Coriolis Effect because
A) It is the largest planet in the Solar System
B) It rotates fastest among planets
C) It has the most moons
D) Both A & B
E) None of the above

27) Which Solar System moon is most likely to have a sub–surface salt–water ocean?
A) Titan B) Europa C) Callisto D) Triton E) Io

28) Which of the following statements about comets and asteroids is *true*?
A) Most of the trillions of comets in our solar system have tails.
B) Comets are balls of ice and dust.
C) There are about 1 million known asteroids in the solar system.
D) All asteroids lie in the asteroid belt between Mars and Jupiter.
E) Only asteroids collide with the earth.

29) What do asteroids and comets have in common?
A) They have nothing in common with each other.
B) They have similar densities.
C) They have a similar range of orbital inclinations.
D) Most are unchanged since their formation in the solar nebula.
E) They have similar orbital radii.

30) Why do asteroids and comets differ in composition?
A) Asteroids and comets formed at different times.
B) Comets formed from the jovian nebula, while asteroids did not.
C) Comets are much larger than asteroids.
D) Asteroids formed inside the frost line, while comets formed outside.
E) Asteroids are much larger than comets.

31) Where are the *Trojan asteroids* located?
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 Mars's orbit
E) on orbits that cross Earth's orbit

32) What is a *meteorite*?
A) a comet that burns up in the earth's atmosphere
B) a streak of light caused by a star moving across the sky
C) a fragment of an asteroid from the solar system that has fallen to the earth's surface
D) a small moon that orbits one of the giant planets
E) a streak of light caused by a small particle from space burning up in the earth's atmosphere

33) A typical shooting star in a meteor shower is caused by a _____ entering the earth's atmosphere.
A) boulder–size particle from an asteroid
B) boulder–size particle from a comet
C) pea–size particle from an asteroid
D) microscopic particle of interstellar dust
E) pea–size particle from a comet

34) Halley's comet is named after the English scientist Edmund Halley because he
A) was the first to see it in 1682.
B) calculated its orbit and predicted that it would return in 1758.
C) was the most famous astronomer in England during its appearance.
D) was the first to publish pictures of it and report it to the International Astronomical Union (IAU).
E) discovered it.

35) What part of a comet points most directly away from the Sun?
A) the plasma tail
B) the dust tail
C) the coma
D) the jets of gas
E) the nucleus

36) Where did comets that are now in the Oort cloud originally form?
A) outside Neptune's orbit
B) within the solar nebula, but far outside the orbit of Pluto
C) inside Jupiter's orbit
D) near the jovian planets
E) all of the above

37) Comets with extremely elliptical orbits, like comets Hyakutake and Hale–Bopp,
A) come from the Kuiper belt.
B) are captured by Jupiter.
C) come from the asteroid belt.
D) are Trojan comets.
E) come from the Oort cloud.

38) The first planets around other Sun–like stars were discovered
A) at the turn of this century.
B) by Huygens, following his realization that other stars are Suns.
C) by Galileo following the invention of the telescope.
D) at the turn of last century.
E) about a decade ago.

39) Which of the following methods has led to the most discoveries of massive planets orbiting near their parent stars?
A) detecting the infrared light emitted by the planet
B) detecting the gravitational effect of an orbiting planet by looking for the Doppler shifts in the star's spectrum
C) detecting the starlight reflected off the planet
D) detecting a planet ejected from a binary star system
E) detecting the shift of the star's position against the sky due to the planet's gravitational pull

40) How much brighter is a Sun–like star than the reflected light from a planet orbiting around it?
A) a million times brighter
B) a hundred times brighter
C) a billion times brighter
D) a thousand times brighter
E) ten thousand times brighter

TRUE/FALSE. Mark asnwer as (A) if TRUE, and (B) if FALSE.

41) Smaller worlds generally have thinner lithospheres.

42) Winter and summer differ in length on Mars because of its elliptical orbit.

43) Mars has a thicker atmosphere than the earth.

44) Carbon dioxide is the primary constituent of Mars' atmosphere.

45) If Jupiter were 10 times more massive, it would actually have a smaller radius.

46) Jupiter is slowly shrinking through gravitational contraction today

47) Uranus continues to generate internal heat through gravitational contraction.

48) *Synchronous rotation* is when a moon's rotation period and orbital period are the same.

49) Both the existence and the location of Neptune were predicted mathematically before the planet actually was detected by telescope.

50) A spacecraft traveling through the asteroid belt has a high risk of being destroyed through a collision.

51) No spacecraft has ever visited an asteroid or comet.

52) Pluto's gravity affects the orbit of Uranus, and this fact was used to discover Pluto.

53) Viewed from Pluto, the Sun would appear more than a thousand times fainter than on Earth.

54) Comet nuclei can be darker than charcoal.

55) Shooting stars are simply other names for meteors.

56) A comet that has an orbit around the Sun inclined to the ecliptic plane by 65° probably originated in the Kuiper belt.

57) Astronomers have discovered more planets around other stars than in our Solar System.

58) The Doppler technique for planet detection has found Earth like planets around nearby Sun–like stars

59) A planet's size can be determined by observing its transit across a star.

60) Planetary orbits that are face–on to our line of sight produce no Doppler shift in the stellar spectrum

1) B
2) B
3) A
4) A
5) C
6) D
7) C
8) B
9) B
10) D
11) A
12) D
13) B
14) C
15) C
16) B
17) E
18) D
19) E
20) E
21) D
22) B
23) C
24) E
25) A
26) D
27) B
28) B
29) D
30) D
31) C
32) C
33) E
34) B
35) A
36) D
37) E
38) E
39) B
40) C
41) FALSE
42) TRUE
43) FALSE
44) TRUE
45) TRUE
46) TRUE
47) FALSE
48) TRUE
49) TRUE
50) FALSE

51) FALSE
52) FALSE
53) TRUE
54) TRUE
55) TRUE
56) FALSE
57) TRUE
58) FALSE
59) TRUE
60) TRUE