

Name _____ Student ID _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. Write your student ID in the space provided on the SCANTRON form and bubble in the appropriate circles. When you are finished with exam place the SCANTRON form into the exam form and turn in both the exam form and the SCANTRON at the front desk.

- 1) Of the following, which is **not** considered to be one of the fundamental observational results any viable theory for the formation of the Solar System must explain. 1) _____
- A) There is a dichotomy in the properties of the planets, that is, there are distinct classes of planets known as Terrestrial and Jovian planets
 - B) The large sizes of the orbits of the Jovian planets in our Solar System
 - C) The anomalous spins of Venus, Uranus, and Pluto
 - D) All of the planet's orbits are in the counter-clockwise sense as viewed from the north
 - E) The orbits of the planets are nearly circular in shape and roughly confined to the ecliptic plane
- 2) In noting that the Earth is "differentiated", we mean that: 2) _____
- A) the iron and nickel core is denser than the silicate mantle and crust.
 - B) the Earth's magnetic field is different now in that its polarity has reversed from it was 700,000 years ago.
 - C) the Earth has evolved in a different pattern than any other planet.
 - D) radioactive heating in the core is at a slower pace than when the Earth was new.
 - E) the density of its materials decreases as you go downward toward the core.
- 3) Our best data about the surface topography of Venus has come from: 3) _____
- A) orbiter photos from Pioneer Venus Orbiter.
 - B) spacecraft flybys like Mariner 2 and visual observations of the planet.
 - C) radar data taken by the orbiting spacecraft Magellan.
 - D) radio and visual observations from Earth-based observatories.
 - E) visual observations made by the Hubble Space Telescope
- 4) The presence of the magnetic field around the Earth is a good indication that: 4) _____
- A) a huge iron meteorite lies somewhere high up in the mantle, not in the core.
 - B) the Earth's interior is similar to Mercury's, as both have fields.
 - C) the Earth's interior must be completely molten to the center.
 - D) the Earth's interior has had time to solidify, with a rigid bar magnet created.
 - E) we have a liquid metal outer core, spinning rapidly as we rotate.
- 5) Mercury, as does the Moon, experiences extreme high and low temperature variations between night and day because: 5) _____
- A) Mercury has no axial tilt, with its equator always exposed to direct Sunlight.
 - B) its oceans are much hotter than ours.
 - C) its dense atmosphere creates a runaway greenhouse.
 - D) it has no atmosphere to moderate temperatures over the globe.
 - E) it rotates very slowly.

- 6) Why are the Jovian planets so large? 6) _____
- A) The Jovian planets are normal in size; the Terrestrial planets were just as large but the Sun's heat reduced their size.
 - B) They started out as small stars, but lost most of their mass through an enhanced wind because the fusion reactions in their cores were unstable.
 - C) The gas and dust were hotter in the outer regions, making it easier for the planets to form.
 - D) They formed from large protoplanets in the outer cooler parts of the Solar Nebula which allowed them to sweep up gas from the Solar Nebula.
 - E) The Jovian planets are at least a billion years older than the Terrestrial planets and have constantly gained matter from comets.
- 7) Which of the following characterizes a shield volcano? 7) _____
- A) It will be smaller than cinder cones like Maxwell Mons on Venus.
 - B) It cannot grow very large, for the plates are constantly moving.
 - C) It erupts only briefly before subsiding forever.
 - D) It sits above a hot spot in the planet's mantle.
 - E) It is formed by moving tectonic plates.
- 8) The lunar highlands are: 8) _____
- A) made of lighter colored, younger rocks than the maria.
 - B) brighter than the maria, since they are covered with reflective glass from the rays.
 - C) more rugged, heavily cratered, and older than the lunar maria.
 - D) formed by plate tectonics, like the Earth's Himalayas.
 - E) formed by volcanic eruptions, much like our Andes.
- 9) Large impacts such as the one suggested to have led to the demise of the dinosaurs occur roughly every _____. 9) _____
- A) 3.2 billion years on the Earth
 - B) they were a one-time event; the impact occurred during the Epoch of Heavy Bombardment
 - C) 4.6 billion years, they are extremely rare only a couple are expected to occur over the lifetime of the Earth
 - D) 10,000 years on the Earth
 - E) 100,000,000 years or so on the Earth
- 10) Currently we know of how many extra-Solar planets? 10) _____
- A) three planets, all around Gliese 851
 - B) None; ours is the only Solar System now known.
 - C) 37 planets, including some around pulsars as well as normal stars
 - D) over 400 planets, the number growing by the day
 - E) 18 Earth-like planets, all in the habitable zones around nearby solar type stars
- 11) In comparing our own Solar System with others found to date, we find that: 11) _____
- A) the newly discovered planetary systems completely disprove our current model for how our Solar System formed.
 - B) Earth-like planets are common in our Galaxy.
 - C) almost 50 % of the discovered systems show Earth-like planets in habitable zones
 - D) after planets form, strong orbital migration likely occurs.
 - E) other planetary systems must form exactly as did ours because of the similarities of the discovered planets and their orbits compared to those of the planets in our Solar System.

- 12) In terms of chemical composition of the interiors of the planets: 12) _____
A) the Terrestrials are similar to the Sun, for they formed closer to it.
B) all the planets are made of the same elements, and in the same proportions.
C) each planet is unique, with no similarities among them.
D) the Jovians are much more like the Sun than are the Terrestrials.
E) the Sun is unique in having far more light elements than any of the planets do.
- 13) What property of Mars is responsible for producing the great heights of its volcanos? 13) _____
A) Its lower surface gravity does not pull them down as much as on Earth.
B) Mars has more radioactive material than the Earth.
C) Its lower temperature and higher surface gravity allows higher peaks to form.
D) Its cold temperatures allows the magma to freeze faster.
E) Its volcanoes spout steam, similar to the geyser Old Faithful on the Earth
- 14) From the center outward, the correct ordering of the layers of the Earth is: 14) _____
A) molten metallic core, molten rock lithosphere, solid silicate crust.
B) liquid iron inner core, solid nickel outer core, rocky mantle, silicate crust.
C) solid metal core, molten metal mantle, rocky lithosphere, gases in atmosphere.
D) solid metallic inner core, molten metal outer core, silicate mantle and crust.
E) solid rock core, liquid metal mantle, solid rock crust.
- 15) Various observations suggest there may be recent or even continuing volcanic activity on Venus. 15) _____
Which of the following has NOT been observed?
A) fluctuations in the level of sulfur dioxide in the planet's atmosphere
B) observed bursts of radio energy, similar to those produced by lightning discharges occurring in the plumes of erupting volcanoes on Earth
C) chains of large shield volcanoes similar to Hawaii
D) surface features resembling rift valleys on Earth
E) spacecraft detection over a period of days of active flowing lava on Venus
- 16) The rate of cratering: 16) _____
A) has recently increased with more collisions in the asteroid belt.
B) has remained constant over the last 4.6 billion years.
C) fluctuates over time, with massive bodies occasionally coming in from the Oort Cloud.
D) shows that large asteroid impacts are more common now than in the past.
E) shows that most interplanetary debris was swept up soon after the formation of the Solar System.
- 17) Of the following, which is **not** commonly associated with a subduction zone? 17) _____
A) the formation of chains of shield volcanoes
B) frequent earthquakes.
C) the production of tsunamis
D) volcanism
E) the destruction of crust.
- 18) Plate motion on the Earth is driven by: 18) _____
A) cracking of and large scale earthquakes in the lithosphere
B) convective motions in the asthenosphere
C) convective motions in the atmosphere
D) the motion of large mountain ranges such as the Himalayas
E) slips along transform faults

- 19) What happens when the cloud from which the Solar System formed, the Solar Nebula, first starts to contract? 19) _____
- A) It spins faster.
 - B) It flattens out.
 - C) It develops large condensations called protoplanets.
 - D) only A and B
 - E) A, B, and C
- 20) What factor caused different planets to form out of different types of material? 20) _____
- A) the spin (angular momentum) of the forming planet
 - B) the quantity of dust particles in the Solar Nebula
 - C) the variation in temperature throughout the Solar Nebula
 - D) all of the above
 - E) none of the above
- 21) The detection of most extra-Solar planets is done by: 21) _____
- A) seeing planetary transits and gravitational lensing using the Hubble Space Telescope and Kepler
 - B) receiving radio signals from them.
 - C) seeing the drop in light as they transit their star's disk.
 - D) noting Doppler shifts in the emission from their stars due to the gravitational influence of the planets on their star's motion.
 - E) imaging them with the Hubble Space Telescope and a occulting disk over their star.
- 22) Seismic waves have been most useful for mapping: 22) _____
- A) the depths of the oceans on the Earth.
 - B) the density of the lithosphere on the Moon.
 - C) the surface of Mars.
 - D) the interior of Venus.
 - E) the Earth's core and mantle.
- 23) Maxwell Montes on Venus is a huge: 23) _____
- A) ocean basin larger than the Pacific Ocean.
 - B) impact crater larger than Texas.
 - C) rift valley.
 - D) shield volcano.
 - E) tectonic mountain chain, like the Himalayas.
- 24) How do the densities of the Jovian and Terrestrial planets compare? 24) _____
- A) Made from the same Solar Nebula, they are all similar.
 - B) All Terrestrials are more dense than any of the Jovians.
 - C) The closer a planet lies to the Sun, the less its density.
 - D) More massive Jovians all have high densities, compared to the tiny Terrestrials.
 - E) No real pattern here; densities vary greatly and are very individual to each world.
- 25) The lunar maria are radioactively dated at: 25) _____
- A) 4.6 billion years old, forming first among the lunar features.
 - B) 3.5-2.5 billion years old, similar to the formation of our own oceans.
 - C) 4.2-3.9 billion years old, comparable to the adjacent highlands.
 - D) 3.9-3.2 billion years old, forming after most of the bombardment was over.
 - E) less than a billion years old, the most recent additions to the Moon.

- 26) Earth and Venus are often called sister planets; in which ways are they most alike? 26) _____
A) atmospheric composition and density
B) size, density, and surface gravity
C) cloud composition and weather
D) surface temperature and atmospheric pressure
E) polar caps and rusty red deserts
- 27) When an oceanic plate and a continental plate collide: 27) _____
A) volcanoes form near the boundary between them.
B) that region is safe from earthquakes because now the plates are static.
C) they both stop moving.
D) they produce large rift valleys such as the mid-Atlantic ridge.
E) they almost always produce long strings of coronae as found on Venus.
- 28) If a Martian meteorite has 1/8 of the original U 235 which has not yet decayed into lead 207, and the half life of U 235 is 700 million years, this rock was formed: 28) _____
A) 2.1 billion years ago.
B) 1.4 billion years ago.
C) 700 million years ago.
D) less than 100 million years ago.
E) about 350 million years ago.
- 29) Active geology on a planet is driven by: 29) _____
A) rotation of the asthenosphere
B) heating caused by the absorption of Solar energy
C) heat flow from the interior of the planet to the surface of the planet
D) the impacts of large bodies
E) the rapid rotation of the planet's core
- 30) When Kepler is lucky enough to see an extra-solar planet transit its star: 30) _____
A) we can determine its shape.
B) we can deduce from the drop in the light from the star, the planet's size, mass, and hence density, and the planet's temperature.
C) it will cause the star to vanish for several hours.
D) we can determine what elements are in the atmosphere of the Earth.
E) we can be certain it is a Terrestrial, not a Jovian.
- 31) The largest difference between Mars' northern and southern hemispheres is that: 31) _____
A) the northern is higher overall, despite some high volcanoes in the south.
B) the southern has higher elevation and appears older, with more impact craters.
C) the southern has higher elevation and is dominated by the Tharsis Bulge near the southern pole.
D) the southern is much darker and younger, with large mare-like basaltic lava flows.
E) the northern is dominated by the Tharsis Bulge and large volcanic chains near the northern pole.
- 32) The crust of the Earth is about _____ oceanic crust. 32) _____
A) 55% B) 25% C) 45% D) 80% E) 95%

- 33) Magellan did **not** find which of these on Venus? 33) _____
A) impact craters, all larger than five kilometers across
B) continent sized uplands
C) coronae, huge but very flat circular features
D) sea-floor spreading as seen at the Mid-Atlantic ridge.
E) large shield volcanoes
- 34) Beyond our own Solar System, the planets found to date have tended to be: 34) _____
A) large Jovians far from their stars like in our Solar System
B) small Terrestrial planets, much like the Moon and asteroids, with orbits which place them very close to their stars
C) imaginary, with no concrete proof that they really exist.
D) large Jovians with orbits much more like the Terrestrial planets in our Solar System.
E) Kuiper Belt Objects, far from the glare of their stars.
- 35) Which of these is **not** a characteristic of the Solar Nebula theory our current model for the formation of the Solar System? 35) _____
A) All the planets should orbit the Sun counterclockwise as viewed from the north.
B) The formation of water ice is crucial for our understanding of the formation of Jupiter.
C) Larger planets should form closer to their star, where there is more debris.
D) Planets should rotate counterclockwise as viewed from the north.
E) All the planets should follow the ecliptic plane.
- 36) Which of the following is **NOT** a way that Terrestrial and Jovian planets differ? 36) _____
A) Jovians have rings, Terrestrials don't.
B) Jovians are less dense than any of the Terrestrials.
C) Jovian orbits are much more eccentric than are Terrestrials, and farther off the ecliptic.
D) Jovians have larger escape velocities than do the solid Terrestrials.
E) Jovians have many more satellites than do Terrestrials.
- 37) What percentage of the surface of Venus could be characterized as continental-sized highlands? 37) _____
A) 100%
B) 75%
C) less than 10%
D) 45%
E) about 30%, like the Earth
- 38) The oldest rocks found in the crust of the Earth are radioactively dated at about: 38) _____
A) 200 million years old.
B) 2.7 billion years old.
C) 64.9 million years old.
D) 3.2 billion years old.
E) 4 billion years old.
- 39) Mercury's surface most resembles that of which other body? 39) _____
A) Io B) Mars C) Venus D) Earth E) Moon

40) Venus has features named Aphrodite Terra and Ishtar Terra. What are these features?

40) _____

- A) large basins similar to the maria on the Moon
- B) great rift valleys like Valles Marineris on Mars
- C) continental-sized plateaus
- D) very large volcanos
- E) large impact craters

Answer Key

Testname: ASTR.121.X2.WTR10

- 1) C
- 2) A
- 3) C
- 4) E
- 5) D
- 6) D
- 7) D
- 8) C
- 9) E
- 10) D
- 11) D
- 12) D
- 13) A
- 14) D
- 15) E
- 16) E
- 17) A
- 18) B
- 19) D
- 20) C
- 21) D
- 22) E
- 23) D
- 24) B
- 25) D
- 26) B
- 27) A
- 28) A
- 29) C
- 30) B
- 31) B
- 32) A
- 33) D
- 34) D
- 35) C
- 36) C
- 37) C
- 38) E
- 39) E
- 40) C