

## Exam 2B March 29, 2010

In each of the following multiple choice questions, select the best possible answer. First circle the answer on this exam, then in the line on the scan sheet corresponding to the number of the question, clearly darken the region corresponding to your answer. Be sure to put your name on the cover page for the exam and on the front and back of the scan sheet. Be sure also to indicate on the scan sheet which exam you have. Turn in the exam and the scan sheet.

- 1) Synchronous Rotation is when
  - a) a body is stationary relative to the stars.
  - b) a body rotates with a period equal to the rotational period of the object its orbiting.
  - c)** a body rotates with a period equal to its orbital revolution.
  
- 2) Green House Effect: The atmospheres of planets can act as thermal blankets because they \_\_\_\_\_ the high-energy (ultraviolet) light of the Sun and \_\_\_\_\_ the low energy (infrared) light radiated by the planet.
  - a) pass : pass
  - b)** pass : absorb
  - c) absorb : pass
  - d) absorb : absorb
  
- 3) The tidal pull of the Moon is an example of a differential force, as the near and far sides of the Earth do not experience the same gravitational pull of the Moon.
  - a)** True
  - b) False
  
- 4) Which of the following is not a pattern of motion in our solar system?
  - a)** Planets *all* rotate in the same direction.
  - b) Planets *all* orbit in the same direction.
  - c) Large planets *all* have many moons orbiting them.
  - e) Planets *all* orbit the same direction as the Sun's spin.
  
- 5) A Kuiper Belt object was recently discovered that may be larger than Pluto.
  - a)** True
  - b) False
  
- 6) Which of the following is not icy in composition?
  - a) comet nuclei
  - b) Kuiper Belt Objects
  - c) the polar cap of Mars
  - d)** asteroids
  - e) most jovian (gas giant) satellites
  
- 7) What is true about solar system densities?
  - a)** The denser planets lie closer to the Sun.
  - b) In differentiated bodies, the denser materials lie near their surfaces.
  - c) The asteroids all have about the same density as water.
  - d) Saturn has the same density as iron.
  - e) Planetary density increases with increasing distance from the Sun.

- 8) The Kuiper Belt is found where in the solar system?
- a) beyond the orbit of Neptune
  - b) among the orbits of the terrestrial planets
  - c) between the orbits of Mars and Jupiter
  - d) between the orbits of Jupiter and Uranus
  - e) sixty degrees ahead or behind Jupiter
- 9) The tail of a comet always points
- a) toward the Sun and disappears at perihelion.
  - b) toward Earth and never varies.
  - c) away from the Sun and disappears at perihelion.
  - d) away from the Sun and becomes longest and brightest at perihelion.
  - e) in the direction of the comet's motion.
- 10) The Trojan asteroids are found
- a) orbiting around the Kuiper Belt body Hector.
  - b) with the others, between Mars and Jupiter; their red color gives them their name.
  - c) sixty degrees ahead or behind Jupiter, sharing its orbit about the Sun.
  - d) beyond Neptune, with orbits similar to Pluto's.
  - e) closer on average to the Sun than is the Earth.
- 11) Which of the following are the jovian (gas giant) planets?
- a) Jupiter, Saturn, Uranus, Neptune, and Pluto
  - b) only Jupiter
  - c) only Jupiter and Saturn
  - d) Jupiter, Saturn, Uranus, and Neptune only
  - e) everything past Mars and the asteroid belt
- 12) The most distant objects in our solar system are
- a) in the Kuiper Belt.
  - b) the jovians.
  - c) in the Oort Cloud.
  - d) short period comets.
  - e) the Trojan asteroids.
- 13) Where are most of the known asteroids found?
- a) in the same orbit as Jupiter
  - b) in the Oort cloud
  - c) between the orbits of Mars and Jupiter
  - d) between the orbits of the jovian planets
  - e) between the orbits of the terrestrial planets

- 14) Why are the inner planets made of denser materials than the outer planets?
- a) In the beginning, when the protoplanetary disk was spinning faster, centrifugal forces flung the lighter materials toward the outer parts of the solar nebula.
  - b) Denser materials were heavier and sank to the center of the nebula.
  - c) When the solar nebula formed a disk, materials naturally segregated into bands, and in our particular solar system the denser materials settled nearer the Sun while lighter materials are found in the outer part.
  - d) The Sun's gravity pulled denser materials toward the inner part of the solar nebula, while lighter gases escaped more easily.
  - e) In the inner part of the nebula only metals and rocks were able to condense because of the high temperatures, whereas hydrogen compounds, although more abundant, were only able to condense in the cooler outer regions.**
- 15) In light of modern solar system theory, why do the orbits of the planets all lie near the same plane?
- a) The Sun's gravity forced them into these orbits.
  - b) The fast rotation of the early solar nebula offset the gravitational pull on material in the plane perpendicular to the axis of rotation**
  - c) Perturbations from Jupiter pulled the rest of the planets into the same plane.
  - d) This happened purely by chance.
  - e) The angular momentum was kept to a minimum this way.
- 16) As a rotating gas cloud contracts, it spins
- a) faster due to an increase in angular momentum.
  - b) slower due to a decrease in angular momentum.
  - c) at a constant rate.
  - d) faster due to conservation of angular momentum.**
  - e) slower due to conservation of angular momentum.
- 17) The terrestrial planet cores contain mostly metal because
- a) the entire planets are made mostly of metal.
  - b) convection carried the metals to the core.
  - c) metals condensed first in the solar nebula and the rocks then accreted around them.
  - d) metals sank to the center during a time when the interiors were molten throughout.**
  - e) radioactivity created metals in the core from the decay of uranium.
- 18) How do we know that the Moon's maria are younger than the terrae?
- a) there are fewer volcanoes on the terrae
  - b) the dust layer on the terrae is thicker
  - c) crater density is lower on the maria**
  - d) the lunar crust is thicker under the maria

- 19) In noting that the Earth is "differentiated," we mean that
- a) the density increases as you descend downward toward the core.
  - b) the Earth is very different than any other planet we study.
  - c) the Earth's magnetic field varies at different locations on the globe.
  - d) the density of oceanic basalt is less than that of granite on the mountain tops.
  - e) the radioactive heating in the core is increasing with time.
- 20) The presence of a magnetic field is a good indication that
- a) the Earth's interior is similar to Mercury's, as both have fields.
  - b) a huge iron meteorite lies somewhere high up in the mantle, not in the core.
  - c) we have a liquid metal outer core, spinning rapidly as we rotate.
  - d) the Earth's interior must be completely molten to the center.
  - e) the Earth's interior has had time to solidify, with a rigid bar magnet created.
- 21) Which of these theories seems to best explain the Moon's origin?
- a) Impact Theory
  - b) Capture Theory
  - c) Coformation Theory
  - d) Fission Theory
  - e) Fusion Theory
- 22) Compared to the Earth's mantle, the Earth's core is
- a) hotter and denser
  - b) cooler and denser
  - c) hotter and less dense
  - d) cooler and less dense
- 23) The ozone layer of the Earth's atmosphere is hotter than the regions just above and just below it. Why?
- a) High speed winds produce considerable frictional heating in the ozone layer
  - b) Solar ultraviolet radiation is absorbed in the ozone layer
  - c) The solar wind strikes the ozone layer and heats it
  - d) Aurorae occur in the ozone layer
- 24) The Earth's magnetic field forms a protective cavity about the Earth known as the \_\_\_\_\_ which deflects the \_\_\_\_\_ around the Earth.
- a) Magnetoshield, solarwind
  - b) Magnetoshield, ultraviolet radiation
  - c) Magnetosphere, solarwind
  - d) Magnetosphere, ultraviolet radiation
  - e) Ionosphere, solarwind
- 25) The luminous emissions of the aurora are produced
- a) by charged particles from near earth space colliding with the gases of the upper atmosphere
  - b) by sunlight scattering from ice crystals in the upper atmosphere
  - c) when the upper atmosphere reaches extreme temperatures and begins to glow

26) How does the giant impact theory of the origin of the Moon account for the fact that the Moon is iron-poor compared with the Earth?

- a) the impact happened after the Earth's iron had sunk to form the core
- b) the impacting body was iron-rich
- c) most of the iron was vaporized by the impact and escaped into space
- d) iron released by the impact formed a separate body that escaped

27) Suppose you were an astronaut on the Moon. How much time would elapse between one sunrise and the next? (THINK. DRAW.)

- a) trick question the Moon doesn't rotate
- b) one Earth month
- c) one Earth day
- d) one Earth year

28) Mercury, Venus, and Earth have similar densities.

- a) True
- b) False

29) Venus' rotation on its axis

- a) is the fastest of the terrestrial planets.
- b) is clockwise, unlike most other solar system objects.
- c) shows it is tidally locked in its orbit around the Sun.
- d) is highly tilted to its orbital plane, causing large seasonal changes.
- e) prevents us from seeing all of its surface features

30) The long, high cliffs on Mercury are called

- a) wrinkle ridges
- b) scarps
- c) subduction zones
- d) plate boundaries

31) Our most detailed maps of Venus come from

- a) the *Magellan* space probe.
- b) the Hubble Space Telescope.
- c) direct observation from Earth-based optical telescopes.
- d) manned landings.
- e) Earth-based radio telescopes.

32) Which of the following bodies experiences the greatest range of temperatures?

- a) Mercury
- b) Venus
- c) Earth
- d) Mars

33) Which of the following bodies has the atmosphere with the greatest surface pressure?

- a) Mercury
- b) Venus
- c) Earth
- d) Mars

- 34) Which of the following bodies has the strongest magnetic field?  
a) Mercury                                      b) Venus  
**c) Earth**    d) Mars
- 35) What is the most clearly observed, direct evidence of seasonal changes on Mars?  
a) The presence of large scale canyons like Valles Marineris.  
b) The presence of small scale dry river beds on the surface of Mars.  
**c) Regular variations in the size of Mars's polar ice cap.**  
d) The occurrence of global scale dust storms  
e) Regular variations in Martian attendance at resort areas along Valles Marineris
- 36) Much of the water on Mars  
**a) is thought to be in a layer of permafrost just below the surface.**  
b) lies in shallow pools near the poles.  
c) is locked in the seasonal ice cap.  
d) is found in deep pools near the equator.  
e) is in the form of clouds.
- 37) What is the main constituent of the atmosphere of Venus?  
a) oxygen                                      b) nitrogen  
c) hydrogen                                      **d) carbon dioxide**  
e) sulfuric acid
- 38) Which of the following characteristics may explain Venus's lack of magnetic field?  
**a) a relatively slow rotation**  
b) an iron rich core  
c) a molten core
- 39) Olympus Mons is  
a) a dark smooth region on the moon.  
b) a raised continent like feature on the surface of Venus  
**c) a large volcano on the surface of Mars**  
d) a long rift feature found on Venus
- 40) The low surface gravity helps Martian volcanoes grow to great heights.  
**a) True**                                      b) False
- 41) Which of the following is an example in which you are traveling at constant speed but not at constant velocity?  
a) rolling freely down a hill in a cart, traveling in a straight line  
b) driving backward at exactly 50 km/hr  
c) jumping up and down, with a period of exactly 60 hops per minute  
**d) driving around in a circle at exactly 100 km/hr**  
e) none of the above

42) The force of gravity is an inverse square law. This means that, if you double the distance between two large masses, the gravitational force between them

- a) also doubles.
- b) weakens by a factor of 2.
- c) strengthens by a factor of 4.
- d) weakens by a factor of 4.**
- e) is unaffected.

43) Magnetic fields are produced by

- a) static electric charge
- b) permanent magnets
- c) electric currents
- d) both a and c
- e) both b and c**

44) Density is defined as

- a) mass per unit volume.**
- b) weight per square inch.
- c) size divided by weight.
- d) mass times weight.
- e) weight divided by the planet's radius.

45) The Moon's near side always faces Earth due to

- a) the Sun's gravity.
- b) Earth's magnetic field.
- c) Earth's tidal force.**
- d) conservation of angular momentum in the solar nebula.
- e) the solar wind.