

Name: _____

Astronomy

Time Allotted: 30 minutes

Key: (*) = none, one, or more than one answer possible (e.g. Answer: A, D, and E)

1. Observer 1 stands at the top of a skyscraper on Earth (radius = 6400 km) at an elevation of 1600 km. Observer 2 stands at the top of an identical skyscraper on another planet with radius 2400 km. Assuming both planets have a flattening ratio of 0, estimate the ratio of the farthest distance to the horizon that can be seen by Observer 1 and Observer 2.

Answer: _____

2. The Sun-Earth-Mars angle is observed to be 90 degrees, meaning that they are at quadrature. What phase will Mars appear to be in to an observer on Earth?

- a) New
- b) Crescent
- c) Quarter
- d) Gibbous
- e) Full

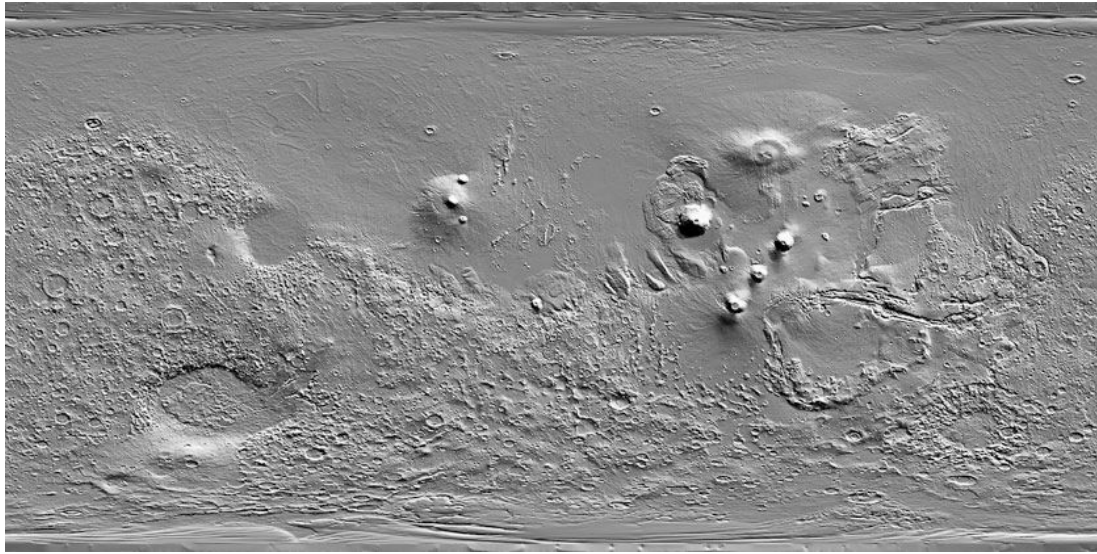
3. An upright, standing observer in the northern hemisphere looks straight out to the horizon to view the moon. Another observer does the same thing, except in the southern hemisphere. Which of the following statements are true of the relative appearance of the moon to these two observers? (*)

- a) Appears roughly identical
- b) Appears as a mirror image about a horizontal axis
- c) Appears as a mirror image about a vertical axis
- d) Phases appear to run in reverse order

4. Which of the following statements are true of volcanism on Venus? (*)

- a) Most recent volcanic activity can be attributed to subsurface hotspots.
- b) Venusian volcanoes are comprised of an even mix of shield and cinder cone volcanoes.
- c) Given two identical volcanoes with lava of identical gas content on Venus and Earth, the one on Venus would erupt less explosively.
- d) Water vapor is a primary constituent of gas produced by Venusian volcanoes.

Answer Q5-7 using the figure below.



5. This is a topographic shade profile of what solar system body?

Answer: _____

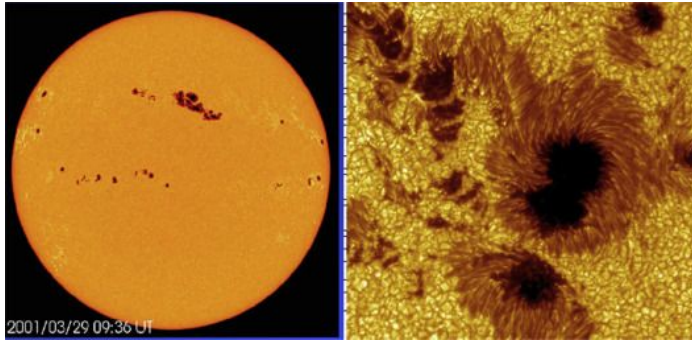
6. Assuming the upper part of the image is farther north than the lower part, which of the following statements are true regarding the surface of this body? (*)

- a) The northern part of the planet is mostly basaltic while the southern part is relatively felsic.
- b) The northern part of the planet is relatively young compared to the southern part.
- c) The large volcanoes are likely stratovolcanoes given their size.
- d) The large volcanoes provide evidence of tectonic activity .

7. The best explanation for the relatively dark areas in the image is:

- a) Local depressions on the surface
- b) Unconsolidated sediment and dust lifted and later deposited by winds
- c) Shadows caused by an indirect sun angle
- d) Concentrations of organic material around chemical “smokers”

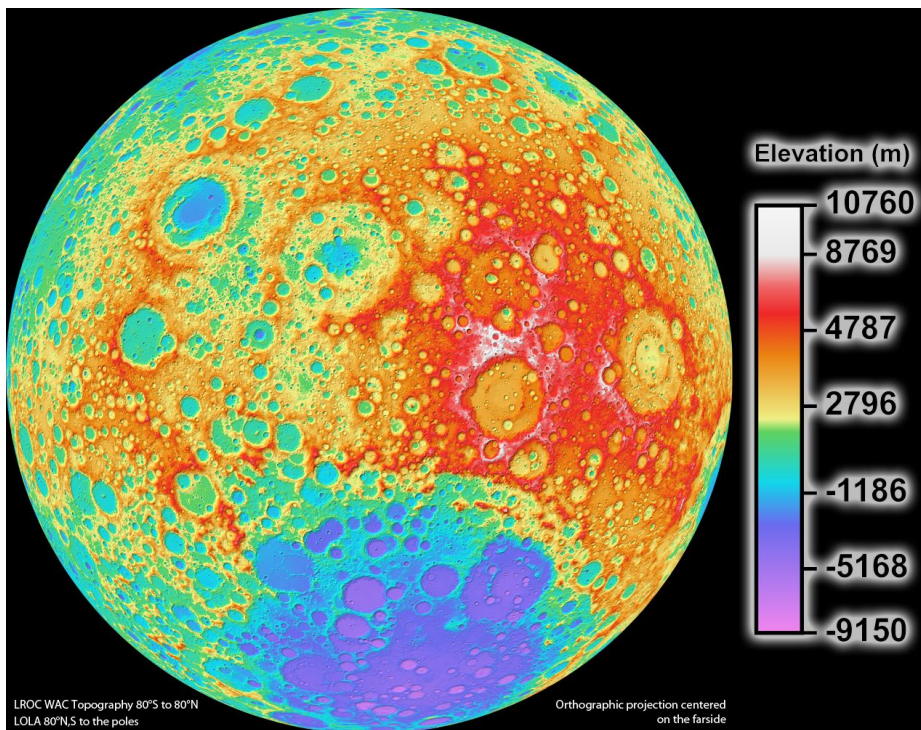
Consider the figure below.



8. The image above depicts an important feature of the Sun. Based on your knowledge of this feature, which of the following answer choices is most likely correct? (*)

- a) The feature is dark compared to its surroundings due to relatively higher temperatures.
- b) The feature is dark compared to its surroundings due to relatively lower temperatures.
- c) Many of these features can be found during periods of greater solar activity.
- d) The features closer to the Sun's equator have a faster rotational period.
- e) The features farther from the Sun's equator have a faster rotational period.
- f) This feature can only be found once every 11 years.

Consider the figure below.



9. The image above is a detailed topographic map of our moon. Which of the following statements about its features are true? (*)

- a) The regions of low elevation are mostly smooth plains consisting of basaltic lavas.
- b) The moon consists of mostly igneous rock, resulting from recent volcanic activity.
- c) The visible craters are evidence of recent impacts because not enough time has passed for them to be removed by tectonic activity.
- d) The moon's composition is less complex compared to the Earth because it never underwent magmatic differentiation.
- e) The moon's craters and topographic features have been preserved under the protection of its atmosphere.

10. Based on your knowledge of the three properties of the Milankovitch cycles, which of the following predictions are most likely correct concerning glacial growth on Earth? (*)

- a) A greater eccentricity will cause more glaciers to survive and grow.
- b) A lesser eccentricity will cause less glaciers to survive and grow.
- c) A greater tilt will cause more glaciers to survive and grow.
- d) A lesser tilt will cause more glaciers to survive and grow.
- e) A Northern Hemisphere summer during aphelion will cause more glaciers to survive and grow in the Northern Hemisphere.
- f) A Northern Hemisphere summer during perihelion will cause more glaciers to survive and grow in the Northern Hemisphere.

11. The sun exhibits limb darkening, an optical phenomenon in which the center of the disk appears brighter than the edges (limb). This phenomenon supports which of the following statements? (*)

- a) The Sun's photosphere increases in temperature with depth.
- b) There exists a temperature minimum layer in the Sun.
- c) The transition region between the chromosphere and the corona is smooth.
- d) Within the Sun's visible surface, photons emitted from the star are no longer absorbed.
- e) Heat comes from the center of the Sun.

12. Which of the following correctly orders the processes that occurred in our galaxy's formation of the planets from earliest to latest?

- a) Condensation, gravitational collapse, accretion.
- b) Accretion, condensation, gravitational collapse.
- c) Condensation, accretion, gravitational collapse.

- d) Gravitational collapse, accretion, condensation.
- e) Gravitational collapse, condensation, accretion.

13. Given that the length of a year on Mars is 687 Earth days and that the length of a synodic day on Mars is 24 hours and 40 minutes, which of the following is the closest estimate to the length of a Martian sidereal day?

- a) 12 hours and 20 minutes
- b) 24 hours and 37 minutes
- c) 24 hours and 40 minutes
- d) 24 hours and 43 minutes
- e) 49 hours and 20 minutes

14. A newly discovered planet in the solar system has an orbital period of 64 years. In astronomical units, which of the following is the closest estimate to the length of the semimajor axis of the planet's orbit?

- a) 16 AU
- b) 64 AU
- c) 256 AU
- d) 4096 AU
- e) 262144 AU

15. During which lunar phase is tidal range at its maximum?

- a) New moon
- b) First quarter
- c) Third quarter
- d) Waxing crescent

16. Given that Mercury and Venus orbit the sun in exactly circular orbits at distances of 0.35 AU and 0.72 AU respectively, which of the following is the closest estimate to the maximum angular separation visible to an observer on Venus between Mercury and the sun?

- a) 24 degrees
- b) 30 degrees
- c) 45 degrees
- d) 90 degrees

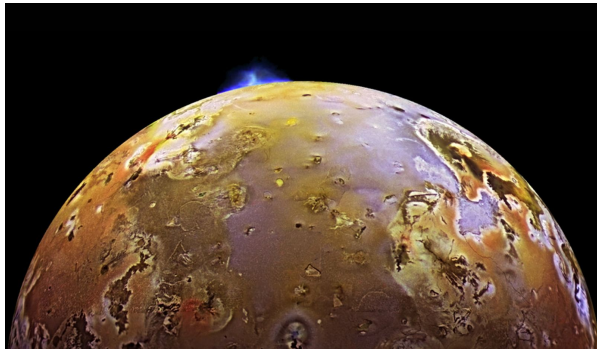
17. Suppose that in July of 2019, Mars, Earth, and the Sun align. Given an orbital period of 1.8 years, when could one expect the planets to align again?

- a) July 2020
- b) April 2021
- c) November 2021
- d) January 2022

18. Which of the following statements are likely true of short-period comets? (*)

- a) They tend to orbit near the ecliptic
- b) They tend to orbit in a clockwise direction around the sun
- c) They tend to have shorter lifespans than long-period comets
- d) Short-period comets tend to be more dense than long-period comets

Consider the image below, taken by NASA's Galileo spacecraft.



19. The image above depicts Io, one of Jupiter's moons. Which of the following hypotheses is/are likely to explain the eruption pictured? (*)

- a) Subduction followed by flux melting and eruption
- b) Orbital resonance resulting in strong tidal forces
- c) A subsurface layer of water erupting as a geyser due to steam buildup
- d) Fluctuations in atmospheric pressure resulting in flash steaming of subsurface water

20. Long, sinuous channels on Venus are likely the result of which of the following?

- a) Mafic lava flows
- b) Carbon dioxide ice "rivers"
- c) Tectonic activity