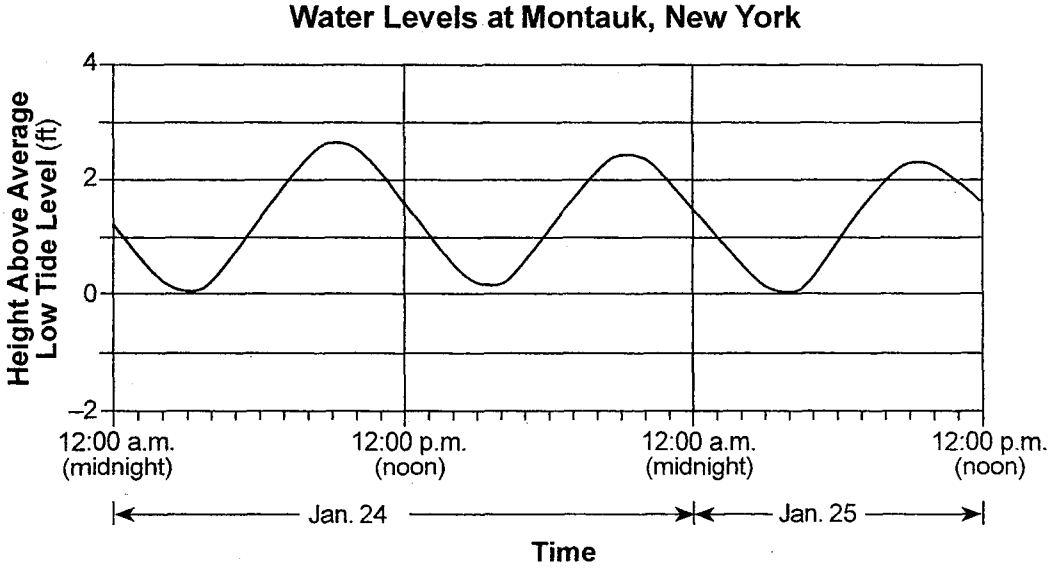
Name: _____ Teacher: _____

2018-2019 Midterm Exam Version: 4

Base your answers to questions 1 through 4 on the graph below and on your knowledge of Earth science. The graph shows the observed water levels, in feet (ft), for a tide gauge located at Montauk, New York, on the easternmost end of Long Island, from January 24, 2008 to noon on January 25, 2008.



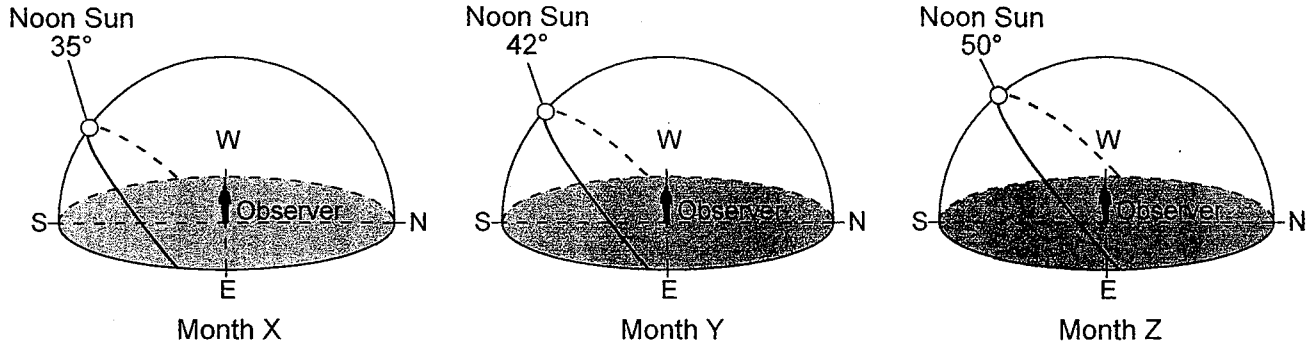
1. What was the height of the water above average low tide level at noon on January 24?
   (1) 1.2 ft
   (2) 1.6 ft
   (3) 2.2 ft
   (4) 2.6 ft

2. These changing water levels at Montauk can best be described as
   (1) cyclic and predictable
   (2) cyclic and not predictable
   (3) noncyclic and predictable
   (4) noncyclic and not predictable

3. What causes the water-level variation pattern shown by the graph?
   (1) changes in wind velocity produced by coastal storms
   (2) changes in magnetic orientation of the North American Plate
   (3) Earth's revolution and the distance from the equator
   (4) Earth's rotation and the gravitational pull of the Moon

4. What is the approximate latitude and longitude of the tide gauge?
   (1) 40°30' N 72°00' W
   (2) 40°30' N 74°00' W
   (3) 41°00' N 72°00' W
   (4) 41°00' N 74°00' W

Base your answers to questions 5 through 8 on the three Sun's path diagrams below and on your knowledge of Earth science. The diagrams represent the position of the noon Sun along its apparent daily path as seen by an observer on the first day of three consecutive months (*X*, *Y*, and *Z*). The observer was located in Utica, New York.



5. Which dates are represented by months *X*, *Y*, and *Z*?

(1) *X*-February 1, *Y*-March 1, *Z*-April 1
(2) *X*-May 1, *Y*-June 1, *Z*-July 1
(3) *X*-August 1, *Y*-September 1, *Z*-October 1
(4) *X*-November 1, *Y*-December 1, *Z*-January 1

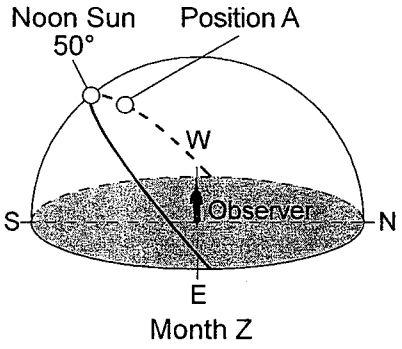
6. Which characteristic of the Sun's apparent daily path stays constant from month *X* to month *Z*?

(1) locations of sunrise and sunset
(2) altitude of the noon Sun
(3) length of time that the Sun moves along its apparent path
(4) rate of the Sun's movement along its apparent path

7. For an observer in the Southern Hemisphere at 43° S latitude, the highest altitude of the noon Sun occurs when the Sun is above the

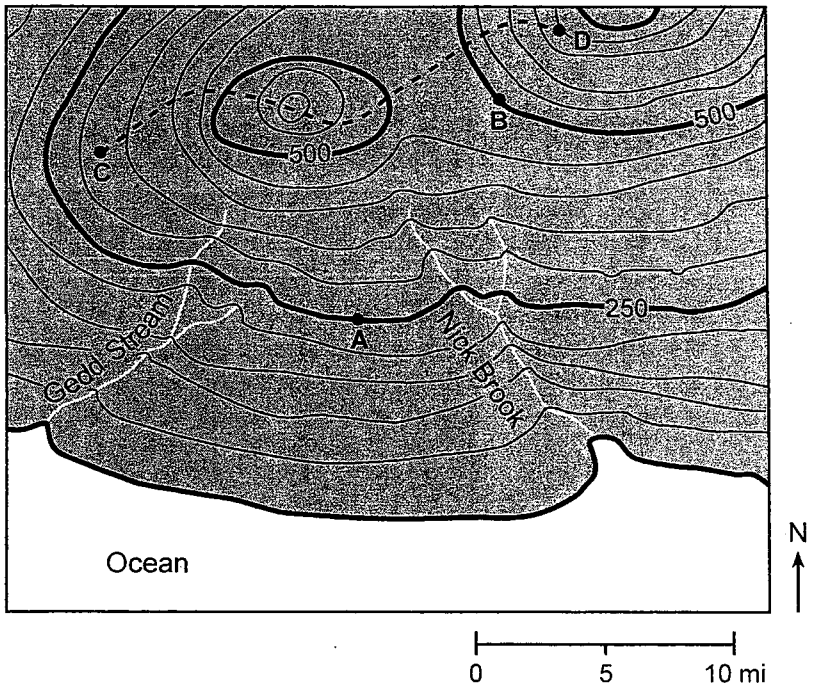
(1) eastern horizon
(2) western horizon
(3) northern horizon
(4) southern horizon

8. Position *A* represents the position of the Sun at another time of day during month *Z*. What is the time of day when the Sun is at position *A*?



(1) 1 p.m.
(2) 5 p.m.
(3) 7 a.m.
(4) 11 a.m.

Base your answers to questions 9 through 11 on the topographic map below and on your knowledge of Earth science. On the map, points *A*, *B*, *C*, and *D* represent surface locations. The dashed line between points *C* and *D* represents a hiking trail. Elevations are in feet (ft).



9.. What is the contour interval on this map?

(1) 25 ft
(2) 50 ft
(3) 150 ft
(4) 250 ft

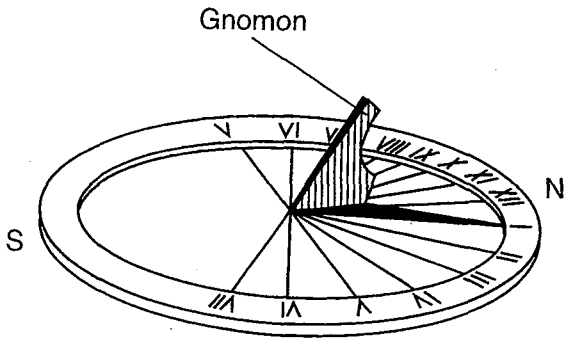
10. The gradient between location *A* and location *B* is approximately

(1) 0.04 ft/mi
(2) 25 ft/mi
(3) 40 ft/mi
(4) 50 ft/mi

11. A person walks along the trail from location *C* to location *D*. The person will be walking

(1) downhill then uphill, only
(2) downhill, then uphill, then downhill again
(3) uphill then downhill, only
(4) uphill, then downhill, then uphill again

2. The diagram below represents a sundial positioned in New York State. During daylight, the shadow cast by the gnomon (pointer) moves across the disc, with the tip of the shadow pointing to the time of day.



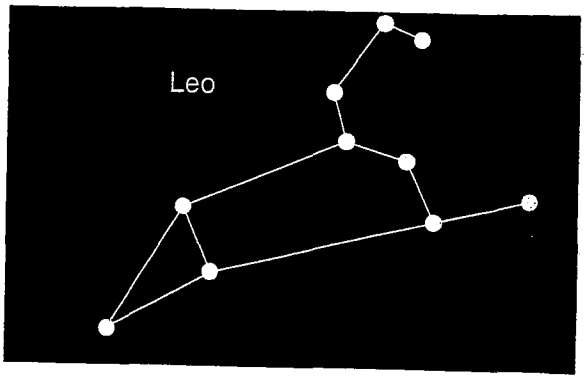
This motion of the gnomon's shadow on the sundial is mainly due to

(1) Earth's rotation
(2) Earth's revolution
(3) the Sun's rotation
(4) the Sun's revolution

3. The formation of the planet Uranus is estimated to have occurred approximately

(1) 100,000 million years ago
(2) 2.0 billion years ago
(3) 4.6 billion years ago
(4) 13.7 billion years ago

14. The diagram below represents the constellation Leo that can be seen by an observer in New York State at midnight during March.



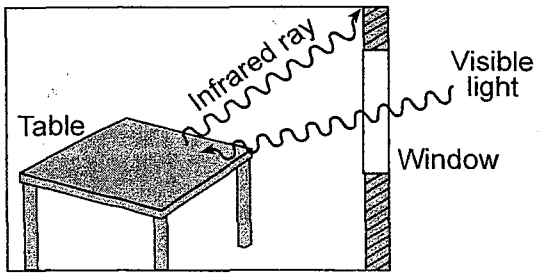
Leo is *not* visible to this observer at midnight during September because

(1) Leo has rotated on its axis
(2) Leo has revolved in its orbit around the Sun
(3) Earth has rotated on its axis
(4) Earth has revolved in its orbit around the Sun

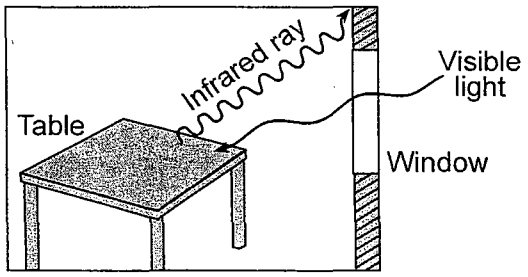
15. An observer in New York City measured the angle of insolation at solar noon each day. During which month did this observer see the noontime angle of insolation increase each day?

(1) April
(2) July
(3) September
(4) December

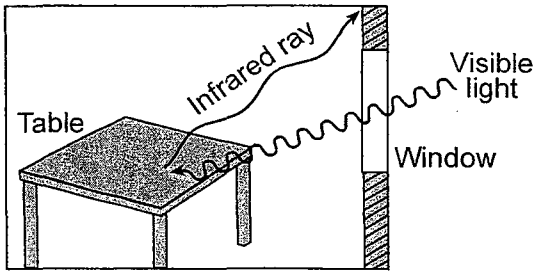
16. Which diagram below best represents both the relative wavelength of visible light entering a house through a window and the relative wavelength of infrared rays being given off by a table within the house?



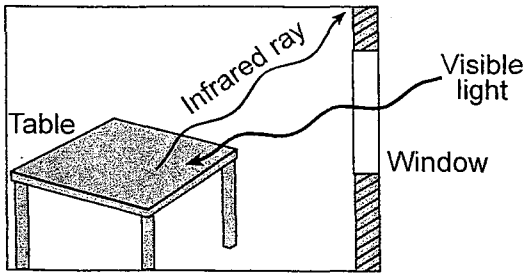
(1)



(3)



(2)



(4)

Base your answers to questions 17 through 19 on the passage below and on your knowledge of Earth science.

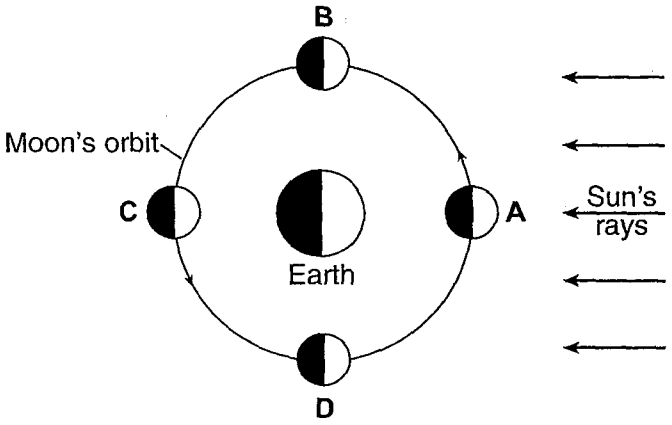
Supermoon Eclipse

On September 27, 2015, a rare total lunar eclipse of a supermoon occurred. A supermoon occurs when the entire lighted half of the Moon faces Earth (full Moon phase) and the Moon is at its closest point to Earth in its orbit. At this time, the Moon will appear 14% larger and 30% brighter than normal. Supermoon events are rare, but a total lunar eclipse during a supermoon is even more rare. There have been only six total supermoon lunar eclipses since 1900. The next one will not happen until 2033.

17. Supermoon total lunar eclipses are celestial events that

(1) are random occurrences
(2) are predictable
(3) will never happen again after 2033
(4) will happen every full Moon

18. The diagram below represents the Moon in four positions, *A* through *D*, in its orbit around Earth.



(Not drawn to scale)

At which position in its orbit was the Moon located during the 2015 supermoon total lunar eclipse?

(1) *A*
(2) *B*
(3) *C*
(4) *D*

19. The time it took for the Moon to go from this supermoon to the next full moon phase was

(1) 15 days
(2) 27.3 days
(3) 29.5 days
(4) 365 days

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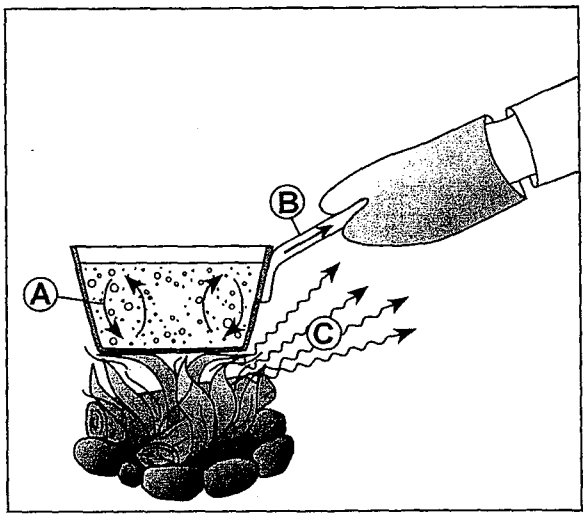
20 Arrows in the diagram below show three methods of energy transfer labeled *A*, *B*, and *C*.



Which list correctly identifies the energy transfer processes *A*, *B*, and *C*?

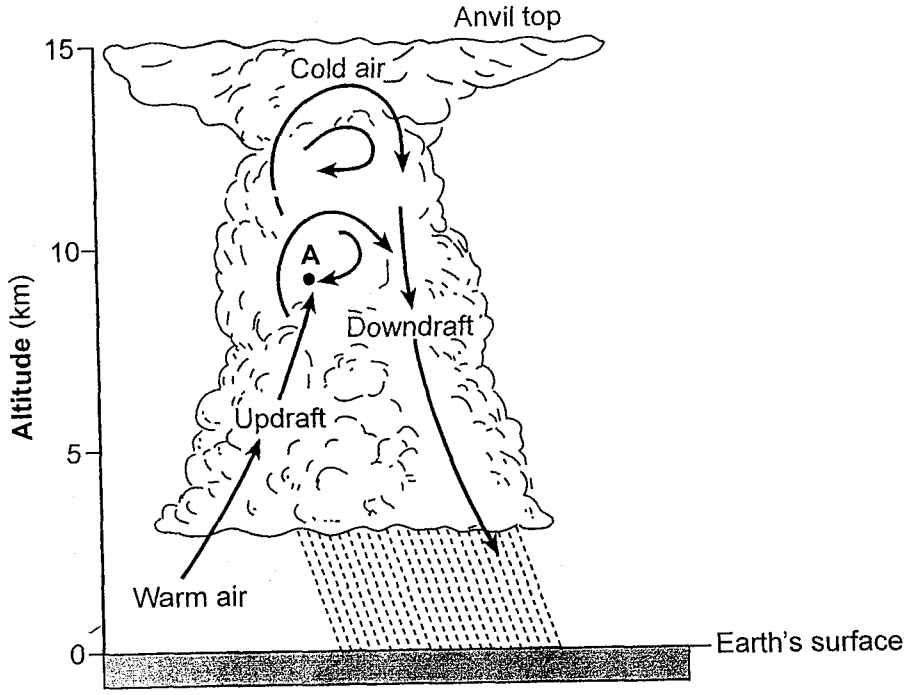
(1) *A*–conduction
B–convection
C–radiation

(2) *A*–convection
B–conduction
C–radiation

(3) *A*–convection
B–radiation
C–conduction

(4) *A*–conduction
B–radiation
C–convection

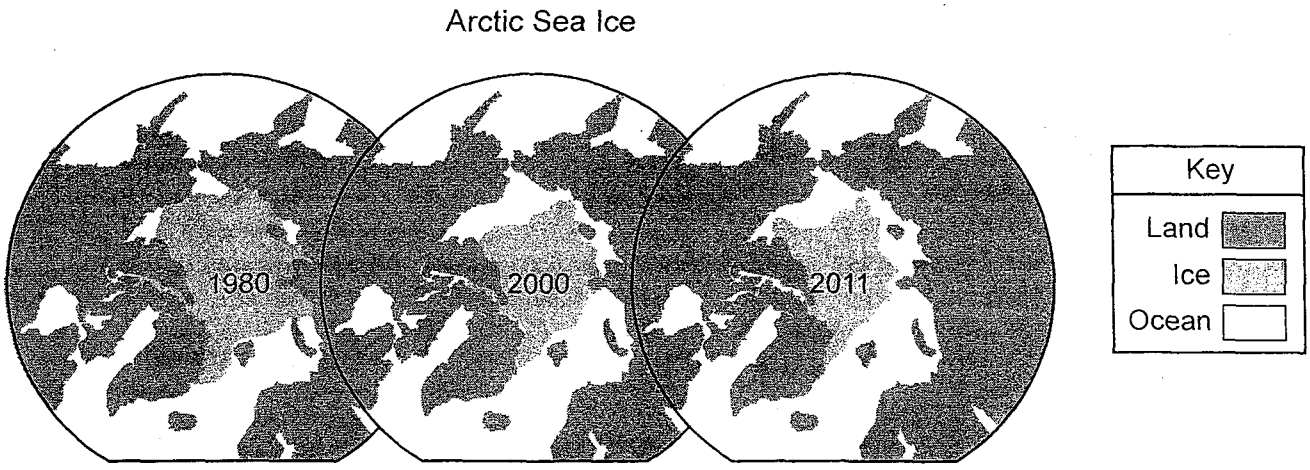
Base your answers to question 21 on the diagram below and on your knowledge of Earth science. The arrows in the diagram show air movement in a thunderstorm cloud. Point *A* represents a location in the atmosphere.



21. In which temperature zone of the atmosphere is point *A* located?

(1) thermosphere
(2) mesosphere
(3) stratosphere
(4) troposphere

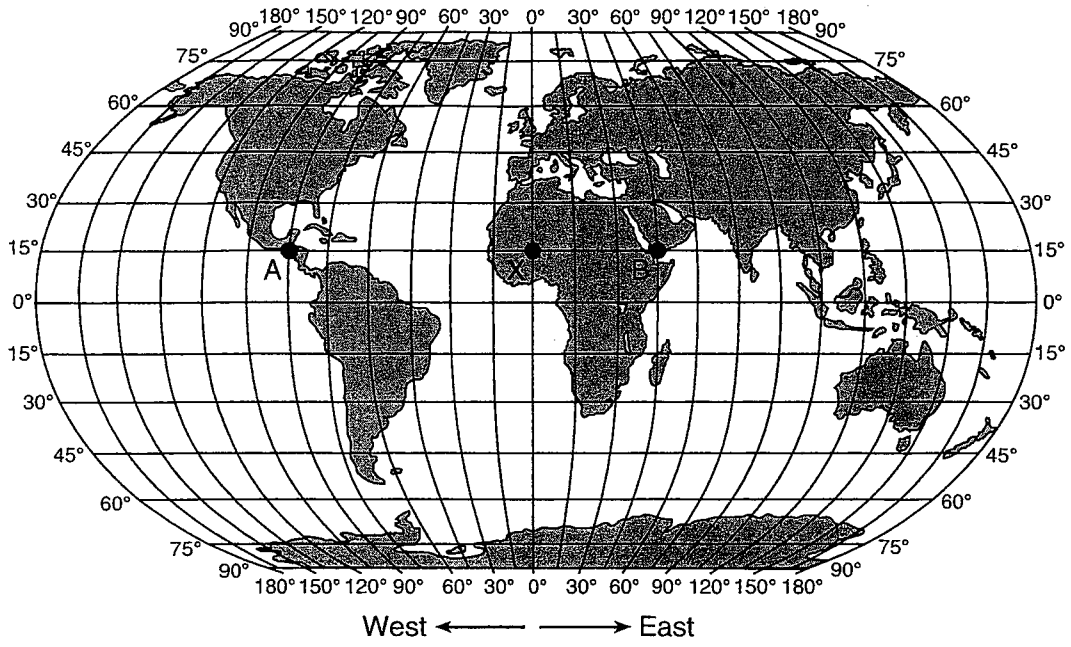
22. The north polar view maps below show the average area covered by Arctic Sea ice in September of 1980, 2000, and 2011.



The maps best support the inference that Earth's climate is

(1) cooling, because the average area covered by Arctic Sea ice is decreasing
(2) cooling, because the average area covered by Arctic Sea ice is increasing
(3) warming, because the average area covered by Arctic Sea ice is decreasing
(4) warming, because the average area covered by Arctic Sea ice is increasing

23. The map below shows three locations, labeled *A*, *X*, and *B*, on Earth's surface.



Which table correctly indicates the solar times at locations *A* and *B* when it is 12 noon at location *X*?

Location	Solar Time
A	6 a.m.
B	9 a.m.

(1)

Location	Solar Time
A	6 p.m.
B	9 a.m.

(3)

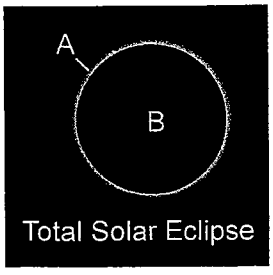
Location	Solar Time
A	6 a.m.
B	3 p.m.

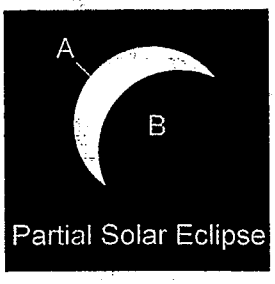
(2)

Location	Solar Time
A	6 p.m.
B	3 p.m.

(4)

24. The photographs below show two types of solar eclipses. Letters *A* and *B* represent two celestial objects.

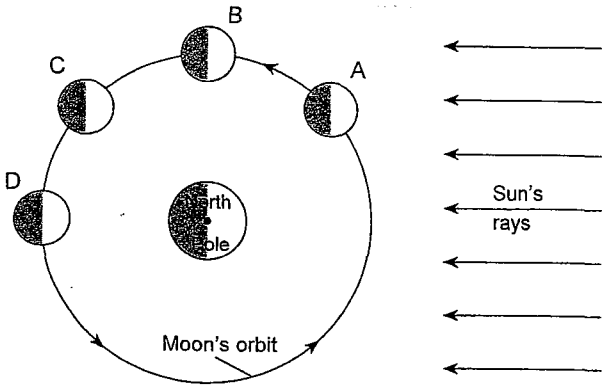




Which two celestial objects are represented by letters *A* and *B*?

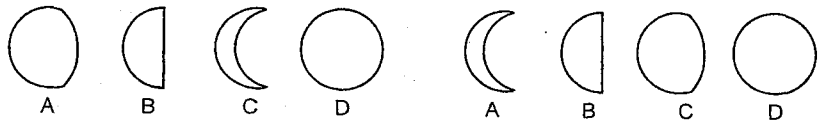
(1) *A*-Moon; *B*-Sun
(2) *A*-Moon; *B*-Earth
(3) *A*-Sun; *B*-Moon
(4) *A*-Sun; *B*-Earth

25. The diagram below represents four positions of the Moon, labeled *A* through *D*, as it orbits Earth.



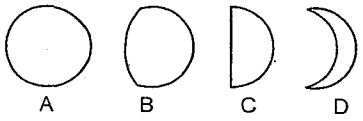
(Not drawn to scale)

Which diagram best represents the sequence of Moon phases, as seen by an observer in New York State, when the Moon travels from position *A* to position *D* in its orbit around Earth?

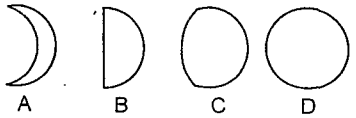


(1)

(3)

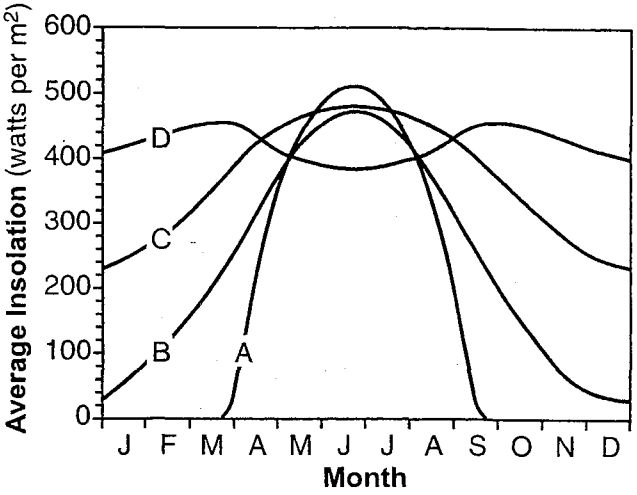


(2)



(4)

26. The graph below shows the average monthly amount of insolation received throughout a year at four locations (*A*, *B*, *C*, and *D*) on Earth.



Which line on the graph best represents the average monthly insolation received at the equator?

(1) *A*
(2) *B*
(3) *C*
(4) *D*

27. Planets that are closest to the Sun are identified as

(1) low-density Jovian
(2) low-density terrestrial
(3) high-density Jovian
(4) high-density terrestrial

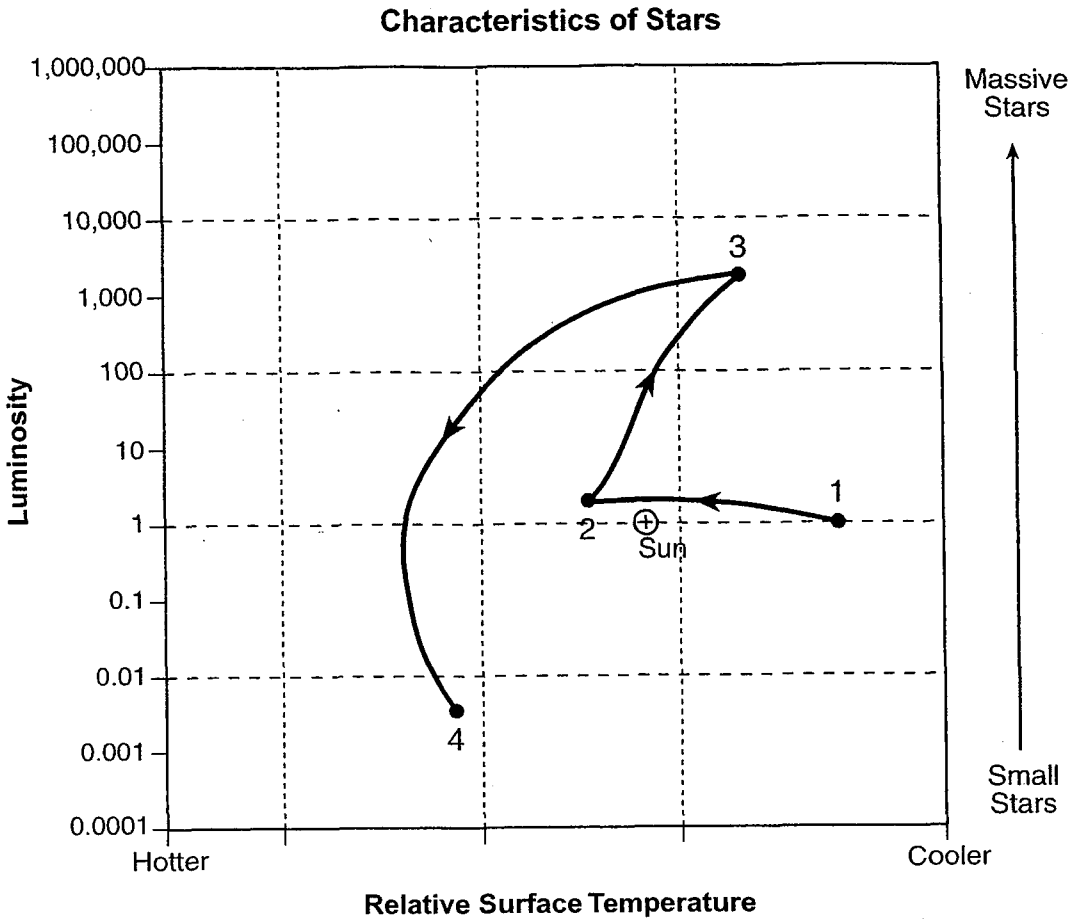
28. Which process of the water cycle occurs when water absorbs 2260 Joules of heat energy per gram?

(1) melting of ice
(2) condensation of water vapor
(3) evaporation of water
(4) freezing of water

29. The deflection of Earth's planetary winds is an example of

(1) the Coriolis effect
(2) the Doppler effect
(3) convection
(4) gravitational pull

Base your answers to questions 30 through 31 on the graph below and on your knowledge of Earth science. The graph shows the changes in a single star's luminosity and relative temperature from its formation (point 1) to its late stage (point 4) relative to the Sun.



30. Which is a possible surface temperature of this star at point 2?

(1) 3000 K
(2) 5000 K
(3) 7000 K
(4) 10,000 K

31. Which table correctly classifies this star at points 3 and 4?

Point	Classification
3	Giant
4	White Dwarf

(1)

Point	Classification
3	Supergiant
4	Main Sequence

(3)

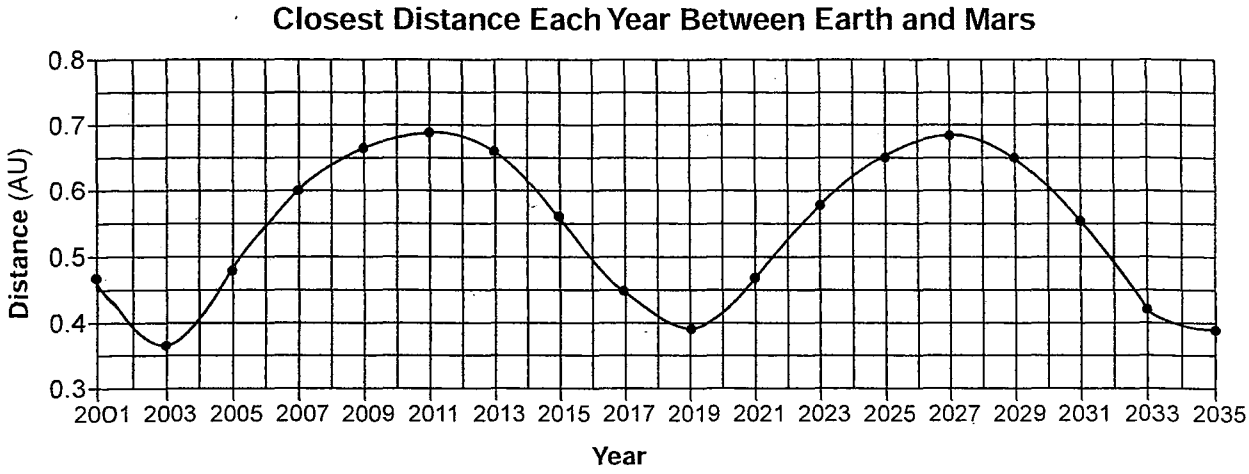
Point	Classification
3	White Dwarf
4	Supergiant

(2)

Point	Classification
3	Giant
4	Main Sequence

(4)

Base your answers to questions 32 through 34 on the graph below and on your knowledge of Earth science. The graph shows the closest distance between Earth and Mars during each year from 2001 to 2035. Distances are measured in astronomical units (AU). One AU equals the average distance from Earth to the Sun.



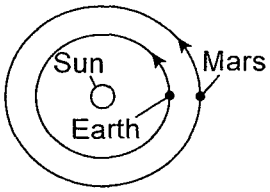
32. Mars reaches its closest distance to Earth approximately every

(1) 16 years
(2) 8 years
(3) 3 years
(4) 0.36 years

33. How many million kilometers is one astronomical unit?

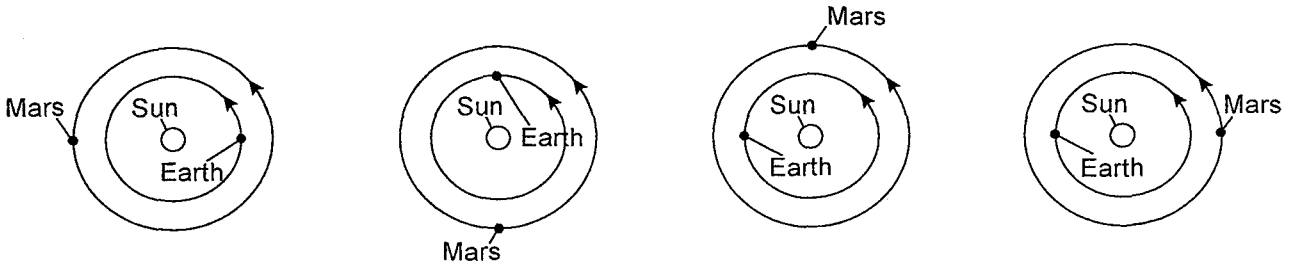
(1) 108.2 million km
(2) 149.6 million km
(3) 227.9 million km
(4) 377.5 million km

34. The diagram below represents the positions of Earth and Mars in their orbits around the Sun when they were closest in the year 2003.



(Not drawn to scale)

Which diagram represents the positions of Earth and Mars approximately one-half of an Earth year (183 days) later?



(1) (2) (3) (4)

35. The diagrams below represent spectral lines of hydrogen gas observed in a laboratory and the spectral lines of hydrogen gas observed in the light from a distant star.

Spectral Lines of Hydrogen in a Laboratory

Shorter Wavelength **Longer Wavelength**

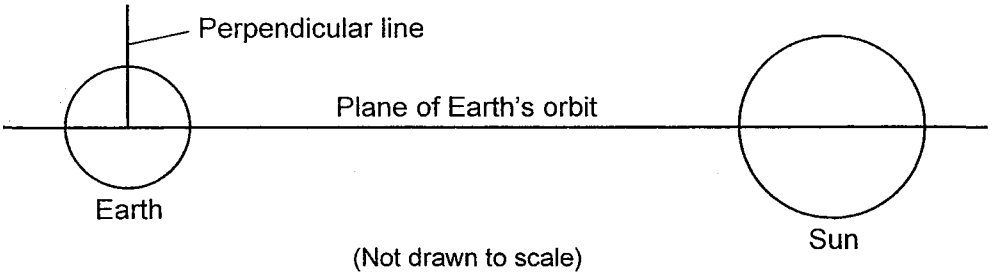
Spectral Lines of Hydrogen from a Distant Star

Shorter Wavelength **Longer Wavelength**

Compared to the spectral lines observed in the laboratory, the spectral lines observed in the light from the distant star have shifted toward the

(1) red end of the spectrum, indicating the star's movement toward Earth
(2) red end of the spectrum, indicating the star's movement away from Earth
(3) blue end of the spectrum, indicating the star's movement toward Earth
(4) blue end of the spectrum, indicating the star's movement away from Earth

36. The diagram below represents a cross-sectional view of the plane of Earth's orbit around the Sun. A line drawn perpendicular to the plane of Earth's orbit is shown on the diagram.



How many degrees is Earth's rotational axis tilted with respect to the perpendicular line shown in the diagram?

(1) 15°
(2) 23.5°
(3) 90°
(4) 180°

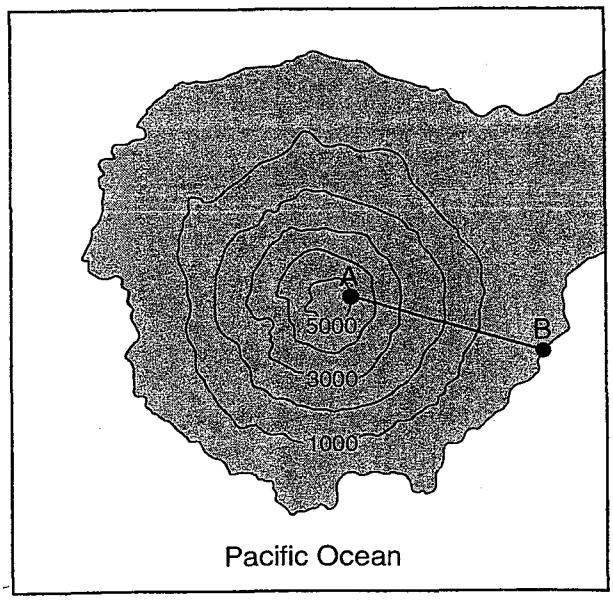
37. A mineral sample is found to have a density of 3.0 grams per cubic centimeter. It is then broken into two pieces, with one piece twice as large as the other. The smaller of the two pieces will have a density of

1) 1.0 g/cm^3
2) 3.0 g/cm^3
3) 1.5 g/cm^3
4) 6.0 g/cm^3

38. A person observes a sediment consisting of clay, sand, and pebbles and then states that this material was transported and deposited by an agent of erosion. This statement is

1) a fact
2) an observation
3) an inference
4) a measurement

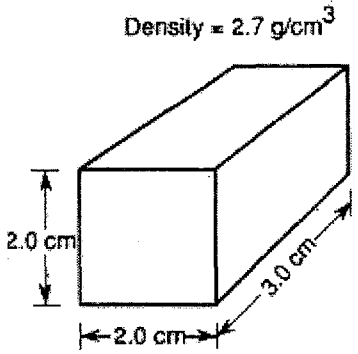
39. The topographic map below shows a portion of a volcanic island in the Pacific Ocean. Elevations are shown in feet. Letters *A* and *B* represent locations on Earth's surface. Locations *A* and *B* are 2.5 miles apart.



What is the approximate gradient from point *A* to point *B* on the island?

(1) 1000 ft/mi
(2) 1250 ft/mi
(3) 2000 ft/mi
(4) 2500 ft/mi

40. Base your answer to the following question on the diagram below, which represents a solid material of uniform composition.



If this material is cooled and contracts, the density of the material will

1) increase
2) remain the same
3) decrease

41. Ocean tides are best described as

1) predictable and cyclic
2) unpredictable and noncyclic
3) predictable and noncyclic
4) unpredictable and cyclic

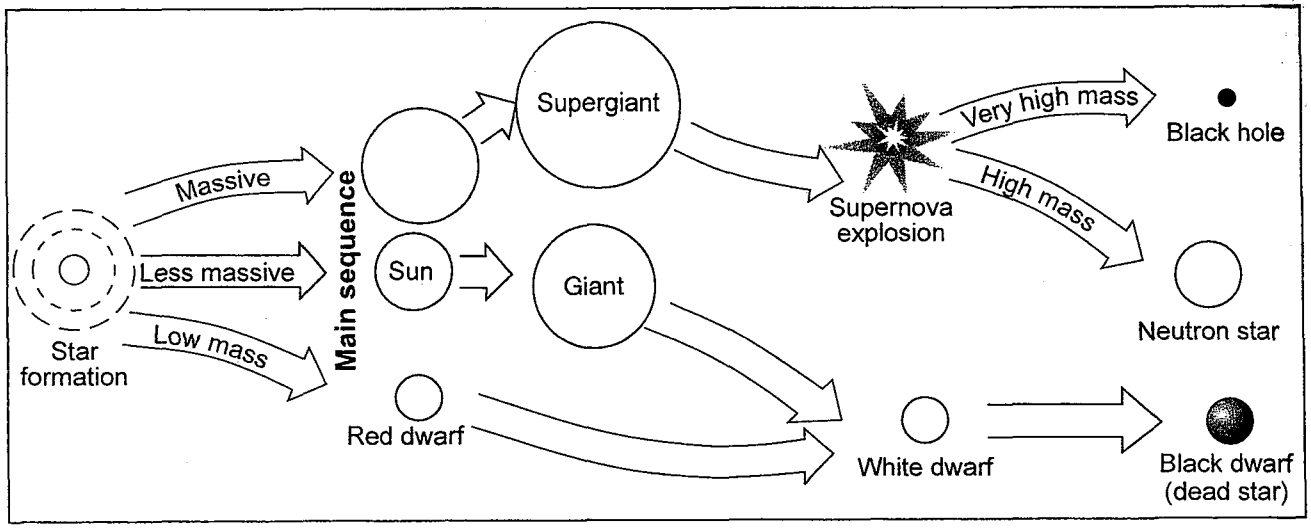
42. In addition to carbon dioxide, two other major greenhouse gases in Earth's atmosphere are

(1) oxygen and nitrogen
(2) oxygen and methane
(3) water vapor and nitrogen
(4) water vapor and methane

43. Equal areas of which surface would absorb the greatest amount of insolation on a sunny day?

(1) light-colored, smooth surface
(2) light-colored, rough surface
(3) dark-colored, smooth surface
(4) dark-colored, rough surface

Base your answers to questions 44 through 46 on the diagram below and on your knowledge of Earth science. The diagram represents some of the inferred stages in the life cycle of stars according to their original mass.



(Not drawn to scale)

44. The final stage in the life cycle of the most massive stars is a

(1) black hole
(2) black dwarf
(3) supergiant
(4) white dwarf

45. Which star may once have been similar to our Sun in mass and luminosity?

(1) *Deneb*
(2) *Spica*
(3) *Procyon B*
(4) *Proxima Centauri*

46. Energy is produced in the cores of main sequence stars when

(1) lighter elements undergo fusion into heavier elements
(2) heavier elements undergo fusion into lighter elements
(3) cosmic background radiation is absorbed
(4) cosmic background radiation is released

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47. Which table correctly shows the interior temperature, melting point, and state (phase) of matter of the materials located 4000 kilometers below Earth's surface?

Interior Temperature (°C)	Melting Point (°C)	State of Matter
5700	5400	solid

(1)

Interior Temperature (°C)	Melting Point (°C)	State of Matter
5400	5700	solid

(3)

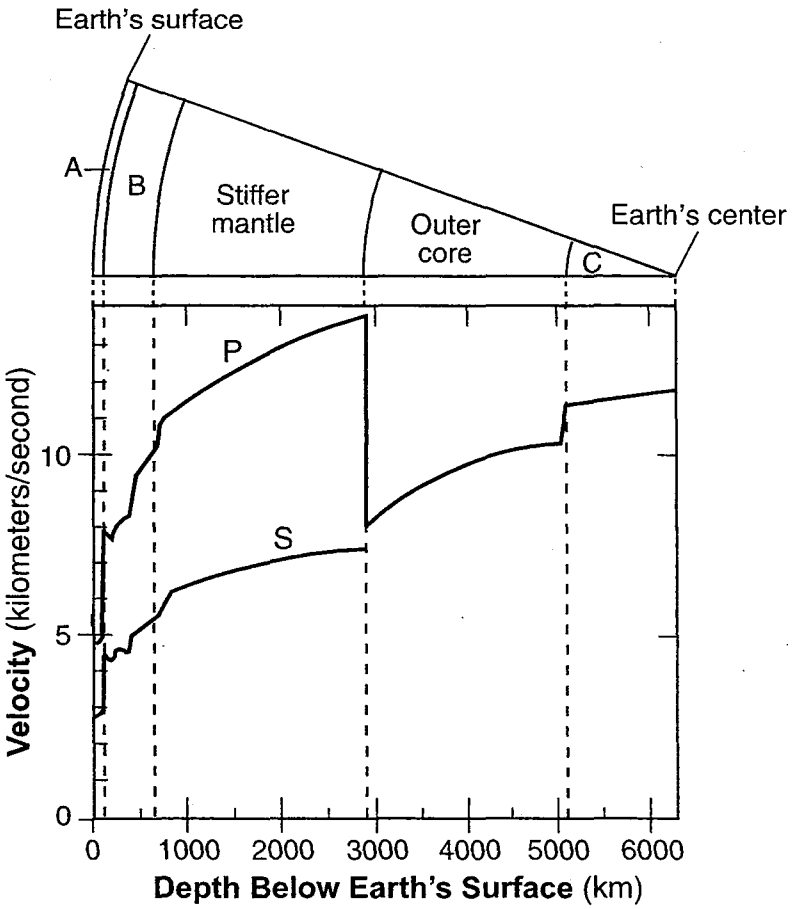
Interior Temperature (°C)	Melting Point (°C)	State of Matter
5700	5400	liquid

(2)

Interior Temperature (°C)	Melting Point (°C)	State of Matter
5400	5700	liquid

(4)

Base your answers to questions 48 through 50 on the diagram and graph below and on your knowledge of Earth science. The diagram represents a portion of Earth's interior. Letters *A*, *B*, and *C* represent interior layers. The graph shows the velocity of *P*-waves and *S*-waves at various depths in Earth's interior.



48. Which layers of Earth's interior are represented by letters *A* and *B*?

(1) *A* is the crust and *B* is the rigid mantle.
(2) *A* is the lithosphere and *B* is the asthenosphere.
(3) *A* is the asthenosphere and *B* is the crust.
(4) *A* is the rigid mantle and *B* is the lithosphere.

49. What is the approximate velocity in kilometers/second of the *P*-waves at a depth of 1000 kilometers?

(1) 6.2 km/s
(2) 7.2 km/s
(3) 11.3 km/s
(4) 13.8 km/s

50. Some locations within layer *C* have an inferred density of

(1) 3.4 g/cm^3
(2) 5.6 g/cm^3
(3) 11.5 g/cm^3
(4) 12.9 g/cm^3