

ES Jan Exam 2015 **TAN EXAM**

Please PRINT your name, school, area, and which test you are taking onto the scan-tron.

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice. Reference tables are located at the end of the test. A ruler is also on the reference sheets.

1. Which of the following is an important rock-forming mineral?

- A) pyrite B) galena C) quartz D) magnetite

2. The diagrams to the side represent fractured samples of four minerals.

Which mineral property is illustrated by these diagrams?

- A) hardness B) streak C) cleavage D) density



3. The most abundant element found in rocks and minerals on the earth's surface is

- A) silicon B) iron C) magnesium D) oxygen

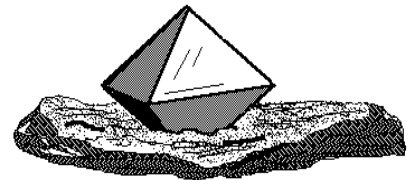


4. The softest mineral in Moh's scale of hardness is

- A) muscovite B) talc C) gypsum D) fluorite

5. The crystal of magnetite, shown right side, is an octahedron, having eight sides. The distances between points top and bottom, left and right, and front and back are equal. Magnetite crystals are in the

- A) isometric system B) tetragonal system
C) orthorhombic system D) monoclinic system



6. The three major groups of rocks are:

- A) igneous, sedimentary and plutonic B) sialic, basic and mafic
C) igneous, sedimentary and metamorphic D) plutonic, intrusive, and extrusive

7. Clay sediments when lithified become

- A) marble B) limestone C) slate D) shale

8. When subjected to heat and pressure by deep burial, limestone becomes

- A) marble B) phyllite C) schist D) gneiss

9. The portion of the earth which geologists believe is composed of iron and nickel is the

- A) crust B) mantle C) core D) lithosphere

10. The division of the Earth's interior into crust and mantle is based primarily on the study of

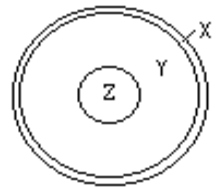
- A) radioactive dating B) seismic waves C) volcanic eruptions D) gravity measurements

11. The portion of the earth labeled Y in the diagram to the right is the

- A) crust B) mantle C) core D) lithosphere

12. Use the same diagram. The portion of the earth labeled Z in the diagram is the

- A) crust B) mantle C) core D) asthenosphere



13. For any earthquake, there is a shadow zone where no p or s waves are detected. The portion of the solid earth through which the s waves cannot pass and which refracts the p waves away from the shadow zone is the

- A) crust B) mantle C) inner core D) outer core

14. The Earth's internal heat is the primary source of energy that

- A) warms the lower troposphere B) melts glacial ice at lower altitudes
C) moves the lithospheric plates D) pollutes deep groundwater with radioactivity

15. The feature produced when two crustal plates carrying continents on the converging edges collide is a

- A) mountain range B) trench C) mid-oceanic ridge D) island arc

16. Crustal plates separate and new crust is produced at
 A) continental mountain ranges B) oceanic trenches C) mid-oceanic ridges D) island arcs

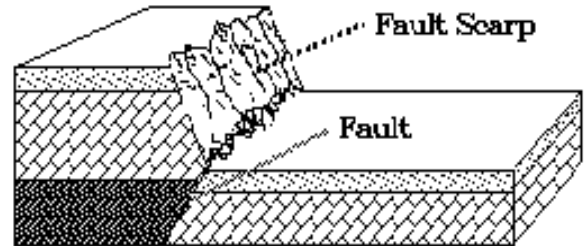
17. Tectonic plates are diverging at the
 A) Marianna Trench B) San Andreas Fault C) Mid Atlantic Ridge D) Aleutian Island Arc

18. The magnitude of an earthquake is often measured on the Richter Scale. An earthquake having a magnitude of 7.6 produces more ground motion than one with a magnitude of 6.6 by a factor of

A) 1 B) 10 C) 100 D) 1000

19. The fault shown in the diagram to the right is a

A) normal fault B) reverse fault
 C) thrust fault D) strike-slip fault



20. Use the same diagram from #19. The fault in the diagram was caused by

A) compression forces (pushing the two blocks together)
 B) tension forces (pulling the two blocks apart)
 C) horizontal shearing forces (sliding the blocks horizontally)

21. A seismograph in Denver records the arrival of earthquake tremors. The p-wave arrives at 08:27:11. The s-wave is recorded at 08:34:41. The seismologists checks the tables and concludes that the distance to the earthquake is (tables in reference section end of test)

A) 6.0 km B) 6,000 km C) 8.5 km D) 8,500 km

22. The data table below shows the origin and depths of all large-magnitude earthquakes over a 20 year period. According to these data most of these earthquakes occurred within the Earth's

Depth Below Surface in Km	Number of Earthquakes
0-33	27788
34-100	17585
101-300	7329
301-700	3167

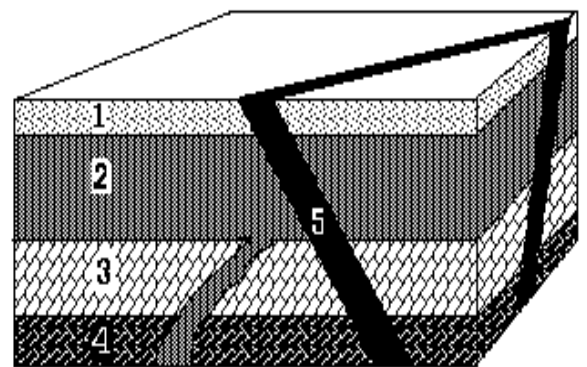
A) Lithosphere B) Asthenosphere
 C) stiffer mantle D) outer core

23. The Sourland Mts. near Princeton and Trenton are made of diabase, a dark colored medium grained rock. They were formed by the

A) extrusion of lava B) intrusion of lava C) extrusion of magma D) intrusion of magma

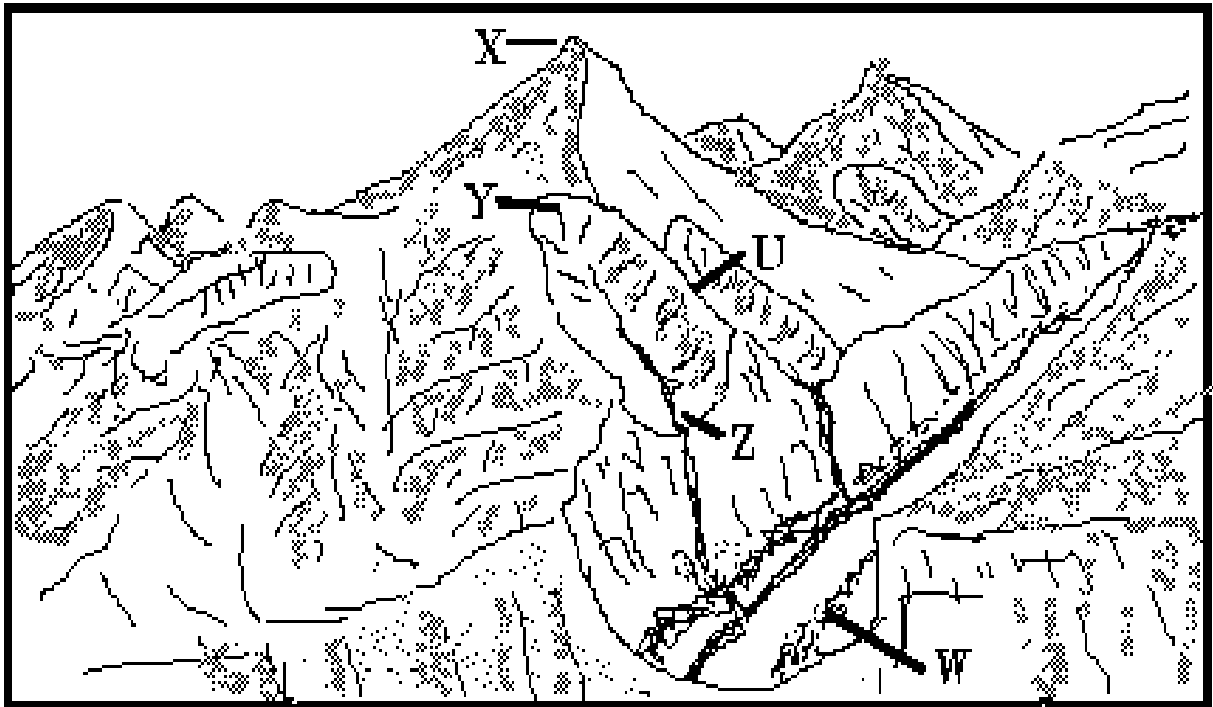
24. A sheet of rock which forms when intrusive magma cuts across the bedding of existing (country) rock (5 in the right diagram) is a

A) dike B) sill C) laccolith D) neck



25. Shield volcanoes, such as those of the Hawaiian Islands, produce a free flowing fluid type of lava. The rock that results is

A) andesite B) basalt C) rhyolite D) dacite



The diagram above shows a number of features carved out of the rock by alpine glaciers. Use the diagram with questions # 26 and 27.

26. In the diagram above which letter represents the horn?
 A) W B) X C) Y D) Z

27. The erosion of rock at the head of a mountain glacier carves out a bowl shaped depression (letter W in the above diagram) known as
 A) a U-shaped valley B) a hanging valley C) a cirque D) a tureen

28. The Grand Teton Mts. in Wyoming, like the Alps in Switzerland were shaped by mountain glaciers. Peaks formed by the head ward erosion of three or more glaciers are
 A) arêtes B) horns C) cols D) tarns

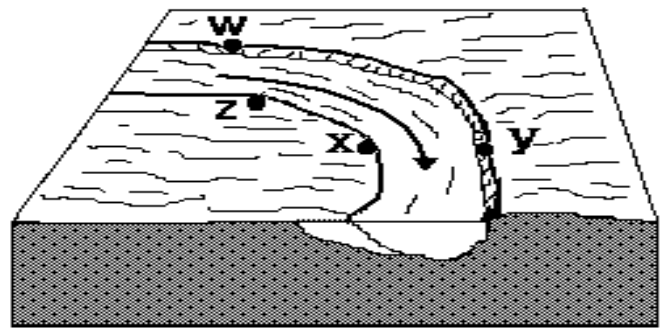
29. Which statement (s) is(are) always true about deserts?
 I. Deserts are hot II. Deserts are hot and have small amounts of precipitation
 III. Deserts have small amounts of precipitation.
 A) I only B) II only C) III only D) None of these.

30. A large part of the salt in the oceans probably was carried there by rivers. The salt was in the rivers'
 A) salted load B) bed load C) suspended load D) dissolved load

31. In New Jersey, a good example of an estuary is
 A) Delaware Bay B) Lake Hopatcong C) Barnegat Bay D) Little Egg Harbor

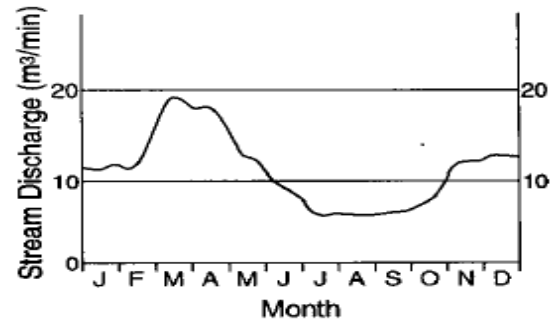
32. You would reasonably expect to find meandering rivers and streams in New Jersey, mostly in which geological area of the state?
 A) the Valley and Ridge B) the Piedmont C) the Highlands D) the Coastal Plain

33. The arrow in the diagram to the right shows the direction that water is flowing in a stream. Which part of the stream has the greatest amount of erosion?



- A) w B) x C) y D) z

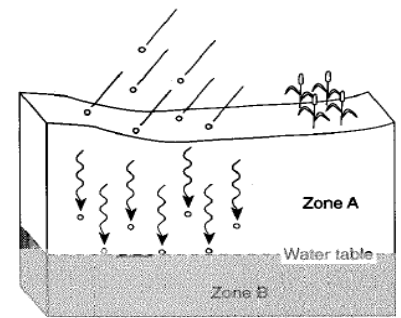
34. The graph, right side, shows the discharge rate of a river over one year. During which time span did a water deficit exist in the water budget for the surrounding area?



- A) January and February
 B) May and June
 C) August and September
 D) Nov and Dec.

35. Geologists call water which is located below the surface of the earth,
 A) fluvial water B) ground water C) saline water D) subsurface water

36. The surface level of a natural lake during periods of normal rainfall is
 A) usually below the water table B) usually above the water table
 C) usually at the water table D) not related to the water table



37. The diagram to the right is a cross-sectional view of rain falling on a farm field then moving into the water table. Which word best describes the movement of the rainwater through zone A?
 A) runoff B) saturation
 C) infiltration D) precipitation

38. The islands which are parallel to the eastern coast of the United States and which extend from New York to Mexico are called
 A) sand dunes B) barrier islands C) long shore bars D) sand spits

The map to the right shows Island Beach at Barnegat Bay and the direction of the prevailing winds.
 Use the map with questions #39, 40, 41

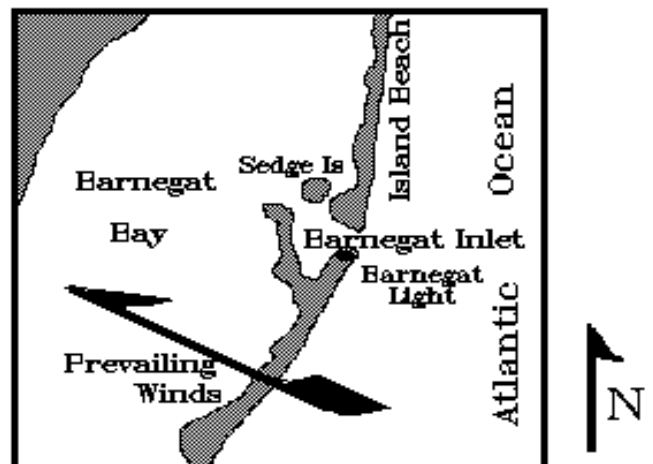
39. The prevailing onshore winds at Barnegat Bay are from the

- A) south B) southeast
 C) north D) northwest

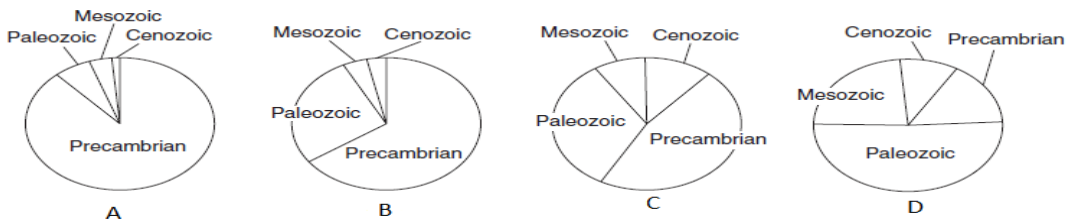
40. The dunes on Island Beach will migrate toward the
 A) north B) northwest
 C) south D) southeast

41. Island Beach at Barnegat Bay is vulnerable to hurricanes because

- A) the storm surge is often higher than the islands
 B) they are always on the side of the storm which has the highest wind speed
 C) hurricanes usually hit the island during high tides
 D) all of the above



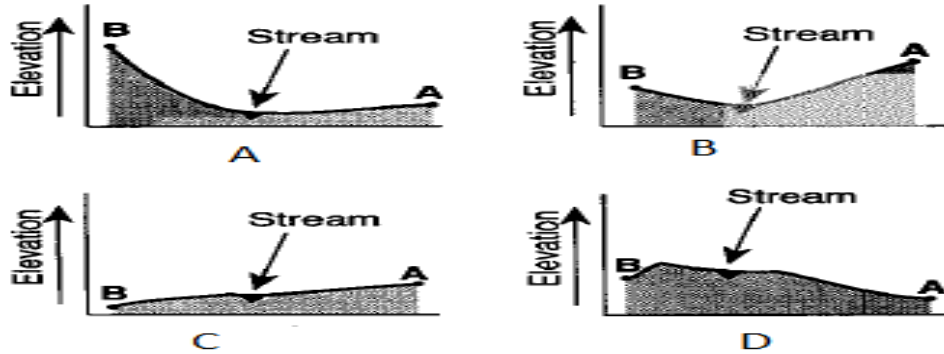
42. Heat from the sun combines with cooling at night to cause large, often curved, pieces of rock to separate and fall away from exposed masses of the rock. The process is known as
 A) exfoliation which is a physical process
 B) foliation which is a physical process
 C) exfoliation which is a chemical process
 D) foliation which is a chemical process
43. Which process requires water to gain heat energy from the environment?
 A) evaporation B) condensation C) infiltration D) precipitation
44. Friction occurring at an interface always produces a
 I. transformation of energy II. form of pollution III. chemical change IV. phase change
 A) I and II B) III and IV C) I only D) III only
45. Which graph best represents the relative length of time of the major intervals of Earth's geologic history?



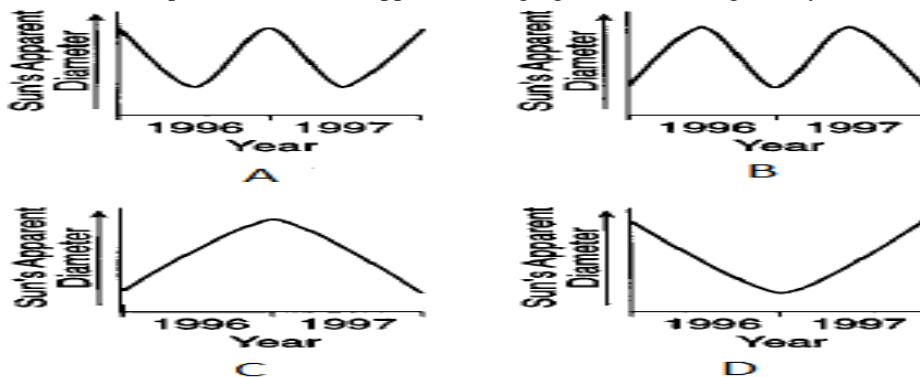
46. The Watching Mts. in Northern New Jersey and Sourland Mts. in Central New Jersey were formed during the time when dinosaurs roamed the state. The Era was the
 A) pre-Cambrian B) Cenozoic C) Mesozoic D) Paleozoic
47. Fossilized tracks have been found of dinosaurs that roamed over what is now New Jersey about
 A) 1 million years ago B) 67 million years ago C) 208 million years ago D) 580 million years ago
48. Uranium has a radioactive half-life of about 4.5 billion years. The earth is estimated to be about 4.5 billion years old. The oldest rocks found on earth would have a ratio of uranium atoms to lead atoms of
 A) less than 1:8 B) about 1:4 C) about 1:2 D) more than 1:1
- Use the contour map below for questions # 49 through 52. Elevations on the map are measured in feet. The maximum elevation of Basket Dome is listed at point X. On the map are locations of A, B, C, D, X, and Y.



49. In what general direction does Tenaya Stream flow?
 A) southwest to northeast B) northeast to southwest C) northwest to southeast D) southeast to northwest
50. Which lettered choice represents the highest elevation on the map?
 A) X B) Y C) C D) D
51. The highest elevation of Basket Dome 40 years ago was measured at 7600 ft. What is the rate of change in elevation for this area in inches/year?
 A) 0.6 inches/year B) 1.7 inches/year C) 24 inches/year D) 40 inches/year
52. Which graph below represents the profile between points B and point A?



53. What is the shortest distance between any two points on the surface of the Earth called?
 A) the equator B) longitude C) latitude D) a great circle
54. How are longitude and latitude lines shown on a globe of the earth?
 A) Longitude lines are in parallel planes and latitude lines meet at the equator.
 B) Latitude lines are in parallel planes and longitude lines meet at the equator.
 C) Longitude lines are in parallel planes and latitude lines meet at the poles.
 D) Latitude lines are in parallel planes and longitude lines meet at the poles
55. The time is 03:42 p.m. Eastern Standard Time. Greenwich Mean Time (GMT) uses a twenty-four hour clock. Therefore, GMT is
 A) 0342 hours B) 1042 hours C) 1542 hours D) 2042 hours
56. Energy from our Sun reaches the Earth mainly by
 A) red shifts B) density currents C) conduction D) electromagnetic waves
57. An observe on Earth measured the apparent diameter of the Sun over a 2 year time period. Which graph below best represents the Sun's apparent changing diameter during the 2 years?



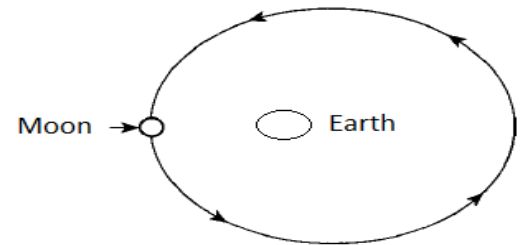
58. Sunspots and flares on the surface of the sun are produced by
A) explosions in the core B) convection currents
C) the sun's magnetic field D) explosions in the chromosphere

59. The number of lunar months in a year is closest to
A) 10 B) 11 C) 13 D) 14

60. About 150 BC the Greek astronomer, Hipparchus, during a lunar eclipse, matched the curve of a coin's edge to the shadow of the earth on the surface of the moon. He knew the diameter of the coin and the distance from his eye to the coin. He also knew the diameter of the earth's shadow. From these measurements he could deduce
A) the diameter of the moon B) the distance to the moon
C) the diameter of the sun D) the distance to the sun

61. An eclipse of the sun can occur only when the moon is
A) full B) crescent C) gibbous D) new

62. This diagram represents the moon revolving around the Earth in an elliptical orbit. As the Moon makes one complete revolution around the Earth starting at the position shown, how will the gravitational attraction between the Moon and Earth vary?
A) decrease, then increase B) increase, then decrease
C) remain the same D) steadily decrease



63. A major difference between the Earth and Venus is that Venus
A) is much smaller B) is much larger
C) has a much higher temperature D) is not made up of rock

64. The celestial equator is a projection into space of
A) the earth's equator B) the earth's orbit C) the sun's equator D) the sun's apparent path.

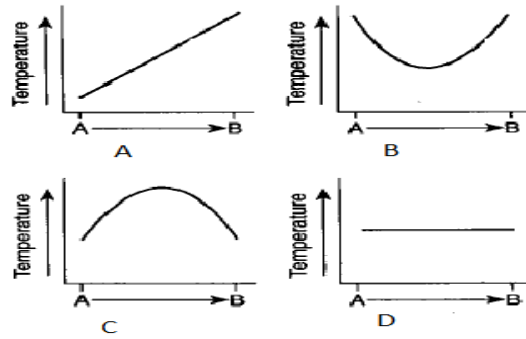
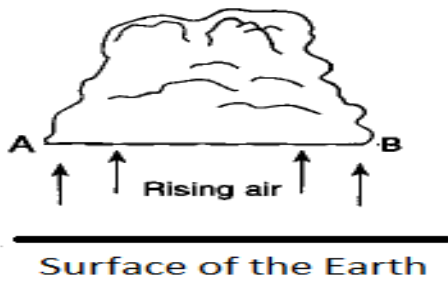
65. Which motion causes some constellations to be visible in New Jersey during the summer nights and other constellations to be visible only during winter nights?
A) stars in constellations revolve around the Earth B) stars in constellations revolve around the Sun
C) The Earth revolves around the Sun D) The Earth rotates on its axis.

66. Galaxies, like our Milky Way, are made of
A) hundreds of stars B) thousands of stars C) millions of stars D) billions of stars

67. Observing a galaxy 8 billion light years away is the same as
A) looking back 8 billion years in time B) looking forward 8 billion years in time
C) looking at the creation of the universe D) looking at the present state of the galaxy.

68. Which statement best explains why water in a beaker or glass becomes colder when ice cubes are added?
A) The water changes into ice B) Heat flows from the water into the ice cubes
C) Water is less dense D) Heat flows from the ice cubes into the water.

69. The diagram below shows a cross section of a cumulus cloud with the base indicated by line AB. Which graph below best represents the temperature measured along line AB? Line AB represents the base of the cloud.



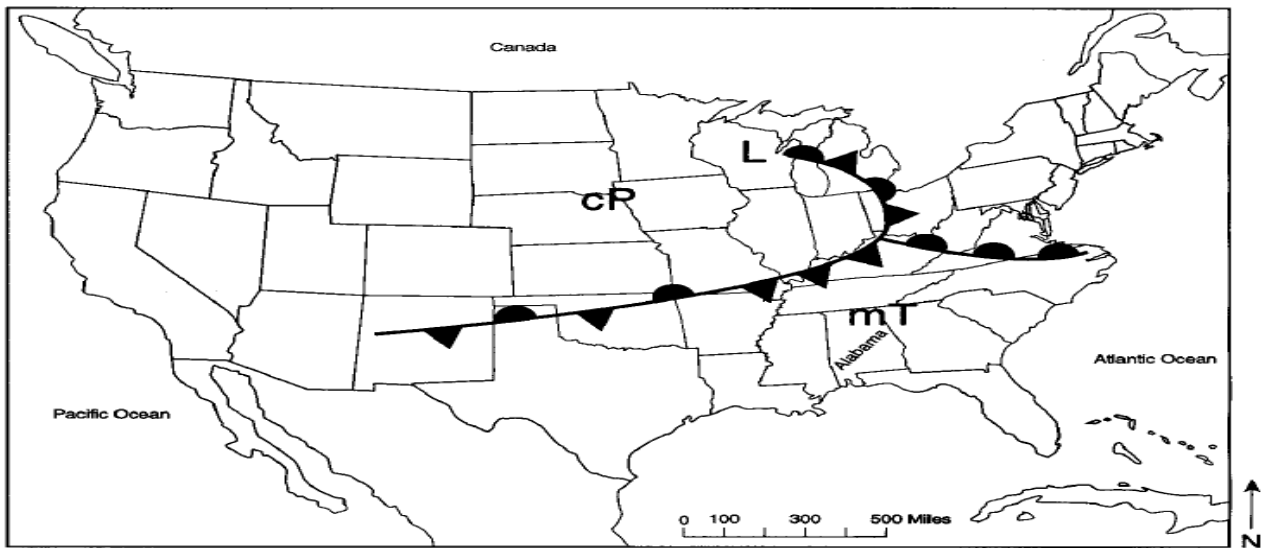
Use the weather map below for questions #70, 71, 72.

70. What is the total number of different types of weather fronts shown on this weather map?

- A) 2 B) 3 C) 4 D) 5

71. Which statement best describes the air mass over Alabama?

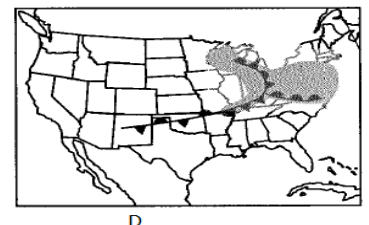
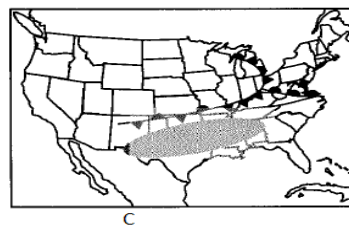
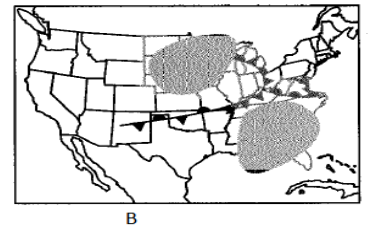
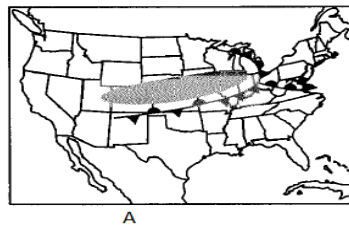
- A) Warmer and more humid B) Warmer and drier C) colder and more humid D) colder and drier



72. Use the 4 maps on the lower right.

Which map shows the most probable region of precipitation?

The shaded areas represents precipitation.



The shaded area on each map represents precipitation.

NEW JERSEY SCIENCE LEAGUE
EARTH SCIENCE EXAM ANSWER KEY TAN TEST

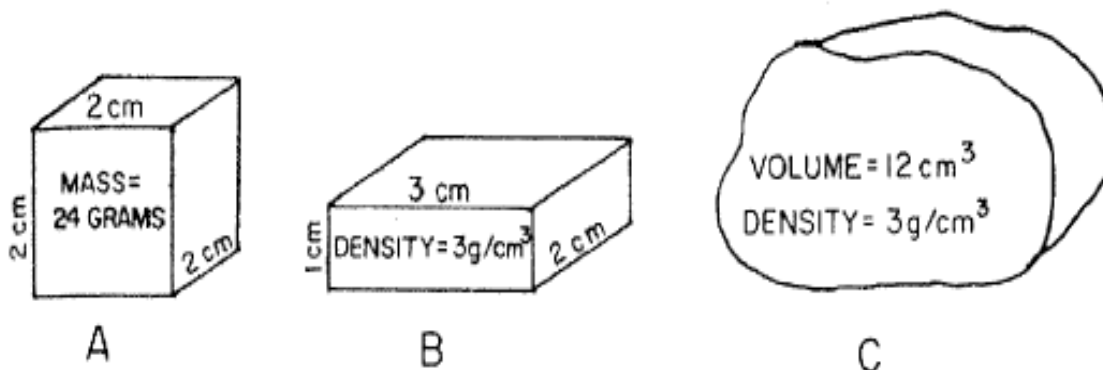
DATE: January 15, 2015

1	C	19	B	37	C	55	D
2	C	20	A	38	B	56	D
3	D	21	B	39	B	57	A
4	B	22	A	40	B	58	C
5	A	23	D	41	A	59	C
6	C	24	A	42	A	60	B
7	D	25	B	43	A	61	D
8	A	26	B	44	C	62	A
9	C	27	C	45	A	63	C
10	B	28	B	46	C	64	A
11	B	29	C	47	C	65	C
12	C	30	D	48	D	66	D
13	D	31	A	49	B	67	A
14	C	32	D	50	C	68	B
15	A	33	C	51	A	69	D
16	C	34	C	52	A	70	C
17	C	35	B	53	D	71	A
18	B	36	C	54	D	72	D

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The diagrams below represent three samples of the same substance. Each has a different size and shape. Use the diagrams for questions 1, 2, 3, 4, 5.



1. What order of letters ranks the substance by volume from the smallest to the largest?

- A) C, A, B B) B, A, C C) A, B, C D) B, C, A

2. What is the density of sample A?

- A) 0.00 g/cm³ B) 3.0 g/cm³ C) 2.0 g/cm³ D) 4.0 g/cm³

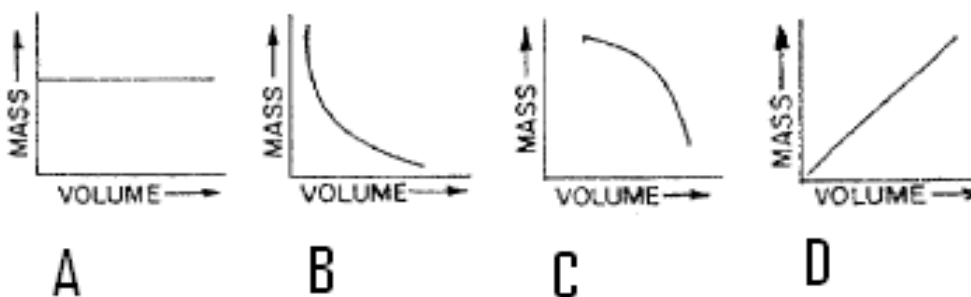
3. What is the mass of sample B?

- A) 2 g B) 4 g C) 6 g D) 18 g

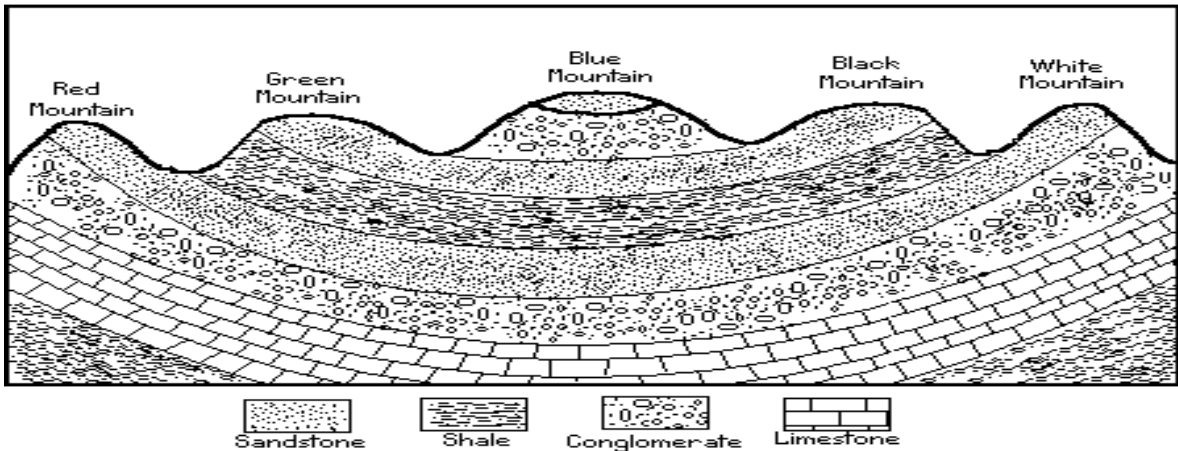
4. If sample C were compressed, then what would happen to the volume and density?

- A) The volume and density would both decrease
 B) The volume and density would both increase
 C) The volume would decrease while the density would increase
 D) The volume would increase while the density would decrease.

5. Which graph best represents the relationship between the volume and mass of the substance?

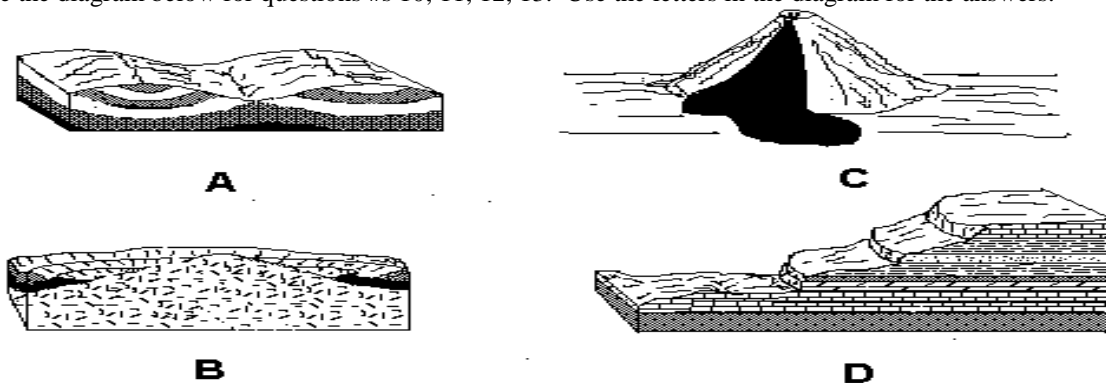


The diagram below is a cross section of the earth's upper crust. Use it with questions 6, 7, 8, 9



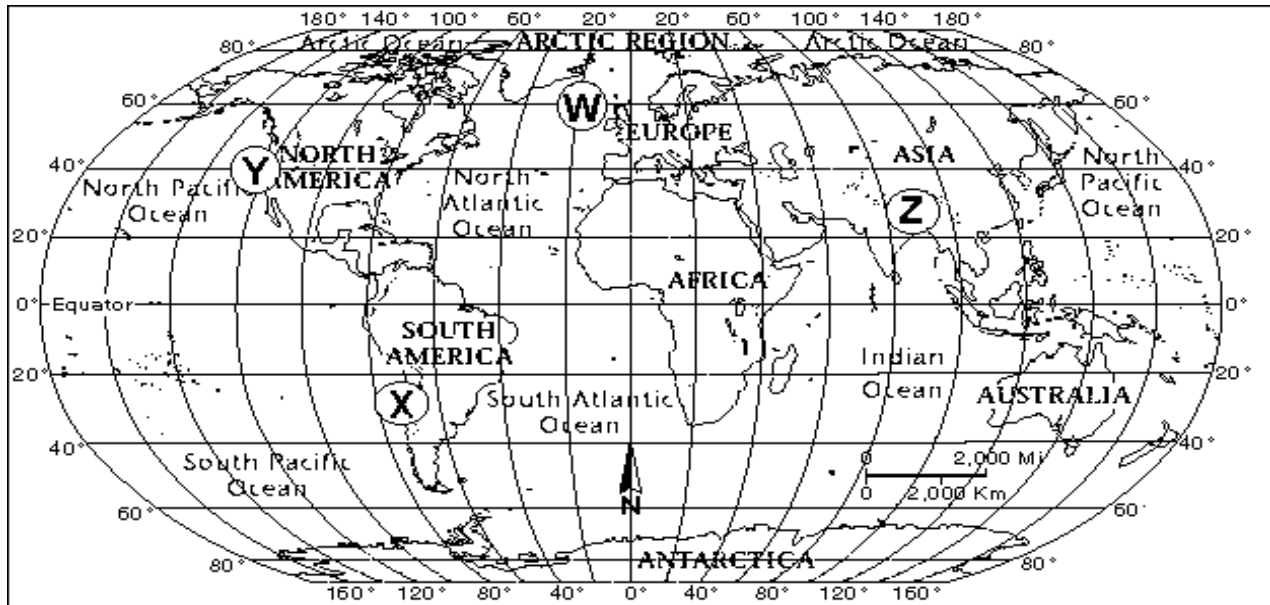
6. The top of which mountain is composed of the youngest rock?
A) Red Mt. B) Green Mt. C) Blue Mt. D) Black Mt.
7. What type(s) of bedrock can be found in this area?
A) igneous, only C) igneous and sedimentary, only
B) sedimentary, only D) sedimentary and metamorphic, only
8. The two conglomerate layers represented in the diagram have the same texture, but only the lower of the two layers contains pebbles of quartzite. This leads to the inference that these two rock layers probably were
A) affected by contact metamorphism
B) solidified at great depth
C) formed from sediments having different sources
D) formed from sediments deposited at the same time
9. Which inference is best supported by the diagram above?
A) The region shows no evidence of crustal movement.
B) The region shows evidence of extinct volcanoes.
C) The region has had extensive folding.
D) The region has undergone extensive faulting.

Use the diagram below for questions #s 10, 11, 12, 13. Use the letters in the diagram for the answers.

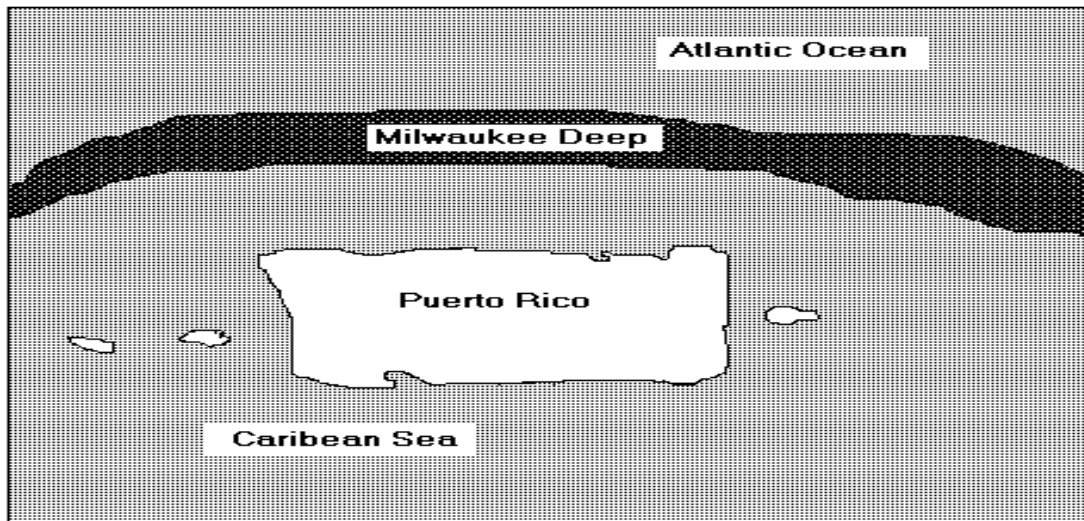


10. Which diagram shows an area in which fine-grained igneous rocks are most likely to be found?
11. Which diagram shows an intrusive igneous body?
12. Which diagram below shows a synclinal sedimentary structure?
13. Which structure most resembles the structure you would expect to see in the Grand Canyon?

Use the world map, for questions 14 and 15, below, has four locations identified as W, X, Y, Z.



14. A major earthquake occurs in Katmandu, the capitol of Nepal (Z). The tectonic cause is
- the subduction of a plate carrying ocean floor.
 - collision of two plates carrying continents on their leading edges.
 - one plate sliding laterally along the edge of another.
 - two plates moving away from each other.
15. In 1986 the Baseball World Series in San Francisco was delayed by a major earthquake on a branch of the San Andreas fault. The tectonic cause was
- the subduction of a plate carrying ocean floor.
 - collision of two plates carrying continents on their leading edges.
 - one plate sliding laterally along the edge of another.
 - two plates moving away from each other.
16. The supercontinent which existed when all the present continents were last joined is known as
- Gondwanaland
 - Eurasia
 - Laurasia
 - Pangaea



The map above shows the island of Puerto Rico and the Milwaukee Deep (sometimes known as the Puerto Rico Trench). Use it with questions 17 and 18.

17. The map leads to the interpretation that Puerto Rico is located

- A) over a hot spot B) over a subduction zone C) on a rift zone D) on a terminal moraine

18. A feature which you could reasonably expect to find on the islands south of the Puerto Rican Trench is

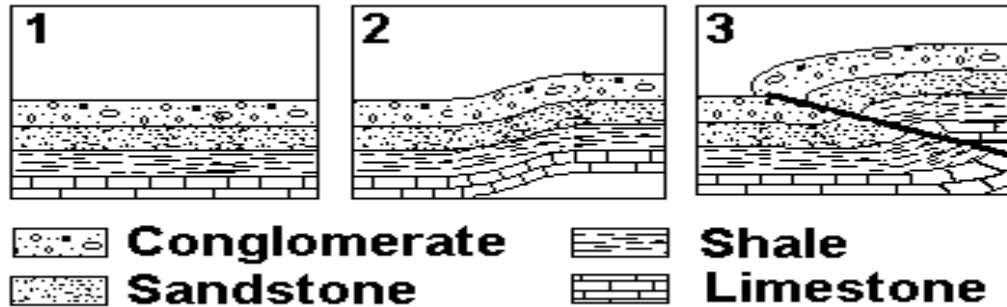
- A) volcanoes B) transform faults C) cirques D) tarns

19. Movement on the San Andreas fault is horizontal, with little or no vertical motion.

Thus, the San Andreas is a

- A) normal fault B) strike-slip fault C) thrust fault D) reverse fault

The three diagrams below shows a sequence of events that occurred in a rock formation. Number 1 occurred first, followed by 2 and 3. Use these diagrams with questions # 20, 21, 22.



20. Which of the statements below is illustrated by this sequence?

- A) Igneous intrusions cause metamorphism of surrounding rocks.
 B) Younger rock layers are always found on top of older layers.
 C) A layer of rock can sometimes be older than the layer beneath it.
 D) Faults nearly always produce valleys.

21. In diagram #2 above, the fold that has developed in the bed of rock is known as

- A) an anticline B) a monocline C) a syncline D) a lithocline

22. In diagram #3 above, the fault that has developed is

- A) a normal fault B) a reverse fault C) a transform fault D) a thrust fault

23. Mauna Loa on the Big Island of Hawaii is a shield volcano, composed of basaltic lava flows.

Which of the profiles below most resembles Mauna Loa?



24. Volcanic ash layers can be used as time markers because they

- A) are deposited rapidly over large areas
 B) have characteristic color and texture
 C) are deposited only on land
 D) contain fossil diatoms

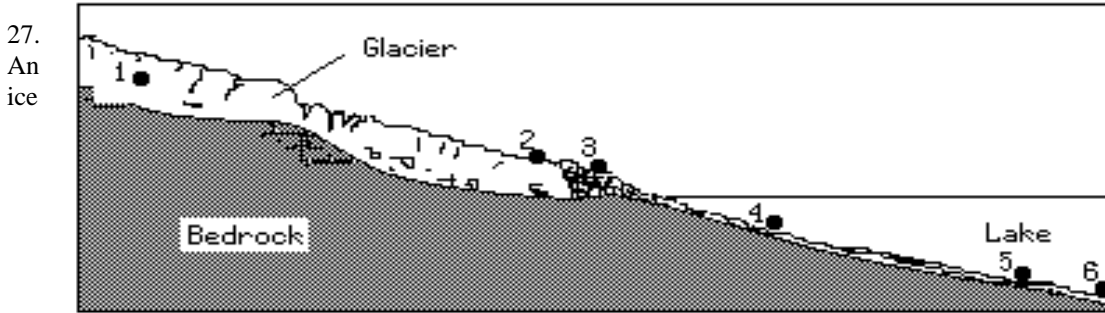
25. Which process could lead directly to the formation of pumice rock?

- A) precipitation of minerals from evaporating seawater.
 B) metamorphism of unmelted rock material
 C) deposition of quartz sand
 D) explosive eruption of lava from a volcano

26. The only large ice sheets found on earth today are located on

- A) Antarctica B) Antarctica and Greenland C) Antarctica and Alaska D) Greenland and Siberia

The diagram below represents a glacier moving out of a mountain valley. Use it with questions 27, 28, 29

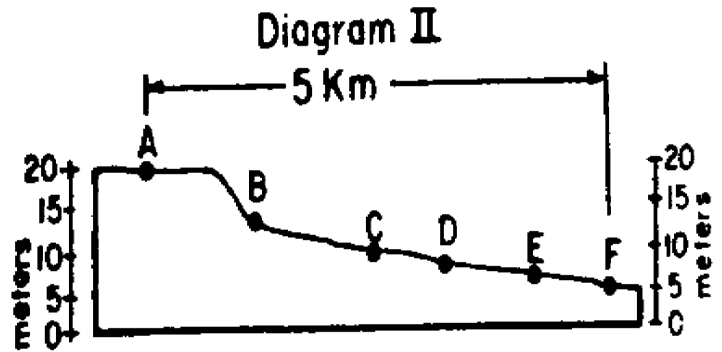
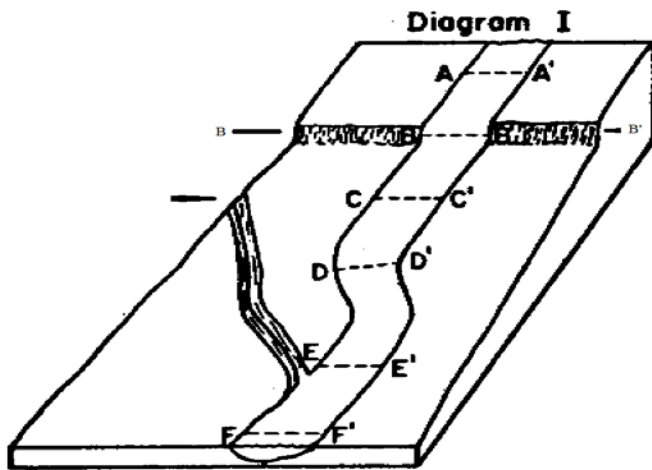


interface between deposition and erosion by the ice is most likely located at
 A) positions 1 and 2 B) positions 2 and 3 C) positions 3 and 4 D) positions 4 and 5

28. Colloidal-sized particles carried by water are most probably being deposited at
 A) position 2 B) position 3 C) position 4 D) position 6

29. Which characteristic would form as the glacier advances from point 2 to point 1?
 A) a V-shaped valley. B) a thick, well sorted soil.
 C) layers of salt and other evaporites. D) scratched and polished bedrock.

Diagram 1 below shows the paths of two streams flowing over a section of land. Points on the larger stream are marked as A, A', B and B' etc. The smaller stream flows into the larger stream just below point E. Diagram II shows the longitudinal profile of the larger of the two streams. Use the two diagrams with questions 30, 31, 32, 33



30. At which location would the water in the stream have the greatest potential energy?

- A) A B) B C) C D) D

31. What is the approximate average gradient of this stream between points A and F?

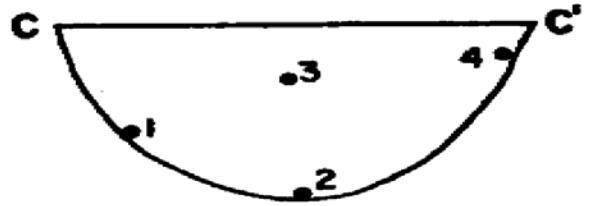
- A) 1 m/km B) 15 m/km C) 3 m/km D) 20m/km

32. The greatest volume of water would be flowing past which location?

- A) F-F' B) B-B' C) C-C' D) E-E'

33. The adjacent the diagram shows the cross section of the stream at C-C'. At which number location would the velocity of the water be the greatest?

- A) 1 B) 2 C) 3 D) 4



34. The water table in aquifers is dropping across the United States because the rate of

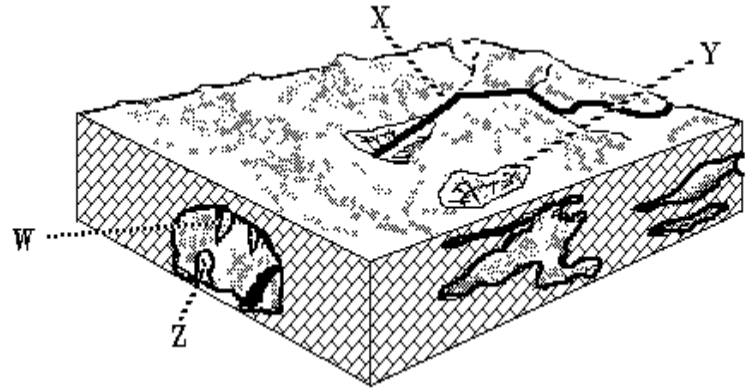
- A) recharge exceeds pumping
 B) pumping exceeds recharge
 C) rainfall exceeds pumping
 D) pumping exceeds rainfall

35. Limestone is eroded in a chemical reaction by carbon dioxide dissolved in ground water. Water and carbon dioxide form

- A) carbolic acid B) carbonic acid C) hydrochloric acid D) tannic acid

36. The depression in the ground above a limestone formation, shown by Y to the right is most likely a

- A) kettle B) pothole
 C) cirque D) sink



37. The river, indicated by X above, is known as

- A) an intermittent stream
 B) a disappearing stream
 C) a Karst stream D) a youthful stream

38. The movement of water along an ocean beach is called the long-shore drift and is caused by

- A) waves striking the beach at a 90° angle
 B) waves striking the beach at an angle other than 90°
 C) ocean currents parallel to the beach
 D) salt and fresh water density currents

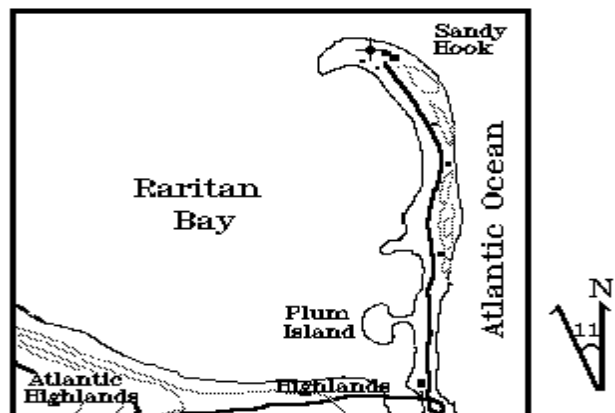
39. Which landform is produced where the Mississippi River flows into the Gulf of Mexico?

- A) a delta B) an outwash C) a drumlin D) an escarpment

Use the map of Sandy Hook NJ for questions # 40.

40. Sandy Hook is known as a

- A) spit
 B) a moraine
 C) a barrier beach
 D) a tombolo



41. Ocean tides are best described as

- A) unpredictable and cyclic B) unpredictable and noncyclic
 C) predictable and cyclic D) predictable and noncyclic

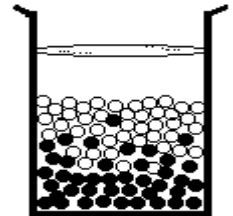
42. The adjacent photograph shows an arch of rock from the western United States. How did the arch most likely form?

- A) An earthquake forced bedrock up into the shape of an arch
- B) The bedrock in the arch was more resistant to weathering and erosion than the surrounding bedrock which was removed.
- C) Sand and gravel were deposited and compacted into the shape of an arch.
- D) A glacier melted leaving the form of the arch.



43. White and black particles of sediment were mixed then allowed to settle in a container of water. The pattern of sedimentation indicates that, compared to the black particles, the white particles of sediment have

- A) a lower density
- B) a rougher surface
- C) a larger surface
- D) a greater volume

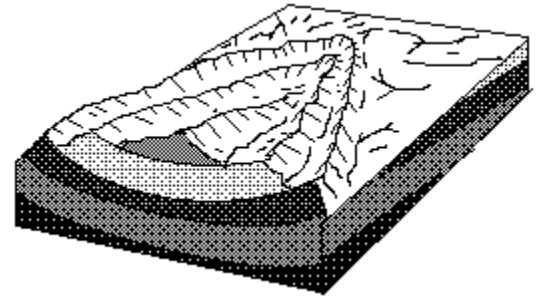


44. The Era known as the "Age of Reptiles" is the

- A) pr-Cambrian
- B) Paleozoic
- C) Mesozoic
- D) Cenozoic

45. If the top has been eroded off an anticline, the oldest beds will be exposed

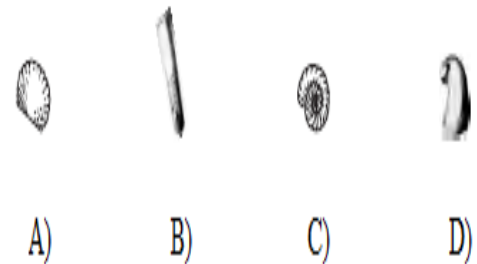
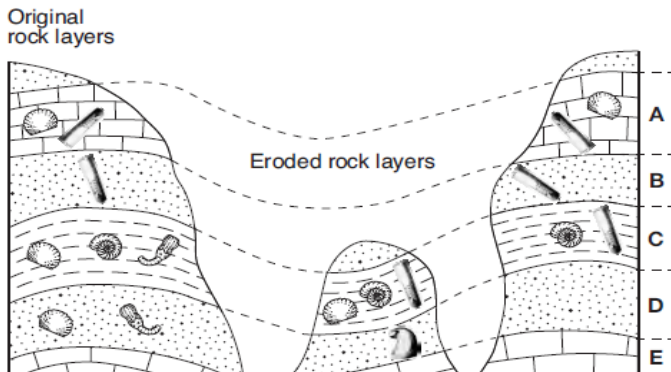
- A) on the top
- B) on the bottom
- C) on the outside edges
- D) in the center



46. In 2004 geologists created the first new geologic period to be named in 113 years. It is the Ediacaran Period, named for a group of hills in Australia. It began about 620 million years ago and is part of what is known as the

- A) Pre-Cambrian Era
- B) Paleozoic Era
- C) Mesozoic Era
- D) Cenozoic Era

47. The diagram below represents three bedrock outcrops. The layers have NOT been overturned. Letters A through E identify different rock layers. The fossils found in the rock layers are also shown. Which fossil could be classified as an index fossil?



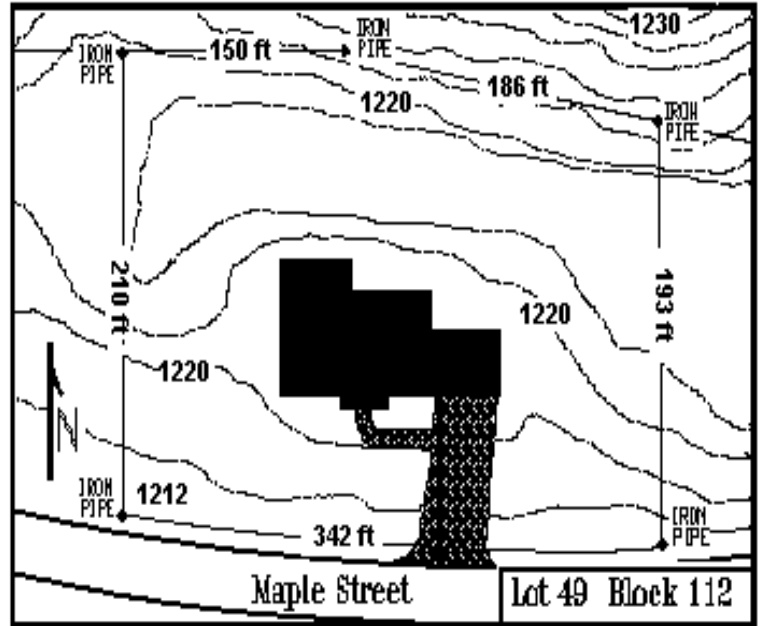
48. The discovery of coal in the Antarctica indicates
- A) forests can grow on continental glaciers
 - B) coal can form in cold climates
 - C) Antarctica's climate was once warmer
 - D) Antarctica currently has area of tropical forest.

This map is a builder's plat plan, used for planning and gaining approval for subdividing property and building.

Use it with questions 49, 50, 51, 52

49. The contour interval for the map is

- A) 1 foot
- B) 2 feet
- C) 5 feet
- D) 10 feet



50. Relief is the vertical difference in elevation between the highest and lowest points in a given area.

The relief for the building lot is closest to

- A) 4 feet
- B) 6 feet
- C) 1217 feet
- D) 1223 feet

51. The topography at the northern property line is

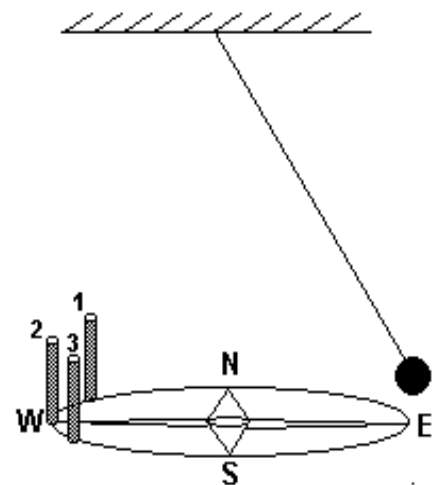
- A) sloping upward toward the north
- B) sloping downward toward the north
- C) relatively flat

52. Drainage from the property is to the

- A) north
- B) south
- C) east
- D) west

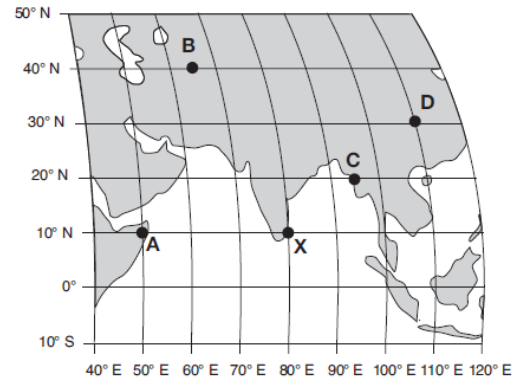
53. Your class room has a heavy pendulum suspended from the ceiling and is free to swing in any direction. There are three pegs set on the floor. Peg #2 is directly west of the pendulum. Peg #1 is north of peg #2, and peg #3 is south of peg #2. If the pendulum is pulled directly east and released, it will knock down peg #2. After swinging for a several minutes, it will

- A) continue to swing between pegs #1 and #3
- B) it will knock down peg #1
- C) it will knock down peg #3



54. There are five locations on the map labeled; A, B, C, D, and X. The Earth's longitude and latitude system is also marked on the map. Location X it is solar noon. Which location will be the next to experience solar noon?

- A) A
- B) B
- C) C
- D) D

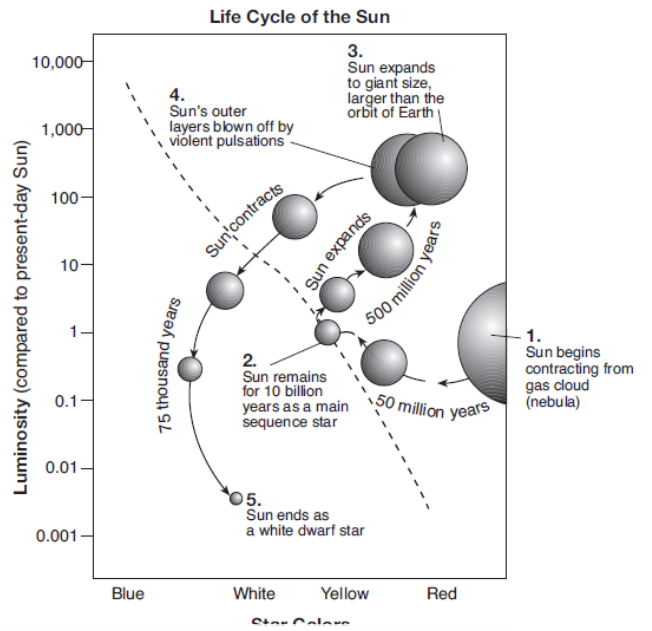


55. Based on the adjacent Life Cycle of the Sun one could predict our Sun to spend the greatest amount of time in its life cycle

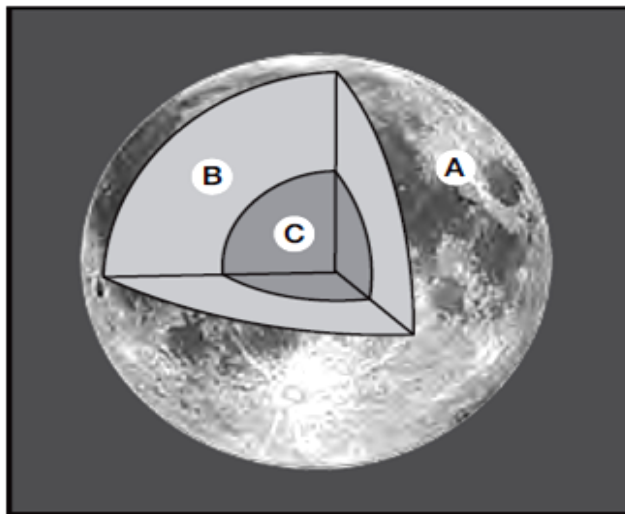
- A) contracting from a gas cloud (nebula)
- B) as a main sequence star
- C) moving away from the main sequence and becoming a giant star
- D) changing from a giant star to a dwarf star.

56. A person would predict the Sun to be the most luminous when it is classified as a

- A) white dwarf star
- B) gas cloud (nebula)
- C) main sequence star
- D) giant star



Layers of the Moon



Key	
Inferred Depth Below the Surface:	
A	Crust: 0 km to 60 km
B	Mantle: 60 km to 1100 km
C	Core: 1100 km to 1738 km

Use the diagram of the Moon on the previous page for questions # 57 and 58.

Scientific instruments left on the Moon's surface have recorded 12558 moonquakes in eight years. Most of these moonquakes are between 700 km to 1200 km below the surface. Scientists have inferred that most moonquakes are thought to be caused by gravitational forces between the Moon, Earth, and the Sun. Use the diagram below for questions # 57,58. The diagram above is not drawn to scale.

57. The same type of evidence was used to find the inferred depths of the Moon's interior layers and the Earth's interior layers. What type of evidence was used to determine the inferred depth of the boundary between the Moon's mantle and core?

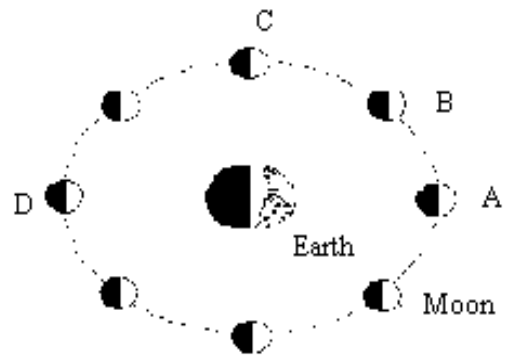
- A) seismic data recorded on the Moon's surface
- B) magnetic data measured on the Moon's surface
- C) convection currents mapped in the Moon's mantle and core
- D) temperatures measured in the Moon's mantle and core.

58. What is the inferred thickness of the Moon's mantle?

- A) 60 km
- B) 638 km
- C) 1040 km
- D) 1738 km

59. In which position in its orbit is the hidden side of the moon the same as the dark side of the moon?

- A) A
- B) B
- C) C
- D) D



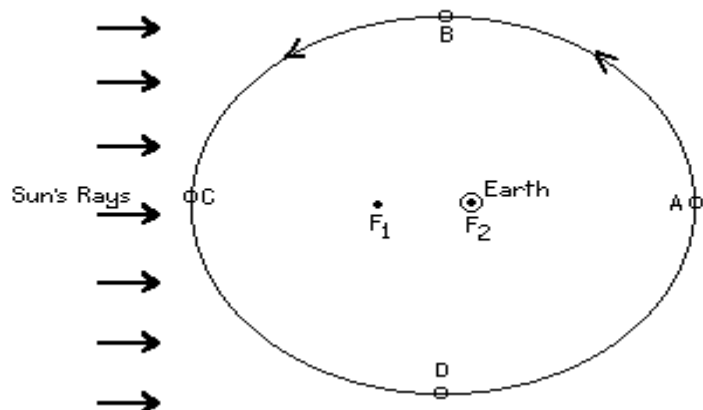
In the diagram below, F1 and F2 are the focal points of the moon's orbit around the earth. Use the diagram with questions 60, 61

60. When viewed from the earth, the moon has the greatest apparent diameter at point

- A) A
- B) B
- C) C
- D) D

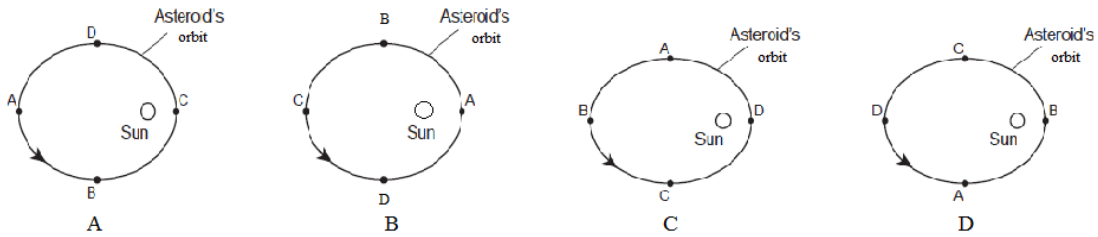
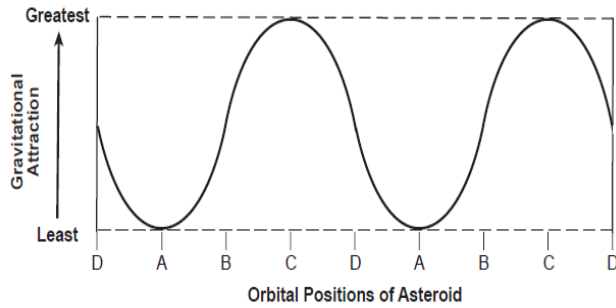
61. The moon's speed in its orbit will increase between points

- A) D to A, only
- B) A to B, only
- C) C to D and D to A
- D) A to B and B to C



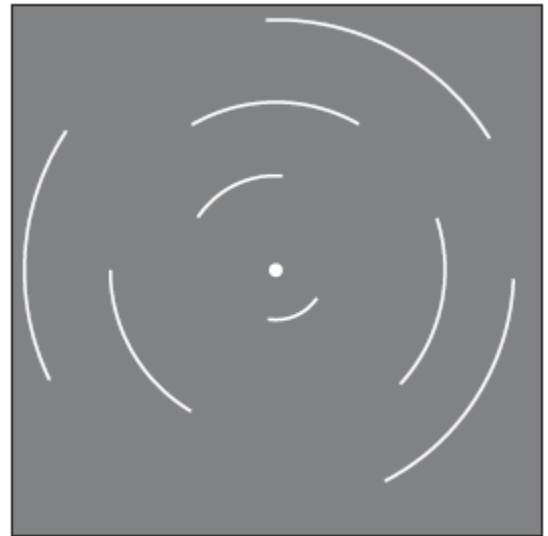
The graph below shows the varying amount of gravitation attraction between the Sun and an asteroid in our solar system. Letters A, B, C, and D are four positions in the asteroid's orbit around the Sun.

62. Which diagram best represents the positions of the asteroid in its orbit around the Sun?



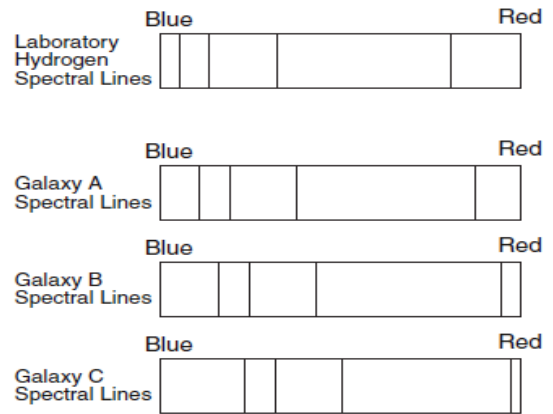
63. At a location in the Northern Hemisphere a camera was placed outside at night with the lens pointing straight up. The shutter was left open for four hours. The adjacent star trails were seen. At which latitude were these star trails observed?

- A) 1°N
- B) 30°N
- C) 60°N
- D) 90°N



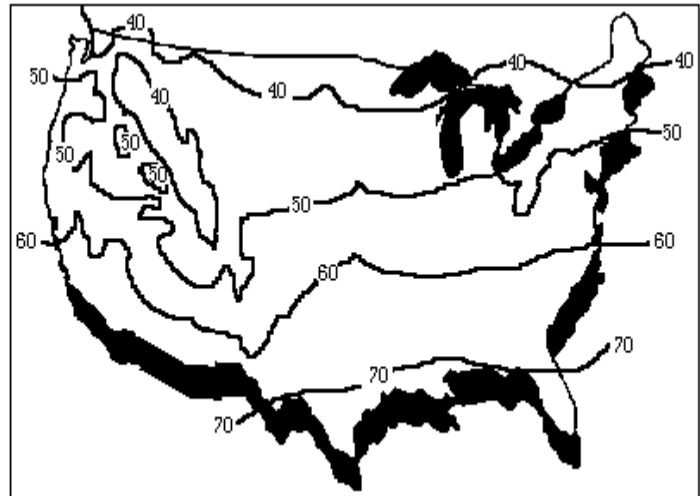
64. The spectra of three galaxies were collected and compared to a laboratory sample of the hydrogen gas. What conclusion can be drawn about the movement of galaxies A, B, and C?

- A) galaxies A and B are moving away from the Earth, but C is moving toward the Earth
- B) Only galaxy C is moving away from the Earth
- C) all three galaxies are moving toward the Earth
- D) all three galaxies are moving away from the Earth

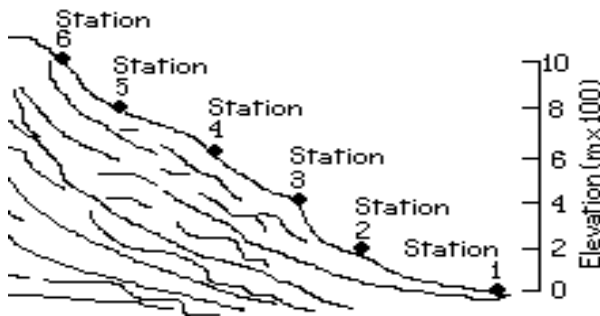


65. The map of the United States shows mean annual temperatures in degrees Fahrenheit. Which climatic factor is most important in determining the pattern shown in the eastern half of the United States?

- A) ocean currents
- B) mountain barriers
- C) elevation above sea level
- D) latitude



Use the following information and table with questions 66, 67, 68.



Station	Atmospheric	
	Pressure (mb)	Temperature (°C)
1	1016	27
2	996	25
3	976	23
4	956	21
5	936	19
6	916	17

An atmospheric scientist placed weather instruments every 200 meters in elevation on the side of a mountain. An experiment was designed to collect air temperature and barometric pressure simultaneously at all elevations. The data are shown for 12:00 noon on one clear, calm day.

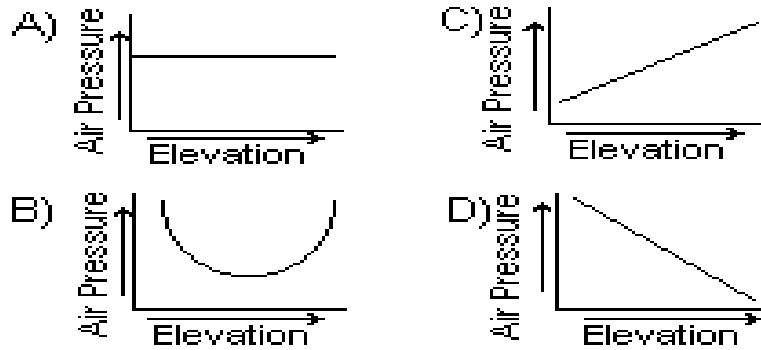
66. From sea level to an elevation of 1,200 meters, air pressure decreased at the rate of

- A) 1.0 mb/m
- B) 0.1 mb/m
- C) 10.0 mb/m
- D) 100.0 mb/m

67. The change in temperature between Station 1 and Station 6 is most likely due to change in

- A) planetary wind belts.
- B) elevation above sea level.
- C) ocean currents.
- D) latitudes.

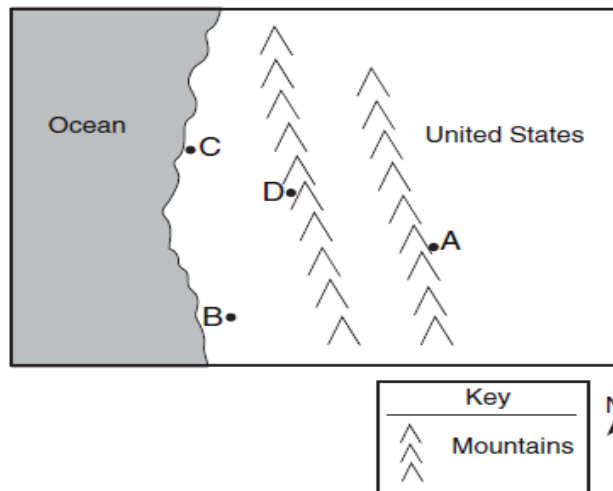
68. Based on data collected, which graph best represents the relationship between elevation above sea level and air pressure?



The map below shows the location of four cities, A, B, C, and D in the western United States. The prevailing winds are from the southwest.

69. Which of the four cities receives the least amount of yearly rainfall?

- A) A
- B) B
- C) C
- D) D



Use the weather map below with questions 70, 71, 72.

70. The high-pressure system is most likely the center of a

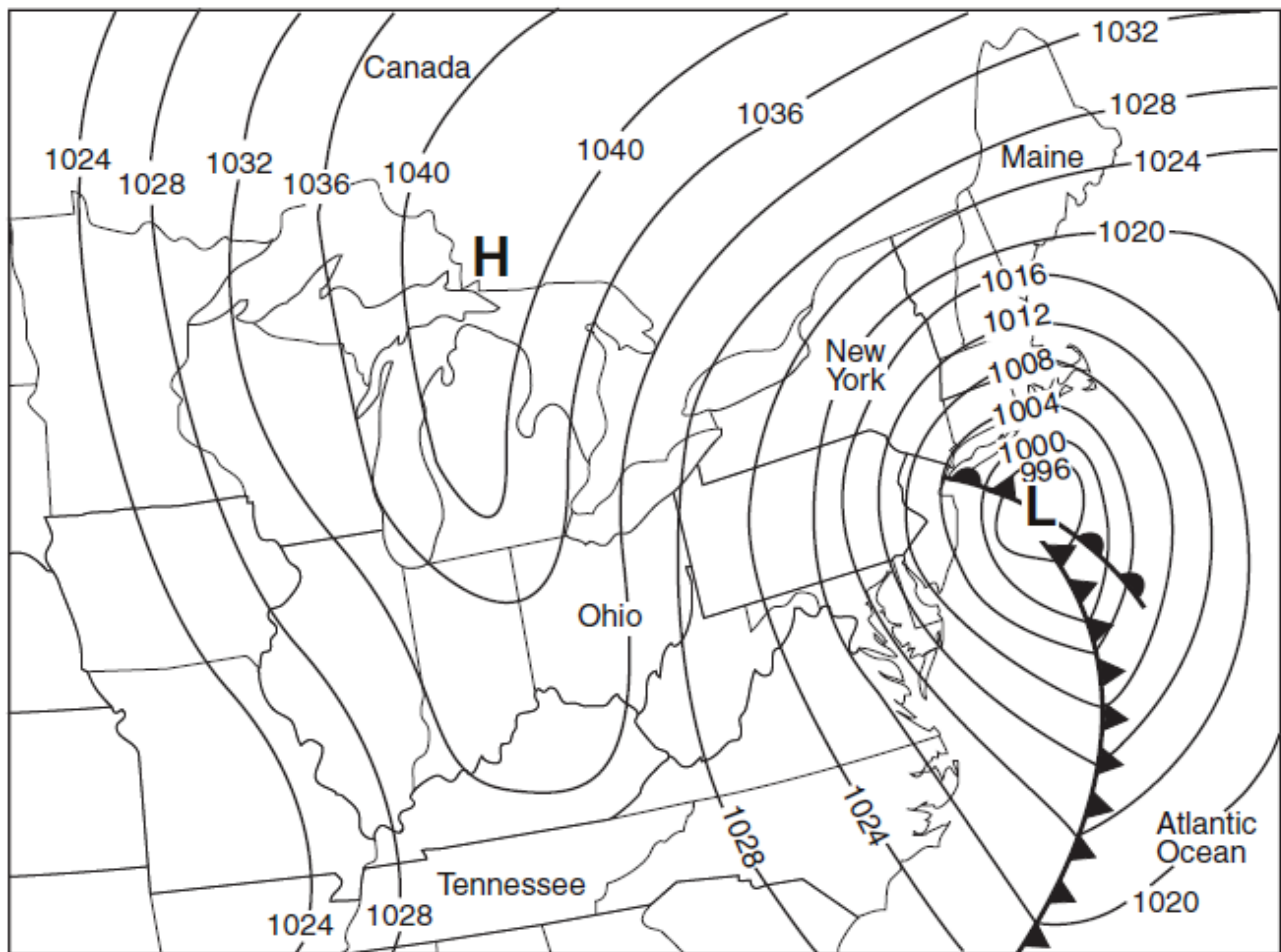
- A) continental polar air mass that originated in central Canada
- B) maritime polar air mass that originated over the Gulf of Mexico
- C) continental tropical air mass that originated in the Arctic region
- D) maritime tropical air mass that originated over the Atlantic Ocean

71. The region in the northern portion has cloudy skies and snow. What is the reason for this?

- A) Air above this region is sinking and cooling, while water vapor is evaporating.
- B) Air above this region is sinking and warming, while water vapor is evaporating.
- C) The air above this region is rising and cooling, while water vapor is condensing
- D) Air above this region is rising and warming, while water vapor is condensing.

72. Which location has the highest surface wind speed?

- A) central Tennessee
- B) northwestern Ohio
- C) northern Maine
- D) eastern Pennsylvania



NEW JERSEY SCIENCE LEAGUE
EARTH SCIENCE EXAM ANSWER KEY TAN TEST

DATE: February 12, 2015

1	B	19	B	37	B	55	B
2	B	20	C	38	B	56	D
3	D	21	B	39	A	57	A
4	C	22	D	40	A	58	C
5	D	23	A	41	C	59	D
6	C	24	A	42	B	60	A
7	B	25	D	43	A	61	C
8	C	26	B	44	C	62	A
9	C	27	B	45	D	63	D
10	C	28	D	46	A	64	D
11	B	29	D	47	C	65	D
12	A	30	A	48	C	66	B
13	D	31	C	49	B	67	B
14	B	32	A	50	B	68	D
15	C	33	C	51	A	69	A
16	D	34	B	52	C	70	A
17	B	35	B	53	C	71	C
18	A	36	D	54	B	72	D

ES March Exam 2015 **TAN EXAM**

Please PRINT your name, school, area, and which test you are taking onto the scan-tron.

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice. Reference tables are located at the end of the test. A ruler is also on the reference sheets.

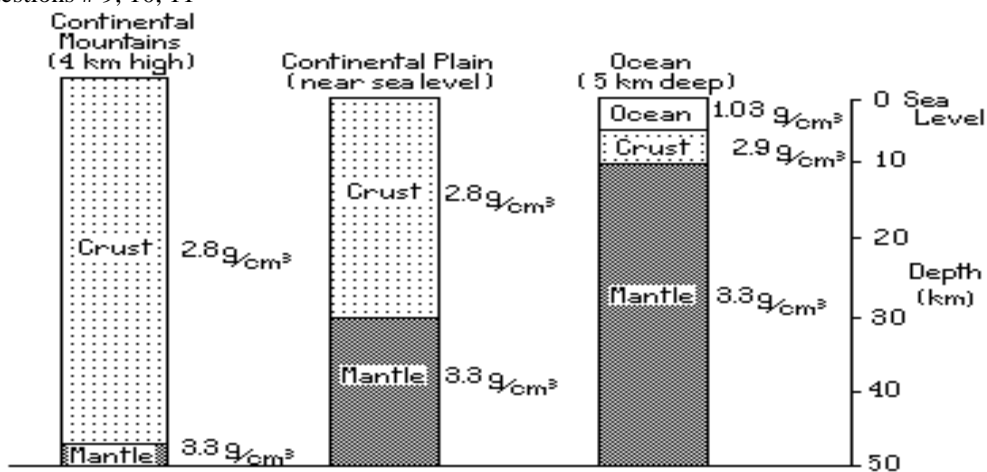
- Galena breaks along three different flat planes to form cubes. This property of minerals is called
 A) cleavage B) rupture C) fracture D) rift
- The general name for a mineral or group of minerals mined for its economic value is
 A) gangue B) burden C) wad D) ore

The description of Apophyllite, below, is to be used with questions # 3, 4, 5, 6, 7

Apophyllite: Crystallizes in the tetragonal system. Basal cleavage. Usually colorless or white; may be pink, pale green, or yellow. Hardness: 4.5 – 5. Specific gravity: 2.35. Translucent to transparent. Pearly luster on basal faces; vitreous luster on prism faces.

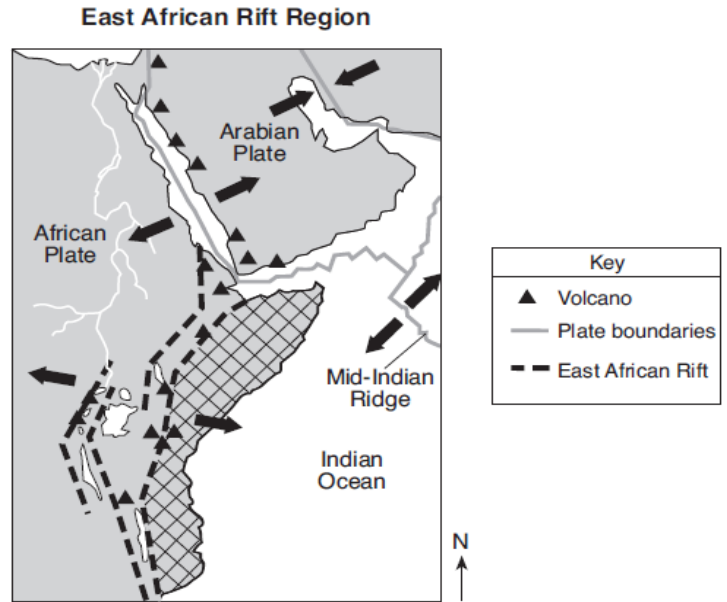
- An unknown colorless and transparent mineral can scratch fluorite, is not scratched by fluorite, cannot scratch apatite, and is scratched by apatite. Its hardness on the Mohs Scale is:
 A) less than 4 B) about 5 C) about 4.5 D) greater than 5
- A sample of the unknown mineral massed in air is 470mg. The same sample massed while suspended in water is 270mg. Its specific gravity (density without the units of measurement) is
 A) 200 B) 2.35 C) 1.74 D) 0.57
- The sample of the unknown mineral is colorless and one can see through it. It is
 A) transparent B) translucent C) diffuse D) opaque
- The best interpretation of the data for the unknown mineral is that it is
 A) certainly apophyllite C) too hard to be apophyllite
 B) probably apophyllite D) not dense enough to be apophyllite
- The rock cycle refers to changes which rocks undergo
 A) at the earth's surface C) from depth to surface to burial
 B) due to heat and pressure D) deep in the earth's crust
- What kind of sedimentary rock can be formed both chemically and organically?
 A) limestone B) rock gypsum C) rock salt D) bituminous coal

The diagram below shows a column of rock to a depth of 50 km below sea level at three different locations. Use it with questions # 9, 10, 11



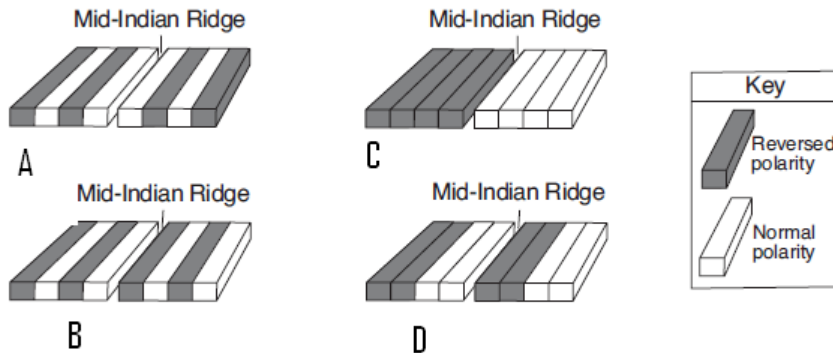
9. Which material is most likely to be found 20 km below sea level at the continental mountain location?
 A) basalt B) granite C) shale D) limestone
10. Compared with the oceanic crust the continental crust is
 A) thinner and less dense C) thicker and less dense
 B) thinner and more dense D) thicker and more dense
11. Based on the sketch above what is the approximate thickness of continental crust?
 A) about 5 miles C) about 50 km
 B) about 5 km D) about 500 km

The map below shows the tectonic plate boundaries near the East African Rift. The arrows show the relative tectonic plate movement. A region of Africa is crosshatched. Use the map with question # 12 and 13



12. What appears to be happening to the crosshatched region of eastern Africa?
 A) The region is moving northward relative to the rest of Africa.
 B) The region is moving eastward relative to the rest of Africa
 C) Several volcanic mountains are forming as the rest of Africa subducts under this region.
 D) A folded mountain range is forming as this region collides with the rest of Africa.

13. Which diagram best represents the polarity of the magnetic field preserved in the ocean-floor bedrock found on both sides of the Mid-Indian Ridge?



14. Crustal plates are destroyed at
 A) transform faults B) mid-oceanic ridges C) oceanic trenches D) rift valleys
15. Magma from the mantle wells up to create new edges on crustal plates in
 A) subduction zones B) rift valleys C) island arcs D) hot spots

16. Pangea existed about how many million years ago?

- A) 60 B) 180 C) 500 D) 2,300

17. The number of seismographic stations necessary to exactly locate an earthquake is

- A) one B) two C) three D) five

18. The distance to an earthquake from a seismographic station can be determined because

- A) S and P waves travel at different speeds C) S waves do not travel through the center of the earth
B) L waves lose intensity over distance D) P waves are refracted by the earth.

19. The magnitude of an earthquake is often measured on the Richter Scale. An earthquake having a magnitude of 7.6 produces more ground motion than one with a magnitude of 6.6 by a factor of

- A) 1 B) 10 C) 100 D) 1000

20. The data table below shows the origin and depths of all large-magnitude earthquakes over a 20 year period. According to these data most of these earthquakes occurred within the Earth's _____

- A) Lithosphere
B) Asthenosphere
C) stiffer mantle
D) outer core

Depth Below Surface in Km	Number of Earthquakes
0-33	27788
34-100	17585
101-300	7329
301-700	3167

21. The map below shows California and a section of the San Andreas Fault. What is the primary geologic process occurring along the San Andreas Fault?

- A) transform movement
B) spreading movement
C) subduction
D) convergence



22. Material produced by explosive type volcanoes is usually

- A) silica rich B) carbon rich C) calcium rich D) iron rich

23. The type of volcano with the steepest slopes has

- A) a shield structure B) a cinder cone C) a composite cone D) fissure flows

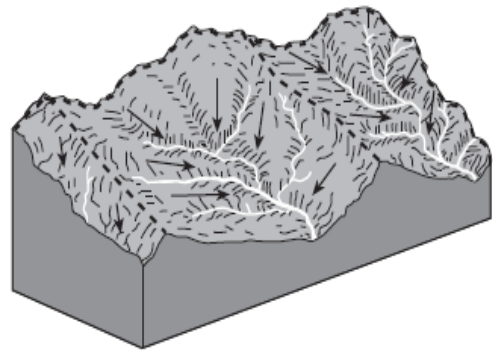
24. Mountain glaciers over the entire earth are melting. As they do, they leave seasonal deposits of till known as the

- A) marginal moraine
B) terminal moraine
C) lateral moraine
D) recessional moraine

25. Which of the lakes listed below was formed by continental glaciation of North America?

- A) Great Lakes B) Lake Meade C) Great Salt Lake D) Lake Okeechobee

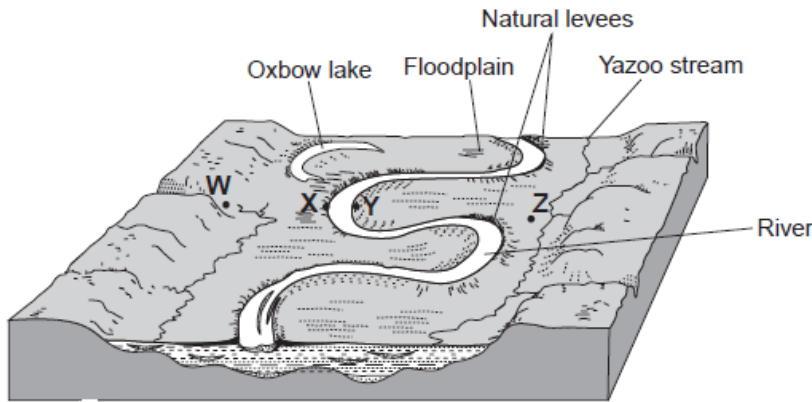
26. The diagram below represents the drainage basins of some river systems separated by highland divides, which are shown with dashed lines. The arrows show the directions of surface-water flow.



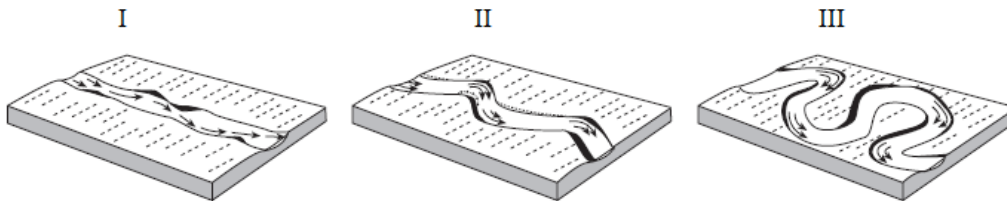
The areas separated by the highland dividers are called?

- A) meanders
- B) floodplains
- C) watersheds
- D) tributaries

The diagram below represents the landscape features associated with a meandering river. Letter W, X, Y, and Z are locations in the floodplain associated with the river. Use the diagram with questions # 27, 28, 29,



27. The diagrams below represent stages in the formation of the meandering river.



Which sequence of letters best represents the usual changes over time in the river?

- A) I → II → III
- B) I → III → II
- C) III → I → II
- D) III → II → I

28. During transport by this river, what will most likely happen to a particle, such as a small stone?

- A) more rounded
- B) more dense
- C) heavier
- D) larger

29. Which change would most likely increase the velocity of the river?

- A) a decrease in the slope of the river
- B) a decrease in the temperature of the river
- C) an increase in the river's discharge
- D) an increase in the width of the river

30. Acidic ground water dissolves minerals to form caverns in

- A) granite
- B) shale
- C) gneiss
- D) limestone

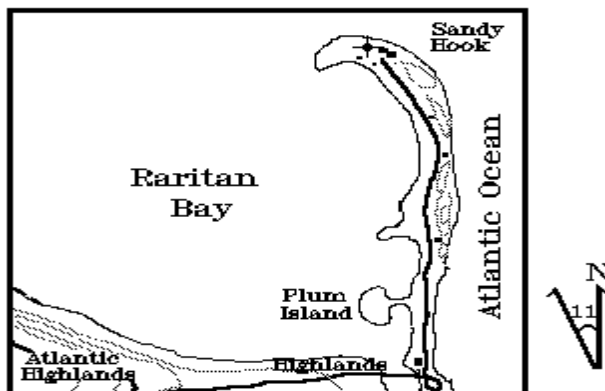
31. A small fissure in the cap rock (or aquitard, or aquaclude) above an aquifer can let water escape to the surface. The flow of water from the ground is

- A) an artesian well
- B) a spring
- C) a lake
- D) a tarn

32. The refraction (bending) of waves around the end of a sand spit usually results in the formation of a
 A) hook B) barrier beach C) bar D) tombolo
33. The movement of water along an ocean beach is called the long-shore drift and is caused by
 A) waves striking the beach at a 90° angle
 B) waves striking the beach at an angle other than 90°
 C) ocean currents parallel to the beach
 D) salt and fresh water density currents

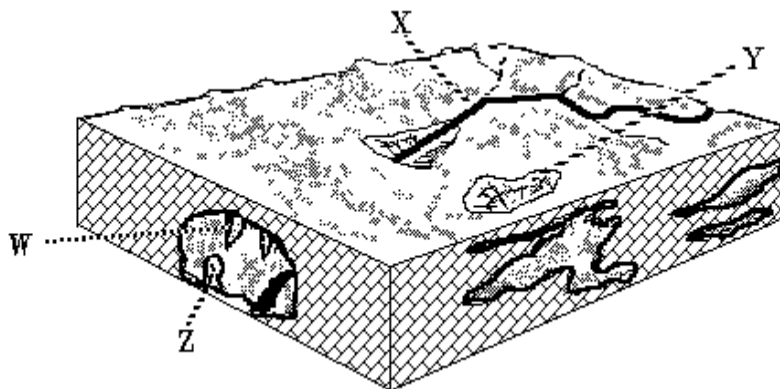
34. Sandy Hook, at the entrance to Raritan Bay and New York Harbor, has been extended to the north and shaped into a hook mostly by

- A) the Gulf Stream and refraction of waves
 B) the wind and discharge from the Hudson River
 C) long shore currents and discharge from the Hudson River
 D) long shore currents and refraction of waves



35. The diagram below represents caves that develop in a region over time. Points X and Y are located within the cave. What type of weathering was primarily responsible for the formation of the caves?

- A) physical weathering of sandstone
 B) physical weathering of limestone
 C) chemical weathering of sandstone
 D) chemical weathering of limestone.



36. A rock is crushed into a pile of fragments? Which statement is true?
 A) the total surface area decreases, while the chemical composition changes.
 B) the total surface area decreases, while the chemical composition remains the same
 C) the total surface area increases, while the chemical composition changes
 D) the total surface area increases, while the chemical composition remains the same.

37. The Era known as the "Age of Fish" is the
 A) preCambrian B) Cenozoic C) Mesozoic D) Paleozoic

38. Below is a dome. The top surface has been eroded. If the top surface is relatively flat, then the oldest bed will appear to be located

- A) on top
 B) on the bottom
 C) in the center
 D) around the outside edge



39. Fossil bones of hyracotherium, the first horse, were found in the South Dakota Badlands. This indicates that the Miocene sediments of the Badlands were deposited in the
- A) Mesozoic Era
 B) Cenozoic Era
 C) Paleozoic Era
 D) Archeozoic Era

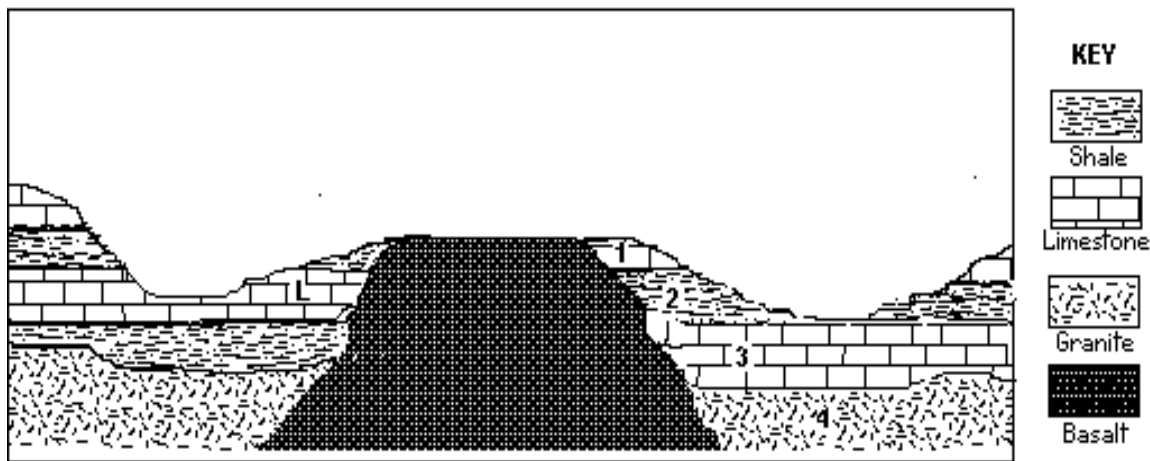
40. Tyrannosaurs lived during the Cretaceous Period, Edaphosaurs during the Permian, Stegosaurus in the Jurassic, and Phytosaurs in the Triassic. Using the reference tables at the end of the test determine the group that lived most recently.

- A) Tyrannosaurs B) Edaphosaurs C) Stegosaurus D) Phytosaur

41. The eruption of the volcano that made Crater Lake in Oregon killed a lot of trees. The wood from many of the trees was preserved by burial and it has been analyzed for radioactive carbon-14. Carbon-14 has a half-life of about 5,730 years, and decays to nitrogen-14. About 55% of the carbon-14 has decayed in those trees. Which of the following is the best estimate of the number of years ago that the Crater Lake volcano erupted?

- A) 400 B) 4,500 C) 5,000 D) 6,500

The block diagram below shows a geologic structure. Use it with questions #



42. The structure shown by the geological map above is a

A) anticline B) syncline C) dome D) basin

43. Fossils in the rock are 300 million years old. It was formed by sediments that were deposited in the

A) Pre-Cambrian Era B) Paleozoic Era C) Mesozoic Era D) Cenozoic Era

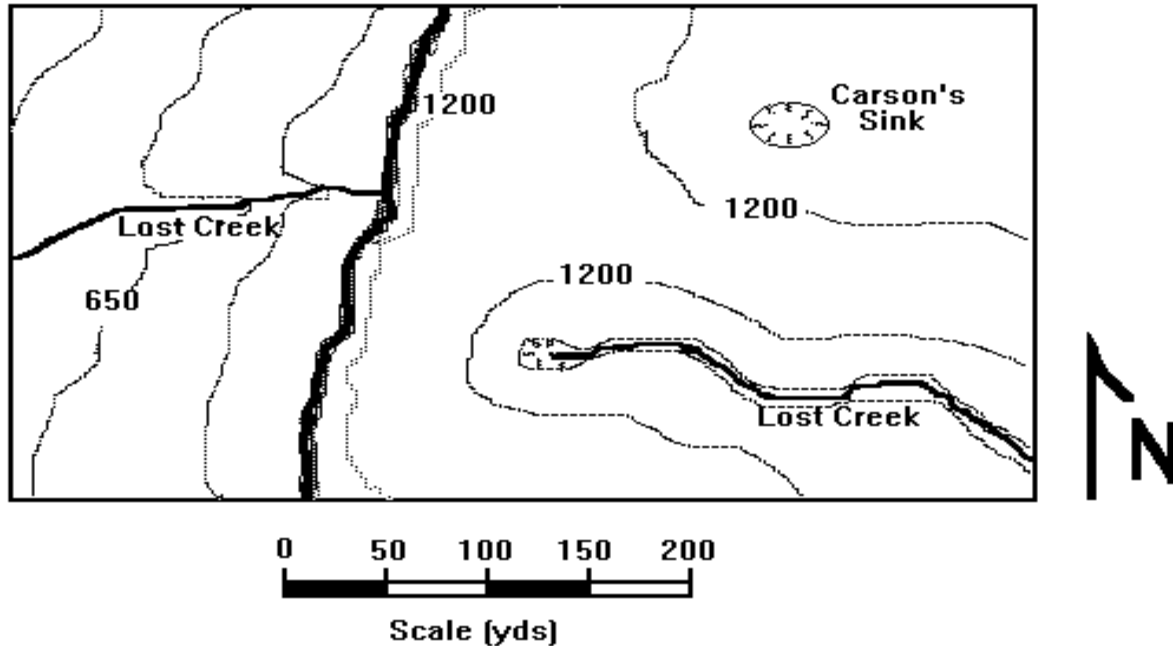
44. The numbered rock layer on the right side of the diagram that most likely is the same age as layer L on the left is

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

45. The sequence of layered limestone and shale is best explained by alternating

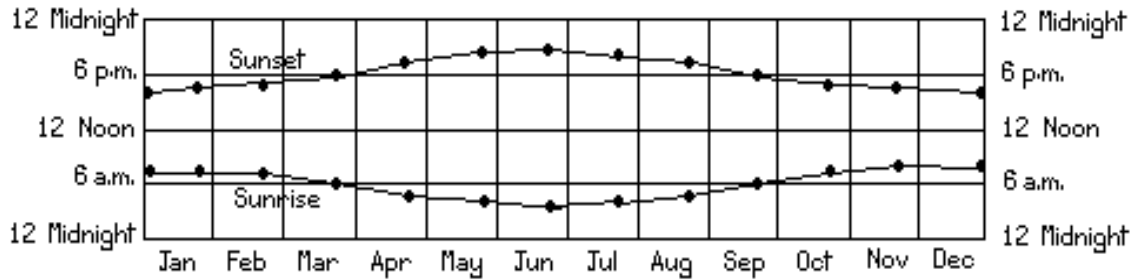
- A) rise and fall in sea level.
 B) winter ice and summer open water
 C) depths of fresh water lakes
 D) seasonal velocity of rivers carrying sediments

Use the contour map below for questions 46, 47, and 48.



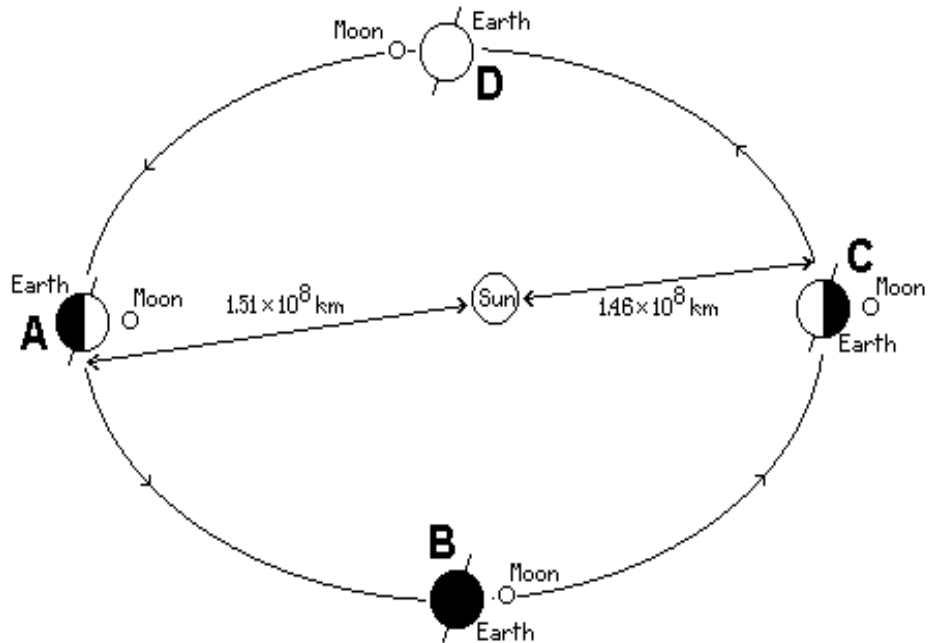
46. The contour line at Carson's Sink shows a
 A) hill top B) constructed mound C) quarry D) depression
47. If the contour interval is 50 feet, then the height of the cliff is about
 A) 450 ft B) 550 ft C) 650 ft D) 1150 ft
48. Lost Creek is
 A) an intermittent stream B) a braided stream C) an interrupted stream D) a disappearing stream
49. The bedrock in the upland part of the area shown is most probably
 A) granite B) shale C) limestone D) basalt
50. The number of full-hour standard time zones around the earth is
 A) 12 B) 24 C) 75 D) 360
51. On March 21 at noon, Local Time, in the Northern hemisphere, you see the sun to be 50° above the horizon. Therefore, your latitude is
 A) 40° N B) 50° N C) 90° N D) 130° N
52. The distance from the sun to the earth is approximately 93 million miles. Light travels at a speed of 186,000 miles/second. The time it takes for light leaving the sun to reach the earth is about
 A) 8 seconds B) 8 minutes C) 8 hours D) 8 days
53. Compared to other stars in the Hertzsprung-Russell main sequence (see reference tables), the sun in size and color is
 A) small and red B) medium and red C) medium and yellow D) large and yellow

Use the graph below for questions #54 and 55.



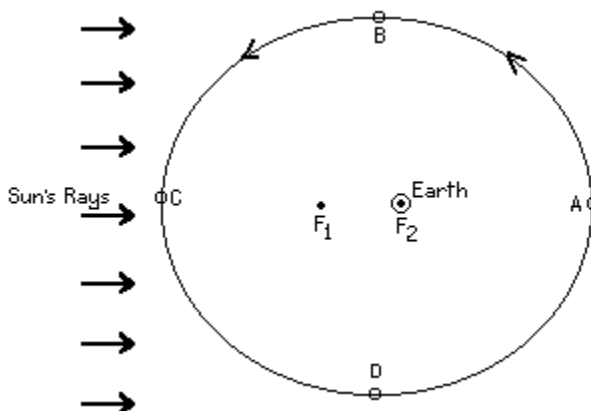
54. The daily change in the time of sunrise and sunset primarily is due to the
- 23.5° tilt of the earth's axis
 - sun's apparent angular diameter
 - changes in the distance from the earth to the sun
 - changes in the earth's orbital speed
55. According to the above graph the number of hours of daylight on September 1 was about
- 7
 - 8
 - 12
 - 14
56. If the moon rises over the eastern horizon at sunset, the phase of the moon is
- new
 - first crescent
 - full
 - last gibbous
57. An eclipse of the sun is big news. At which position in the diagram below must the moon be located in order for there to be a solar eclipse?

- A
- B
- C
- D



In the diagram below, F1 and F2 are the focal points of the moon's orbit around the earth. Use the diagram with questions # 58 and 59.

58. If the moon takes 6.6 days to move to point B, the best estimate of the complete orbit is
- A) 20 days
 - B) 25 days
 - C) 27 days
 - D) 29 days



from point A period for one

59. When viewed from the earth, the greatest apparent diameter at point
- A) A
 - B) B
 - C) C
 - D) D

moon has the

60. Using the planetary data in the reference tables determine which planet would have the longest time from sunrise to sunset, when measured from the equator of that planet?

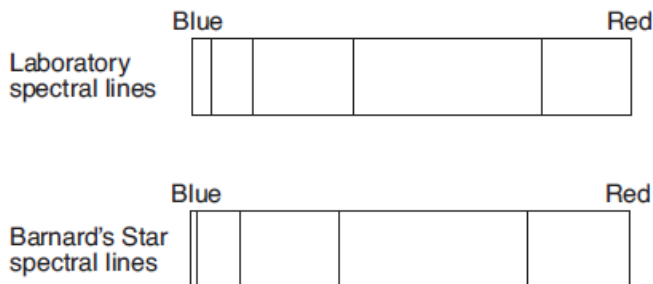
- A) Mercury
- B) Venus
- C) Earth
- D) Mars

61. Barnard's star is about 6 light years away from Earth. How is the energy of this star transferred to Earth?

- A) red shift
- B) conduction
- C) density currents
- D) electromagnetic waves

62. The first spectrum below is the spectrum of hydrogen gas from a laboratory. The second spectrum is that of hydrogen from Barnard's star. What information about Barnard's star do these spectrums reveal?

- A) Barnard's star is smaller than most stars.
- B) Barnard's star is moving toward the Earth
- C) Barnard's star is stationary
- D) Barnard's star does not have any orbiting planets.



63. The most distance objects in the universe are called
- A) stars
 - B) galaxies
 - C) quasars
 - D) planets

64. The nearest star is called Proxima Centauri and is 4.2 light years away. If you were travelling at the speed of light, 186,000 miles/second, then how many years would it take to travel to Proxima Centauri?

- A) 4.2 years
- B) 186,000 years
- C) 781,200 years
- D) 5.8×10^{12} years

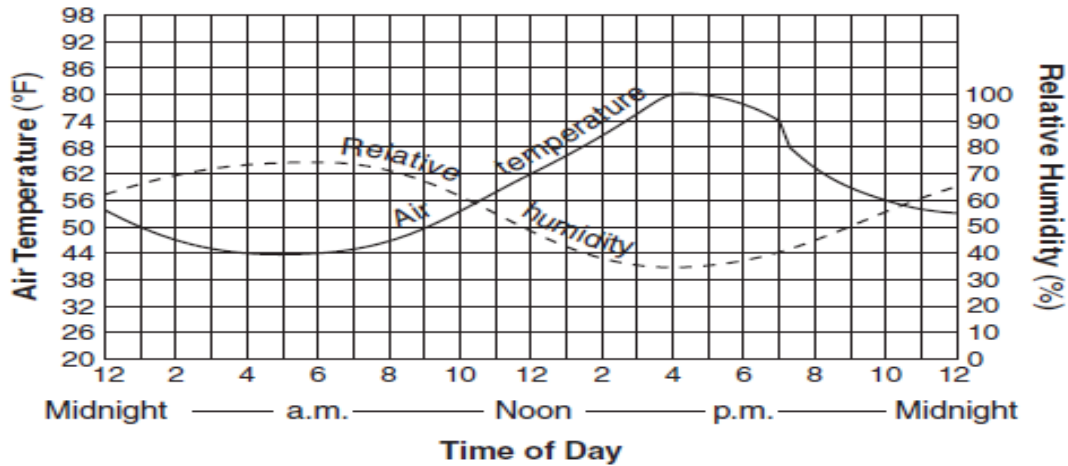
65. Which of the following Earth surfaces usually reflects the most incoming solar radiation?

- A) snow cover
- B) dark soil
- C) green grass
- D) lake water

66. Which weather variable generally decreases when wind speed is increasing, clouds are thickening, and visibility drops?

- A) relative humidity
- B) dew point
- C) precipitation
- D) air pressure

The graph below shows air temperature and relative humidity at a location during a 24 hour period. Use with questions # 67 and 68.

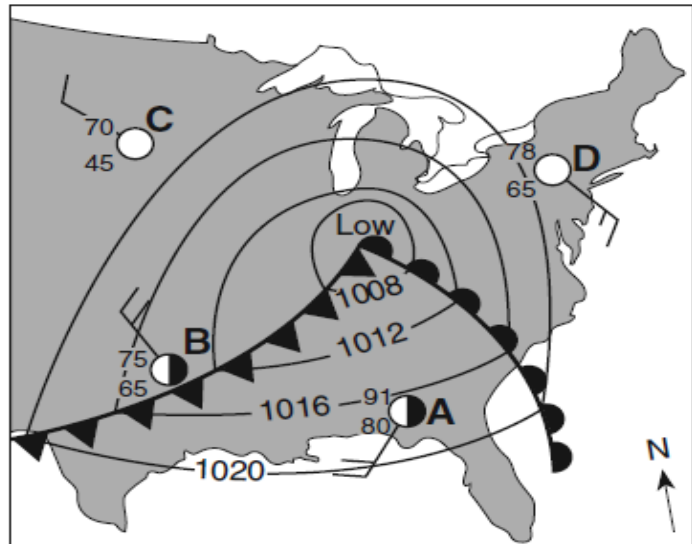


67. From 12 noon to 4 pm what was the approximate change in relative humidity?
 A) 15% B) 30% C) 20% D) 40%
68. At what time would the rate of evaporation most likely be the greatest?
 A) 5 am B) 4 pm C) 11 am D) 11 pm

The weather map below shows a low pressure system over the eastern United States. Letters A,B,C,D are weather stations.

69. Which weather instrument was used to measure the wind speed at station D?
 A) barometer
 B) thermometer
 C) psychrometer
 D) anemometer

70. What is the wind speed and direction at station letter D?
 A) 10 knots from southeast
 B) 15 knots from the southeast
 C) 15 knots from northwest
 D) 25 knots from the northwest



71. Surface winds within this low-pressure system most likely are flowing
 A) toward the center in a clockwise pattern
 B) toward the center in a counterclockwise pattern
 C) away from the center in a clockwise pattern
 D) away from the center in a counterclockwise pattern
72. Which lettered location has the lowest relative humidity?
 A) A B) B C) C D) D

NEW JERSEY SCIENCE LEAGUE
EARTH SCIENCE EXAM ANSWER KEY TAN TEST

DATE: March 12, 2015

Record onto the area record the # correct

1	A	19	B	37	D	55	D
2	D	20	A	38	C	56	C
3	C	21	A	39	B	57	A
4	B	22	A	40	A	58	C
5	A	23	B	41	D	59	A
6	B	24	D	42	C	60	B
7	C	25	A	43	B	61	D
8	A	26	C	44	A	62	B
9	B	27	A	45	A	63	C
10	C	28	A	46	D	64	A
11	C	29	C	47	A	65	A
12	B	30	D	48	D	66	D
13	A	31	B	49	C	67	A
14	C	32	A	50	B	68	B
15	B	33	B	51	A	69	D
16	B	34	D	52	B	70	B
17	C	35	D	53	C	71	B
18	A	36	D	54	A	72	C

ES April 9th Exam 2015 TAN EXAM

Please PRINT your name, school, area, and which test you are taking onto the scan-tron.

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice. Reference tables are located at the end of the test. A ruler is also on the reference sheets.

1. The mass of a sample of galena is determined to be 76 grams. When it is dropped into a graduated cylinder containing 265.0 ml of water, the volume increased to 275.0 ml. Determine the density of the galena.

- A) $0.14 \text{ cm}^3/\text{g}$ B) 7.6 g/cm^3 C) 76 g/cm^3 D) 760 g cm^3

2. Galena can be scratched by calcite, but not by gypsum. Using the hardness scale in the reference tables determine its hardness.

- A) 2 B) 2.5 C) 3 D) 3.5

3. The physical properties of a mineral are most closely determined by the

- A) arrangement of the mineral's atoms C) size of the mineral sample
B) age of the mineral sample D) temperature of the mineral sample

4. Minerals form as the result of geologic processes in the earth's crust. They form as the result of

- A) Igneous intrusions or extrusions. C) Metamorphism.
B) Precipitation or evaporation. D) All of these

Use the data table below for questions # 5 and 6.

Mineral Sample	Color	Luster	Streak	Breakage pattern
Galena	Gray	Metallic	Gray	Breaks into cubes
Halite	Colorless	Nonmetallic	Colorless	Breaks into cubes
Quartz	Colorless	Nonmetallic	Colorless	Irregular breakage
Gold	Yellow	Metallic	Yellow	Irregular breakage

5. What two minerals samples would be most difficult to distinguish from each other based upon their color, luster, and streak?

- A) halite & quartz B) halite & gold C) galena & quartz D) galena & gold

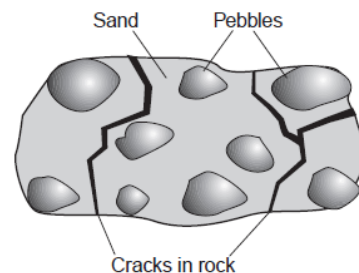
6. Which two mineral samples most likely have a similar internal arrangement of atoms?

- A) galena & quartz B) galena & halite C) gold and halite D) gold & galena

7. Refer to Moh's mineral hardness scale at the end of the test. Which statement is best supported by the scale?

- A) A fingernail will scratch calcite, but not quartz.
 B) A fingernail will scratch quartz, but not calcite
 C) A piece of glass can be scratched by quartz, but not by calcite.
 D) A piece of glass can be scratched by calcite, but not by quartz.

8. The diagram below right is a sedimentary rock which has cracks and pebbles. Which statement most accurately compares the ages of the cracks and pebbles to the age of the sedimentary rock in which they are found?

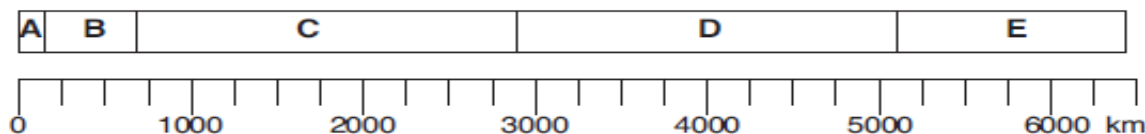


- A) The cracks and pebbles are both younger than the sedimentary rock
 B) The cracks and pebbles are both older than the sedimentary rock
 C) The cracks are younger and the pebbles are older than the sedimentary rock.
 D) The cracks are older and the pebbles are younger than the sedimentary rock.

9. Which common rock is formed from the solidification of molten material?

- A) rock gypsum B) slate C) rhyolite D) coal

The diagram below represents zones of the Earth's interior, identified by letters A through E. The depth is measured in kilometers.



10. The Moho is a boundary located in zone

- A) A B) B C) C D) D

11. What is the approximate thickness of zone C?

- A) 650 km B) 1600 km C) 2250 km D) 2900 km

12. S-waves produced by an earthquake are transmitted through zones

- A) A and B only B) A, B, and C only C) C, D, and E only D) D and E only.

13. Which zone is characterized by partially melted rock and large-scale convection currents?

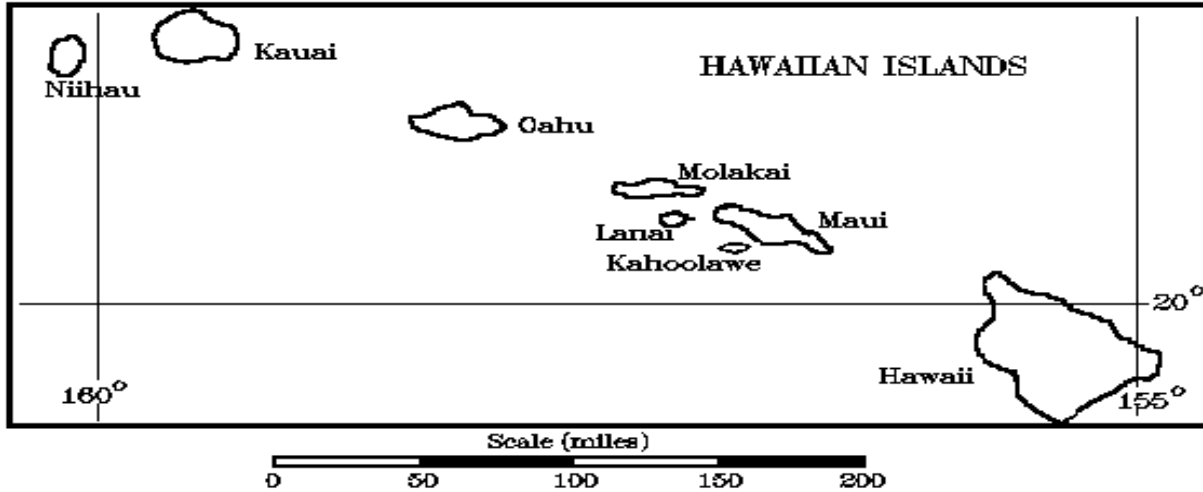
- A) A B) B C) C D) E

14. Which zones would contain the lithosphere?

- A) A and B B) B and C C) C and D D) D and E

15. Crustal plates that fit together to make the earth's lithosphere are generated at and move away from
 A) transform faults B) rift zones C) oceanic trenches D) subduction zones

Use the map below with question #16.



16. The island of Hawaii has active volcanoes on it and is still being built. Kauai is about 5 million years old. Which of the following is true?

- A) The Pacific Plate is moving NW at about 4inches/year
 B) The Pacific Plate is moving SW at about 4inches/year
 C) The Pacific Plate is moving NW but the rate cannot be determined.
 D) Neither the rate nor the direction of motion can be determined from the information given.

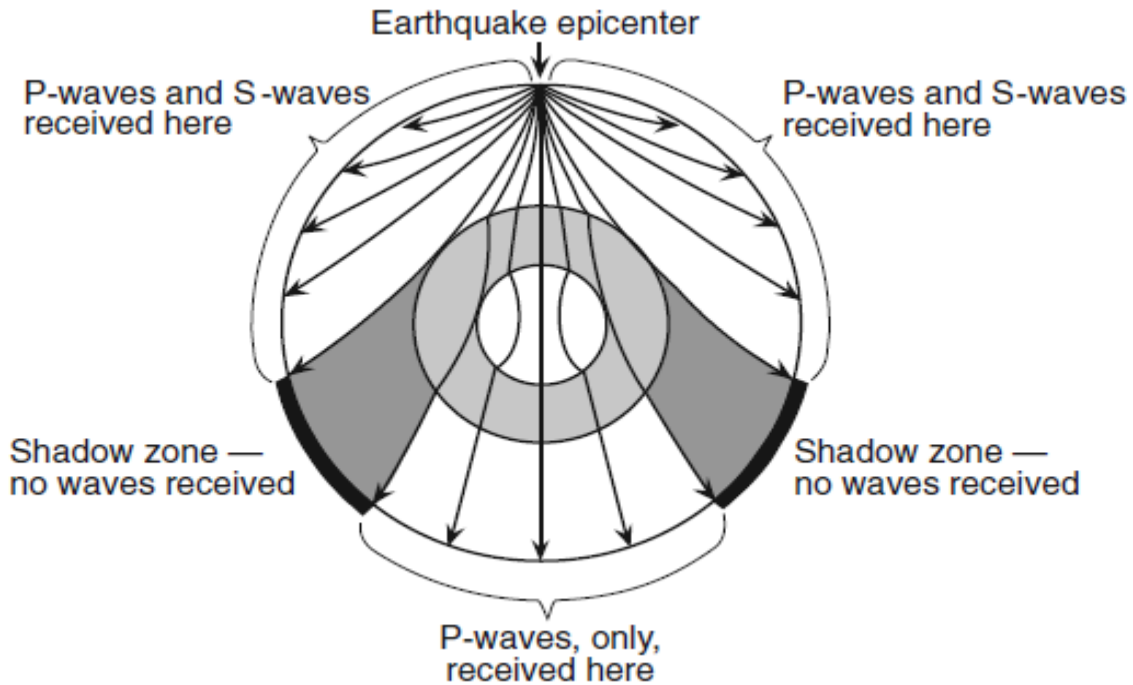
17. The Aleutian Islands, off Alaska, are a volcanic island arc. Off shore from the islands a geologist would expect to find

- A) a subduction zone B) a hot spot C) an oceanic ridge D) a magnetic reversal

18. The Andes Mountains on the west coast of South America include a large number of volcanoes. The area is subject to severe earthquakes. The cause of both is

- A) a rift zone B) a subduction zone C) a line of hot spots D) a terminal moraine

Base your answers to questions # 19 on the cross section below.



The cross section shows the paths of seismic waves traveling from an earthquake epicenter through different layers of the Earth's interior.

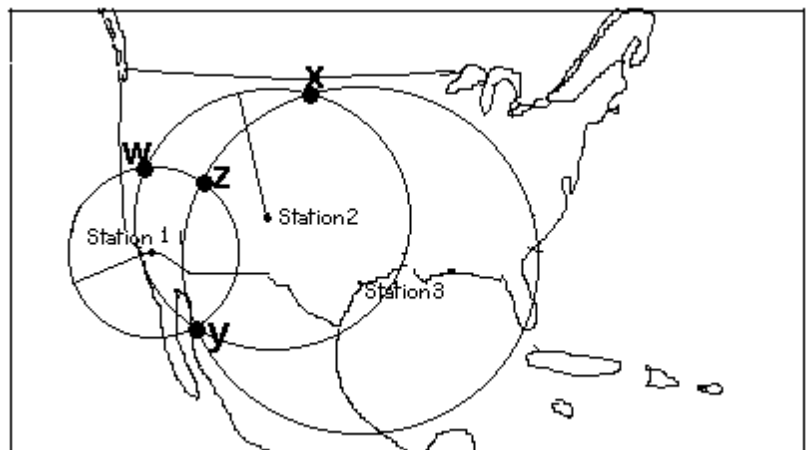
19. No P-waves or S-waves are received in the shadow zone because
- A) P-waves are absorbed and S-waves are refracted by the Earth's outer core.
 - B) P-waves are refracted and S-waves are absorbed by the Earth's outer core.
 - C) Both P-waves and S-waves are refracted by the Earth's outer core.
 - D) both P-waves and S-waves are absorbed by the Earth's outer core.

20. When two tectonic plates collide, oceanic crust usually subducts beneath continental crust because oceanic crust is primarily composed of igneous rock that has

- A) low density and is mafic
- B) low density and is felsic
- C) high density and is mafic
- D) high density and is felsic

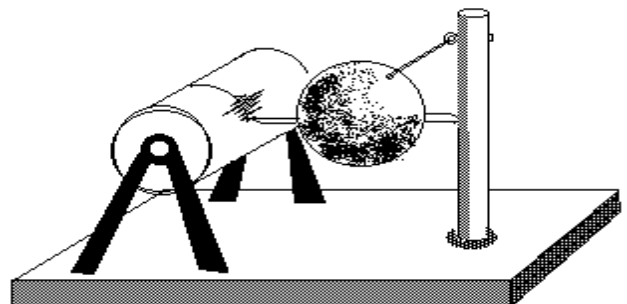
21. The map below shows the United States and Mexico. Three different earthquake stations have picked up the waves from an earthquake. Four different locations W, X, Y, and Z have been marked on the map. Which location on the map represents the epicenter of the earthquake?

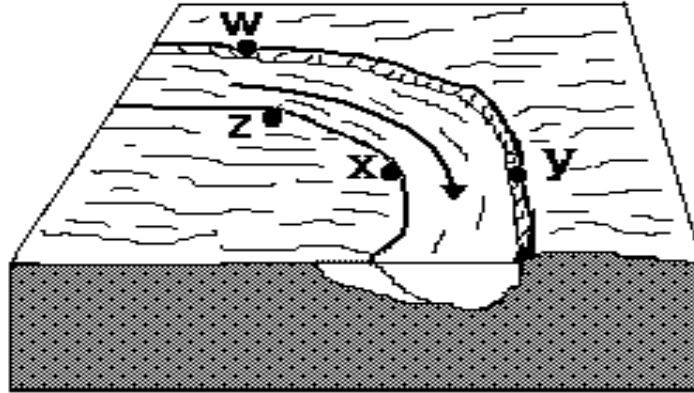
- A) W
- B) X
- C) Y
- D) Z



22. A picture of a seismograph is below right. What does the seismograph measure?

- A) s-waves only
- B) p-waves only





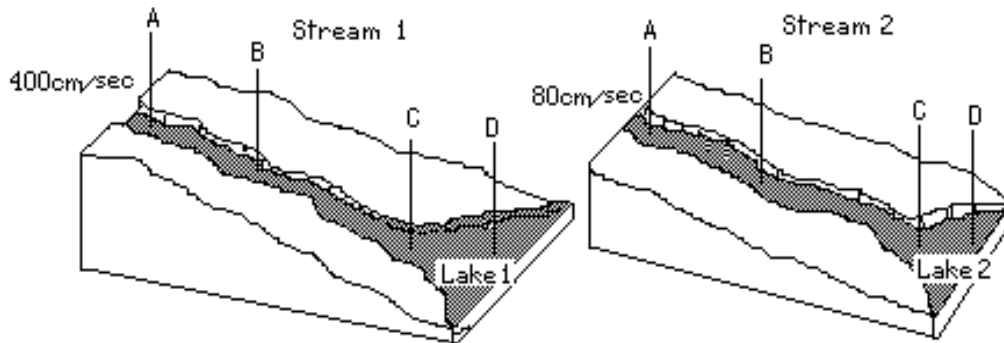
30. The arrow shows the direction that water is flowing in a stream. The greatest amount of erosion takes place at which point?

- A) w B) x C) y D) z

31. At which point is the water velocity the greatest?

- A) w B) x C) y D) z

Glacial sediments, containing clay, silt, sand, and pebbles, slide into each of the streams at points A. Notice that the water velocity is higher in Stream 1 than in Stream 2. Four different locations A, B, C, and D are marked on each stream. Use the diagrams below with questions 32, 33, 34



32. Which statement is the best interpretation of the information given above and by the diagrams?

- A) Stream 1 will move all of the particles more efficiently than Stream 2.
 B) Stream 2 will move all of the particles more efficiently than Stream 1.
 C) There is no difference in the efficiency of the streams to move all of the particles.

33. At which position will the water have the lowest amount of kinetic and potential energy?

- A) A B) B C) C D) D

34. If a sudden rainstorm occurs at both streams above point A, the erosion rate will

- A) increase for Stream 1, but not for Stream 2. C) increase for both streams.
 B) increase for Stream 2, but not for Stream 1. D) not change for either stream.

35. When placed in water, ice rises to the top of the liquid water. Unlike most solids that sink when placed in their liquid, ice floats because

- A) it is less dense than water C) gases inside the ice make it buoyant
 B) the pressure of the water holds it up D) it is colder than water.

36. About what % of the water on Earth is fresh liquid water?

- A) 1% B) 2% C) 3% D) 97%

37. When ground water dissolves limestone to form a cavern and the roof of the cavern collapses, the structure formed is a
 A) sink hole B) kettle hole C) kame D) esker

38. A type of rock which makes a good aquifer because it usually has good porosity and permeability is
 A) granite B) sandstone C) shale D) gneiss

39. The narrow, sandy, barrier islands in the ocean along the coast of New Jersey were deposited over time by
 A) wind B) streams C) glacial ice D) wave action

40. A small stream runs into a lagoon which is protected by a barrier island. Which event will most like occur during a heavy rainfall?
 A) Less sediment will be carried by the streams.
 B) An increase in sea level will cause more sediment to be deposited along the shore.
 C) The shoreline will experience a greater range in tides
 D) The discharge from the streams into the lagoon will increase.

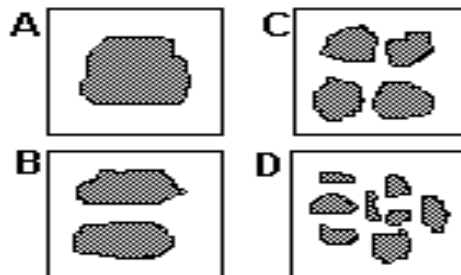
41. The direct cause in the formation of barrier beach islands, such as Long Beach Island and Fire Island, by the transport of sand along a coast line is
 A) wave action at a 90° angle to the beach
 B) wave action at some angle other than 90° to the beach
 C) ocean currents parallel to the beach
 D) fresh water currents from rivers

42. Weathering of rock is most important to living things because it
 A) releases oxygen B) makes soil C) leaches salts D) releases ground water

43. Freezing and thawing of water in rocks causes them to break apart. A similar process in dry, hot desert climates is the result of
 A) salt formation B) blowout C) leaching D) expansion and contraction

44. In which kind of climate does chemical weathering usually occur most rapidly?
 A) hot and dry B) hot and wet C) cold and dry D) cold and wet

45. The four limestone samples shown below have the same composition, structure, mass, and volume. Under the same climatic conditions, which will weather fastest?



46. A good index (or guide) fossil for use in identifying the sequence or age of rock formations has the following characteristics:

- A) lived for a short period of time over a small area.
- B) lived for a long period of time over a small area.
- C) lived for a short period of time over a wide area.
- D) lived for a long period of time over a wide area.

47. Based upon the reference tables at the end of the exam what is the oldest of the Eras is the
 A) Paleozoic B) Precambrian C) Cenozoic D) Mesozoic

48. Fossils of tree ferns are found in the black shales from eastern Pennsylvania. The swamps in which the tree ferns grew, during the Pennsylvanian Period, also have been an economic and energy source of
 A) coal B) petroleum C) peat D) lignite

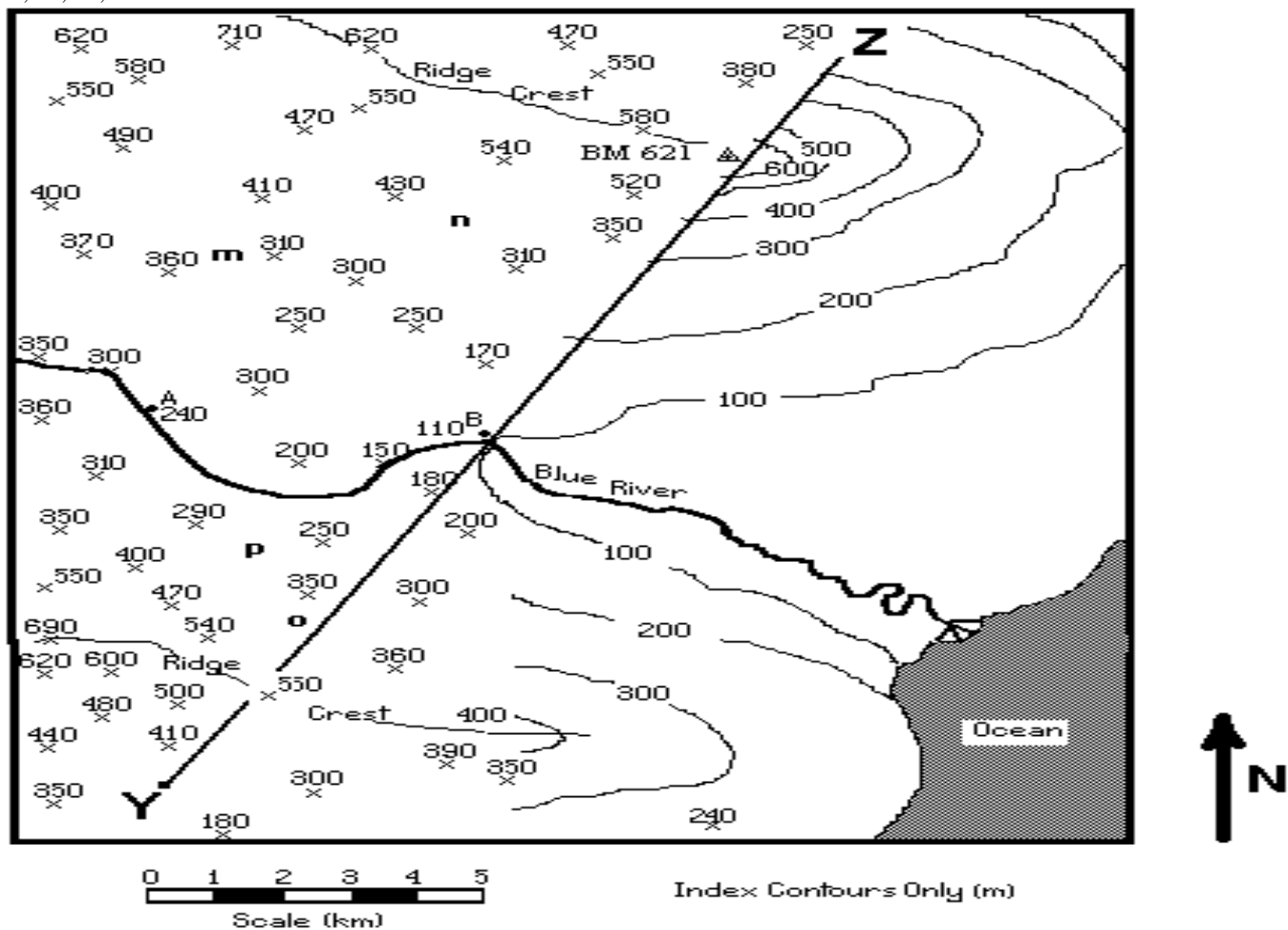
49. What evidence suggests that a mass extinction of the dinosaurs happened at the end of the Cretaceous Period?

- A) an absence of dinosaur fossils in the Paleocene bedrock
- B) drawings of dinosaurs made by humans in caves during the Paleocene Epoch
- C) an abundance of dinosaur fossils in Early Cretaceous bedrock
- D) evolution of dinosaurs during the Late Cretaceous Epoch.

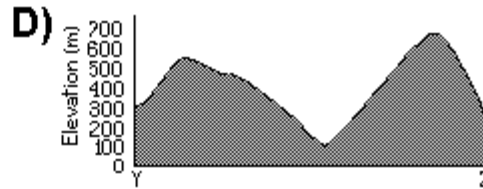
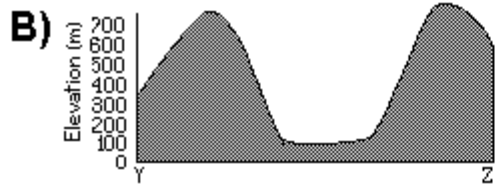
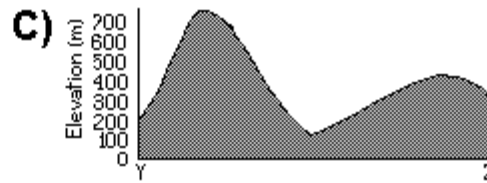
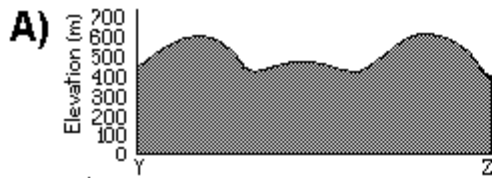
50. The time line below represents the entire geologic history of the Earth. Which lettered position represents the first appearance of humans?



The map is a topographic map that is only partially completed. Only index contour lines are shown in the right-hand half. Survey points for elevation are shown on the left-hand half of the map. Use the map with questions 51, 52, 53, 54.



51. Which diagram below best represents the profile along line Y-Z?



52. A benchmark is located at the top of the northernmost hill. When all the contour lines are completed on the map, what will be the elevation represented by the contour line that is then closest to the benchmark?

- A) 590 m B) 600 m C) 620 m D) 630 m

53. In which general direction is Blue River flowing?

- A) east B) west C) northwest D) southeast

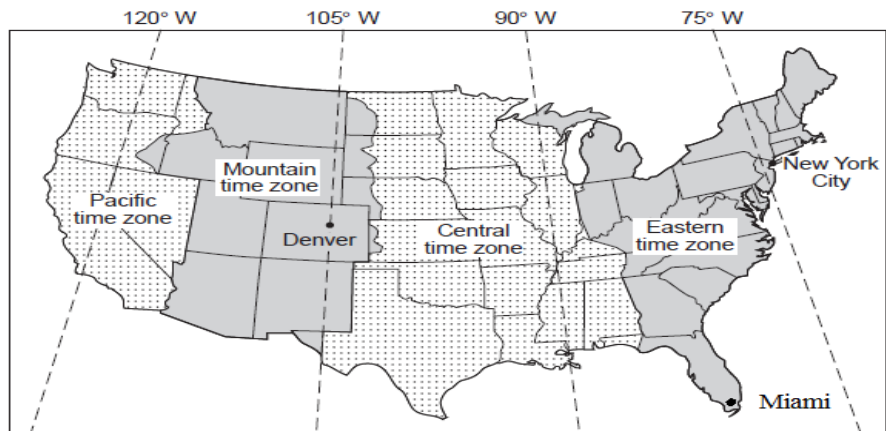
54. The gradient(slope) of Blue River between points A and B is approximately

- A) 5 m/km B) 20 m/km C) 30 m/km D) 150 m/km

55. The map below shows the four major time zones in the United States. Notice on the map that New York City and Denver Colorado are marked.

When it is noon in Denver, what is the time in New York City?

- A) 10 am
B) 2 pm
C) noon
D) 3 pm



56. Use the same map in #55. A ship is travelling from New York City to Miami, Florida. Both cities are marked on the map. The captain of the ship observes Polaris. Which statement describes the observed changes in the altitude of Polaris made by the captain during the voyage ?

- A) Each night the altitude decreases in the northern sky
B) Each night the altitude decreases in the southern sky.
C) Each night the altitude increases in the northern sky.
D) Each night the altitude increases in the southern sky.

57. The sunspot cycle is known to affect our weather and has a period of about

- A) 3 years B) 7 years C) 11 years D) 17 years

58. The layer of the sun that produces most of its visible light is the

- A) chromosphere B) photosphere C) corona D) core

59. Which one of the following DOES NOT have the same speed as the others?

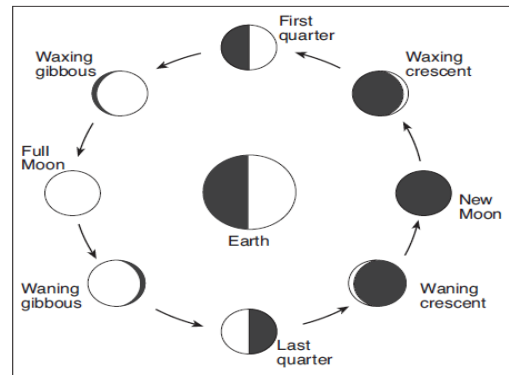
- A) Microwaves in your microwave oven B) Radio waves from your local radio

C) The solar wind streaming from the sun

D) light from a fluorescent light bulb

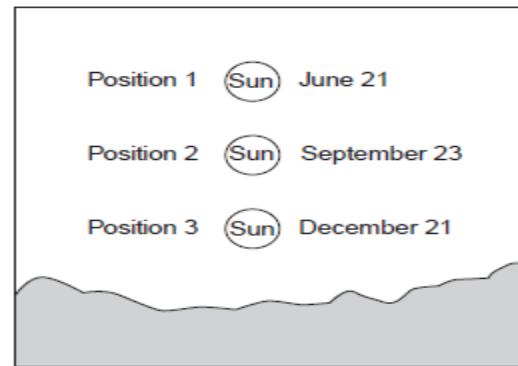
60. A solar eclipse was observed on March 20, 2015 that is the first day of spring this year. Which Moon phase was present on that day?

- A) new Moon
- B) first quarter
- C) full Moon
- D) last quarter



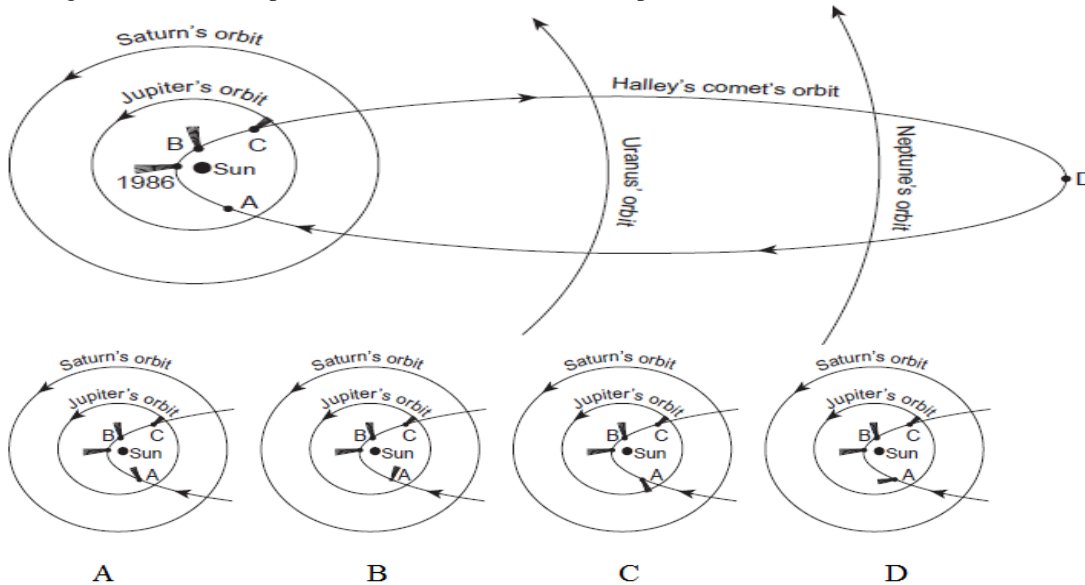
61. Positions 1, 2, and 3 in the diagram below represent the noon Sun above the horizon on three different days during the year as viewed from New Jersey. At which position was the noon Sun on January 21 as viewed from New Jersey?

- A) above position 1
- B) below position 3
- C) between 1 and 2
- D) between position 2 and 3



South
Drawing not drawn to scale

62. The diagram below represents the revolution of Halley's comet around the Sun in 1986. The period of Halley's comet is 75 years. In 1986 the comet was at perihelion, its closest point to the Sun. Positions A, B, C, and D are positions of Halley's comet in its orbit. The tail of the comet is shown at perihelion, B and C. Which drawing below shows the position of the tail of the comet at position letter A?



63. Compared to the orbit of the Jovian planets the orbit of Halley's comet is

- A) less elliptical with a shorter distance between foci

- B) less elliptical with a greater distance between foci
- C) more elliptical with a shorter distance between foci
- D) more elliptical with a longer distance between foci

64. The apparent magnitude of a star is its
 A) size B) visual brightness C) absolute brightness D) temperature

65. Stable stars, like our sun, maintain a balance between
- A) mass and energy
 - B) shrinking due to gravity and enlargement from collecting more gases
 - C) shrinking due to gravity and shrinking due to cooling
 - D) expansion due to thermal energy and shrinking due to gravity

66. Most estimates for the age of the universe are between 13 and 14 billion years. When astronomers observe a galaxy that is 8.5 billion light years away they are looking

- A) 1/2 to 2/3 of the way back in time to the Big Bang
- B) outward and away from the Big Bang
- C) at the galaxy as it formed during the Big Bang
- D) at the galaxy as it exists today

67. The highest angle of insolation in New Jersey (40° N latitude) occurs on June 21 at noon. The angle of the sun's rays to the ground at that time is about

- A) 23.5° B) 40° C) 73.5° D) 90°

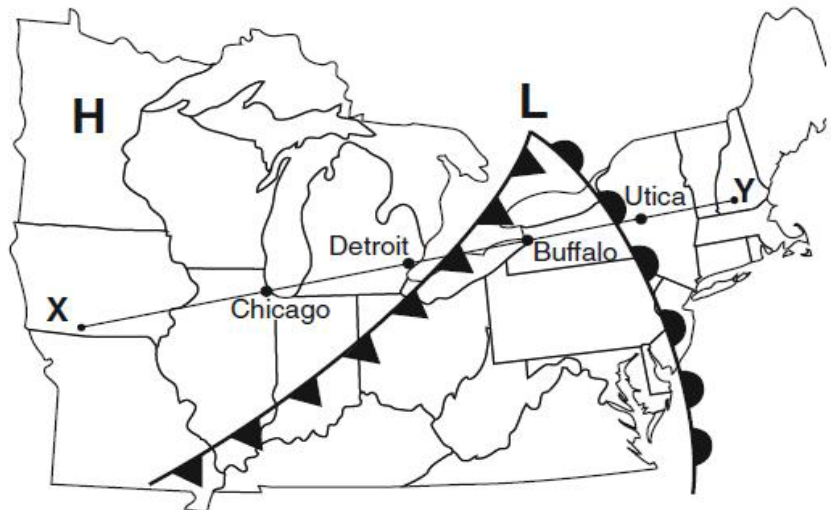
68. Earth's atmosphere is warmed when
- A) ultraviolet radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
 - B) x-ray radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
 - C) infrared radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere
 - D) gamma radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere

69. As compared to warm air, cold air usually has

- A) a lower pressure C) the same pressure
- B) a higher pressure D) pressure unrelated to temperature

Use the weather map below for questions 70, 71, and 72.

70. What type of weather front is between Buffalo and Detroit?
- A) warm front
 - B) cold front
 - C) Occluded front
 - D) stationary front.



71. What type of weather front is sweeping from Detroit and Chicago toward Buffalo?

- A) stationary front B) warm front C) cold front D) isolated front

72. The weather forecast for Utica is

- A) rain and warmer B) fair and warmer C) colder with showers likely D) fair and colder

NEW JERSEY SCIENCE LEAGUE
EARTH SCIENCE EXAM ANSWER KEY TAN TEST

DATE: April 9th, 2015

Record onto the area record the # correct (corrected)

1	B	19	B	37	A	55	B
2	B	20	C	38	B	56	A
3	A	21	C	39	D	57	C
4	D	22	C	40	D	58	B
5	A	23	A	41	B	59	C
6	B	24	A	42	B	60	A
7	C	25	B(A)	43	D	61	D
8	C	26	C	44	B	62	C
9	C	27	B	45	D	63	D
10	A(all full credit)	28	D	46	C	64	B
11	C	29	C	47	B	65	D
12	B	30	C	48	A	66	A
13	B	31	C	49	A	67	C
14	A	32	A	50	D	68	C
15	B	33	D	51	D	69	B
16	A	34	C	52	C&B	70	B
17	A	35	A	53	D	71	C
18	B	36	A	54	B	72	A