USESO National Open Exam 2020

Some multiple choice questions have only one correct answer. Others, that are marked with a (*) may have multiple correct answers. To get full points for such questions you must choose all of the correct answers. You will lose points for correct answers that are not marked. You will also lose points for incorrect answers that are marked.
Exception: If the answer is part of a linked group, such as the following example.

Example (*) For the values of x=3^2 and y=9, which of the following are true?

A x=y
B x>y
C x<y
D y is a prime
E y is a polynomial
F y is an irrational number
G y is an integer

Several answers are correct, and you should be able to select and mark them all. However for A, B and C, these three possible choices are mutually exclusive. Logically only one choice can be correct. Thus for this type of linked answer set, only one point can be lost for any miss marked answer(s) for A, B and C. G is also a correct answer and must be marked.

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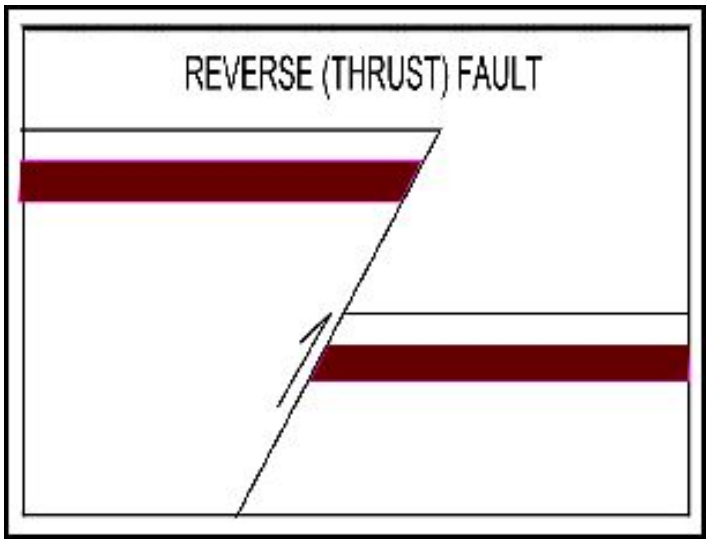
#1 A geologist studies a stratigraphic sequence and identifies the following rocks, from top to bottom: sandstone, quartzite, granite. In which of the following environments was this sequence most likely observed?

A. Near a large intrusive igneous body, such as a batholith
B. In a zone with extensive folding from high differential stress
C. Near evidence of a prehistoric tropical beach
D. Adjacent to the high-energy headwaters (i.e. source) of a river

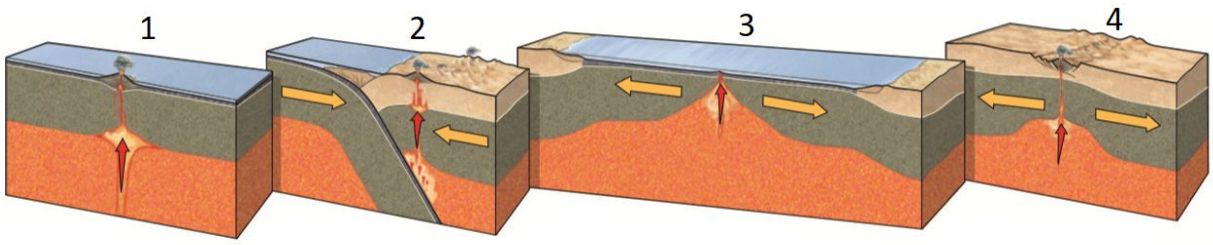
#2 Using the diagram below of a reverse fault, answer the following question.



Which of the following processes is/are likely to be directly associated with this kind of fault? (*)

A. Ocean basin formation
B. Volcanic island arc formation
C. Mountain building
D. Hotspot volcanism
E. Earthquakes
F. Movement of glaciers
G. Mid-ocean ridge formation

Using the diagram below of various settings of igneous activity, answer the following question.



#3 Select all of the following which is/are true of the formation of magmas in these settings. (*)

A. The mantle plume that forms in setting 1 is composed of denser, more felsic magma
B. The mantle plume that forms in setting 1 is composed of lighter, more mafic magma
C. The formation of magma in setting 2 is due to the addition of water
D. The formation of magma in setting 2 is due to decreased pressure overhead
E. The magma formed at setting 3 is likely felsic in composition
F. The rocks formed at setting 3 is likely mafic in composition
G. The lava extruded at setting 4 is likely more felsic than at setting 1
H. The lava extruded at setting 4 is likely more mafic than at setting 1

#4 Suppose, while excavating vertically through sedimentary strata, one encounters rock units (labeled A-D) in the following sequence: A, B, C, D, C, B, A. What deformational feature is this most likely a part of?

A. Dome, an upwarped region
B. Recumbent fold, a fold “on its side”
C. Normal fault
D. Reverse fault

#5 The Basin and Range Province covering much of Western United States contains fault-block mountains that are associated with normal faults. These normal faults generally run parallel to the base of the north–south trending mountain ranges of the region. From this information, we can infer that mountains of the Basin and Range Province most likely formed as a result of:

A. The isostatic uplift of sections of the crust that are less dense than surrounding materials.
B. Tensional stresses that pull on the crust in the region.
C. Compressional forces that push sections of the crust upward.
D. The erosion of softer materials of the crust that then expose the underlying resistant bedrock.
E. The activity of volcanic hotspots that disrupt the structure of the crust.

#6 Rocks such as breccia are more likely to form in a(n) _____ environment, while mudstone is more likely to form in a(n) _____ environment.

A. Low energy erosional; high energy erosional
B. Low energy depositional; high energy depositional
C. High energy erosional; low energy erosional
D. High energy depositional; low energy depositional

#7 Which of the following is a possible result of plates moving along a transform boundary?

A. opening of a new ocean basin
B. seafloor spreading
C. earthquakes and tsunamis
D. mantle convection

#8 Which of the following characteristics best describes the igneous rock most likely to be found along the outside of a shield volcano?

A. Mafic and coarse grained
B. Mafic and fine grained
C. Felsic and coarse grained
D. Felsic and fine grained

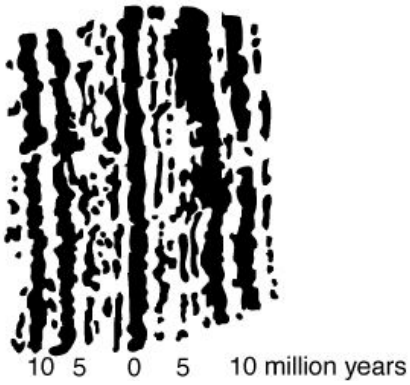
#9 The main geologic evidence for the accumulation of atmospheric oxygen 2.3 Bya (billion years ago) is based on which of the following chemical properties?

A. The precipitation rate of silica
B. The dissolved oxygen capacity of different temperatures of water
C. The hydrogen bond strength in H_2O
D. The solubility of Fe ions

#10 Which of the following is/are true regarding silica content in magmas? (*)

A. Magmas with low silica content are more likely to form glass textures when cooled rapidly than magmas with high silica content.
B. Magmas with low silica content flow faster than magmas with high silica content.
C. Eruptions involving magmas with low silica content are more explosive than eruptions involving magmas with high silica content.

D. Magmas with high silica content require higher temperatures to preserve its molten state than magmas with low silica content.

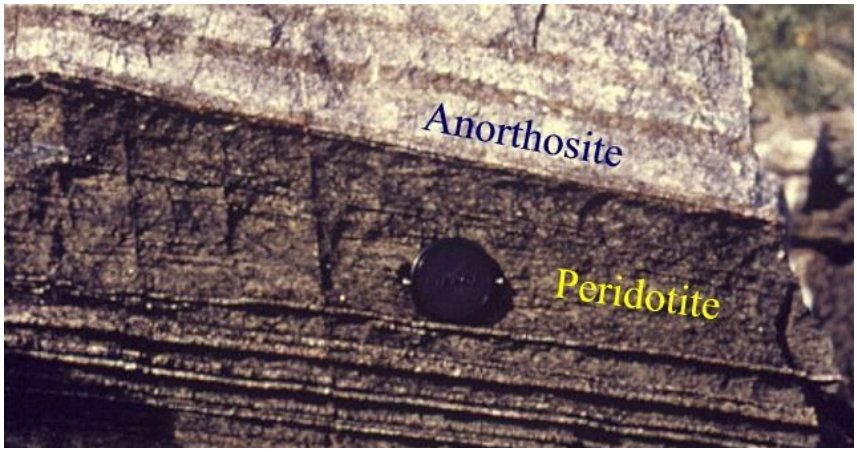


#11 Black strips in this image correspond to rock formed when the Earth's magnetic field was how it is today, and white strips correpond to rocks formed when the field was in the reverse direction. This image is thereby evidence for which of the following? (*)

A. The migration of magnetic poles from geographic poles
B. The movement of rigid tectonic plates above a plastic base
C. Multiple reversals of magnetic poles in geologic history
D. The silica-rich and iron-poor composition of the ocean floor
E. The gradual alignment of magnetic minerals in rocks after cooling.

#12 Maya the geologist has three samples of white rock. She knows that they are limestone, gypsum and kaolinite, but she cannot tell which one is which. Which of the following options would give her the most veritable way to tell which one is which?

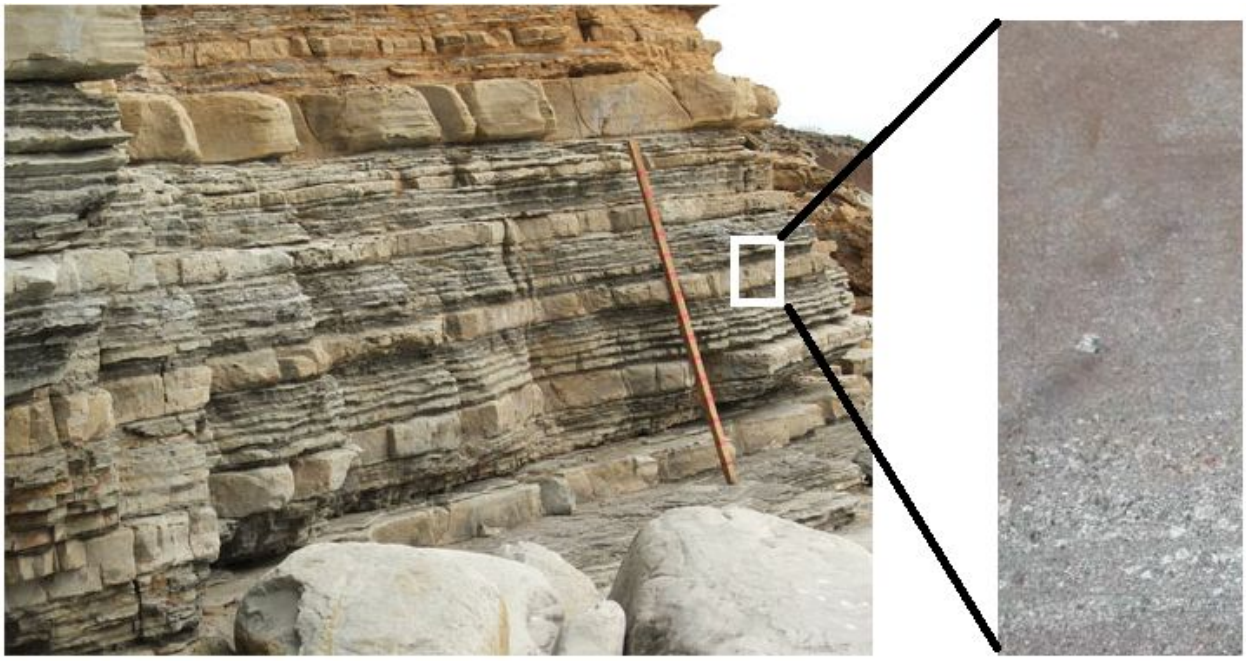
A. Limestone fizzes with HCl, gypsum can be scratched with a fingernail and kaolinite expands in water
B. Limestone expands in water, gypsum can be scratched with a fingernail, and kaolinite fizzes with HCl
C. Gypsum expands in water, kaolinite can be scratched with a fingernail and limestone expands in water
D. Gypsum expands in water, limestone can be scratched with a fingernail and kaolinite fizzes with HCl



#13 Which of the following **best** explains the petrologic processes that led to the formation above?

A. Anorthosite and peridotite are sedimentary rocks that were deposited in a lake bed
B. Olivine crystals in peridotite are denser than plagioclase in anorthosite, leading to crystal settling at the bottom of a magma body and the formation of distinct layers
C. A loss of heat towards the anorthosite led to fractional crystallization of feldspar, differentiating it from the peridotite
D. An anorthositic sill intruded into a peridotite groundmass

Refer to the following figure for the next two questions.



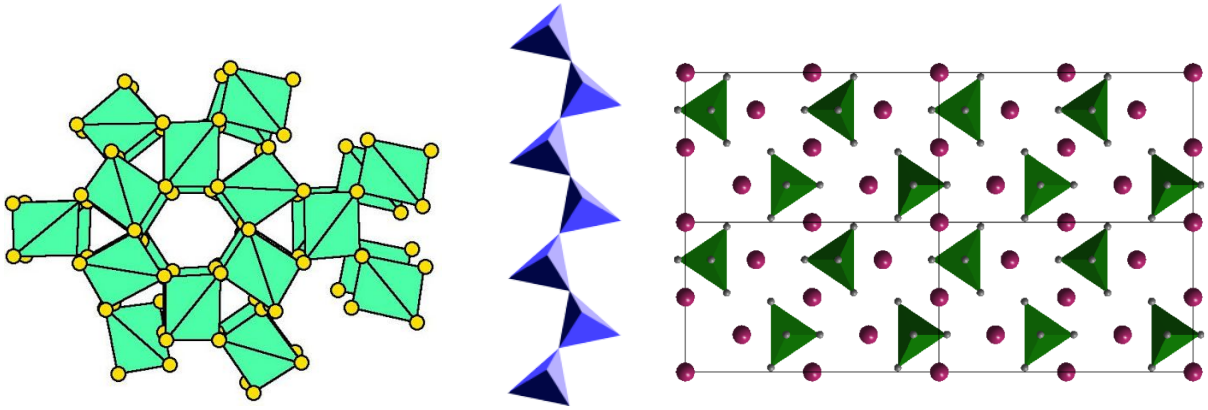
#14 Which of the following depositional features is **most** likely represented by the figure?

A. Poorly sorted glacially deposited rock
B. Seasonal lake deposits
C. Graded turbidites
D. Cross-bedded sand dunes
E. Graded alluvial fan bases

#15 Which of the following characteristics about the depositional feature are correct? (*)

A. Predominantly highly rounded quartz grains
B. Predominantly highly rounded feldspar grains
C. Formed at the base of a slope
D. Formed through wind-driven processes
E. Possibly seismic in origin

#16 Using the figure below of common silicate mineral structures and knowledge of Bowen's reaction series, answer the following question.



A B C

Which of the following statements about igneous minerals are **true**? (*)

A. Albite melts concurrently with olivine
B. As magma is formed, A melts before B which melts before C
C. As magma is formed, C melts before B which melts before A
D. The loss of overlying pressure after oceanic sediments are accreted off is the primary mechanism of melting at subduction zones
E. Hydrated rocks melt at lower temperatures than anhydrous rocks

F. Olivine has a structure most similar to structure C
G. Quartz has a structure most similar to structure B

#17 Indicate all of the following which fall under the category of silicate minerals: (*)

A. Biotite
B. Hornblende
C. Calcite
D. Quartz
E. Pyrite
F. Orthoclase

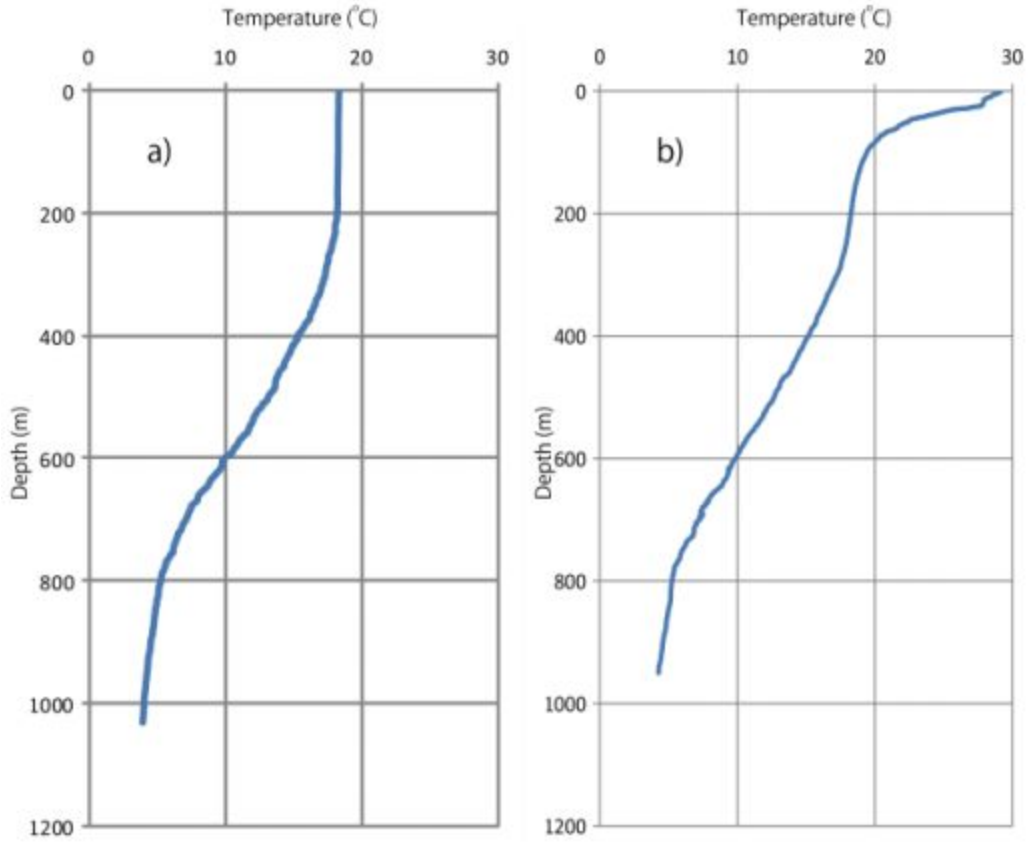
#18 In a typical subtropical gyre, the easternmost currents are usually:

A. Cold in the northern hemisphere; warm in the southern hemisphere
B. Warm in the northern hemisphere; cold in the southern hemisphere
C. Cold in both hemispheres
D. Warm in both hemispheres

#19 Brine rejection is an integral process in the formation of the North Atlantic Deep Water, a driving force of thermohaline circulation. Which of the following best describes the process of brine rejection?

A. Warm water cannot have high salinity, forcing colder, more saline water below
B. Dissolution of salt is an exothermic process, creating a thermal gradient in the water column
C. The decay of large amounts of organic matter (e.g. brine shrimp) leads to a dense water mass
D. Sea ice formation leaves behind salt, forming a high salinity water mass

#20 Use the following diagram of two thermoclines relating temperature (x-axis) and depth (y-axis) in different bodies of water to answer the following question.



Which of the following statements are most likely to be true? (*)

A. The left diagram represents the profile during the winter because it shows strong vertical mixing of water layers
B. The right diagram represents the profile during the winter because it shows no vertical mixing of summer layers
C. The right diagram represents the profile during the summer because it shows strong vertical mixing of water layers
D. The right diagram represents the profile during the summer because it shows no vertical mixing of water layers
E. The right diagram is characteristic of the Arctic Ocean
F. The left diagram is characteristic of the Arctic Ocean

#21 Select all of the following that increases as you move down a mature stream. (*)

A. Discharge
B. Mean Velocity
C. Maximum particle size able to be carried

D. Capacity

#22 Select all of the following that are **true** regarding ocean surface currents at the equator. (*)

A. The Coriolis effect causes surface waters to converge at the equator
B. They are primarily meridional
C. The water of such currents has a relatively low salinity
D. They lose heat to the atmosphere before feeding into western boundary currents
E. Most flow westward, but some flow to the east

#23 Select all of the following that are **true** about the oceanic lithosphere as time passes. (*)

A. Younger lithosphere is generally closer to spreading centers than older lithosphere
B. Ocean depth is often greater towards spreading centers
C. The lithosphere becomes less dense and more buoyant as it ages
D. Thickness of sediment deposits tends to increase with distance from a spreading center
E. Iron oxides in lithospheric rock create visible bands that can be used for determining age
F. Eventually, oceanic lithosphere is usually accreted onto the margins of continents

#24 A mature stream flows from a floodplain into a lake. A sudden decrease in the lake's water level would have what effect on the characteristics of the stream?

A. The width of the stream would increase
B. The stream would develop more meanders
C. The discharge, or volume of water passing a point per given amount of time, would increase
D. The stream would begin to erode surrounding sediment

#25 Density of seawater increases as:

A. temperature, salinity, and pressure decrease.
B. temperature, salinity, and pressure increase.
C. temperature increases; salinity and pressure decrease.
D. salinity and pressure increase; temperature decreases.
E. pressure increases; temperature and salinity decrease.

#26 Which of the following statements are likely **true** as you **dive deeper** in an area of the Arctic Ocean where sea surface temperature is less than 0℃? (*)

A. Temperature increases slightly, then remains constant
B. Aragonite solubility increases
C. Density decreases slightly, then remains constant
D. Chlorophyll concentration increases
E. Calcite solubility increases

#27 Which of the following statements are likely **true** about currents in the North Pacific? (*)

A. The California Current in the East Pacific is significantly stronger than the Kuroshio Current in the West Pacific
B. The California current in the East Pacific is significantly weaker than the Kuroshio Current in the West Pacific
C. The California current in the East Pacific is about the same strength as the Kuroshio Current in the West Pacific
D. The North Equatorial Current (southern arm of the North Pacific Subtropical Gyre) is generated primarily by the trade winds
E. Vertical water movement is primarily dominated by upwelling at the equator
F. The most saline water typically occurs near 30N

#28 Which of the following best explains why a wind blowing towards the south on the Western coast of the United States will likely lead to higher biological activity?

A. The balance of gravity and the Coriolis force results in a net transport of water towards the shore, bringing in nutrient-rich water from the ocean.
B. The balance of friction and the Coriolis force results in a net transport of water towards the shore, bringing in nutrient-rich water from the ocean.
C. The balance of gravity and the Coriolis force results in a net transport of water away from the shore, allowing nutrient-rich deep water to rise to the surface.
D. The balance of friction and the Coriolis force results in a net transport of water away from the shore, allowing nutrient-rich deep water to rise to the surface.
E. The wind blows nutrients from northern forests into the ocean, leading to higher biological activity.
F. The wind moves nutrient-rich cold water from north to south.

#29 Use the following chemical reactions to answer the following question.
$CO_2(g) + H_2O(l) \rightarrow H_2CO_3(aq)$
$H_2CO_3(aq) + CaCO_3(s) \rightarrow Ca(HCO_3)_2(aq)$

Which of the following correctly describes $CaCO_3$ in the ocean? (*)

A. As depth increases, the solubility of CO_2 increases due to increased pressure, decreasing the pH and leading to more $CaCO_3$ dissolving.
B. Solid $CaCO_3$ is generally not found below a certain depth in the ocean.
C. $CaCO_3$ in the ocean is mainly obtained from river sediments.
D. Almost all biogenic sediment on the ocean floor is composed of CaCO3.

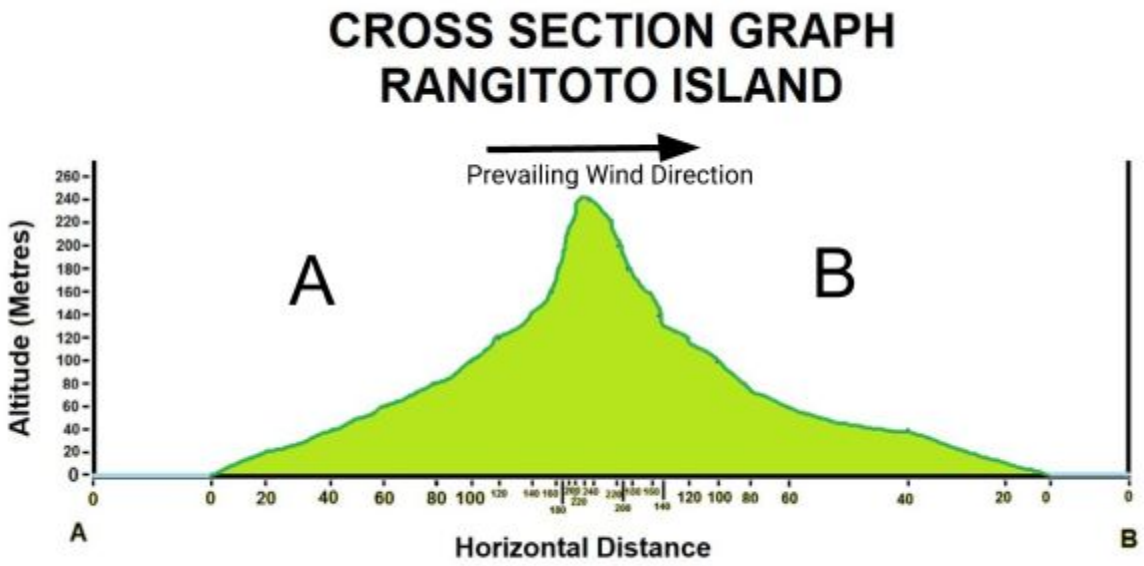
#30 At a time when tides are particularly strong, the moon phase is most likely to be: (*)

A. New Moon
B. First Quarter
C. Full Moon
D. Third Quarter

#31 Which of the following statements are true of ocean acidification? (*)

A. Ocean acidification has a directly detrimental effect on organisms like diatoms with silicon-based shells
B. Ocean acidification actually describes a shift closer to a neutral pH
C. Human activity is a significant contributor to ocean acidification
D. The average ocean pH has decreased 0.1 since the industrial revolution, which is small enough such that the effect on ocean life has been insignificant

#32 Using the figure below of Rangitoto Island, New Zealand, answer the following 2 questions.



Compared to "A", the "B" side of the island is likely to be:

A. Hotter and drier
B. Colder and wetter
C. Hotter but similar in humidity
D. Colder but similar in humidity

#33 The temperature on this island is likely to be:

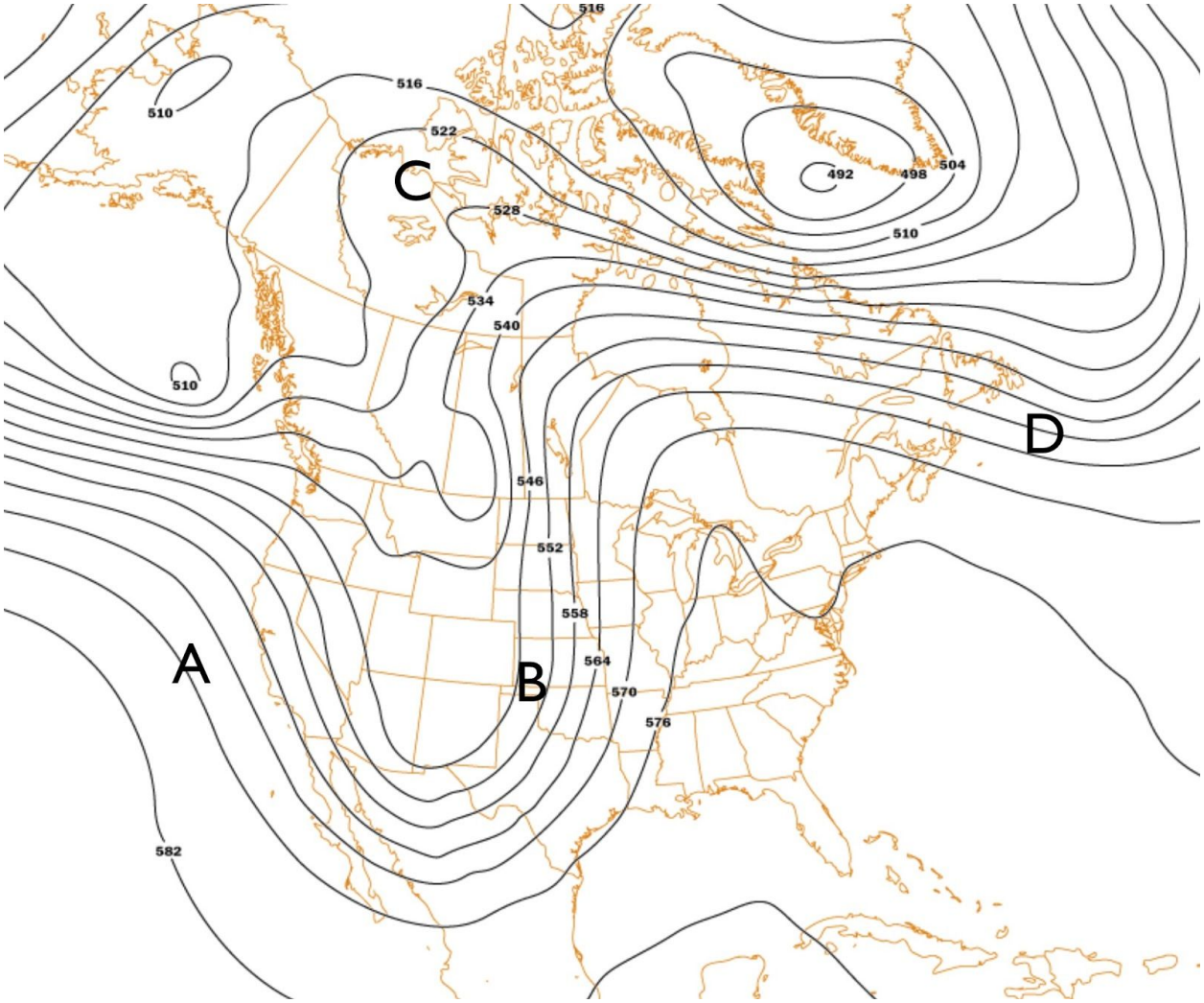
A. Slightly warmer in June compared to December
B. Slightly warmer in December compared to June
C. Significantly warmer in June compared to December
D. Significantly warmer in December compared to June

#34 Why do cumulonimbus clouds form "anvil-like" tops?

A. As moist air cools and sinks, it contracts, forming a narrower cloud. Consequently, the top of the cloud is wider and looks like an anvil.
B. As moist air rises forming the cloud, it experiences less pressure, allowing it to expand outward.
C. As moist air rises, it reaches a temperature inversion, which prevents its rise, forcing sideways movement.

D. As moist air rises and forms clouds, it becomes drier, allowing the molecules to move around more freely and the air to expand, forming a wider anvil.

#35 Using the image below of a 500 mb meteorological chart, a contour map of the elevation at which the pressure is 500 mb (e.g. '492' = 4920 meters), answer the following question.



In which position would the most severe weather likely occur?

A. Position A
B. Position B
C. Position C
D. Position D

#36 Atmospheric stability refers to the atmosphere's influence on the vertical motion of air due to differences in temperature. Which of the following is/are true regarding atmospheric stability? (*)

A. When the rate at which an air parcel cools with altitude is faster than that of its surrounding atmosphere, the parcel of air will remain stagnant.
B. When the rate at which an air parcel cools with altitude is faster than that of its surrounding atmosphere, the parcel of air will rise.
C. Towering clouds form when air parcels always cool slower with altitude than the surrounding atmosphere.
D. Clouds cannot form when air parcels always cool faster with altitude than their surrounding atmosphere.

#37 Which of the following is/are true regarding climate changes with respect to latitude? (*)

A. Differences in seasonal temperature decreases with increasing latitude.
B. Rays from the Sun travel through less atmosphere with increasing latitude.
C. Increases in temperature in response to greenhouse gases are greater at lower latitudes.
D. The upper boundary for cloud formation is lower at higher latitudes.

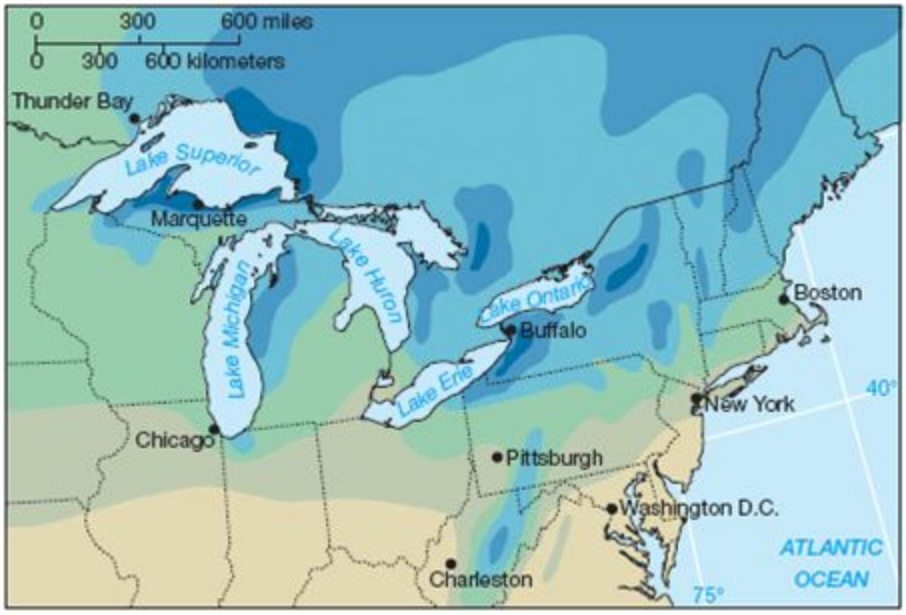
#38 Wind is controlled by differences in atmospheric pressure, the Coriolis effect, and friction. Which of the following statements correctly describe(s) each factor's effect on wind? (*)

A. The Coriolis effect only affects wind direction and not wind speed.
B. A larger distance in which a difference in atmospheric pressure exists results in faster winds.
C. Winds closer to the ground are slower due to friction. Therefore, the Coriolis effect has a larger effect on surface winds than upper-air winds.
D. The Coriolis effect is strongest at the equator and weakest at the poles due to the higher tangential velocity at the equator.
E. Smaller atmospheric pressure differences in the winter result in weaker winds.

#39 Indicate all of following statements that are true concerning atmospheric stability: (*)

A. Warmer air being held above cooler air corresponds to an unstable atmosphere
B. Air that is warmer than its surroundings tends to rise
C. Air that is cooler than its surroundings tends to sink, leading to a stable atmosphere
D. There is a net heat transfer between a rising parcel of air and its surroundings

#40 Consider the following map of annual snowfall in the Great Lakes Region (darker shades indicate higher annual snowfall):



Which of the following best describes why Marquette receives more snow than Thunder Bay?

A. A northerly wind pushes air over Lake Superior where the air picks up moisture due to evaporation from warm lake water.
B. A southerly wind pushes air over Lake Superior where the air picks up moisture due to evaporation from warm lake water.
C. A northerly wind pushes air over Lake Superior where the air loses moisture due to precipitation from the air mass.
D. A southerly wind pushes air over Lake Superior where the air loses moisture due to precipitation from the air mass.

#41 Which of the following sets of terms best describes the air mass from the previous question before it passes over the lake?

A. Warm and moist
B. Warm and dry
C. Cold and moist
D. Cold and dry

#42 A meteorologist mounts two thermometers side by side. One is covered with a piece of cloth dipped in distilled water and the other is kept dry. An electric fan blows air past both thermometers and the resulting temperatures are recorded. Which of the following are true regarding the results? (*)

A. A small difference between the two thermometer measurements indicates low humidity.
B. A small difference between the two thermometer measurements indicates high humidity.
C. Cooling the air temperature will increase the relative humidity, defined as the ratio of the actual vapor pressure to the saturation vapor pressure.
D. Cooling the air temperature will increase the mixing ratio, defined as the ratio of the mass of water vapor to the mass of dry air.
E. Cooling the air temperature will increase the dew point, defined as the temperature at which air would be saturated with water vapor.

#43 In some region, a dry air parcel cools at a rate of 10° C per 1000 m of elevation and a wet air parcel (saturated with water vapor) cools at a rate of 6° C per 1000 m of elevation. Which of the following is true regarding the scenario? (*)

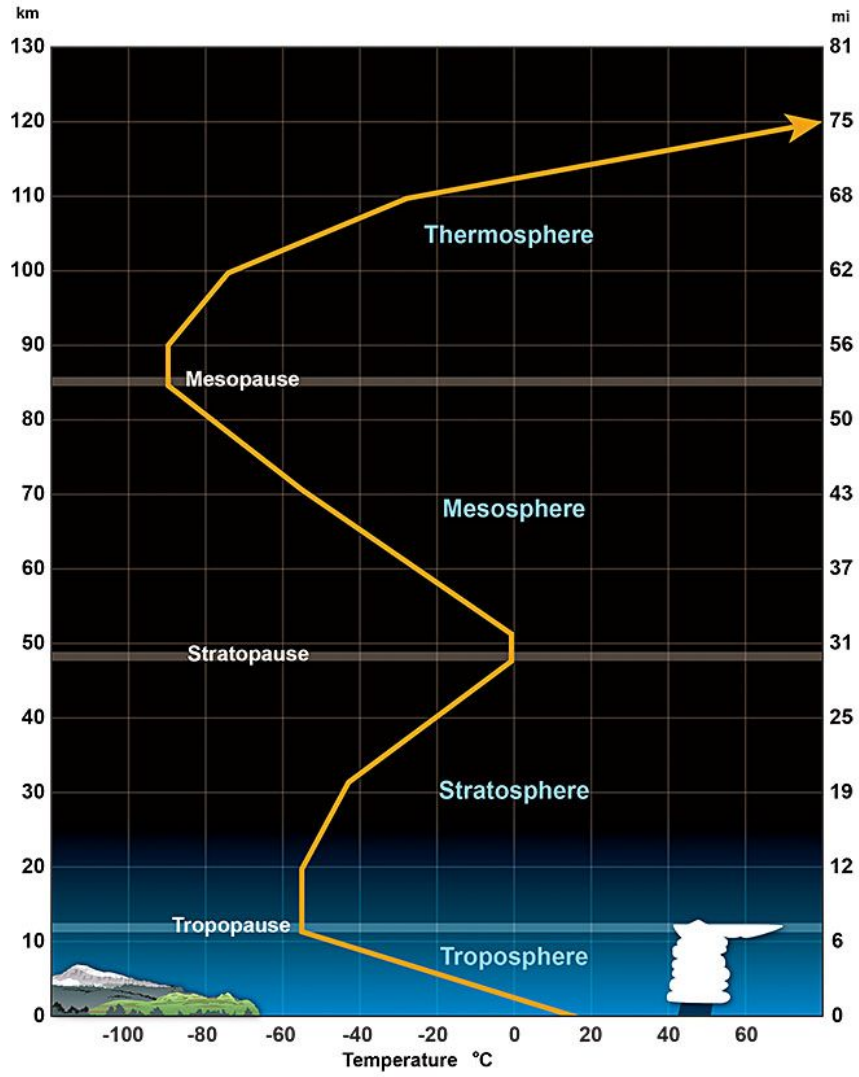
A. If the atmospheric temperature decreases at a rate of 12° C per 1000 m of elevation, an air parcel forced upward will continue to rise on its own.
B. If the atmospheric temperature decreases at a rate of 12° C per 1000 m of elevation, the air parcel will resist vertical movement.
C. If the atmospheric temperature decreases at a rate of 12° C per 1000 m of elevation, the air parcel will resist vertical movement until it is saturated with water vapor.
D. If the atmospheric temperature decreases at a rate of 8° C per 1000 m of elevation, the air parcel will continue to rise on its own.
E. If the atmospheric temperature decreases at a rate of 8° C per 1000 m of elevation, the air parcel will resist vertical movement.
F. If the atmospheric temperature decreases at a rate of 8° C per 1000 m of elevation, the air parcel will resist vertical movement until it is saturated with water vapor.

#44 During the winter, snowstorms form downwind of the Great Lakes. This occurs when a cold, dry air mass moves over the warmer lake water. Which of the following is true regarding this phenomenon? (*)

A. This occurs when a continental polar air mass moves over the Great Lakes.
B. This occurs when a maritime polar air mass moves over the Great Lakes.
C. As the air warms over the lake, it becomes less buoyant and spreads out to form stratus clouds.

D. As the air moves over the lake, it sweeps up moisture, quickly becoming saturated.

#45 Using the graph below indicating the relation between temperature and altitude among the different layers of the atmosphere, answer the following question:

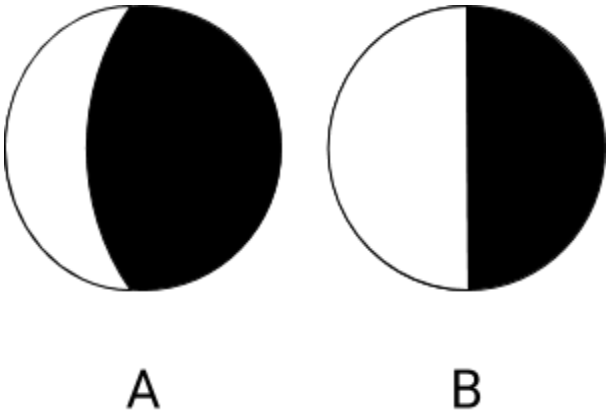


Indicate all of the statements that correctly describe the temperature decreases/increases in various layers of the atmosphere. (*)

A. The absorbed heat in the mesosphere dissipates through the thermosphere and is lost there leading to a decrease in temperature with altitude
B. The thermosphere has so few particles that collisions between them rarely occur even with its extremely high temperatures
C. The tropopause is the upper altitude limit for weather to occur

D. The heavy presence of ozone in the stratosphere leads to the absorption of solar radiation

#46 Using the figure below of moon phase observations, answer the following question.



A scientist observes the moon on two separate days from the same location. She records the data of observation as March 16, 2020 and March 18, 2020. Which of the following statements is most likely true?

A. “A” occurred on March 16, “B” occurred on March 18
B. “A” occurred on March 18, “B” occurred on March 16
C. It is impossible for these phases to have occurred two days apart
D. This depends on the hemisphere where this observation was made

#47 The “dark side of the moon” is relatively smooth and non-reflective. Which of the following statements about this side of the moon is most likely to be true?

A. Similar to basalt in composition and relatively young
B. Similar to granite in composition and relatively old
C. Similar to basalt in composition and relatively old
D. Similar to granite in composition and relatively young

#48 Which terrestrial planet has the strongest magnetic field?

A. Mercury
B. Venus
C. Earth
D. Mars

#49 In a lunar eclipse, the line of nodes points at the sun. The moon must also be in what phase?

A. New Moon
B. First Quarter
C. Waning Gibbous
D. Full Moon
E. Third Quarter

#50 Mercury possesses a 3:2 spin-orbit resonance with the Sun, meaning it rotates about its axis 3 times with every 2 revolutions around the Sun. Approximately how long, in Mercury years, does a single 360 degree rotation take?

A. 0.42
B. 0.59
C. 0.67
D. 1.53

#51 The above answer refers to the *sidereal day* of Mercury. Which of the following explains why there is a difference in between Mercury's sidereal day and its solar day (that is, the time between consecutive noons for a given position)?

A. Mercury has an exceptionally eccentric orbit, bringing it closer to or farther from the Sun
B. The tilt of Mercury's axis results in changes in the duration of daytime over the course of one year
C. Mercury's axis precesses, or "wobbles" over time, continually shifting the position of the equinoxes
D. Mercury revolves about the sun so that a rotation about its axis of more than 360 degrees is needed to face the Sun again

#52 Which of the following characteristics contribute to Jupiter's strong magnetic field? (*)

A. Hydrogen-rich atmosphere
B. Metallic hydrogen outer core
C. Solid, ferromagnetic nickel-iron core
D. Interaction with solar wind particles
E. Fast rotation about its axis

#53 Use the following table of masses and densities of the 4 inner planets of the solar system to answer the following question.

Planet	Mass (Earth masses)	Density (grams per centimeter cubed)
Mercury	0.055	5.4
Venus	0.815	5.2
Earth	1	5.5
Mars	0.107	3.9

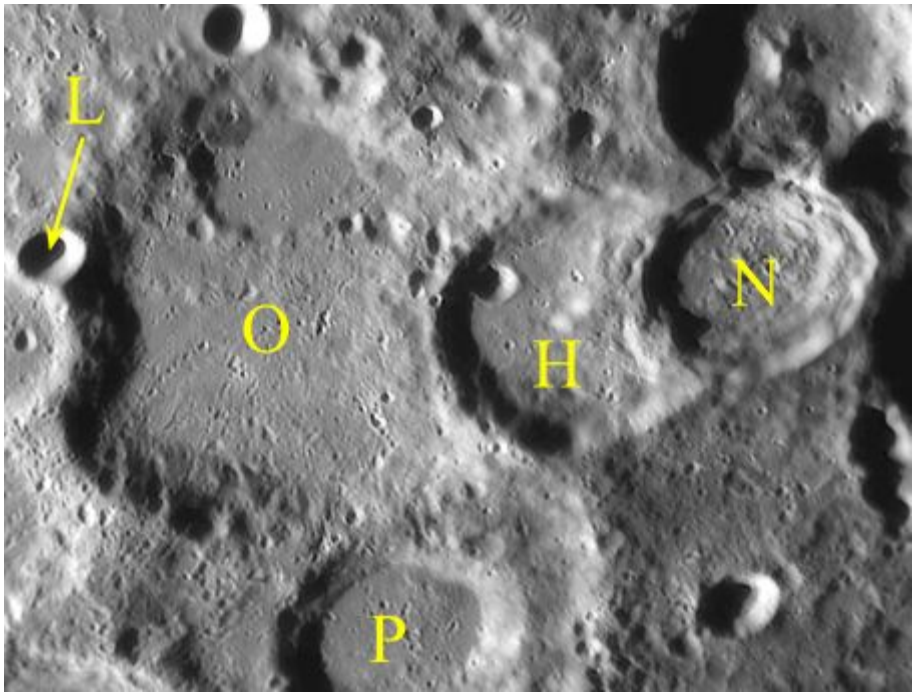
Accounting for the fact that gravity compresses larger planets to a greater degree, which planet do you expect to have the largest metal core relative to its volume?

A. Mercury
B. Venus
C. Earth
D. Mars

#54 A hypothetical comet orbiting the Sun has an orbital semimajor axis of 64 AU. Which of the following best approximates the orbital period of the comet (in Earth years)?

A. 2 years
B. 16 years
C. 64 years
D. 256 years
E. 512 years

#55 Using this photo of lunar craters, answer the following question.



Which of the following statements must be true about these craters? (*)

A. Crater N is older than Crater H
B. Crater L is younger than Crater O
C. Crater P is the same age as Crater O
D. Crater N is younger than Crater O
E. Ejecta from the impact of Crater N might be found in Crater H
F. Craters on the Moon are also known as maria

#56 Which of the following statements is/are true regarding the Sun? (*)

A. Sunspots are areas on the surface of the Sun that are hotter than the surrounding plasma
B. The atmosphere of the Sun is hottest closest to the surface
C. The edge or limb of the solar disk appears to be dimmer than the center because temperature increases with depth in the Sun's photosphere
D. Solar winds can interact with the Earth's magnetic field to ionize gases in the troposphere, causing auroras

#57 The terrestrial planets have diverse surface conditions that affect the formation and evolution of craters. Which of the following are consequences of the terrestrial planets' surface conditions? (*)

A. Mercury's strong magnetic field prevents most meteoroids from impacting the surface.
B. Crater density on Venus is much smaller than that on the Moon and Mars due to Venus' dense atmosphere.
C. Few craters are preserved on the Earth due to the atmosphere and hydrologic cycle.
D. Active plate tectonic activity on Mars causes nearly every surface crater to be eroded rapidly.

#58 Which of the following is true regarding the solar system's planets? (*)

A. On Mars, large smooth regions in the Northern Hemisphere can likely be attributed to cooled basaltic lava flows.
B. On Jupiter, the Great Red Spot's color can be attributed to iron on the surface
C. Uranus has very similar conditions across all latitudes
D. Mercury experiences the hottest temperatures in the solar system due to its greenhouse effect.

#59 The Milankovitch cycles, a series of fluctuations in Earth's orbital eccentricity, axial tilt, and precession, lead to sizable changes in the Earth's climate. Circle all of the following that would increase the possibility of an ice age. (*)

A. Increasing eccentricity of Earth's orbit which decreases overall solar radiation in one year
B. Decreasing eccentricity which leads to milder seasons and a higher chance of ice to survive summer insolation
C. Increasing axial tilt which decreases overall solar radiation in one year
D. Decreasing axial tilt which leads to milder seasons and a higher chance of ice to survive summer insolation

#60 Scientists cannot directly determine the elemental composition of Earth, but assumptions and calculations have been made. How did scientists make these assumptions?
A. By creating theoretical models alone
B. By sampling the oldest Earth rocks in many different locations
C. By measuring meteorite samples that remain unchanged since their formation
D. By drilling deep into the lithosphere and taking an average bulk composition of the material therein