

# 1. Continental Drift

1. Why was Wegener's theory of continental drift not accepted during his lifetime?
  - A. He had a difficult personality and was disliked
  - B. He could not disprove the idea of land bridges between continents
  - C. GPS had not been invented so there was no way to tell if continents were moving,
  - D. He did not have an explanation for how continents moved
  
2. Which of these statements is true about the Earth's crust?
  - A. Continental crust is many times thicker than oceanic crust
  - B. The crust cannot be thicker than 10 km
  - C. The lithosphere is the same as the crust
  - D. The rocks found in continental crust are more dense than the rock in oceanic crust
  
3. What is the ultimate driving force behind plate tectonics?
  - A. Heat from the Earth's core
  - B. Heat from the Sun
  - C. The spinning motion of the Earth
  - D. The pull of the Moon's gravity
  
4. If the Earth's core became much hotter, which outcome would be most likely?
  - A. Continents would move slower
  - B. Continents would move faster
  - C. Continental drift would stop
  - D. Continental drift would occur at the same speed as before
  
5. Which of the following countries straddle multiple tectonic plates?
  - A. Australia
  - B. Canada
  - C. Great Britain
  - D. Iceland
  - E. Japan
  - F. Saudi Arabia
  - G. New Zealand

## 2. Plate Boundaries

1. Which of the following are true of subduction zones:
  - A. They are a type of divergent plate boundary
  - B. The Mariana trench was formed by a subduction zone
  - C. They are associated with gentle and slow-moving volcanic eruptions
  - D. They only occur between oceanic and continental plates
  
2. Which of the following statements are true?
  - A. Mid ocean ridges occur at convergent plate boundaries
  - B. The Mohorovičić discontinuity is the boundary between Earth's mantle and outer core
  - C. The Himalayas are on the boundary between the Indian and Eurasian plate
  - D. The African plate is the largest major tectonic plate
  
3. The Andes mountains were formed by:
  - A. A collision between two continental plates
  - B. A subduction zone between an oceanic and a continental plate
  - C. A transform or strike-slip boundary
  - D. A mid-ocean ridge that was later uplifted
  
4. What geologic process formed the deepest lakes in the world?
  - A. Divergent plate boundary
  - B. Convergent plate boundary
  - C. Transform plate boundary
  - D. Erosion
  
5. Which of the following statements about hotspots are true?
  - A. Yellowstone National Park was formed by a hotspot
  - B. Hotspots always move at a slow and steady rate
  - C. A hotspot is responsible for the formation of the Hawaiian islands
  - D. The most active volcano in the world is over a hotspot

## 4. Weathering vs Tectonics

1. Which of the following plate boundaries or tectonic processes often results in shield volcanoes?
  - A. Subduction zones
  - B. Continental-continental convergent zones
  - C. The rift valleys in divergent zones
  - D. Mid-ocean ridges
  - E. Hot spots in Earth's crust
  
2. Which of these statements is true about weathering?
  - A. Caves are formed by chemical weathering
  - B. Weathering is the movement of material from one location to another
  - C. Frost wedging and thermal expansion are examples of chemical weathering
  - D. Rusting of rock is biological weathering
  
3. Which of these mountain ranges or mountains are becoming shorter or lower in elevation each year?
  - A. Himalayas
  - B. Andes
  - C. Appalachians
  - D. Hawaii (Mauna Loa on the big island)
  - E. Hawaii (Kawaikini on the island of Kauai)
  
4. Which type of rock is formed from eroded materials?
  - A. Igneous
  - B. Metamorphic
  - C. Sedimentary
  - D. No rocks are formed in this way; only sand and soil are formed from eroded materials
  
5. Which of the following rocks commonly experiences chemical weathering through carbonation?
  - A. Limestone
  - B. Gneiss
  - C. Sandstone
  - D. Granite

## 5. Earthquakes and Faults

1. If a rock is under tension stress, what is likely to happen? Assume the rock is under enough heat and pressure to be ductile.
  - A. The rock will thin and lengthen
  - B. The rock will compress and fold
  - C. The rock will break, causing an earthquake
  - D. The rock will melt
  
2. Select each true statement.
  - A. Rocks always break under pressure
  - B. Normal faults are associated with tension
  - C. Movement along a fault is often slow (just a few millimeters per year)
  - D. A deep earthquake is more damaging than a shallow earthquake of the same magnitude
  
3. Select each true statement about P-waves.
  - A. P-waves are shear waves that move with an up-down motion
  - B. P-waves are compressional waves that move in the same direction they travel
  - C. P-waves are the most destructive type of earthquake energy
  - D. P-waves travel faster than other seismic waves
  
4. Which waves can travel through liquids?
  - A. P-waves
  - B. S-waves
  - C. Both
  - D. Neither
  
5. How much stronger is a 6.2 magnitude quake than a 3.2 magnitude quake?
  - A. 3 times
  - B. 30 times
  - C. 100 times
  - D. 1000 times

## 7. Go With The Flow

1. What is the best definition of a watershed?
  - A. A river or stream flowing into a larger river or lake
  - B. A land area that channels water to a stream
  - C. A depression or dip in Earth's surface
  - D. A landform created by the deposition of sediment at the mouth of a river
  
2. Which part of a river is *most active* in weathering material?
  - A. Tributaries
  - B. The main trunk
  - C. The mouth or delta
  - D. All parts of a river are actively eroding sediment
  
3. Which statements about rivers are true?
  - A. Water flows fastest on the inside of the curve and slowest on the outer edge
  - B. A flood plain experiences flooding every year
  - C. Oxbow lakes show the location of an older riverbed
  - D. All rivers eventually reach the ocean
  
4. What is true about the sediment load of a stream?
  - A. The largest sediments will be in the dissolved load
  - B. The Colorado River has a low sediment load
  - C. The sediment load only includes rock, gravel, and sand moved by the stream
  - D. Fast-moving water can move larger particles than slow-moving water
  
5. An alluvial fan is different than a delta because:
  - A. It forms where rivers meet lakes
  - B. It is only found at the source zone
  - C. It occurs on flat plains where rivers flood
  - D. It forms on land, usually at the base of mountains

## 8. The Cryosphere

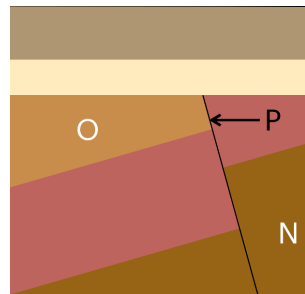
1. Permafrost is ground that remains frozen for at least:
  - A. 6 months
  - B. 1 year
  - C. 2 years
  - D. 10 years
  
2. The top layer of soil above permafrost that thaws and refreezes each year is called the:
  - A. Active layer
  - B. Frozen crust
  - C. Ice cap
  - D. Glacier
  
3. If the accumulation zone of a glacier is receiving more snow than the ablation zone is losing, what will happen?
  - A. The glacier will retreat
  - B. The size of the glacier will be stable
  - C. The glacier will advance
  - D. There is not enough information to say
  
4. Why does the cryosphere reflect sunlight back into space?
  - A. Ice and snow tend to have a high albedo
  - B. Rock always absorbs more heat than ice
  - C. Ice and snow tend to have a low albedo
  - D. Cold objects are more reflective than warm objects
  
5. Thawing permafrost can cause which of the following?
  - A. Lower sea level
  - B. The collapse of trees, roads, and buildings
  - C. More volcanic eruptions
  - D. An increase in global methane levels

## 10. How Old Are Rocks?

1. If a sedimentary layer of sandstone contains clasts or inclusions of gneiss, which is true?
  - A. The gneiss is older than the sandstone
  - B. The sandstone is older than the gneiss
  - C. The sandstone and gneiss are the same age because they are part of the same rock layer
  - D. It's not gneiss to ask a rock how old it is

2. The diagram shows rock layers O and N as well as fault P. List the labeled features from oldest to youngest.

- A. NPO
- B. OPN
- C. NOP
- D. PON
- E. ONP
- F. PNO



3. Why do scientists measure the ratio of isotopes in minerals?
  - A. It is stable and does not change
  - B. It changes in a predictable way
  - C. It helps determine the rock's relative age
  - D. It helps determine the rock's absolute age
4. Which type of rock is best for radiometric dating?
  - A. Sedimentary rocks because they're always created in horizontal layers
  - B. Igneous rocks because when first formed, they contain minerals with no daughter isotopes
  - C. Metamorphic rocks because the high temperature resets the radioactive clock
  - D. All rocks can be dated using radiometric techniques
5. A rock has a 1:1 daughter-to parent ratio  $^{40}\text{Ar}$  to  $^{40}\text{K}$ . In other words, it contains 50%  $^{40}\text{Ar}$  and 50%  $^{40}\text{K}$ . How many half lives have passed?
  - A. None; the rock just formed
  - B. 1
  - C. 2
  - D. 3

# 11. Geologic Time

1. Select each true statement:
  - A. An index fossil is one that is only found in one location
  - B. Most prehistoric animals and plants were fossilized after they died
  - C. Index fossils are specific to a certain time but found over a widespread geographic area
  - D. It takes approximately 100 years to make a fossil
  
2. Which correctly orders the major divisions of geologic time from largest to smallest?
  - A. Period → Era → Eon
  - B. Period → Eon → Era
  - C. Eon → Era → Period
  - D. Era → Eon → Period
  
3. Matching rock layers of the same age in different locations using evidence like fossils and layer order is called:
  - A. Stratigraphic correlation
  - B. Catastrophism
  - C. Uniformitarianism
  - D. Logical
  
4. Pangea was a supercontinent for approximately
  - A. 1 million years
  - B. 100 million years
  - C. 1 billion years
  - D. 100 billion years
  
5. A layer of shale deposited by an ancient lake is 100 meters thick. If lake sediments form at an average rate of 1 mm/yr, how long did it take to accumulate 100 m of sediment?
  - A. 1,000 years
  - B. 10,000 years
  - C. 100,000 years
  - D. 1 million years



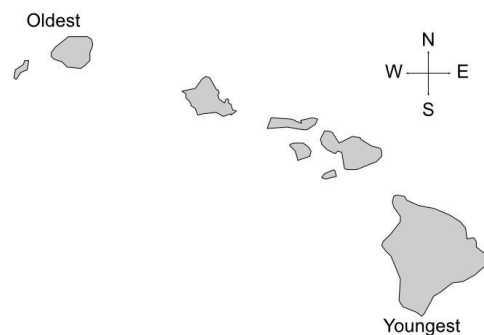
## 13.Geoscience Quiz Show

1. Which of the following statements are true?

- A. Increased volcanism is associated with every type of plate boundary
- B. Plate tectonics explains nearly all major geologic processes on Earth.
- C. The distribution of earthquakes in Earth's crust is random
- D. Evidence of tectonic activity has only been observed on Earth

2. The youngest, tallest island in Hawai'i is at the SE end of the island arc. Assuming the hotspot is stationary, what does this pattern indicate?

- A. The Pacific Plate is moving to the southeast
- B. The Pacific Plate is moving to the southwest
- C. The Pacific Plate is moving to the northeast
- D. The Pacific Plate is moving to the northwest



3. Which type of plate boundary is responsible for creating the Andes Mountains?

- A. Divergent boundary where plates move apart
- B. Transform boundary where plates slide past each other
- C. Convergent boundary where oceanic plate subducts beneath continental plate
- D. Hot spot volcanism unrelated to plate boundaries

4. Which statement about geological time is true?

- A. An Era is longer than an Eon
- B. Life first emerged during the Carboniferous period
- C. The Jurassic is a geological period.
- D. There have been 3 eras on Earth

5. The Ring of Fire around the Pacific Ocean is characterized by high concentrations of which geological features?

- A. Mid-ocean ridges and transform faults
- B. Earthquakes, volcanoes, and deep ocean trenches
- C. Continental rift valleys and flood basalts
- D. Stable continental shields and cratons

6. In the competition between weathering and tectonics, what determines whether mountains grow taller or are worn down?

- A. The type of rock that makes up the mountain range
- B. The rate of tectonic uplift compared to the rate of erosional processes
- C. The presence or absence of glacial activity
- D. The orientation of the mountain range relative to prevailing winds

7. What is the primary cause of most earthquakes?

- A. Volcanic eruptions releasing built-up pressure
- B. Sudden release of stress along pre-existing fractures in rock
- C. Gravitational settling of loose sediments
- D. Chemical weathering weakening rock structures

8. Which characteristic would cause a river to be more effective at eroding a landscape?

- A. Low discharge volume or flow rate
- B. High discharge volume or flow rate
- C. Narrow channel
- D. Wide channel

9. Permafrost is defined as ground that remains frozen for what minimum time period?

- A. At least one full winter season
- B. At least one full year
- C. At least two consecutive years
- D. At least five consecutive years

10. Identify the false statement.

- A. Identical fossils on different continents can be explained by animals swimming across the Atlantic Ocean.
- B. India used to be near the South Pole.
- C. The Appalachian Mountains and Scottish Highlands used to be part of the same mountain range.
- D. Pangea began breaking apart about 200 million years ago (early Mesozoic).

11. Why do river deltas form where rivers join larger bodies of water?

- A. Increased water velocity causes more erosion
- B. Decreased water velocity causes sediment deposition
- C. Chemical reactions between fresh and salt water create sediment
- D. Biological weathering from fish creates new sediment

12. If trilobites are found in a rock, what does this mean?

- A. The rock is from the Jurassic time period
- B. The rock is younger than the Mesozoic (the age of the dinosaurs)
- C. The rock cannot be dated from the presence of the fossil alone
- D. The rock can be dated with a high degree of confidence

13. What type of rock is most useful for radiometric dating?

- A. Igneous
- B. Metamorphic
- C. Sedimentary
- D. Marmoset

14. The focus of an earthquake refers to which location?

- A. The point on Earth's surface directly above the earthquake
- B. The underground location where the earthquake rupture begins
- C. The location where seismic waves are first detected
- D. The point where the most damage occurs

15. Which type of seismic wave arrives first at a recording station?

- A. Surface waves that travel along Earth's surface
- B. Love waves that cause horizontal ground motion
- C. S-waves that shake the ground side to side
- D. P-waves that travel as compressions

16. In earthquake-resistant construction, base isolation systems work by:

- A. Making buildings as rigid as possible to resist shaking
- B. Allowing the building to move independently of ground motion
- C. Anchoring the building deeply into bedrock
- D. Using the heaviest possible construction materials

17. Select the true statement.

- A. Erosion and weathering are the same thing
- B. Deposition occurs most where water moves fastest
- C. Caves are primarily formed by chemical weathering
- D. All valleys are created by rivers

18. Which landform results when a river loses energy and deposits its sediment load?

- A. An alluvial fan or deltas
- B. A river terrace indicating past flood levels
- C. A deeply incised canyon or gorge
- D. A series of waterfalls and rapids

19. Which relative dating principle states that features cutting through rock layers are younger than the rocks they cut?

- A. The principle of superposition
- B. The principle of original horizontality
- C. The principle of cross-cutting relationships
- D. The principle of faunal succession

20. Radioactive decay used in radiometric dating follows which type of mathematical pattern?

- A. Linear decrease over time
- B. Random fluctuations with no predictable pattern
- C. Cyclical changes that repeat over time
- D. Exponential decay with a characteristic half-life

## 14. Relative Humidity

1. The weather report says the temperature is 30°C (86°F) and the Relative Humidity (RH) is 50%. Which statement about RH is true:
  - A. The air contains half as much water vapor as it would at saturation
  - B. Half of the air is water vapor
  - C. The dew point must be above 30°C
  - D. The air contains twice as much water vapor as it would at saturation
2. If air temperature remains constant at 20°C and more water vapor is added, absolute humidity (AH) increases. What happens to relative humidity (RH)?
  - A. RH increases
  - B. RH decreases
  - C. RH will stay the same
  - D. There is not enough information to know if RH will change
3. If the air temperature is 20°C and the dew point is 20°C, what is the relative humidity?
  - A. 1%
  - B. 20%
  - C. 50%
  - D. 100%
4. Which of the following statements about afternoon thunderstorms are true?
  - A. Afternoon thunderstorms are more common when air is warm and dry
  - B. Mountains can help trigger storms by encouraging moist air to rise and cool
  - C. The tallest cumulonimbus clouds are up to 1 km tall
  - D. At any given moment, there are about 2,000 thunderstorms happening around the world
5. If the amount of water vapor in the air stays the same but the air temperature increases, what will happen to relative humidity (RH)?
  - A. RH increases
  - B. RH decreases
  - C. RH will stay the same
  - D. There is not enough information to know if RH will change

## 16. Heat Index and Wind Chill

1. Two afternoons have the same air temperature of 32 °C (90 °F). Tuesday has 40% RH; Friday has 70% RH. Which day will have the higher heat index and why?
  - A. Tuesday
  - B. Friday
  - C. The heat index for Tuesday and Friday will be the same because the air temperature is the same
  - D. More information is needed; wind speed is needed to calculate the heat index
2. Deja states that working outside on Monday, which has a forecast for temperatures of 94° F and 80% humidity, would be less dangerous than working outdoors on Wednesday, which has a forecast for 104° F temperatures and 40% humidity. Is Deja correct or mistaken?
  - A. Deja is correct. The higher temperatures on Wednesday give that day a higher heat index.
  - B. Deja is mistaken. The higher humidity on Monday makes being in that 94 degree heat more dangerous than the drier 104 degree heat.
  - C. Deja needs more information to determine the heat index for the coming week.
3. Which statement about windchill is FALSE?
  - A. Wind chill can cool a car's engine block below the actual air temperature if the wind is strong enough.
  - B. Frostbite is not possible if the temperature is above freezing but the wind chill is below freezing
  - C. Cold temperatures can be dangerous with or without wind
  - D. Windchill is only calculated for temperatures below 50° F and wind speeds above 3 mph
4. When the apparent temperature is higher than the actual temperature, which statement is true?
  - A. The windchill index would be useful
  - B. The humidity must be low
  - C. The heat index would be useful
  - D. None of the above are true
5. The air temperature outside is 20°F, and the wind chill is 5°F. A metal fence post is sitting outside. What temperature is the fence post?
  - A. Somewhere between 5°F and 20°F depending on how long it's been outside
  - B. Lower than 5°F because metal conducts cold very well
  - C. 5°F, because wind chill affects everything outside
  - D. 20°F, because wind chill only affects objects that generate their own body heat.

## 17. Air Masses and Fronts

1. Select each true statement.
  - A. All planets with an atmosphere will have wind.
  - B. Relative humidity tells you how many grams of water are in a cubic meter of air.
  - C. Wind always moves from areas of low pressure to high pressure
  - D. Cold air can hold more water than warm air
  - E. The dew point is the temperature where the relative humidity would be 100%
2. A city is currently under a high pressure system. Which weather conditions would you most likely expect?
  - A. Heavy rain and thunderstorms
  - B. Clear skies and calm conditions
  - C. Dense fog and drizzle
  - D. Strong winds and snow
3. A cold, dry air mass forms over northern Canada and frequently influences weather in the central United States. This air mass would be classified as
  - A. maritime tropical (mT)
  - B. maritime polar (mP)
  - C. continental polar (cP)
  - D. continental tropical (cT)
4. Why do low pressure systems tend to produce clouds and precipitation?
  - A. Cold air sinks, causing moisture to freeze at the surface
  - B. Air flows outward and downward, spreading moisture across the ground
  - C. Low pressure pulls moisture directly out of the ocean
  - D. Air converges and rises, cooling as it goes up and forming clouds
5. A cold front is passing through a region. Which sequence of weather events would you most likely observe?
  - A. Gradual warming over several days, followed by light steady rain
  - B. A sudden drop in temperature, strong winds, and brief heavy storms
  - C. A long period of drizzle, then slowly clearing skies
  - D. Steady warming, high humidity, and no precipitation



## 19. Global Weather Patterns

1. Besides Antarctica, most of the world's deserts are at 30° latitude. Why?
  - A. 30° receives the more direct solar radiation than any other latitude
  - B. The sinking air of the Hadley cells create high pressure areas, causing a lack of precipitation
  - C. The rising air of the Hadley cells pulls moisture into the upper atmosphere, causing drying
  - D. 30° N and S mark the boundary of the tropics
2. Which of the following statements about the Intertropical Convergence Zone (ITCZ) are true?
  - A. The ITCZ remains fixed at 0° latitude throughout the entire year
  - B. Convergence of trade winds in the ITCZ creates high pressure areas
  - C. ITCZ produces more intense and persistent thunderstorms than any other region on Earth
  - D. The ITCZ has lower barometric pressure than surrounding areas
3. The prevailing winds that blow east to west near the equator are called:
  - A. Northerlies
  - B. Easterlies
  - C. Southerlies
  - D. Westerlies
  - E. Tradewinds
  - F. Santa Ana Winds
  - G. The Mistral
4. The polar jet stream lies between which large cells of rotating air?
  - A. The Ferrel cells and the Hadley cells
  - B. The Polar cells and the Hadley cells
  - C. The Polar cells and the Ferrel cells
  - D. The two Hadley cells
5. Which direction does the Jet Stream flow?
  - A. East to West
  - B. West to East
  - C. Depends on the time of year
  - D. Depends on whether it is in the Northern or Southern Hemisphere

## 20. Ocean Currents

1. Which of the following statements about the Coriolis effect are true?
  - A. It's caused by differential heating between water and land
  - B. Earth's rotation causes moving air to deflect to the right in the Northern Hemisphere and to the left in the Southern Hemisphere
  - C. Toilets in the Northern hemisphere always flush clockwise due to the Coriolis effect.
  - D. It applies to any moving object within a rotating frame of reference
2. Why is Great Britain significantly warmer than Newfoundland?
  - A. Primarily because of the gulf stream
  - B. Primarily because of warmer westerly winds
  - C. Because Britain has more urban areas which absorb more solar radiation
  - D. Because Newfoundland has icebergs
3. Select the false statement.
  - A. Surface currents are driven by wind
  - B. Deep ocean currents are driven by changes in the density of sea water
  - C. The Tradewinds and Westerlies influence each of the 5 ocean gyres
  - D. All ocean currents are driven by temperature and salinity
4. The thermohaline circulation is driven by deep water formation, which is formed by:
  - A. Solar radiation warming water at the equator
  - B. The weight of water piled at the center of subtropical gyres
  - C. Cold, salty water sinking in polar regions
  - D. Freshwater rivers flowing into the ocean
5. Select each true statement.
  - A. Upwelling zones are among the most biologically productive regions on Earth
  - B. Warm water can carry more oxygen than cold water
  - C. The gulf stream is the largest ocean current
  - D. The ACC makes Antarctica warmer than it would be otherwise

## 22. ENSO

1. During an El Niño event, what happens to trade winds and sea surface temperatures?
  - A. Trade winds strengthen and the eastern Pacific cools
  - B. Trade winds weaken (or even reverse) and the eastern Pacific warms
  - C. Sea surface temperatures warm while trade winds remain the same
  - D. Trade winds strengthen with no change in sea surface temperatures
2. Which of the following are impacts of a strong El Niño?
  - A. Wetter and colder than normal weather in the Pacific Northwest
  - B. Drought and an active fire season in Australia
  - C. Drought in California and the southern United States
  - D. Flooding in Peru and Ecuador
3. What does a La Niña watch mean?
  - A. El Niño is ending
  - B. La Niña conditions are expected to develop within the next month
  - C. Scientists are watching La Niña occur right now
  - D. La Niña conditions are expected to develop within the next 6 months
4. Which of the following statements about ENSO are true?
  - A. ENSO impacts temperature and precipitation patterns on every continent
  - B. El Niño is associated with more hurricanes in the Atlantic Ocean
  - C. ENSO includes only El Niño and not La Niña
  - D. ENSO events align with solar activity and typically occur once every 10 to 11 years
5. During El Niño, what happens to atmospheric pressure over the eastern Pacific?
  - A. It decreases
  - B. It increases
  - C. It remains unchanged

## 23. The Weather Forecast

1. Which of the following best explains why the 10 day forecast is often inaccurate?
  - A. Weather models don't include ocean data
  - B. The atmosphere is chaotic, and small changes grow over time
  - C. Satellites cannot measure air pressure
  - D. Weather balloons only measure upper atmosphere once per month
2. On a weather map, a blue line with triangles represents a:
  - A. Low pressure zone
  - B. High pressure zone
  - C. Warm front
  - D. Cold front
3. Select each true statement.
  - A. Doppler radar can detect the movement and intensity of precipitation.
  - B. Weather forecasts become more accurate the further into the future they predict.
  - C. A cold front typically brings a rapid drop in temperature and a chance of thunderstorms as it passes.
  - D. A barometer measures atmospheric temperature
4. When a forecast says "20% chance of rain," what does that mean?
  - A. It will rain for 20% of the day.
  - B. 20% of meteorologists expect rain.
  - C. There is a 20% probability that measurable rain will occur in the area.
  - D. 20% of the clouds contain rain droplets.
5. What is it called when a forecaster compares several model runs that start with slightly different initial conditions?
  - A. Gradient Descent
  - B. Deterministic modeling
  - C. The butterfly effect
  - D. Ensemble forecasting

## 25. Tropical Cyclones

1. Select each true statement?
  - A. The primary source of energy for a cyclone is warm moist air
  - B. If Earth wasn't tilted on its axis, cyclones wouldn't form
  - C. The highest winds and heaviest rainfall are on the outer edge of cyclone
  - D. Cyclones always weaken when they move over land
2. The Galapagos Islands are located 1° south of the equator in the Pacific Ocean. Select each true statement.
  - A. The Galapagos islands never experience hurricanes.
  - B. The Galapagos Islands experience frequent hurricanes.
  - C. The Coriolis effect is at its weakest at the Galapagos islands.
  - D. The Coriolis effect is at its strongest at the Galapagos islands.
3. What determines whether a storm is called a hurricane, typhoon, or cyclone?
  - A. The storm's intensity
  - B. The direction of rotation
  - C. The part of the world where it occurs
  - D. The number of times it makes landfall
4. El Niño increases vertical wind shear in the Atlantic Ocean. The result of El Niño is likely to be
  - A. More hurricanes in the Atlantic
  - B. Fewer hurricanes in the Atlantic
  - C. No change in hurricanes in the Atlantic
  - D. Hurricanes will spin the wrong direction in the Atlantic
5. Where is the tropical cyclone in this image located?
  - A. The Northern Hemisphere
  - B. The Southern Hemisphere
  - C. The Equator
  - D. Not enough information



## 26.WeatherQuizShow

1. What happens to RELATIVE HUMIDITY when the air temperature increases? Assume that the amount of water vapor in the air remains the same.

- A. It increases
- B. It decreases
- C. It stays the same
- D. It reaches 100%

2. What is true about dry bulb and wet-bulb readings from a thermometer?

- A. The wet bulb temperature is usually higher than or equal to the dry bulb temperature
- B. The air temperature reported in a weather forecast is the wet bulb temperature
- C. Neither of them are used to calculate the relative humidity
- D. There will be larger difference between the two readings when the humidity is low

3. The dew point is a

- A. Temperature
- B. Percentage
- C. Time
- D. Elevation

4. A warm front is likely to produce which type of weather along its boundary?

- A. Sudden thunderstorms
- B. Gentle widespread rain
- C. Clear skies with no rain
- D. Tropical cyclone

5. Which of these are associated with or caused by a strong El Niño?

- A. Flooding in Australia
- B. Weaker trade winds in the Pacific
- C. Stronger Atlantic Hurricanes
- D. Droughts in California and the Southwestern US

6. The Coriolis effect causes moving air to

- A. curve to the left in the Northern Hemisphere
- B. curve to the right in the Northern Hemisphere
- C. curve most strongly at the equator
- D. curve in random directions

7. Which of the following best explains why hurricanes lose strength when they move over land?

- A. They absorb less solar radiation
- B. Mountains block their path
- C. Wind shear stops their rotation
- D. They lose access to warm, moist air

8. What is the name for the global winds that move weather systems across the United States and Europe?

- A. the easterlies
- B. the trade winds
- C. the doldrums
- D. the westerlies

9. Which type of front often causes short but intense rain followed by an increase in atmospheric pressure?

- A. Cold front
- B. Warm front
- C. Derecho
- D. Cyclone

10. The air temperature in Houston is 21°C (70°F) with a dew point of 21°C (70°F). The air temperature in Ketchikan is 12°C (54°F) and the dew point is 12°C (54°F). In which location would Bob feel like the weather was more humid?

- A. Houston
- B. Ketchikan
- C. The dew point matches the temperature, so neither location would feel humid
- D. Both locations would feel humid because they both have a relative humidity of 100%.

11. The image shows the cone of uncertainty for Hurricane A and Hurricane B. Which hurricane will be the strongest? !  
[Both hurricanes show the same path, but Hurricane A has a wider cone of uncertainty.](<https://i.imgur.com/9Z72I1g.jpeg>)

- A. Hurricane A
- B. Hurricane B
- C. They'll be the same size.
- D. There is not enough information.

12. Do thunderstorms more often occur in the afternoon?

- A. Yes, because the cooler temperatures of evening causes more condensation
- B. Yes, because thunderstorms are most likely to form at the warmest part of the day
- C. No, because they occur most often in the morning when the dewpoint is highest
- D. No, because their occurrences are randomly distributed

13. Select the true statement.

- A. If the relative humidity is 100%, then precipitation will occur.
- B. Cold air can "hold" more water vapor than warm air.
- C. The temperature where the relative humidity is 100% is called the dew point.
- D. The dew point is not very useful for determining how comfortable the weather will be

14. Select the true statement about the ITCZ:

- A. It has lower pressure and more thunderstorms than surrounding areas
- B. It is always centered over the equator
- C. The ITCZ occurs where the subtropical jet stream converges with colder air
- D. Most of the deserts on Earth are located at the latitude of the ITCZ

15. Relative humidity increases in a parcel of air but the temperature remains the same. What happens to the dew point?

- A. Dew point decreases
- B. Dew point increases
- C. Dew point remains the same
- D. There is not enough information to tell



16. A meteorologist does an ensemble run and sees that 6 of 20 models show rain in Death Valley tomorrow afternoon. What's the simplest interpretation of how likely it is to rain in Death Valley tomorrow?

- A. 6% chance of rain
- B. 20% chance of rain
- C. 30% chance of rain
- D. Trick question, it never rains in Death Valley

17. What is doppler radar used for?

- A. Measuring air pressure
- B. Measuring relative humidity
- C. Measuring wind speed in the upper atmosphere
- D. Measuring the motion and intensity of precipitation

18. Which of the following statements is FALSE?

- A. Each year, heat causes more human fatalities than hurricanes, floods, or tornados
- B. The heat index is for conditions in the shade. Sunny environments may feel hotter.
- C. Dizziness, fatigue, and nausea are symptoms of heat exhaustion
- D. The heat index combines air temperature with wind speed to give a more accurate idea of what the temperature "feels like" to the human body

19. Bob sees an announcement about a super typhoon. What can Bob know is true just from this name?

- A. The storm is located in the northern hemisphere of the Western Pacific.
- B. It is going to make landfall soon
- C. The storm will NOT have the characteristic features of a hurricane
- D. The storm will have windspeeds of between 119–146 km/h (74–91 mph)

20. At 10 km altitude over the United States, a weather balloon consistently finds strong westerly winds exceeding 150 km/h. What is this phenomenon and what causes it?

- A. The easterlies; caused by the Hadley Cell circulation pushing surface air westward
- B. The westerlies; originating from subtropical high-pressure belts
- C. The jet stream; caused by the strong temperature contrast between polar and tropical air masses at the tropopause
- D. Geostrophic winds; caused by ocean surface temperatures heating the lower stratosphere unevenly

## 28. Understanding Ecosystems

1. Which statement best describes how energy and matter flow in ecosystems?
  - A. Energy flows one way and matter cycles
  - B. Energy cycles and matter flows one way
  - C. Both energy and matter flow one way
  - D. Both energy and matter cycle
  
2. Net primary productivity is best defined as:
  - A. Total energy captured by photosynthesis
  - B. Energy used by producers for their own respiration
  - C. Energy lost as heat between trophic levels
  - D. Energy available to consumers after producer respiration
  
3. Decomposers are important in an ecosystem because they:
  - A. Add new matter to Earth
  - B. Convert heat back into usable energy
  - C. Return nutrients to abiotic pools for reuse
  - D. Increase trophic efficiency to 100%
  
4. The average fraction of energy transferred from one trophic level to the next is closest to:
  - A. 1%
  - B. 10%
  - C. 50%
  - D. 90%
  
5. In a terrestrial food chain, what trophic level do herbivores occupy?
  - A. Producers
  - B. Primary consumers
  - C. Secondary consumers
  - D. Tertiary consumers
  - E. Apex predators

## 29. Keystone Species

1. A crab eats algae and also scavenges dead fish. What is the best classification?
  - A. Producer
  - B. Decomposer only
  - C. Consumer that can play multiple roles in a food web (correct)
  - D. Tertiary consumer only
  
2. Which scenario describes mutualism?
  - A. A tick feeding on a dog
  - B. A hawk catching a mouse
  - C. Two species of birds competing for the same seeds
  - D. Bees pollinating flowers
  
3. Why are food webs more useful than food chains?
  - A. Webs ignore decomposers.
  - B. Webs show multiple feeding connections among species. (correct)
  - C. Webs are shorter and simpler to draw.
  - D. Webs show top predators.
  
4. According to the 10% Rule of energy transfer, if a field of grass contains 10,000 Calories of energy, how much energy is available to a hawk that eats a mouse that ate the grass?
  - A. 10 Cal
  - B. 100 Cal (correct)
  - C. 1,000 Cal
  - D. 5,000 Cal
  
5. Select each true statement.
  - A. A single species can occupy more than one trophic level in a food web. (correct)
  - B. Removing one species from a food web always has a small, localized effect on the rest of the ecosystem.
  - C. When a primary consumer population crashes, it always causes the producer population to crash as well.
  - D. In a food web, apex predators have no natural predators of their own. (correct)

## 31. Nutrient Cycles

1. What statements about eutrophication (harmful algae blooms) are correct?
  - A. Eutrophication is caused by too much nitrogen and phosphorus
  - B. Eutrophication is caused by a lack of nitrogen and phosphorus
  - C. Clams and oysters reduce eutrophication
  - D. Clams and oysters increase eutrophication
  
2. Which of the following statements about nitrogen are true?
  - A. Atmospheric nitrogen cannot be used by plants or animals
  - B. It is rarely a limiting nutrient
  - C. Plant fertilizer only contains nitrogen
  - D. Some plants can perform nitrogen fixation on their own
  
3. Which of these contains the largest carbon reservoir on Earth?
  - A. The atmosphere
  - B. Terrestrial biomass
  - C. The ocean
  - D. Rocks and sediments
  
4. How does burning fossil fuels impact the carbon cycle?
  - A. It creates new carbon that didn't previously exist on Earth
  - B. It has little impact because the total amount of carbon remains the same
  - C. It moves carbon from the slow (geologic) carbon cycle into the fast carbon cycle
  - D. It decreases the amount of carbon in the ocean
  
5. Which of the following processes is a long-term carbon sink?
  - A. Photosynthesis
  - B. Plankton and marine snow settling on the ocean floor
  - C. CO<sub>2</sub> reacting with water to form carbonic acid
  - D. Volcanic eruptions

## 32. Succession

1. What type of organisms are often the first pioneer species to grow on bare rock?
  - A. Ferns because their spores can travel such long distances
  - B. Lichens and moss because they can grow on bare rock with no soil
  - C. Grasses, because they can survive extreme drought
  - D. Trees, because they only need sunlight and water to grow
  
2. Why does primary succession generally take longer to reach a mature ecosystem than secondary succession?
  - A. Primary succession occurs in ponds and wetlands, which slows down growth
  - B. Secondary succession involves more competition, which speeds up the process
  - C. Primary succession involves no existing seed bank, so it takes longer for pioneer species to get established
  
3. Which of the following statements are true?
  - A. Primary succession always leads to the same climax community regardless of which species arrives first
  - B. Secondary succession always follows primary succession
  - C. Pioneer species become the dominant species in an ecosystem because they are the toughest
  - D. Plants growing on a new volcanic island are one example of primary succession
  
4. Which of the following scenarios are examples of secondary succession?
  - A. A landslide removes vegetation and soil from a mountain slope
  - B. A retreating glacier exposes bare bedrock
  - C. A beaver dam breaks, exposing the mud bottom of the drained pond
  - D. A lava flow buries an existing forest under several meters of rock
  
5. Bob claims that succession doesn't apply to a climax community such as an old growth forest. Which best explains the problem with Bob's claim?
  - A. Climax communities are unstable and will naturally collapse
  - B. An old growth forest isn't an example of a climax community
  - C. Disturbances constantly create gaps within mature ecosystems, so succession is always occurring, even within a climax ecosystem
  - D. There is no problem with this claim. Bob is right!

## 34. Ecosystem Resilience

1. Which of the following would most likely make the native ecosystem LESS resilient to an invasive species?

- A. High biodiversity among native species
- B. A large number of native predators that can prey on the invasive species
- C. Many of the native species having evolved in isolation with few natural predators
- D. The invasive species requiring a very specific diet

2. In general, how does high biodiversity affect ecosystem resilience?

- A. It increases resilience because multiple species can perform similar roles if one is lost
- B. It decreases resilience because more species compete for the same resources
- C. It has no effect on resilience
- D. Whether it impacts resilience depends on whether the ecosystem is tropical or temperate

3. Before 1980, waters surrounding Jamaica were dominated by coral. Now the same areas are mostly covered by algae. Which statement best explains the decline of the coral reefs?

- A. The transition from coral to algae is a natural step in succession
- B. A hurricane damaged the coral reefs
- C. Overfishing and disease damaged the coral
- D. Higher water temperatures caused coral to die off
- E. Multiple stressors pushed the ecosystem past a tipping point

4. After crashing in the 1990s, Atlantic Cod populations never returned to their previous levels. What best explains this?

- A. Introduction of an invasive species
- B. There were no limits on fishing after 1990
- C. Toxins prevented the cod from reaching maturity
- D. The food web rearranged after the crash and the ecosystem is now fundamentally different

5. Which of the following statements are true?

- A. A tipping point can be caused by a catastrophic event OR the combined effect of multiple smaller stressors
- B. Ecosystem resilience refers to the sequence of changes that occur during the recovery from a disturbance
- C. Primary succession always proceeds faster than secondary succession
- D. An ecosystem that recovers quickly from small disturbances will also recover quickly from larger ones

## 35. Human Geography

1. Select each true statement about the world population.
  - A. There are more than 8 billion people on Earth
  - B. 15% of the world's people live within 10 km of the ocean
  - C. Most people live in urban areas
  - D. The world's population is approximately evenly distributed between the northern and southern hemisphere
2. What set of physical geography features best explain why the majority of Earth's people live in the tropics and subtropics?
  - A. These areas lack mountains which allowed for easier travel
  - B. These areas have abundant rainfall and warm temperatures which allow food to be grown year-round
  - C. There is more land in these latitudes than in temperate latitudes
  - D. Physical geography isn't involved; where people live is determined by economic systems, not climate
3. If the growth rate of a population is zero, this means:
  - A. The population is shrinking
  - B. The population is growing
  - C. The population is stable
  - D. The population is absent (does not exist)
4. Country A has an annual birth rate of 32 per 1,000 people. Country B has a birthrate of 11 per 1,000 people. If they both have the same death rate (10 per 1,000 people) which of the following statements are true?
  - A. A is growing much faster than B
  - B. B is growing much faster than A
  - C. B has a larger population than A
  - D. A has a larger population than B
  - E. Both populations are growing
  - F. Both populations are shrinking
5. A small isolated island has enough vegetation to support approximately 200 caribou. A wildlife survey shows the island currently holds 340 caribou. Which outcome is most likely?
  - A. The population will remain stable at 340 (caribou will only reproduce as fast as resources allow)
  - B. The population will increase (caribou will adapt and find new food sources)
  - C. The population will crash (overgrazing will result in starvation)
  - D. There is not enough information to predict an outcome

## 37. Agriculture

1. What percent of the human population's food energy comes from corn, rice, and wheat?
  - A. There are more than 8 billion people on Earth
  - B. 15% of the world's people live within 10 km of the ocean
  - C. Most people live in urban areas
  - D. The world's population is approximately evenly distributed between the northern and southern hemisphere
2. Which of the following crops require tropical climate conditions?
  - A. Wheat
  - B. Potatoes
  - C. Soybeans
  - D. Plantain
  - E. Rice
  - F. Cassava
3. Approximately what percent of the land in the US is used for food production?
  - A. 5%
  - B. 25%
  - C. 50%
  - D. 75%
4. Which of the following statements are true?
  - A. Soil is about 50% pore space (can contain air or water)
  - B. A layer of topsoil several feet thick probably formed in 10 to 20 years
  - C. Pasture can easily be converted into arable land
  - D. Arable land accounts for 20% of Earth's surface
5. Which crops has Math Dad personally farmed?
  - A. Alfalfa
  - B. Wheat
  - C. Corn
  - D. Rice
  - E. Potatoes
  - F. Bananas



## 38. Greenhouse Effect and Energy Choices

1. Which gas has the strongest short term greenhouse effect per molecule.
  - A. Carbon dioxide
  - B. Methane
  - C. Water vapor
  - D. Oxygen
  
2. Which of the following statements about natural gas are true?
  - A. Natural gas doesn't cause carbon emissions
  - B. Natural gas is mostly methane
  - C. Natural gas is filtered out of large lakes
  - D. Natural gas reserves are larger than oil reserves
  
3. Which of the following statements are true?
  - A. Wind and solar are nonrenewable energy sources
  - B. Old growth forests are classified as carbon sources
  - C. The ocean is one of the most important carbon sinks
  - D. Nuclear is a renewable energy source
  
4. Energy production accounts for approximately what % of global greenhouse gas emissions?
  - A. 10%
  - B. 25%
  - C. 50%
  - D. 75%
  - E. 90%
  
5. Which fast growing renewable energy source has the potential to produce power at night?
  - A. Wind
  - B. Solar
  - C. Nuclear
  - D. Hydroelectric

## 39. 5 Myths About Climate Change

1. During the last ice age, New York City was under an ice sheet approximately 600 m (2,000 ft) thick. What is the difference in global average temperature between the last ice age and today?

- A. 1° C
- B. 5° C
- C. 10° C
- D. 15° C
- E. 20° C

2. Someone claims “colder countries like Canada will definitely benefit from climate change.” Which statement is the best logical response?

- A. The statement is incomplete. While northern areas will likely get longer growing seasons, they will also face new problems like droughts, wildfires, and new pests.
- B. The statement is incorrect because climate change will only affect tropical countries, not temperate ones.
- C. The statement is correct. All colder countries will benefit from warming.
- D. The statement is incorrect. Climate change will make Canada become colder.

3. If Earth were 4° C warmer than today, the tropical latitudes would be:

- A. Approximately 4 degrees warmer than today; they would support the same plant and animal life
- B. Mostly uninhabitable due to lethal heat stress
- C. Largely unchanged because most of the heating will occur at the poles
- D. The same temperature as today

4. Which statement best explains why scientists say today's climate change is not just part of Earth's natural cycles?

- A. Before humans, Earth's climate never changed
- B. Past climate changes always involved transitioning into or out of an ice age
- C. Today's warming is much faster than past climate changes and clearly linked to human greenhouse gas emissions
- D. Earth's orbit stopped changing, so climate cycles have stopped too

5. When 88,125 peer-reviewed climate science papers published between 2013 and 2020 were analyzed, what % of them showed consensus that human burning of fossil fuels was causing climate change?

- A. 50%
- B. 75%
- C. 90%
- D. 99.9%

# 41. 5 Solutions to Climate Change

1. South Korea now recycles 95% of its food waste. What incentives did they use to reach this goal?
  - A. They banned food waste from landfills, with fines of approximately \$200 per instance of throwing away food
  - B. They started programs and businesses that convert discarded food into animal feed or biofuel
  - C. They created a mandatory, weight-based "pay-as-you-throw" system for disposing of food scraps
  - D. They grew less food so people would be hungrier and less likely to throw food away
  
2. How much of the ship traffic on the oceans (in terms of tonnage) is moving coal, oil, and gas from one location to another?
  - A. 10%
  - B. 25%
  - C. 40%
  - D. 50%
  - E. 75%
  
3. Select each true statement:
  - A. Deploying wind turbines has spillover benefits that include lower energy costs and reduced pollution
  - B. There aren't enough places to put wind turbines for them to be a reliable source of electricity generation
  - C. It costs more energy to build a wind turbine than the wind turbine will generate
  - D. Most modern wind turbines last for about 30 years
  
4. True or false: it's impossible for renewable energy to produce 100% of the power for a city in the US or Canada.
  - A. True because fossil fuel produces more energy return on investment than any other form of energy
  - B. True because even towns like Kodiak, Alaska will use fossil fuels for heating homes or cooking
  - C. False because renewables like hydropower and nuclear can actually generate more energy for the same amount of investment than fossil fuels
  - D. False because most towns in the US and Canada run entirely on renewable energy
  
5. Which of the statements about air pollution are true?
  - A. Smog and air pollution smell bad but present no health risks
  - B. Air pollution increases the risk of stroke, asthma, heart disease, and lung cancer
  - C. Regulations for vehicles and industry are effective at reducing air pollution
  - D. People build up natural immunity to polluted air after breathing it for a while

## 43.GeoscienceFinalQuizShow

1. Which type of plate boundary is responsible for the formation of the Himalayan mountain range?

- A. Divergent boundary, where plates pull apart
- B. Transform boundary, where plates slide past each other
- C. Convergent boundary, where two continental plates collide
- D. Subduction zone, where oceanic crust dives beneath continental crust

2. If a rock sample originally contained 1,000 atoms of a radioactive isotope with a half-life of 10,000 years, and only 125 atoms of the parent isotope remain, how old is the rock?

- A. 10,000 years old
- B. 30,000 years old
- C. 40,000 years old
- D. 80,000 years old

3. Which of the following rock types is most useful for radiometric dating?

- A. Basalt
- B. Marble
- C. Shale
- D. Limestone

4. Where is the largest reservoir of carbon in the short carbon cycle?

- A. Atmosphere
- B. Forests
- C. Wetlands and Bogs
- D. Oceans

5. If a high pressure zone or a high pressure system is coming to your area, what will this likely mean?

- A. Intense storms with high wind
- B. Steady but light rain over several days
- C. Sunny weather and clear skies with few clouds
- D. There is not enough information to say

6. Which of the following statements is true?

- A. A small difference between dry bulb/wet bulb readings indicates high humidity
- B. The dry bulb temperature will always be lower or equal to the wet bulb temperature
- C. Temperature and humidity are used to calculate wind chill
- D. Absolute humidity is a percentage and relative humidity is measured in grams per cubic meter

7. Which best describes the relationship between the rock cycle and the nitrogen cycle?

- A. They are completely separate cycles with no interaction
- B. Nitrogen is only stored in living organisms, never in rocks
- C. Photosynthesis removes nitrogen from the atmosphere
- D. Nitrogen stored in rocks can be released into the atmosphere through weathering

8. What best describes the Gulf Stream?

- A. A cold and slow ocean current
- B. A warm and fast ocean current
- C. A fast river of air between the polar cell and Ferrel cell
- D. A fast river of air between the Ferrel cell and Hadley cell

9. A weather station records a rapidly falling barometric pressure over 24 hours. What weather will forecasters most likely predict?

- A. Clear skies and warming temperatures moving in
- B. An approaching storm system with clouds, wind, and precipitation
- C. A period of dense fog
- D. Cloudy skies but no rain

10. Which of the following is a typical consequence of a strong El Niño?

- A. Drought conditions in Australia and Indonesia
- B. Colder-than-average ocean temperatures along the coast of Central America
- C. Stronger-than-normal hurricane seasons in the Atlantic
- D. Drought in the Southern United States

11. On the Moment Magnitude Scale, what is the magnitude of an earthquake that releases 1000 times as much energy as a magnitude 3.2 earthquake?

- A. Magnitude 3.5
- B. Magnitude 4.8
- C. Magnitude 6.2
- D. Magnitude 3200

12. Which scenario correctly applies the principle of superposition in geology?

- A. In a folded mountain range, the topmost visible layer is always the oldest because folding pushes ancient rock to the surface
- B. In an undisturbed sequence of sedimentary rock, the bottom layer is the oldest and the top layer is the youngest
- C. Igneous intrusions are always older than the sedimentary layers they cut through
- D. Fossils found in lower rock layers are younger

13. Which three crops provide 60% of total food energy for the world population?

- A. Beef, potatoes, and soybeans
- B. Rice, beans, and corn
- C. Corn, rice, and wheat
- D. Chicken, rice, and wheat

14. Which statement about ecosystems is true?

- A. Energy is recycled while nutrients tend to flow in one direction
- B. A keystone species has a disproportionately large impact on the ecosystem
- C. 20% of the energy in one trophic level is transferred to the next trophic level
- D. The tertiary consumers in an ecosystem will have more biomass than the primary consumers

15. A geologist discovers a granite intrusion cutting through limestone. The limestone contains fossils of organisms that lived 400 million years ago.

What can the geologist conclude?

- A. The granite is younger than 400 million years
- B. The granite and limestone are the same age because they are found at the same location
- C. The granite is older than 400 million years
- D. Nothing can be determined about the granite's age without radiometric dating

16. Select the true statement.

- A. 70% of the human population lives in the Northern Hemisphere
- B. Most of the atmosphere is oxygen
- C. S-waves usually cause more damage than P-waves
- D. An ecosystem is all the living things in a region.

17. Which of the following statements about greenhouse gases is true?

- A. Water vapor is not a green house gas
- B. There is more methane in the atmosphere than carbon dioxide
- C. After being released into the atmosphere, carbon dioxide will stay in the atmosphere for 100+ years
- D. A leak at a natural gas refinery doesn't add greenhouse gas to the atmosphere

18. The European green crab is a destructive invasive species, especially in the coastal waters of North America and Australia. What statement about these animals is true?

- A. They are always green
- B. They are one of the largest crab species
- C. They are poisonous
- D. They are a popular food in Mediterranean cuisine

19. Relative humidity decreases in a parcel of air but the temperature remains the same. What happens to the dew point?

- A. Dew point decreases
- B. Dew point increases
- C. Dew point remains the same

D. There is not enough information to tell

20. Which statement best describes the difference between weather and climate?

A. Weather refers to short-term conditions, while climate describes the long-term average patterns

B. Weather is measured by scientists using satellites, while climate is observed directly by people on the ground

C. Weather changes seasonally, while climate refers only to temperature conditions at the equator

D. Weather describes ocean conditions, while climate describes conditions in the atmosphere