8.E.2: Earth's History

1. Why would a geologist find seashells in an inland area?
2. What provides the most information about Earth's atmosphere in the distant past?
3. Fossils of similar plants have been found around the world, what theory does this evidence support?
4. Where is there evidence that some species of organisms moved from one continent to another?
5. In an undisturbed cliff wall made of sedimentary rock, what can be said abot the bottom layer
6. What is the densest layer of Earth?
7. What are the four layer of the Earth?
8. Tectonic plates are part of Earth's_____.
9. The _____ is in-between the Mantle and the Crust of Earth
10. What is the driving force behind continental drift?
11. Under the Atlantic Ocean, where is the curst the youngest?
12. A spreading center is also known as a _____ plate boundary.
13. The Rocky Mountains are a result of an Oceanic Plate colliding with a _____ plate.
14. The Hawaiian Islands formed over a_____ _____.
15. Which landform is most likely to form where two oceanic plates push together?
16. Where does the seafloor spreading occur?
17. What is chemical weathering?
18. What is erosion?
19. What is deposition?
20. What does the Law of Superposition state?
21. What is radioactive dating used for?
22. The earliest part of Earths history is called what?
23. Which division of the Geological time scale is the longest?

8.E.2.2 Geological Evidence

Open Ended Questions:

1. What cores show evidence of climate and atmospheric changes such as volcano eruptions?
2. What type of rock are fossils found in?
3. What rock can cut through sedimentary rocks?
4. Why are igneous rock intrusions younger than the sedimentary rock layers it cut through?
5. What are the two main faults responsible for earthquakes?

Fossils – Preserved remains or traces of organism that lived in the past.
Amber - Organisms become trapped in the sticky resin (sap) of a pine tree. Resin hardens with organism in it = amber. Shows internal structures, physical features, and DNA.

Carbonized - Organisms/parts are pressed & all decomposition is squeezed out.
Only carbon imprint is left. Occurs when layers of soft mud or clay trap organisms and then harden.
Tell us about the structure of the extinct plants & animals (leaves, stems, flowers, fish...)

Coprolites - Organisms feces (poop) is preserved or replaced with minerals.

Index Fossils - Fossils that were...
1. Only lived during a short part of history.
2. Many fossils must be found in the rock layers.
3. Found over a wide area
-Useful to find the relative age of rock layers.

Mold Fossils - Sediments bury an organism & turn to rock. Organism decays leaving a cavity shaped like it.

Cast Fossils - 1. Mold is filled with sand/mud. 2. Hardens in shape of organism.

Petrified/Permineralization - - Minerals soak into buried remains, Replacing remains, Changing into rock.

Preserved Fossil - - Parts/entire organisms prevented from decaying by being trapped in rock, ice, tar, or amber

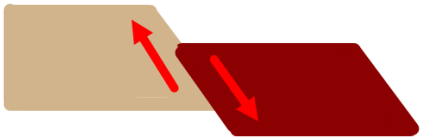
Trace Fossils – Mud or sand hardens to stone where footprint, tracks, or burrows were left behind. A footprint provide clues about the size and behavior, the speed, how many legs it walked on, lived alone or with others. A trail or burrow can give clues about the size and shape of the organism, where it lived, and how it obtained food.

Fossils tell us…
- What organisms occupied the area, organism species identification, and about the diet & ecosystem.

Ice Cores – Tube ice samples that contain environment evidence accumulated over thousands of years.
Tell us…
- Timeline of earth's past
- Atmospheric changes through trapped air
- Gases, bacteria, dust, pollen, ash…
- Temperature changes
- Volcanic activity

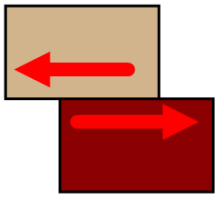
Sedimentary Rock –
1. 75% of Earth's surface that forms when sand, mud, or sediment collect.
2. Different layers of sedimentary rock = gain understanding of Earth's history…
   1. Climate with levels of gases & chemical composition of rocks.
   2. Biological with types of plant and animal species found in the rocks.
   3. Geological with how the rocks have been changed by plate tectonics.
      a. Metamorphic Rock
         i. Were once sedimentary or igneous rocks placed under extreme heat & pressure
3. Igneous Rock – Forms from magma from volcanoes or magma intrusions.
   - Can disturb sedimentary rock layers = Magma intrusion
   - Moves upward through layers
   - Sedimentary layers are there first (older) = Igneous rocks/layers are younger

Fault
1. Break in Earth's crust formed from movement on either side of the fault.
3. Occur where tectonic plates move



Dip Slip Fault (Thrust Fault)
1. Two pieces of land change vertical position; one side is higher than other.

Earthquake – Series of vibrations caused by sudden movements of earth's crust.



Strike Slip Fault - Two pieces of land move horizontally .

Geologic Time Scale
A) Record of major events & diversity of life forms in Earth's history.
B) Begins with Earth's creation = present
C) Mass extinction at end of each era
D) Created from Fossil Record in which diversity & complexity of life increases

2. Why the divisions in time?
- Divisions based on changes (rocks/fossils).

Precambrian Era
1. Earth's creation = 4.6 bya
    I. Sun & light formed
    II. Earth formed
    III. Atmosphere formed from volcanic out-gassing
    IV. Oceans formed
    V. Life formed
2. Simple life forms: bacteria & algae
3. By end: jellyfish & sea worms
4. Few fossils - soft bodied life forms with no hard skeleton

Paleozoic Era
1. Early invertebrates: trilobites, brachiopods, fish, arachnids, insects, amphibians, & reptiles.
2. Early plants: moss, ferns, cone-bearing plants, seed-bearing plants.
3. Mass extinction at end = killed most marine invertebrates & amphibians.

Mesozoic Era
1. Reptiles & dinosaurs dominated
2. Small mammals & birds appeared; Flowering plants
4. Dinosaur mass extinction at end

Cenozoic Era
1. Mammals
2. Diversity of life increased
3. Flowering plants common
4. Human species appeared

8.E.2.2 Geological Evidence Review

1. A sedimentary rock found in a hillside is identified as sandstone. Which can ***most likely*** be concluded about the hillside?

   A. The hillside was once a volcano.

   B. The region was once covered with water.

   C. There were no living organisms that ever lived near the hillside.

   D. Heat and pressure inside the earth helped form the rock layers of the region.

2. A fault is found that cuts through lower rock layers but not those above it. What can most likely be concluded?

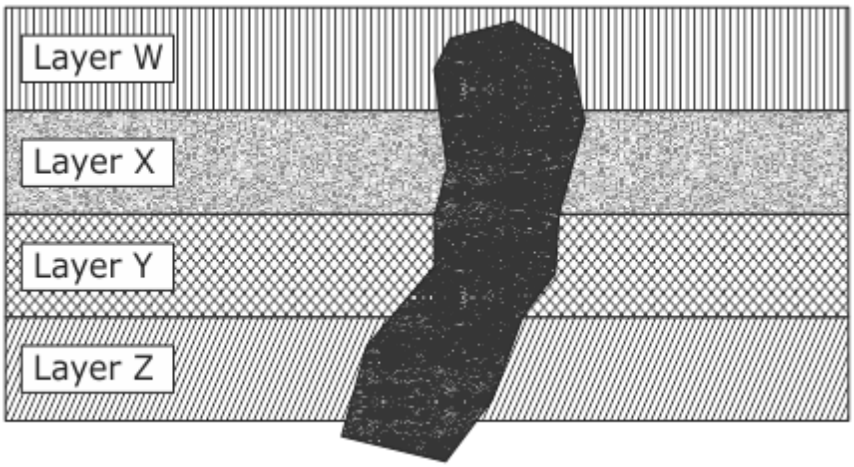
   A. The fault is the same age as the layers it cuts through, and the same age as the layers above

   B. The fault is younger than the layers it cuts through, and younger than the layers above it.

   C. The fault is younger than the layers it cuts through, but older than the layers above it.

   D. The fault is older than the layers it cuts through, but younger than the layers above it.

3. Four sedimentary rock layers are cut by an igneous rock intrusion as shown below.



Which best describes the relative age of the igneous rock intrusion in comparison to the ages of the four sedimentary rock layers?

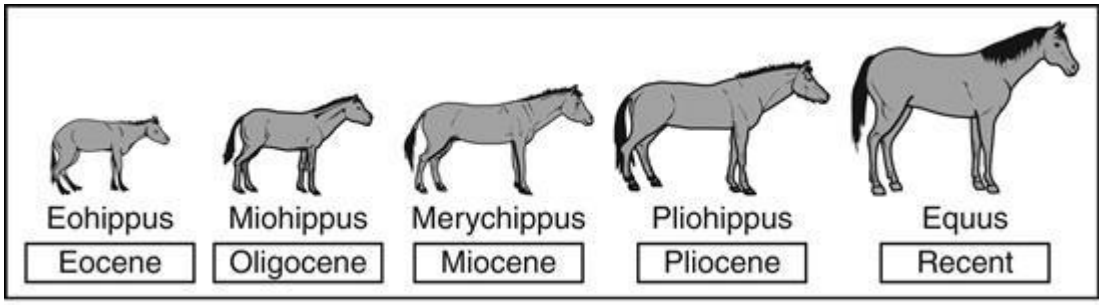
   A. The igneous rock intrusion is older than sedimentary rock layers W, X, Y, and Z.

   B. The igneous rock intrusion is younger than sedimentary rock layers W, X, Y, and Z.

C. The igneous rock intrusion is older than sedimentary rock layer W and younger than sedimentary rock layers X, Y, and Z.

D. The igneous rock intrusion is younger than sedimentary rock layer W and older than sedimentary rock layers X, Y, and Z.

4. Scientists theorize that the ancient animal on the left is related to the modern animal on the right and has gone through many changes over time.



How did the scientists conclude that the animal changed over time?

A. by examining fossil records

B. by learning about natural selection

C. by studying deposition of sediments

D. by observing different types of rock formations

5. Why are index fossils good clues for identifying when rocks were formed?

A. They are easy to form in rock.

B. They are difficult to form in rock.

C. They only existed during specific periods of time.

6. If a fault cuts through multiple layers of rock, which is most likely true?

A. An earthquake happened after the layers formed.

B. An earthquake happened before the layers formed.

C. An earthquake happened at the same time the layers formed.

D. The timing of an earthquake is unrelated to when the layers formed.

7. Petrified palm trees are found in sedimentary rock near glaciers.
The presence of the petrified palm trees most likely provides evidence for which statement?

A. There was once more water in the area.

B. The area was once grassland.

C. The climate in the area was once tropical.

D. There are active faults in the area.

8. Which can scientists infer when they find marine fossils on top of mountains?

A. The mountains were created by erosion.

B. The mountains were created through a catastrophic event.

C. The mountains were created by an uplifting of tectonic plates.

D. The mountains were created through chemical changes in the atmosphere.

9. Fossils of the fern Glossopteris have been found in the continents of South America, Africa, Asia, and Antarctica. The seeds of this fern were too small to be dispersed by wind. Which is best indicated by the presence of Glossopteris fossils on these continents?

A. Glossopteris was versatile enough to adapt to all climates.

B. The landmasses were joined together in pre-historic times.

C. Fossils were much better preserved in the southern continents.

D. The northern climate regions were not suitable for plant growth.

10. The K–T boundary is the geologic stratum that separates the Cretaceous period, which ended sixty-five million years ago with the extinction of the dinosaurs, from the Tertiary period. A student reads the following statement:
Despite the fact that iridium is much less abundant on Earth than gold, clay located at the K–T boundary contains at least twice as much iridium as gold.
How does this statement support the theory that an asteroid impacted Earth about sixty-five million years ago?

A. by supporting the hypothesis that an asteroid impact would change Earth's climate

B. by providing evidence that the iridium was toxic to the species on Earth at that time

C. by providing evidence that the iridium came from a source outside the Earth system

D. by supporting the hypothesis that an asteroid impact would alter Earth's landmass

11. Which provides the best evidence of Earth's changing climate?

A. ice cores

B. volcanic ash

C. metamorphic rocks

D. sediment in river beds

12. An irregularly shaped rock formation is found within a group of parallel rock layers. What most likely created this formation?

A. thrust fault

B. lava intrusion

C. metamorphic rock

D. sediment deposition

13. Which environmental condition most likely existed at the time a fossil formed?

A. Organism remains were deposited in an area of open space.

B. Organism remains were covered by lava flow.

C. Organism remains were buried with little oxygen.

D. Organism remains were buried in an area where a lot of erosion occurred.

14. Which best describes how ice cores can provide scientists with evidence for climate change over a period of time?

A. Ice cores form only during ice ages.

B. Dark rings in the ice core indicate climate change.

C. The temperature of the ice core is lower in layers formed when temperature is colder.

D. The concentration of gases in the ice core indicate colder or warmer temperatures.

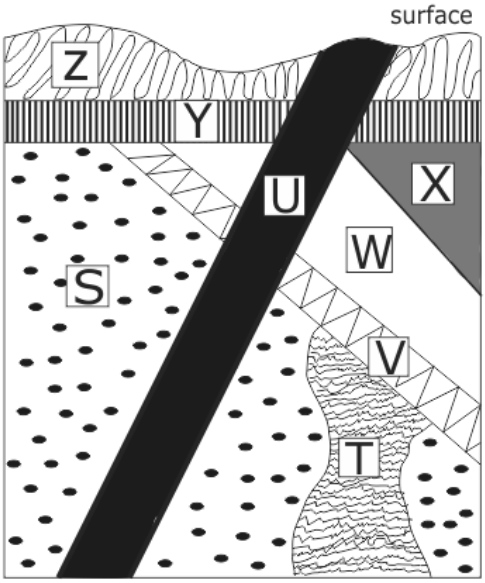
15. Which is the best evidence that Earth went through an Ice Age?

A. Sea levels were lower in the past than they are now.

B. Rocks were deposited by glaciers in now-temperate areas.

C. River meanders were created by melted water from glaciers.

16. The diagram below shows several layers of rock and associated geologic features that have occurred throughout Earth's history.



Which sequence shows the order in which each rock layer or geologic event occurred?

A. S, T, U, V, W, X, Y, Z

B. S, T, V, W, X, Y, Z, U

C. Z, Y, S, T, V, W, X, U

D. U, Z, Y, X, W, V, T, S

17. Scientists found a fossil of an elephant in the African savannah. It has much longer tusks and is much larger than elephant species presently inhabiting the area. This elephant fossil most likely reveals

A. the diet of early elephants.

B. that elephants travel in herds.

C. the function of the trunk of the elephant.

D. that physical changes occurred in elephants over time.

18. Rich beds of marine fossils have been found in Florida. By dating these fossils, scientists can best determine

A. when Florida collided with the North American continent.

B. the date when organisms moved onto dry land.

C. the period during which Florida was covered in water.

D. when the atmosphere of Earth was more humid than it is today.

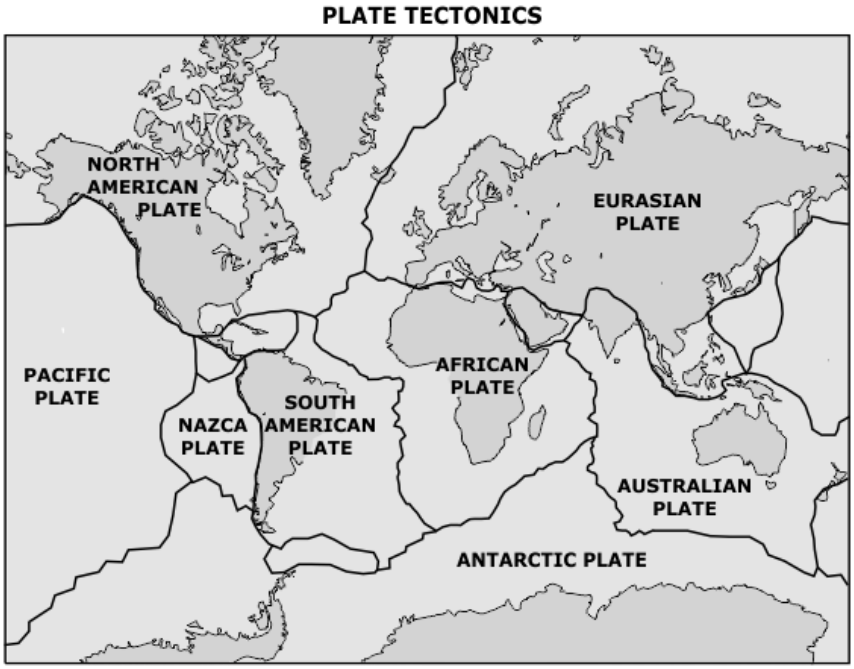
19. The discovery of the theory of continental drift led to the subsequent discovery of which theory?

A. theory of relativity

B. theory of superposition

C. theory of plate tectonics

20. The diagram below shows the Earth's crustal plates.



Which natural occurrence is the direct result of tectonic plate movement?

A. earthquake

B. hurricane

C. tornado

21. Why are fossils most likely found in sedimentary rock samples?

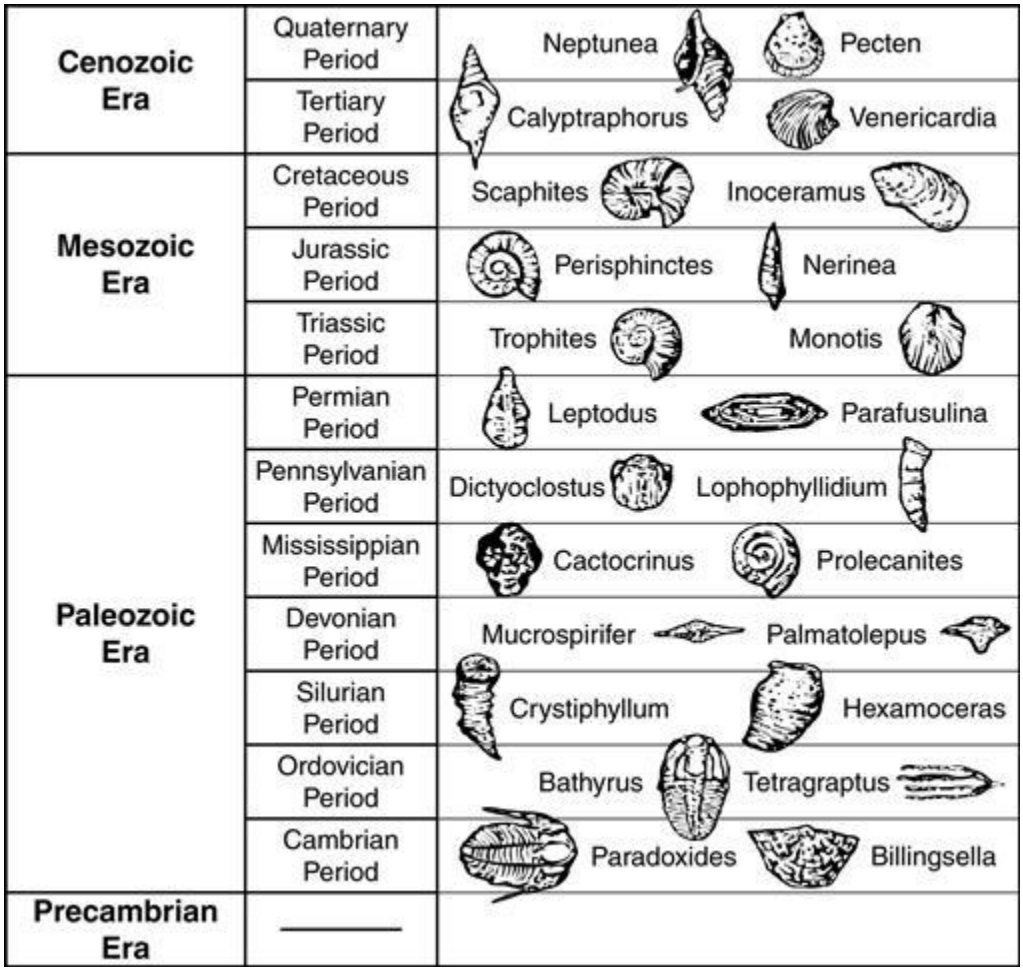
A. More plants and animal species grow on sedimentary rocks.

B. Sedimentary rocks preserve fossils with intense heat and pressure.

C. Sedimentary rocks are formed in layers that trap the material for fossilization.

D. Sedimentary rocks are much stronger than igneous or metamorphic rocks and protect the samples.

22. Scientists estimate that if index fossils were deposited during a certain time frame, then the entire rock layer was also deposited at the same time.



A scientist finds Trophite fossils. According to the chart above, in what era and period was this rock layer deposited?

A. Cenozoic Era; Tertiary Period

B. Mesozoic Era; Triassic Period

C. Paleozoic Era; Permian Period

D. Paleozoic Era; Mississippian Period

23. Fossil remains of a trilobite are most likely to be found in which type of rock?

    A. igneous

    B. volcanic

    C. sedimentary

    D. metamorphic

24. Which of these provides the best evidence that an environmental change has occurred?

    A. a freshwater lake in the mountains

    B. marine fossils in a freshwater lake

    C. saltwater clams in the ocean

    D. a sandy beach next to the ocean

25. Which country would be most likely to provide ice cores that could be used to provide evidence for climate change?

    A. Greenland

    B. Italy

    C. Peru

8.E.2.1: Dating Rocks

Open Ended Questions:

1. Earth's history is influenced by catastrophes such as the impact of what?
2. What is a fossil and why do we study them?
3. How are mold and cast fossils related?
4. What three things can preserve an entire organism?
5. What in general occurs at the end of each era?
6. What 5 major events occurred during the Precambrian Era?
7. What era did trilobites live?
8. What mass extinction ended the Paleozoic Era?
9. What era did reptiles dominate to include the dinosaurs?
10. What mass extinction ended the Mesozoic Era?
11. What era did mammals dominate and humans live?
12. List four things that the fossil record tells us.

13. What is the Law of Superposition?
14. What determines a fossil to be an index fossil?
15. What is relative age dating?
16. What is the most famous index fossil?
17. What is radiometric dating used for?
18. What happens to the atoms during radioactive dating?

Law of Superposition
Uniformitarianism – Earth processes today are similar to those that happened in the past, (erosion, plate movement, atmospheric composition, asteroids, & comets).

Relative Dating/age – Age of one object compared to the age of another object; Not exact age
Used to read age of rock layers or fossils (in original sequence)
2 methods: rock layer order & index fossils

Law of Superposition – Rocks on bottom are older; rocks near surface are younger (undisturbed layers)
Each rock layer is deposited on top of other layers
Each rock layer is older than the one above it
Rock/fossil is older when deeper in rock layers

Index Fossils - Fossils that were...
1. Only lived during a short part of history.
2. Many fossils must be found in the rock layers.
3. Found over a wide area
-Useful to find the relative age of rock layers.

Trilobites – Hard shelled animal with 3 body sections, lived in shallow seas, extinct ~245 mya.
Use to estimate the age of rock layers its found in.

Absolute Age – Radioactive dating used to find the exact age of a rock or fossil in years.

Radioactive Dating
- Used to find when rocks formed and infer age of fossils inside those rocks
- When igneous rocks form, radioactive elements are trapped, begin to decay at a predictable rate
- By measuring the RE left in rock & comparing it to stable elements = estimate how long ago rock formed
- Carbon 14 is used often to Radioactive Date rocks/fossils

Radioactive Elements
- Found naturally in Universe
- Unstable
- Over time decay into stable atoms at predictable rates

8.E.2.1: Dating Rocks Review

1. What can be concluded about the age of fossils in undisturbed rock layers?

A. The top layer has the oldest fossils.

B. The bottom layer has the oldest fossils.

C. The top layer has the oldest and youngest fossils.

2. Which ***best*** describes a fossil that helps determine the relative age of a rock layer?

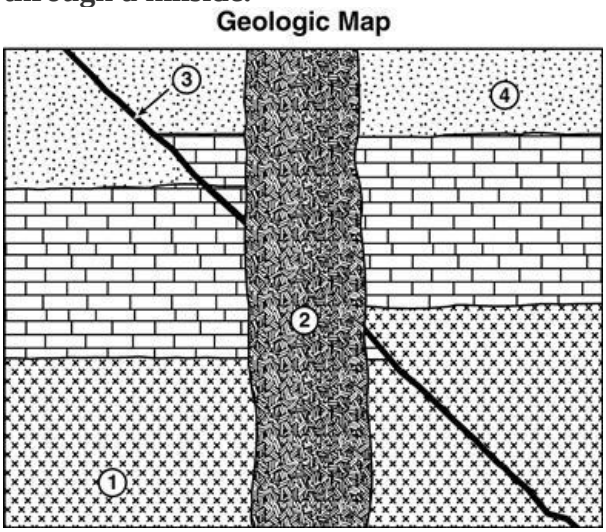
A. trace fossil

B. index fossil

C. radioactive fossil

D. unconformity fossil

3. The geologic map below shows several rock formations exposed when a road is cut through a hillside.



Which formation in this geological map is youngest?

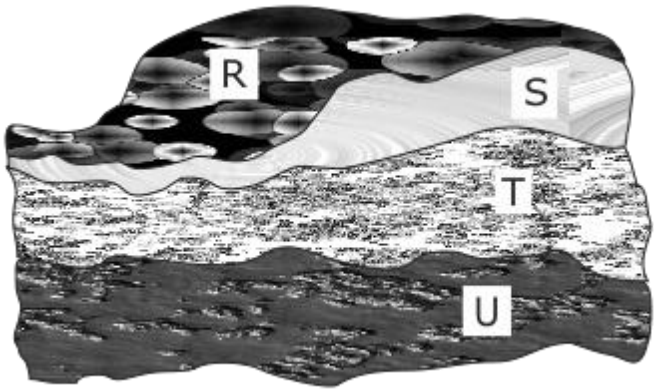
A. 1

B. 2

C. 3

D. 4

4. Scientists have identified four sedimentary rock layers from an archaeological dig as shown below.



Which is ***most likely*** the oldest sedimentary rock layer?

A. Layer R

B. Layer S

C. Layer T

D. Layer U

5. This diagram shows fossils from different eras of geologic time.

Cenozoic Era (Age of Recent Life)	*Calyptraphorus velatus* 	*Venericardia planicosta* 
Mesozoic Era (Age of Medieval Life)	*Nerinea trinodosa* 	*Trophites subbullatus* 
Paleozoic Era (Age of Ancient Life)	*Paradoxides pinus* 	*Tetragraptus fructicosus* 

Which index fossil would indicate the oldest rock?

A. *Venericardia planicosta*

B. *Nerinea trinodosa*

C. *Paradoxides pinus*

6. Through relative dating, a geologist finds a fossil that is approximately 10,000 years old. Which radioactive element would the geologist ***most likely*** use to accurately calculate the fossil's age?

A. gallium-67 with a half-life of 78 hours

B. carbon-14 with a half-life of 5,700 years

C. plutonium-238 with a half-life of 88 years

D. iodine-129 with a half-life of 16 million years

7. Which would ***least likely*** be an earth process that has influenced the formation of rock layers and fossil formation?

A. high levels of soil erosion

B. air masses forming storms

C. movement of crustal plates

8. **In what type of rock would a geologist most likely find evidence of ancient life?**

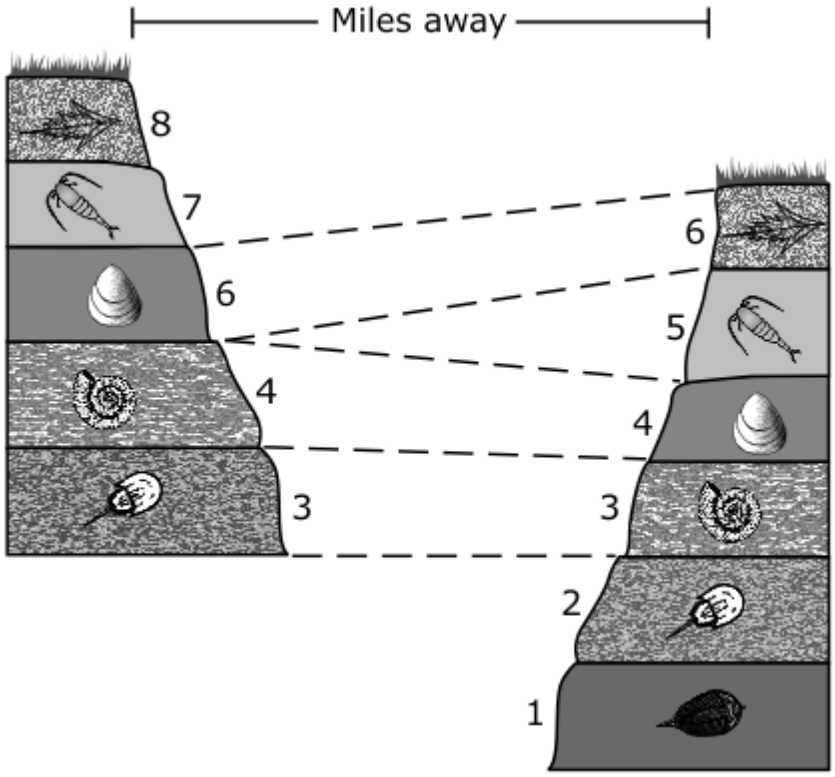
A. sedimentary

B. foliated

C. metamorphic

D. volcanic

9. The diagram below shows two sections of rock layers found several miles apart.



Based upon the information in the diagram, which conclusion can ***best*** be made?

A. The rock layers contained fossils identical to each other.

B. Rock layers are laid down from the youngest to the oldest.

C. Rock layers containing similar fossils were formed at the same time.

10. Which method provides the ***most*** accurate age of a rock sample?

A. superposition

B. relative dating

C. radioactive dating

D. index fossil identification

11. Which is the ***most accurate*** method used in determining the age of a fossil?

A. relative dating

B. geologic column

C. radioactive dating

D. law of superposition

12. Which conclusion can be made when observing multiple undisturbed layers of rock?

A. The shallow layers are older than the deeper layers.

B. The deeper layers are older than the shallow layers.

C. The deeper layers are younger than the shallow layers.

D. The shallow layers are the same age as the deeper layers.

13. Uranium is a naturally occurring radioactive element contained in some rocks. Over time, the uranium radioactively decays to the element lead. The ratio of grams of uranium to grams of lead for four rock samples is shown below.

Rock Sample	$\frac{\text{grams of uranium}}{\text{grams of lead}}$
1	1.5
2	0.8
3	0.6
4	0.1

Assuming no lead was originally present in any of the rock samples, which rock sample is ***most likely*** the oldest?

A. 1

B. 2

C. 3

D. 4

14. A road cut shows a layer of shale on top of a layer of limestone. This indicates

A. the shale layer is older than the limestone layer.

B. a fault occurred during the deposition of the layers.

C. the environment changed between the times of deposition.

D. volcanic activity occurred when these layers were deposited.

15. What can be used to find the exact age of a rock specimen?

A. ice cores

B. index fossils

C. radioactive dating

16. By which method have scientists determined that the Earth is about 4.5 billion years old?

A. plate tectonics

B. relative dating

C. radioactive dating

D. law of superposition

17. The index fossil of a type of trilobite is discovered in layer A of a set of rock layers found at three different sites of a field investigation. Which conclusion can be made about the rocks in layer A at all three sites?

A. The rocks are all different ages.

B. The rocks are all about the same age.

C. The rocks were formed by melting magma.

D. The rocks were formed during a catastrophic event.

18. Fossilized dinosaur eggs have been found in the third of five rock layers during a fossil dig. Based on the law of superposition, which ***best*** represents the age of the eggs?

A. The eggs are older than all of the rock layers.

B. The eggs are younger than all of the rock layers.

C. The eggs are about the same age as the third rock layer.

D. The eggs are about the same age as the fifth rock layer.

19. Which is used to find the relative age of a rock?

A. composition of rock layers

B. position of rock layers

C. carbon-14 dating

D. uranium dating

20. Which is used in radioactive dating?

A. carbon-14

B. index fossils

C. hydrochloric acid

D. law of superposition

21. Through relative dating, the age of a rock was determined to be between 15,000 and 25,000 years old. How long should the half life be of the radioactive element used to date the rock layer?

A. Five thousand years

B. One million years

C. Five million years

22. Which process would be ***most*** effective in determining the age of fossils embedded in rock?

A. relative dating

B. absolute dating

C. use of index fossils

D. use of core sampling

23. Which method of radioactive dating would be ***most*** useful in determining the age of a human

A. carbon-14 method

B. uranium-lead method

C. potassium-argon method

D. rubidium-strontium method

24. The radioactive isotope content of a rock can be used to identify which property of the

A. the total mass of the rock

B. the rate at which the rock formed

C. the types of fossils that the rock contains

D. the amount of time passed since the rock formed

25. Which technique best helps scientists determine the age of our solar system?

A. using relative dating techniques on layers of Earth rocks

B. comparing the fossils found in the oldest Earth rocks

C. creating computer models to predict the formation of Moon and Earth rocks

8.L.4 Evolution and Classification

1. What is the best evidence proving that organisms have adapted to changing environments over time?
2. The Mid-Atlantic Ridge exists between the African and South American geologic plates. What process most often occurs at the 3.Mid-Atlantic Ridge?
3. What is natural selection?
4. Which of the following is most likely to cause the extinction of a species? Mutation, changing environment, natural selection or genetic variation. Explain.
5. What is a vestigial organ?
6. What catastrophes do scientists think led to the mass extinction of the dinosaurs?
7. What is the process that moves sediment from one location to another?
8. In undisturbed sedimentary rock layers , where are older layers of rock located? Where are younger rock layer located?
9. What is an index fossil?
10. Igneous rock can be changed into two other kinds of rocks. Name these kids of rock. Explain how each of these changes can occur.
11. What are the names of the two kingdoms that include both one celled and many celled organisms?
12. An organism is one celled and has no cell wall. To which kingdom does it belong: Eubacteria, Archeabacteria, Fungi or Protista. Explain.
13. Which kingdom is made up only of autotrophs? Protista, Animalia, Plantae or Fungi
14. What is isolation?
15. How can fossils prove that at one time the continents were one big land mass?
16. What is evolution?

8.L.4.1: Evidence of Evolution

Open Ended Questions:

1. What is evolution?
2. What three theories show evidence that organisms and landforms change over time?
3. What evolution accounts for the diversity of species developed through gradual processes over many generations?
4. What is biological adaptation for a species?
5. What are three similarities that determine the degree of relatedness among organisms?
6. What four things do the fossil record document?
7. When does extinction of species occur?
8. What are the goals of biological classification?
9. What is the Theory of Evolution?
10. What is natural selection?
11. How can mutations benefit an organism?
12. Explain the Theory of Plate Tectonics.
13. The evolution of Earth's living thins is strongly linked to the movements of what?

Continental Drift Theory:

1. Wegner believed
2. Continents were one large landmass
3. Broke apart
4. Drifted to new locations

Evidence for Continental Drift

1. Fossil Evidence
    a. Same fossils found in South America & Africa and in Antarctica & Australia
2. Climate Evidence
    a. Greenland (Ice Climate) = fossils of tropical plants. Moved from Equator to North Pole.
    b. South America (Warm Climate) = rocks scratched by ice sheets. Moved from South Pole to Equator.
3. Geology Evidence
    a. Same rock types in South America & Africa and in North America & Scotland

Plate Tectonics Theory

1. Earth's continental & ocean plate movements have caused…
    1) Mountains
    2) Trenches
    3) Continents to change shape
    4) Movement through different climates
2. Natural processes & human activities = environmental challenges
3. Plate Tectonic movement causes…
    1) Sea level changes
    2) Ocean volume changes
    3) Land height changes
    4) Ice caps melt/form
    5) Sea water expand as it warms/cools
    6) Climate changes
    7) Geographic feature changes (mountains)
    8) Evolution
    9) Types of living things in particular places

Theory of Evolution

1. Species change over time
2. Living things change in response to environment

Charles Darwin

1. Father of Evolution
2. All life is related & descended from common ancestor

Natural Selection

1. Beneficial mutations (random mutations within genetic code) stay because aid survival.
2. Passed on to next generation
3. Over time, beneficial mutations add up
    a. Result in entirely different organism

Biological Evolution - Diversity of species developed gradually over many generations.

Biological adaptation – Selection of naturally occurring variations in populations that gives organisms their unique characteristics. Changes in structures, behaviors, physiology enhance survival & reproductive success in environment.

Comparative Anatomy – Comparing the structures of different animals and plants.

Homologous structures – Body structures or organs that share a common ancestry.

Analogous structures – Different species' structures with similar functions but different evolutionary origin. No common ancestor.
Ex: wings of insects & birds, fins of fish & flippers of whales, and streamline shape of penguins & seals.

Embryological structures –
1. Vertebrates (organisms with backbones)
2. Develop in similar stages & timing
3. Differences as reach adulthood
4. Reveals similarities & shows relationships that do not show up in adult organisms.

Vestigial Organs
1. Useful body part in evolutionary past
2. Now useless
3. Ex: wings of flightless bird, legs of snake, human appendix, human tailbone, & human ear muscles.

8.L.4.1: Evidence of Evolution Review

1. Bird wings and insect wings are analogous structures. Which can ***most likely*** be concluded?

A. Insects evolved from birds.

B. Birds evolved from insects.

C. Birds and insects have a close common ancestor.

D. Birds and insects do not have a close common ancestor.

2. Which would provide evidence of lithospheric plate movement over time?

A. fossils of tropical plants found near the equator

B. fossils of tropical fish found in a warm climate area

C. fossils of tropical plants found in a cold climate area

D. fossils of tropical fish found at the bottom of an ocean

3. What can scientists ***most likely*** conclude from fossil records?

A. Extinction is rare.

B. Extinction is common.

C. Extinctions have occured at exact intervals throughout geologic time.

D. Extinctions have never occurred in plant species, only in animal species.

4. Two organisms have homologous structures. Which can ***most likely*** be concluded about the two organisms?

A. They are unrelated.

B. They are the same organism.

C. They share a common ancestor.

D. They evolved in a similar environment.

5. James is examining two different fossil specimens. The fossils of both organisms show wings with similar bone structure. Which conclusion can James ***most likely*** make?

A. The organisms are of different species.

B. The organisms are of the same species.

C. The wings allowed the organisms to fly long distances.

D. The wings served the same function in both organisms.

6. Throughout fossil records, many species appearing in lower layers of rock disappear in higher layers of rock. Which ***best*** explains their disappearance?

A. The species became extinct.

B. The species moved to another geographic location.

C. The fossil remains were disrupted by an earthquake.

D. Environmental conditions were not suitable for fossil formation.

7. Archaeologists are working in a previously undisturbed dig site. A fossil is found at a depth of 5 meters, and a second fossil is found at a depth of 20 meters. When comparing the two fossils, which conclusion can the archaeologists ***most likely*** make?

A. The two fossils are from the same species of organism.

B. The fossil found at 5 meters is older than the fossil found at 20 meters.

C. The two fossils were from organisms which evolved from the same ancestral species.

D. The fossil found at 5 meters is more similar to present-day organisms than the fossil found at 20 meters.

8. Based on the fossil record, which organisms were ***most likely*** to have existed first?

A. plants

B. insects

C. jellyfish

D. bacteria

9. Which ***best*** supports the idea of continental drift?

A. Coastlines are constantly changing shape due to erosion.

B. Earthquakes are frequently felt in many regions of the world.

C. Glaciers currently exist in areas considered too warm for glaciers to form.

D. Fossilized remains of the same plants and animals are found on different continents.

10. A new type of plant was discovered on a newly-formed volcanic island.
The island is hundreds of miles away from the mainland.
Which hypothesis ***best*** explains how the plant arrived?

A. It spontaneously generated.

B. It was carried there by humans.

C. It was carried there by wind or waves.

D. It was already present in volcanic materials.

11. Which is true about fossils?

A. Fossils provide the evidence for the Law of Gravity.

B. Fossils provide the evidence for the Laws of Motion.

C. Fossils provide the evidence for the Theory of Evolution.

12. Organisms can be separated by their most basic characteristics into the broadest groups known as

A. kingdoms.

B. domains.

C. phyla.

D. orders.

13. Which ***best*** demonstrates analogous structures in animals?

A. cat fur and dog fur

B. whale fins and human arms

C. bird wings and insect wings

D. gills in fish and lungs in mammals

14. Which term refers to the classification of organisms in an ordered system that indicates natural relationships?

A. taxonomy

B. tectonics

C. geology

15. It is possible to hypothesize how a particular group of organisms evolved by arranging fossils in a chronological sequence. Where would the oldest fossils be found?

A. the deepest rock layer

B. the most shallow rock layer

C. the rock layer with the greatest variety of fossils

D. the rock layer containing fossils with the most complex structures

16. Fossils of land-dwelling mammals found in both Australia and southern Asia were discovered to have body structures believed to have evolved from a common ancestor. What does this evidence ***most likely*** suggest?

A. These organisms were capable of swimming from one continent to the other.

B. Australia and Asia were once part of a larger continent.

C. These organisms developed during the same time period.

17. Which ***best*** helps scientists explore the relationship between modern organisms and ancestral species to create a system of biological classification?

A. fossils

B. volcanic ash

C. DNA evidence

D. igneous rock layers

The human arm contains the radius and ulna bones. Whales, bats, and dogs also have these bones.

18. Which statement ***best*** explains this relationship between the organisms?

A. The eggs are older than all of the rock layers.

B. The eggs are younger than all of the rock layers.

C. The eggs are about the same age as the third rock layer.

D. The eggs are about the same age as the fifth rock layer.

19. Which ***best*** explains the gaps in the evolutionary history of Earth's life forms?

A. The soft parts of organisms are the only parts preserved as fossils.

B. Environmental changes prevented the formation of fossils.

C. Many organisms died without leaving behind fossil remains.

D. Extinct organisms did not form fossils.

20. How are fossils compared to one another for biological classification?

A. by their size

B. by their estimated life spans

C. by the geographic locations where they are found

D. by similarities and differences in their body structures

21. Which ***best*** explains why Australia has life forms that do not exist anywhere else on Earth?

A. Australia was separated from the other landmasses by geological forces.

B. Australia's climate is very different from those of other continents in the world.

C. Chemicals in Australian soil caused genetic changes in the DNA of the plants and animals.

D. Australia was hit in ancient times by a meteorite, which influenced the evolution of

22. Many plants and animals native to Australia are found nowhere else on Earth. Which ***best*** explains this?

A. The soil of Australia has a high mineral content with plenty of moisture.

B. Geologic evolution occurred, separating Australia from other land masses.

C. The climate of Australia is very favorable to many plant and animal species.

D. Biological evolution failed to create changes in the plant and animal species of Australia.

23. Which evidence found in fossils supports that an ice age occurred during a particular time period?

A. fern fossils

B. glacial sediments

C. high oxygen levels

24. What can be inferred from observed similarities in the forelimbs of humans, dogs and bats?

A. Bats evolved from humans.

B. Dogs evolved from humans.

C. These organisms share a common ancestor.

25. Organisms who are evolutionarily closer are ***most likely*** found at which taxonomic level?

A. order

B. family

C. kingdom

8.L.4.2: Natural Selection

Open Ended Questions:

1. List four things that an organism's phenotype can influence.
2. How do alleles associated with favorable phenotypes increase in frequency in a species?
3. The greater the _____, the greater the chances are for a species to survive during _____ changes.

Taxonomy/Biological Classification - System used to organize and codify all life on Earth.

6 Kingdoms:

1. Plants
2. Animals
3. Archaebacteria – extreme environments
4. Eubacteria – normal bacteria
5. Fungi – mushrooms, mold, mildew
6. Protists (slime molds & algae)

Goals:

1. Describe organisms
2. Examine relationship between organisms
3. Construct evolutionary trees
4. Explore origins of life
5. Relationship to modern organisms

7 Taxonomy Categories

1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
7. Genus
8. Species

1. Phenotype
    a. Body structures & characteristics
    b. Causes genetic variation within populations
    c. Influences ability to
        1) Find, obtain, or utilize resources (food, water, shelter, etc…)

2) Reproduce & pass on traits
3) Adapt to changes

2. Physical Conditions
   a. Affect growth & survival of organism in its environment
   b. If environment changes,
      1) Those with characteristics well suited to new environment = survive & reproduce at higher rates
      2) Therefore, alleles of favorable phenotypes become more common and increase chance of species survival.
3. Survival
   a. Traits (courting behaviors, coloration, odors, competitive strength…)
   b. Asexual reproduction = experience mutations to adapt to environment

4. Genetic Variation
   a. Causes…
      1) Adapt to environmental changes
      2) Diversity of organisms = greater chances for species to survive environmental changes
      3) Get foods, water, shelter, mates
      4) Reproduce
      5) Pass on traits to offsprings
      6) Survive = increase population
      7) Evolution

5. Less Genetic Variation
   a. Causes…
      1) NO adaption to environmental changes
      2) Find LESS food, water, shelter, mates
      3) Pass on UNFAVORABLE traits
      4) Produce FEWER offsprings
      5) DEATH
      6) DECREASE in population
      7) EXTINCTION

8.L.4.2: Natural Selection Review

1. The prairie dog has many adaptions to its ecosystem. Which ***best*** explains the genetic variation in the prairie dog that provided adaptation to its ecosystem?

   A. exceptional vision to see a great distance on the prairie

   B. claws to dig tunnels for shelter from predators

   C. long tails to anchor themselves to trees

2. What type of species has the ***best*** chance of surviving through significant environmental change?

   A. genetically-diverse species

   B. genetically-homogenous species

   C. species with highly-specialized traits

3. Which ***best*** describes the purpose of mixing gene pools?

   A. increases the number of organisms

   B. promotes genetic variation

   C. reduces genetic variation

4. A gardener applies herbicide in a garden. Which ***best*** explains why some weeds in the garden survive applications of the herbicide while others die?

   A. The weed species that die have a low degree of genetic variation, and have adapted to be resistant to the herbicide.

   B. The weed species that survive have a high degree of genetic variation, and have adapted to be resistant to the herbicide.

   C. The weed species that die have a high degree of genetic variation, which has prevented them from adapting to the herbicide.

D. The weed species that survive have a low degree of genetic variation, which has prevented them from adapting to the herbicide.

5. Which adaptation has occurred due to genetic variation allowing some species to seem invisible to predators?

   A. ability to make loud noises
   B. exceptional vision
   C. camouflage

6. Turtles have adapted to their habitat to protect themselves from their predators. Which ***best*** describes this adaptation?

   A. mimicry
   B. parasitism
   C. protective covering

7. How does genetic variation affect an organism's ability to adapt to its environment?

   A. increases it
   B. decreases it
   C. has no known effect in most organisms

8. What characteristic of living things helps them to adapt to a changing environment?

   A. cryptic coloration
   B. genetic variation
   C. phenotypic characteristics

9. Some peacocks are born with a genetic variation that makes them completely white. How does this affect the likelihood of their survival?

   A. Genetic variation in the white peacock makes it stand out in a crowd as a target for potential predators, resulting in fewer white peacocks.

   B. Genetic variation in the white peacock makes it stand out in a crowd and scares potential predators, resulting in more white peacocks.

   C. Genetic variation in the white peacock makes it more attractive to mates, which will result in more white peacocks.

10. Which ***best*** describes the relationship between genetic variation and an organism's ability to adapt to its environment?

   A. The environment causes genetic variation in a population of organisms, which allows them to adapt to their environment.

   B. Genetic variations in a population of organisms result in individuals with similar genetic traits and the ability to adapt to their environment.

   C. Organisms of a population have certain traits that enable them to adapt to changes in the environment, survive, and pass these traits on to offspring.

   D. A population of organisms with little genetic variation is better able to adapt to changes in their environment than organisms with a lot of genetic variation.

11. Which will ***most likely*** occur when a bird's beak size increases over time to better crack open nuts?

   A. Species survival will increase.

   B. Species survival will decrease.

   C. Species reproduction will increase.

   D. Species reproduction will decrease.

12. Which represents an adaptation?
    A. a turtle with a damaged shell
    B. a cat that cannot see in the dark
    C. a bird with a curved wing that allows it to fly faster
    D. a dog that learns to bark when someone knocks on the door

13. Which is the ***best*** hypothesis for the extinction of the dinosaurs at the end of the Cretaceous period?
    A. The dinosaurs killed each other.
    B. Humans destroyed all the dinosaurs.
    C. Mammals evolved and killed the dinosaurs.
    D. The climate changed and the dinosaurs could not adapt.

14. Why are fat layers and thick white fur advantageous for polar bears?
    A. They help the bears catch more food.
    B. They help the bears get rid of excess body heat more easily.
    C. They allow the bears to run and swim faster to escape predators.
    D. They insulate the bears and allow them to blend in with their environment.

15. Which ***best*** explains how environment and genetic variation contribute to the difference in a species' physical appearance?
    A. The climate becomes colder and a new species develops.
    B. The climate becomes colder and a species becomes extinct.
    C. The climate becomes colder and a species adapts to the change.

16. Which bird would be ***best*** adapted to eat the seeds from very hard shells?

A. *Geospiza magnirostris*

B. *Geospiza fortis*

C. *Geospiza parvula*

D. *Certhidea olivacea*

17. Which adaptation ***best*** allows organisms to adjust to the harsh winters of the tundra?

A. thick fur

B. long ears

C. large, glossy leaves

18. Over time, the length of giraffes' necks changed slightly to allow them to reach taller trees. How should this change be classified?

A. mutation

B. adaptation

C. acquired trait

D. genetic constant

19. Bird A can blend in with its environment, fly far, and eat a variety of nuts and seeds. Bird B is an unusually colored, weak flyer that eats only one type of seed regularly. Which statement is ***most likely*** true?

    A. Bird B is a powerful predator.
    B. Bird A will be easily preyed upon by larger birds.
    C. Bird A will eventually thrive and reproduce due to strong genetic variation.
    D. Bird B will eventually thrive and reproduce because of specialized features.

20. A low-level species in a food web suddenly becomes extinct. Of its predators, which will ***most likely*** survive?

    A. the predators that are genetically similar
    B. the predators that feed on many different organisms
    C. the predators that primarily feed on the now-extinct species

21. An arctic hare experiences a genetic variation that keeps its coat from changing to white for the winter season. Which element in the environment would pose the greatest threat because of this variation?

    A. prey
    B. predators
    C. pollution

22. Which is the main cause of the variation in traits within a population of organisms?

    A. genetic mutations
    B. common ancestors
    C. environmental conditions

23. Some body structures in a species tend to become smaller and insignificant over millions of years. Which advantage does this have for the species?

A. It allows the species to become less specialized.

B. It enhances the function of those structures within an organism.

C. It helps organisms reserve more energy for the function of essential body parts.

D. It improves the chance of creating a new species with different body structures.

24. Which ***best*** explains the relationship between evolution and natural selection?

A. Evolution causes natural selection.

B. Evolution prevents natural selection.

C. Natural selection prevents evolution.

D. Natural selection is one aspect of evolution.

25. How is genetic variation related to an organism's ability to adapt to its environment?

A. When genetic variation is low, the ability to adapt is high.

B. When genetic variation is high, the ability to adapt is low.

C. When genetic variation is low, the ability to adapt is low.

D. Genetic variation is unrelated to the ability to adapt