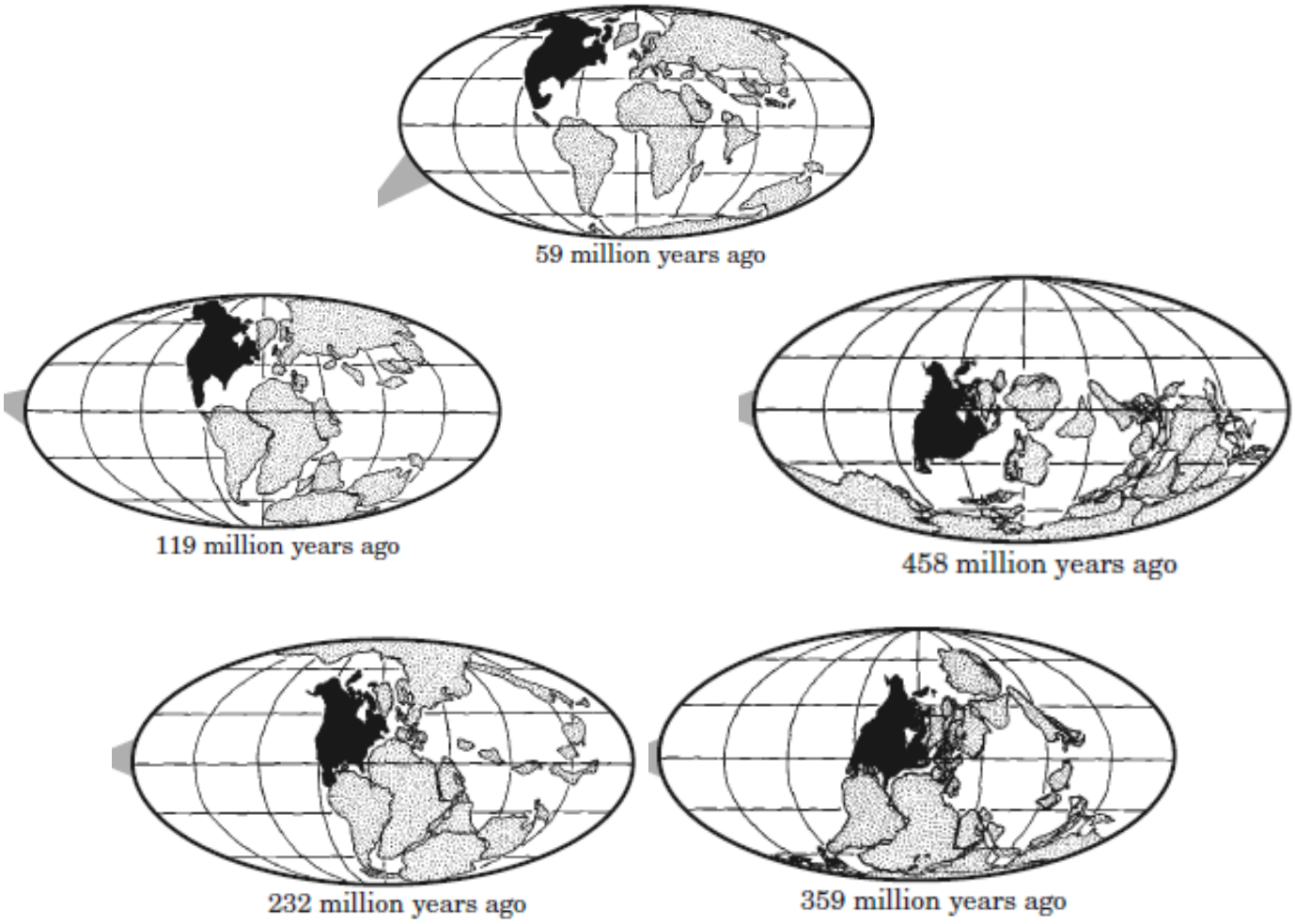
Chapter 3 Section 7 and Chapter 8 Section 5

Geologic Time



Section Question: How can scientists determine the order of past events throughout Earth's history?

What Do you See?
What Do You Think?
What Do You Think Now?

Focus Question A: How can 4.6 billion years of Earth's history be modeled?

Investigate: Earth's History

(Create a timeline of major event in Earth's history) Page 921

Geologic History: Major Events	
Date	Event
2011	Huge earthquake hits Japan.
2005	Gigantic tsunami develops in Asia.
1963	A new island erupts on a mid-ocean ridge near Iceland.
1904	Huge earthquake hits San Francisco.
1800	Atmospheric carbon dioxide rises.
10,000 years ago	Sea levels rise around Earth.
11,500 years ago	End of last glaciation in Europe.
2 Ma	Modern ice age begins and sea level falls.
5 Ma	A land bridge connecting North and South America forms.
7 Ma	Hominids (the human species) separate from chimpanzees.
11 Ma	The Grand Canyon is cut by the Colorado River.
16 Ma	The Rocky Mountains rise up.
35 Ma	A cold current develops around the Antarctic, causing global cooling.
55 Ma	Plate movements leave Antarctica stranded over the South Pole.
65 Ma	A giant meteorite strikes Earth.
140 Ma	Sea level rises and falls.
200 Ma	Pangea begins to break apart.
250 Ma	Ice age ends and deserts expand.
260 Ma	The climate becomes cooler and drier. Ice expands across Earth.
290 Ma	Pangea forms as Euramerica and Gondwanaland collide.
350 Ma	Euramerica and Gondwanaland move towards each other.
410 Ma	The collision of gigantic landmasses forms the Appalachian Mountains.
495 Ma	The supercontinent fragments.
540 Ma	Explosive development of life.
600 Ma	Shifts in climate force the entire Earth to glacial conditions.
1 Ga	A supercontinent called Rodinia contains nearly all of Earth's landmasses.
2 Ga	Ancient mountains form (but are now worn away).
3 Ga	Oldest sedimentary deposits are laid down on the shields.
4 Ga	The core, mantle, and crust differentiate.
4.6 Ga	Earth forms by accretion.

Ma stands for millions of years ago. Ga stands for billions of years ago.

Procedure:

1. Start with 25 meters of paper
2. Choose 10 events from the list and calculate the distance from the beginning of your paper roll to the time of the event.
3. If 50cm = 100 million years, calculate the distance to each event.
    a. Example: (for the first event)

    4,600,000,000 – 4,000,000,000 = 600,000,000

    50cm X 600,000,000 /100,000,000 = 300cm
4. Place the first event on your paper roll 300cm from the beginning.
5. Include a short description of the event and the dates of the event.

Observe: How are the events in Earth's past distributed?

Predict: Where would you put divisions in your timeline?

Investigate: ESRT pages 8 and 9

1. What are the three eras of the Phanerozoic Eon?
    1. _____
    2. _____
    3. _____
2. During which Epoch did humans first appear? About how many years ago was this?
    1. _____
    2. _____
3. What are the three periods of the Mesozoic Era?
    1. _____
    2. _____
    3. _____
4. During which three periods did dinosaurs live?
    1. _____
    2. _____
    3. _____
5. What two important geologic events took place during the Triassic Period?
    1. _____
    2. _____
6. About how many years ago did the first insects appear?
    1. _____
7. About how many years ago is the estimated origin of the Earth and Solar System?
    1. _____
8. How old are the oldest known rocks? From which Eon are they thought to be from?
    1. _____
    2. _____
9. During which period was the Acadian Orogeny?
    1. _____
10. How many years ago did the dinosaurs go extinct?
    1. _____

Focus Question B: How do geologists determine the ages of rocks?

Investigate:

- Start with 32 pennies face up
- Turn over half the pennies every 30 seconds and record your data.

Time (min:sec)	Mineral	Atoms					
		Non-Decayed (heads up)			Decayed (tails up)		
		#	Fraction	Mass (g)	#	Fraction	Mass (g)
0:00	formation	32	$\frac{32}{32}$		0	$\frac{0}{32}$	0
0:30	half the atoms decay						
1:00	another half decay						
1:30	another half decay						
2:00	another half decay						
2:30	another half decay						

Observations:

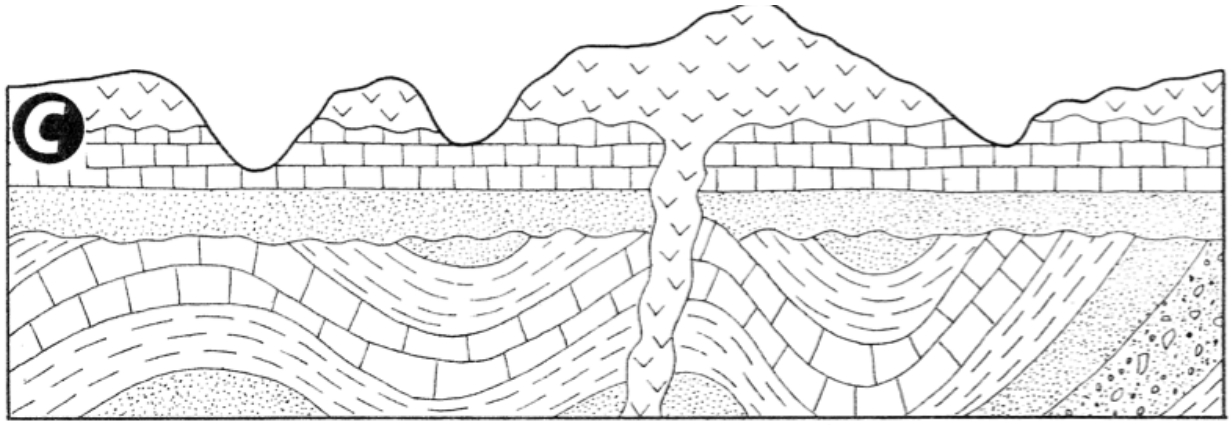
Describe your results:

Explain:

Focus Question C: How can basic geologic principles be used to interpret history?
Investigate: In the space below, draw 6 horizontal layers
If the 6 layers above were subjected to compressive forces, how would they change?
Erode the top portion of your 6 layers

Add an igneous intrusion that breaks through the surface to create a lava flow
Create a fault across your layers and intrusion
Explain:

Evaluate: Interpret the geologic history of the region shown in the picture below. (Use the ESRT to identify the rock types)



RETURN TO WDYTN

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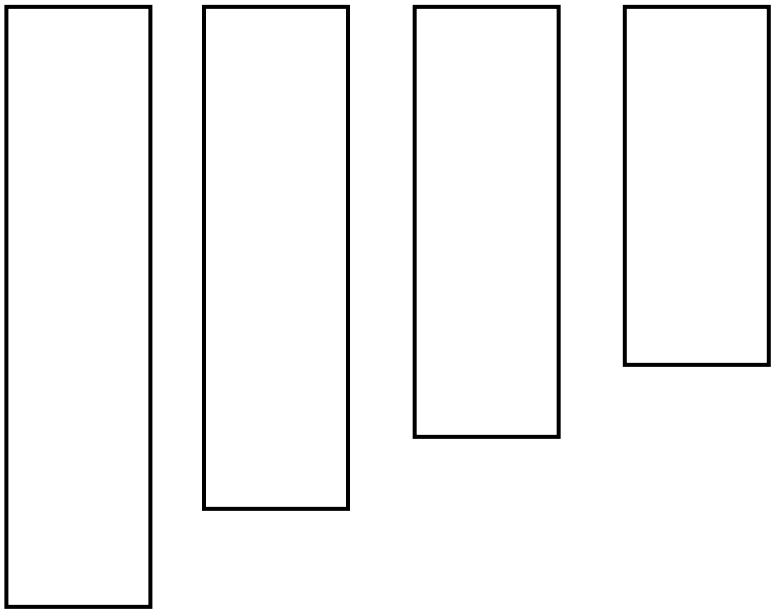
DIGGING DEEPER

Geologic Time Scale

- Earth's total history encompasses a total time of 4.6 billion years
- Homo sapiens appeared on Earth 500,000 years ago
- Breaking down Earth's history into blocks of time allows scientists to easily organize Earth's history
- Unique events are used to distinguish the boundaries between the different blocks of time

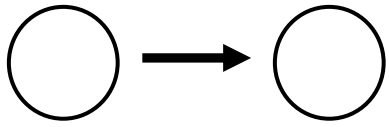
Geologic Time Divisions

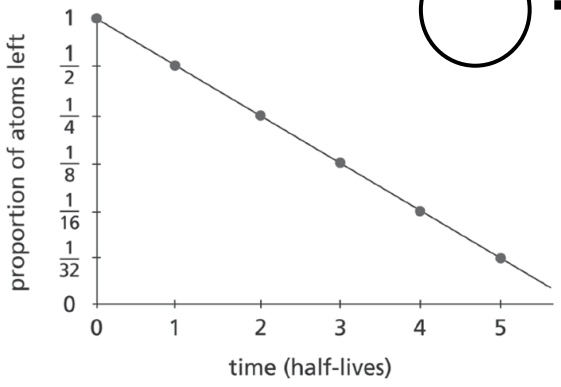


Radioactive Decay

- Absolute age is a date given for a rock sample that is expressed in in years
- Radioactive decay is the process by which an atomic nucleus of an unstable atom loses particles
- Parent atom is the atom that undergoes radioactive decay
- Daughter atom is the product atom from radioactive decay of a parent atom
- Half-life is the length of time it takes for half of a radioactive substance to decay

Radioactive Elements





Why is it useful to have different Radioactive isotopes?

Basic Geologic Principles	

• Uplift is the process by which local areas of Earth's crust can be slowly raised
  ○ Uplift is usually followed by erosion of material
• Subsidence is the process by which local areas of Earth's crust can be slowly lowered
  ○ Subsidence is usually followed by deposition of material
• The principle of faunal succession can be used to correlate rocks that are found in different regions of the world
  ○ If the rocks contain the same fossils then they are the same age
• Index fossils are used to narrow the age range of sedimentary rocks as much as possible.
	Describe each of the Relative dating laws below
	1. Law of Original horizontality
	
	2. Law of Lateral Continuity
	
	3. Law of Superposition
	
	4. Law of Crosscutting Relationships
	
	5. Law of Unconformities

Chapter 3 and 8, Sections 7 and 5 E.B.C. Name:_____
Geologic Time Period:_____

Question (2)		
Claim 1 (2)		
A. Supporting Evidence (3)	B. Supporting Evidence (3)	
Claim 2 (2)		
A. Supporting Evidence (3)	B. Supporting Evidence (3)	
Analysis (6)		

	Claim *A statement or conclusion that answers the original question/problem.*	**Evidence** *Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.*	**Analysis** *A justification that connects the evidence to the claims. It shows why the data counts as evidence by using appropriate and sufficient scientific principles and vocabulary*.
0	Does not make a claim, or makes an inaccurate claim.	Does not provide evidence, or only provides inaccurate or vague evidence.	Does not provide an analysis, or only provides an irrelevant analysis.
1	Makes an accurate but vague or incomplete claim.	Provides vague evidence and does not include specific data.	Repeats evidence and links it to claim, but does not include specific scientific principles.
2	Makes accurate and complete claim.	Provides correct evidence but does not include specific data.	Connects all evidence to the claims using scientific principles or vocabulary but not both.
3		Provides correct evidence and includes specific data.	Connects all evidence to both claims using scientific principles and vocabulary.

CHECKING UP: Page 339, 1 through 4 (2 points each)

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1.

2.

3.

4.

CHECKING UP: Page 929, 2 through 4

2.

3.

4.