Earth Science Lab

Topic: Geologic History

Learning Standards: (New York)

Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity. Students will describe chemical and physical changes, including changes in the states of matter.

Materials:

Laboratory Handout
State Reference Table

Introduction:

Students will discuss the concept of geologic history and the relevance of its present day application.

Class Participation:

Students will be broken up into lab groups to complete the laboratory handout listing the different stages of geologic history. Students will also make further inferences and analyze the different fossils that have been found within each layer of progressively older sedimentary rock. (Supplemental information can be derived from available textbooks and other resources)

Assessments:

Short Term: Upon completion of their labs students will be encouraged to discuss their findings. This exercise will be a valuable asset in aiding their understanding the idea of geologic history. This exercise will also utilize library and referencing skills.

Long Term: Practice regents questions will be assigned throughout the year. Supplemental resources such as graphic organizers, labs and review sheets will help the students become more comfortable with scientific material in preparation for the New York State Earth Science Regents Exam. Student will also exhibit a basic understanding of the dynamics that govern our ever-changing environment.

Conclusion: Students will exhibit an understanding of geological history and the historical record of the age differentiation of various sedimentary rock layers. Students will submit their labs for a grade and be documented in accordance with New York State laws and mandates pertaining to the earth science curriculum.

Instructor Diagnosis and Amendments: Administrative Approval and Suggested Amendments:

_____ _____
_____ _____
_____ _____
_____ _____

Instructor_____
Name _____I.D.#____ Date _____
Period _____ Mark _____

Geological History

Objective: Students will exhibit an understanding of **Geological History** and draw conclusions about the findings of specific fossils found throughout specific sedimentary layers.

Vocabulary:

Sedimentary Rock

_____
_____

Fossil Record

_____
_____

Index fossil

_____
_____

Epoch

_____
_____

Era

_____
_____

Eon

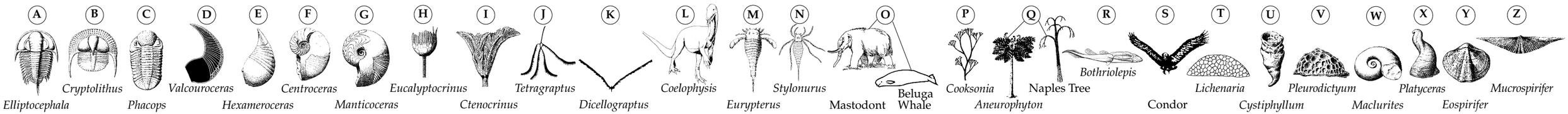
_____
_____

Procedure:

Students will analyze the geological history of their respective states through the use of the fossil record. Geologic history is to complex to be organized by rock ages and isotopic dating so scientists utilize the rare fossils found within each layer of sedimentary rock. Please review the given data and ascertain how the layout can provide detailed information when scientists discover the remains of an index fossil

GEOLOGIC HISTORY OF NEW YORK STATE

(Fossils not drawn to scale)



Eon	Era	Period	Epoch	Millions of years ago	Life on Earth
PHANEROZOIC	CENOZOIC	QUATERNARY	HOLOCENE	0	
			PLEISTOCENE	0.01	Humans, mastodonts, mammoths
		TERTIARY – NEOGENE	PLIOCENE	1.6	Large carnivores
			MIOCENE	5.3	Abundant grazing mammals Earliest grasses
		TERTIARY – PALEOGENE	OLIGOCENE	24	Large running mammals
			EOCENE	33.7	Many modern groups of mammals
			PALEOCENE	54.8	
	MESOZOIC			65	Extinction of dinosaurs and ammonoids
		CRETACEOUS	LATE		Earliest placental mammals Climax of dinosaurs and ammonoids
			EARLY		Earliest flowering plants Decline of brachiopods Diverse bony fishes
				142	
		JURASSIC	LATE		Earliest birds
			MIDDLE		Abundant dinosaurs and ammonoids
			EARLY		
				206	
		TRIASSIC	LATE		Modern coral groups appear
			MIDDLE		Earliest dinosaurs and mammals with abundant cycads and conifers
			EARLY	251	Extinction of many kinds of marine animals, including trilobites
	PALEOZOIC	PERMIAN	LATE		First mammal-like reptiles
			EARLY		
				290	
		CARBONIFEROUS – PENNSYLVANIAN	LATE		Earliest reptiles
			EARLY		Extensive coal-forming forests
				323	
		CARBONIFEROUS – MISSISSIPPIAN	LATE		Abundant sharks and amphibians
			EARLY		Large and numerous scale trees and seed ferns
				362	
		DEVONIAN	LATE		
			MIDDLE		Earliest amphibians, ammonoids, sharks
			EARLY		Extinction of armored fish, other fish abundant
				418	
		SILURIAN	LATE		Earliest insects Earliest land plants and animals
			EARLY		Peak development of eurypterids
				443	
		ORDOVICIAN	LATE		
			MIDDLE		Invertebrates dominant – mollusks become abundant Diverse coral and echinoderms
			EARLY		
				490	Graptolites abundant
		CAMBRIAN	LATE		Earliest fish Algal reefs
			MIDDLE		Burgess shale fauna
			EARLY		Earliest chordates, diverse trilobites Earliest trilobites Earliest marine animals with shells
				544	
PROTEROZOIC				580	Ediacaran fauna
					Soft-bodied organisms
ARCHEAN				1300	Stromatolites

Millions of years ago: 0, 500, 1000, 2000, 3000, 4000, 4600

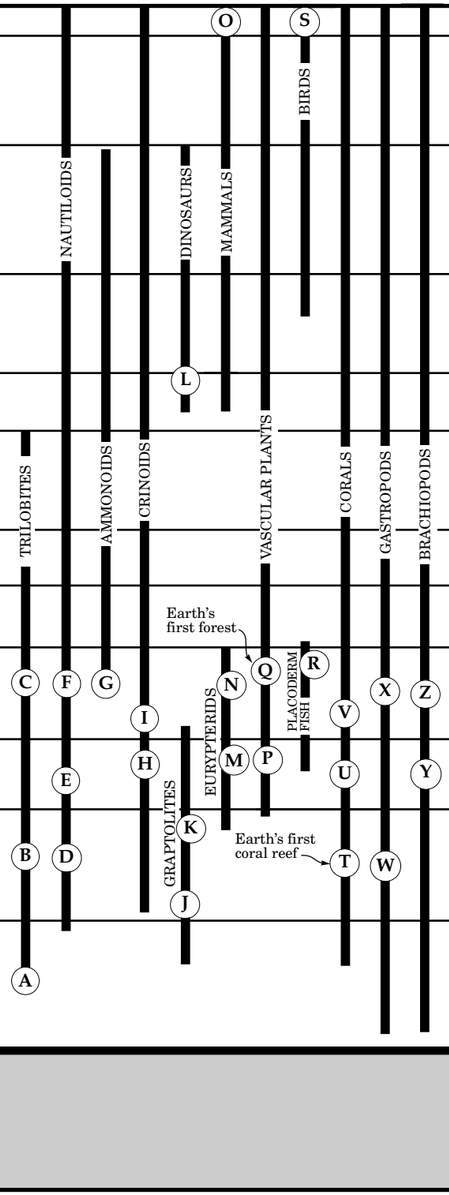
PROTEROZOIC: LATE — Oldest multicellular life; MIDDLE — First appearance of sexually reproducing organisms; EARLY — Transition to atmosphere containing oxygen

ARCHEAN: LATE — Oldest microfossils; MIDDLE — Geochemical evidence for oldest biological fixing of carbon; EARLY — Oldest known rocks

Estimated time of origin of Earth and solar system

Time Distribution of Fossils (Including Important Fossils of New York)

Lettered circles indicate the approximate time of existence of a specific index fossil (e.g. Fossil (A) lived at the end of the Early Cambrian).



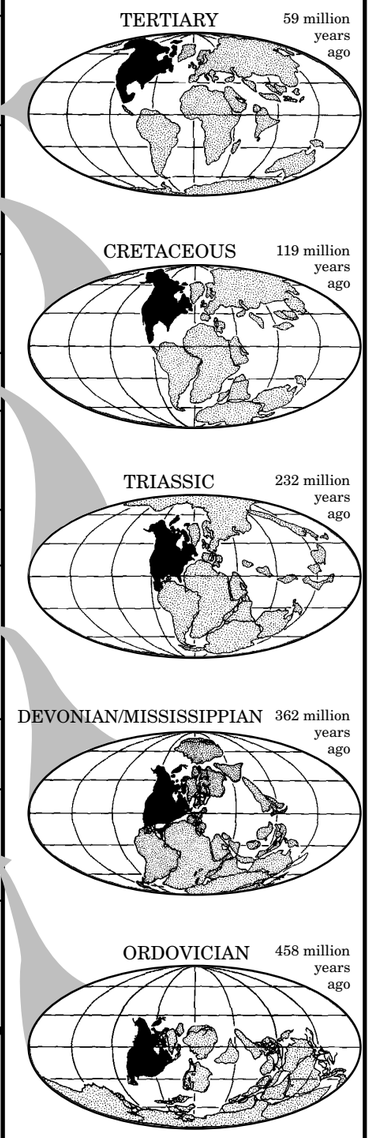
Tectonic Events Affecting Northeast North America

Rifting
Passive Margin
Subduction
Continental Collision
Transform Collision

Important Geologic Events in New York

- Advance and retreat of last continental ice
- Uplift of Adirondack region
- Sands and shales underlying Long Island and Staten Island deposited on margin of Atlantic Ocean
- Development of passive continental margin
- Initial opening of Atlantic Ocean
  North America and Africa separate
- Intrusion of Palisades sill
  Pangea begins to break up
- Extensive erosion
- **Appalachian (Alleghanian) Orogeny** caused by collision of North America and Africa along transform margin, forming Pangea
- Catskill Delta forms
  Erosion of Acadian Mountains
- **Acadian Orogeny** caused by collision of North America and Avalon and closing of remaining part of Iapetus Ocean
- Salt and gypsum deposited in evaporite basins
- Erosion of Taconic Mountains; Queenston Delta forms
- **Taconian Orogeny** caused by closing of western part of Iapetus Ocean and collision between North America and volcanic island arc
- Iapetus passive margin forms
- Rifting and initial opening of Iapetus Ocean
  Erosion of Grenville Mountains
- **Grenville Orogeny:** Ancestral Adirondack Mtns. and Hudson Highlands formed

Inferred Position of Earth's Landmasses



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Observations:

Questions:

1. What are some of the important geologic events that have occurred in your state?

_____

_____

2. What are the respective index fossils used to determine the Devonian, Ordovician and Cambrian periods?

_____

_____

3. What period in geological time did North America reside the lowest in latitude?

_____

_____

4. At what time did the Appalachian Mountains form?

_____

_____

5. What epoch did the earliest humans take shape?

_____

_____

6. When did the first mammals start to take shape?

_____

_____

7. When did the last of the continental ice begin to retreat?

_____

_____

8. During what period did the Atlantic Ocean begin to take shape?

_____

_____

Conclusion: Why are fossils such an important tool for scientists to ascertain the age of the surrounding rock?

_____

_____

Answer Key: Continental Drift Lab

Questions:

1. The beginning of the Atlantic Ocean and the formation of the Appalachisn Mountatins

2. Centroceras, Cryptolithus and Elliptocephala

3. Ordovician

4. Early Permian

5. Pleistocene Epoch

6. Permian Period

7. Pleistocene Epoch

8. Jurassic Period