Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_

Eras of the Geologic Time Scale: Precambrian Time

Geologic Time Scale: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Precambrian Time

1. The Earth Forms
	1. 6 Billion years ago- Solar system formed from swirling gases and \_\_\_\_\_\_\_\_\_\_\_\_
	2. 4.5 Billion years ago- Rocks in the solar system condensed to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. The center of the Earth was melted by \_\_\_\_\_\_\_\_\_\_\_\_\_ and intense \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. 4.1 Billion years ago- Surface of Earth \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, forming the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Oldest rock found in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ formed as Earth cooled
			1. Primitive atmosphere formed from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				1. Did NOT contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gas
		3. Oceans form from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ released in eruptions and maybe \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Where did Life Start?
	1. Hydrothermal Ocean Vents
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rich, with complex molecules which may have joined to form structures such as \_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Oceans covered in ice
		1. Extra protection from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. Meteorites/ Comets
		1. Rich with building blocks of \_\_\_\_\_\_\_\_\_\_\_\_\_
	4. What does it mean to be living?
		* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	5. Prokaryotes
		1. Single- celled organisms that lack a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. Do not need \_\_\_\_\_\_\_\_\_\_\_\_\_ to survive
	6. 3 Billion years ago
		1. Cyanobacteria (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
			1. Creates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from photosynthesis
			2. Gives off \_\_\_\_\_\_\_\_\_\_\_\_ gas
				1. Beginning to form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of today!
			3. Form large \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	7. 1.5 Billion years ago
		1. Eukaryotes
			1. Contain a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and other complex structures in their cells
			2. Evolved from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (bacteria)
	8. 630 Million years ago
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms evolved with soft bodies
			1. Ex: jellyfish, coral stalks, segmented worms and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***National Geographic: Precambrian Time***

Precambrian time covers the vast bulk of the Earth's history, starting with the planet's creation about 4.5 billion years ago and ending with the emergence of complex, multicelled life-forms almost four billion years later. The Precambrian is the **earliest of the geologic ages**, which are marked by different layers of sedimentary rock. Laid down over millions of years, these rock layers contain a permanent record of the Earth's past, including the fossilized remains of plants and animals buried when the sediments were formed.

The Earth was already more than 600 million years old when life began. The planet had cooled down from its original molten state, developing a solid crust and oceans created from water vapor in the atmosphere. Many scientists think these primordial seas gave rise to life, with hot, mineral-rich volcanic vents acting as catalysts for chemical reactions across the surface of tiny water bubbles, which led to the first cell membranes. Other bubbles are thought to have formed self-replicating substances by attracting chemicals from around them. Over time the two combined to produce energy-using, living cells.

The **earliest living organisms** were microscopic bacteria, which show up in the fossil record as early as 3.4 billion years ago. As their numbers multiplied and supplies of their chemical fuel were eaten up, bacteria sought out an alternative energy source. New varieties began to harness the power of the sun through a biochemical process known as photosynthesis—a move that would ultimately lead to simple plants and which opened the planet up to animal life.

Some three billion years ago the Earth's atmosphere was virtually devoid of oxygen. At about 2.4 billion years ago, oxygen was released from the seas as a byproduct of photosynthesis by cyanobacteria. Levels of the gas gradually climbed, reaching about one percent around two billion years ago. About 800 million years ago, oxygen levels reached about 21 percent and began to breathe life into more complex organisms. The oxygen-rich ozone layer was also established, shielding the Earth's surface from harmful solar radiation.

**Unfamiliar Life-Forms**

The **first multicelled animals** appeared in the fossil record almost 600 million years ago. Known as the Ediacarans, these bizarre creatures bore little resemblance to modern life-forms. They grew on the seabed and lacked any obvious heads, mouths, or digestive organs. Fossils of the largest known among them, Dickinsonia, resemble a ribbed doormat. What happened to the mysterious Ediacarans isn't clear. They could be the ancestors of later animals, or they may have been completely erased by extinction.

The earliest multicelled animals that survived the Precambrian fall into three main categories. The simplest of these soft-bodied creatures were **sponges**. Lacking organs or a nervous system, they lived by drawing water through their bodies and filtering out food particles. The **cnidarians**, which included sea anemones, corals, and jellyfish, had sac-like bodies and a simple digestive system with a mouth but no anus. They caught food using tentacles armed with microscopic stinging cells. The third group, the **annelids**, or segmented flatworms, had fluid-filled body cavities and breathed through their skins.

It's thought the final stages of Precambrian time were marked by a prolonged global ice age. This may have led to widespread extinctions, mirroring the bleak endings to the geologic periods that followed.

1. Write a thesis statement for this article
2. Give 4 supporting facts that relate the article to your thesis statement.

Eras of the Geologic Time Scale: Paleozoic Era

Paleozoic Era- “Ancient Life”

Life starts in the seas and moves onto \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Cambrian (550-505 MYA)
	1. Cambrian \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Most major animal phyla are found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			1. Mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ invertebrates with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				1. First trilobites, clams, snails, , gastropods
			2. Burgess Shale- Major fossil \_\_\_\_\_\_\_\_\_\_\_\_ located in Canadian Rockies
2. Ordovician (505-438 MYA)
	1. 1st vertebrates- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (filter feeders)
		1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protects the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which carries signals from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the rest of the body
			1. Starfish, sea urchins, jawless fish, echinoids
3. Silurian (438-408 MYA)
	1. 1st \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fish
		1. Later evolved into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (O3) layer formed which blocks harmful UV radiation
		1. Life could evolve on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. 1st land plants
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Devonian (408-360 MYA)
	1. “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”
		1. 1st \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fish
			1. Scaled and swim bladder for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. 1st insects
		1. Arthropods- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and scorpions
	3. 1st vertebrates on land
		* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				1. Evolved from the lobed-fin fish which included some species of \_\_\_\_\_\_\_\_\_\_\_\_\_
5. Carboniferous (360-286 MYA)
	1. North America is at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Tropical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form coal deposits
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is very warm
		1. Amphibians and insects dominate and become large
			1. Dragon flies 1 meter long and cockroaches 10 cm long
	3. 1st reptiles
6. Permian (286-284 MYA)
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dominate
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ beings to form
		1. Ancestral North America collided with Africa to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mountains
			1. Dry climate
			2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the southern hemisphere
	3. Mass Extinction
		1. More than \_\_\_\_\_\_\_\_\_ of all \_\_\_\_\_\_\_\_\_\_\_\_\_\_ invertebrates go extinct
		2. \_\_\_\_\_\_\_\_ of all land species go extinct

Eras of the Geologic Time Scale: Mesozoic Era

Mesozoic Era- “Age of the Reptiles”

\_\_\_\_\_\_\_ million years ago to \_\_\_\_\_\_ million years ago

1. Triassic (248-213 MYA)
	1. Pangaea (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) formed
	2. 1st \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (small in size- about \_\_\_\_\_\_\_\_\_\_\_\_\_\_ tall)
	3. Conifers and \_\_\_\_\_\_\_\_\_\_\_\_ forests dominate (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
	4. 1st turtles and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Jurassic (213-145 MYA)
	1. Pangaea beings to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diversify and dominate
	3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the sea
	4. 1st \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (small rodents)
	5. 1st \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Jaws and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ like dinosaurs
		2. Bones are \_\_\_\_\_\_\_\_\_, like birds
		3. Had \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Cretaceous (145-65 MYA)
	1. Continents in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ positions
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ still dominate
	3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ evolve and dominate
		1. Flowering plants with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	4. Mass \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. \_\_\_\_\_% of all plant and animal groups die
		2. Alvarez \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Impact Theory
			1. Evidence of Impact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				1. Element that is very rare in Earth rocks and very common in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				2. Called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. How could a meteorite impact cause mass extinction?
			1. Impact caused \_\_\_\_\_\_\_\_\_ waves, \_\_\_\_\_\_\_\_\_\_\_\_ waves, and sent dust into atmosphere
			2. As the dust re-entered the Earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, it would have instantly heated causing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			3. Dust from impact blocked out \_\_\_\_\_\_ & caused major \_\_\_\_\_\_\_\_ change and plant death
	5. What organisms went extinct? What organisms survived?

Eras of the Geologic Time Scale: Cenozoic Era

Cenozoic Era- “Age of the Mamamals”

\_\_\_\_\_\_\_ million years ago to PRESENT

1. Tertiary (65-1.8 MYA)
	1. Starts with a warm and \_\_\_\_\_\_\_\_\_\_ climate
	2. \_\_\_\_\_\_\_\_\_\_\_ dominate
		1. Gradually increasing in \_\_\_\_\_\_\_\_\_\_\_
	3. Angiosperms (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) dominate
	4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ develop
		1. Grazing animals become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	5. Earliest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Approximately 6-7 million years ago
	6. 1ST marine and large \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ animals
		1. Horses, whales, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Quaternary (1.8 MYA- PRESENT DAY)
	1. The “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”
		1. Ice sheets covered \_\_\_\_\_\_ % of all land
		2. Land and \_\_\_\_\_\_\_ bridges connected many continents allowing animal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. Large North American animals go \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			1. Elephants (mastodons and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_), giant \_\_\_\_\_\_\_\_\_\_\_\_\_ and armadillos, and saber- toothed \_\_\_\_\_\_\_\_
		4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ humans evolve
			1. Maybe causing the above extinctions from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_