**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Block: \_\_\_\_\_\_\_**

**Geological Clock of Time**

(May 18, 2012)

In comparison with the age of the Earth, the time of human existence on Earth is like a snapping of the fingers. Can you imagine how long your life is in comparison with the ages of the Earth? It is difficult to visualize. By dating the rocks and fossils through different techniques, like radio-metric dating and stratigraphic comparisons, geologists have been able to construct a picture of the events of the Earth’s history. During this activity, you will plot certain events on a twenty-four hour clock to give you a better picture of the time span of the Earth’s history.

**PROCEDURE**:

On a sheet of paper, draw a **big** circle that will represent a 12 hour clock. Label it the **AM** clock. On the **reverse side** of that paper, draw another big circle that will represent another 12-hour clock. Label it the **PM** clock. **There are three parts to this assignment**:

**Part 1**: From the table of geological events below, **draw** the **hour hand** on your

clocks at the appropriate times. **Also, write** the event next to the line (or write in a key on the side). Be warned: in the last two hours there is an explosion of events. If you want to space out the last two hours to fit everything in, use another sheet of paper and draw a wedge to expand the last 2 hours (10 PM-midnight).

**Part 2**: Using the Era Table (below the Event Table), **color** in the 4 eras on your

clocks.

**Part 3**: Answer the 11 questions (25 pts) on pages 3 &4.

|  |  |  |
| --- | --- | --- |
| **YEARS AGO** | **EVENT** | **CLOCK TIME** |
| 5 billion | Solar System Forms | Midnight |
| 4.6 | Earth Forms | 1:55 **AM** |
| 3.9 | Oldest Rocks Discovered on Earth | 5:17 |
| 3.8 | Oceans Form | 5:45 |
| 3.5 | Oldest Prokaryote Fossils | 7:12 |
| 2.8 | Oxygen at 2% in the atmosphere | 10:33 |
| 2.3 | Stromatolytes abundant | 12:58 **PM** |
| 1.4 | Oldest Eukaryote Fossils | 5:17 |
| 800 million | Oldest multicellular fossils | 8:10 |
| 550 | Oldest trilobite fossil | 9:22 |
| 415 | Oldest land plant fossils (mosses) | 10:00 |
| 410 | /oldest vascular plants with roots & stems,  oldest bony fish with scales and jaws,  /oldest non-marine arthropods: scorpions, insects, etc. | 10:02 |
| 380 | Oldest seed pant fossils | 10:11 |
| 365 | Oldest amphibian fossils | 10:15 |
| 320 | Oldest dragonfly fossil | 10:28 |
| 300 | /huge coal-forming forests of Lepidodendron /oldest reptile fossil | 10:34 |
| **YEARS AGO** | **EVENT** | **CLOCK TIME** |
| 280 million | Oldest reptile egg | 10:40 |
| 255 | Oldest therapsid (mammal-like reptile) | 10:47 |
| 254 | Huge gymnosperm forests | 10:49 |
| 235 | Oldest modern coal reefs, ichthyosaurs | 10:52 |
| 220 | Placodonts (shell-crushing marine reptile) | 10:57 |
| 215 | Oldest true mammal fossils, oldest dinosaur fossils | 10:58 |
| 210 | Pterosaurs (flying dinosaurs) | 11:00 |
| 200 | Huge dinosaurs, oldest frog & turtle fossils | 11:02 |
| 180 | Ancestral lobster, swim bladder in fish | 11:08 |
| 150 | Oldest bird fossil: Archaeopteryx | 11:17 |
| 100 | Oldest “flowering plant” fossils | 11:31 |
| 90 | Oldest snake fossils | 11:34 |
| 70 | Oldest placental mammals | 11:40 |
| 65 | Dinosaurs extinction event | 11:41 |
| 62 | Oldest grass & horse fossils | 11:42 |
| 58 | Oldest bat fossils | 11:43 |
| 55 | Oldest primate & elephant fossils | 11:44 |
| 50 | Oldest whale & penguin fossils | 11:48 |
| 40 | Ancestral dogs. Cats & weasels | 11:49 |
| 30 | Oldest seal & saber tooth cat fossils | 11:51 |
| 3 | Oldest hominid fossils (Australopithecus) | 11:59:08 |
| 1.5 | Pleistocene Ice Age begins | 11:59:34 |
| 200,000 years | Humans appear | 11:59:55 |
| 11,000 | Humans into North America & large animals become extinct | 11:59:59.8 |
| 10,000 | End of last ice age | 11:59:59.9 |
| 500 | Columbus discovered America | 11:59:59.9990 |

**Era Table**

|  |  |  |
| --- | --- | --- |
| **AGO** | **GEOLOGICAL ERA** | **CLOCK TIME** |
| 4.6 billion to 590 million | Pre-cambrian Era | Midnight to 9:20 PM |
| 590 to 248 million | Paleozoic Era | 9:20 PM to 10:48 PM |
| 248 to 65 million | Mesozoic Era | 10:48 PM to 11:41 PM |
| 65 million to present | Cenozoic Era | 11:41 PM to Midnight |

**QUESTIONS:**

1. **a).** Which events were the most difficult to place on the clock?

**b).** Explain why.**(2 pt)**

1. Explain why geologists have not found any terrestrial (land-dwelling) animal fossils that are older than the terrestrial plant fossils (use logic). **(2 pt)**
2. Describe one reason why geologists have not found any horse fossils that are older than the oldest grass fossil (use logic). **(2 pt)**
3. **a)**. What **fraction** of geological time has there been life on Earth?

Oldest Prokaryotic Fossil

**=**

Earth Forms

**b)**. What **%** is that? **(2 pts)**

%

**=**

Divide the fraction from 4A, then multiply by 100

1. **a).** Relative to the age of the Earth, what **fraction** of the geological time have

humans been on Earth?

Humans appear

**=**

Earth Forms

**b)**. What **%** is that? **(2 pt)**

%

**=**

Divide the fraction from 5A, then multiply by 100

1. **a).** Relative to the age of the Earth, what **fraction** of geological time were

dinosaurs found on Earth?

**=**

Oldest Dinosaur fossils – Dinosaurs Extinct

Earth Forms

**b)**. What **%** is that? **(2 pt)**

%

**=**

Divide the fraction from 6A, then multiply by 100

1. **a).** How long from the time that plants invaded the land did it take for them to

evolve roots? **b)**. Why did they need roots? **(2 pt)**

1. The dates used on this clock are the dates of the oldest known fossils for that species. What will cause the dates to change? **(2 pt)**
2. What would geologists say about a movie that shows humans fighting dinosaurs? **(2 pt)**
3. **a).** Which era encompasses the most years? **b).** Which Era has the least number

of years? **(2 pt)**

Most years: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Least years: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. On the back of this paper, fill-out the chart of for the12 geological time **periods and**

**their coinciding eras**. (College Prep: Pages 382-383; Honors: Page 421) **(5 pts)**

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| **ERAS** | **Periods** |
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