

TITLE: Denver's Prehistoric Journey

TOPIC: Geologic Time Scale and Evolution

GRADE LEVEL: 7-12

CONTENT STANDARD: Earth and Space Science

CONTENT OBJECTIVE: Exploring the fossils in the Prehistoric Journey exhibit at the Denver Museum of Nature and Science

TIME REQUIRED: 2 hours (plus travel to the museum)

MATERIALS NEEDED: Student pages, museum visit, which costs \$2 per student.

DIRECTIONS FOR INSTRUCTION/ACTIVITY:

Student pages follow. The student pages were created to help students on their path through the Prehistoric Journey exhibit at the Denver Museum of Nature and Science, located at 2001 Colorado Boulevard, Denver, CO, 303-322-7009/1-800-925-2250. Call for information and reservations for a school visit. At this time, students are \$2 each, but teachers and adult chaperones are free. The museum prefers an adult chaperone per ten students.

The exhibit starts with a short video that represents the first 4 billion years of Earth's history and then proceeds through time, starting with a diorama of life during the Cambrian Explosion. Each new section starts with such a diorama, illustrating the types of life that had developed during that time, and followed by fossils and displays of important concepts. The student pages lead students through the journey. Encourage students to explore all parts of the exhibit, and offer extra credit for additional information.

EVALUATION: The completed report is used for evaluation, and it is wise to provide a quiz or questioning after the return to school.

Answers:

1. 600 Ma (Ma = million years ago)
2. Rocks are sandstones and shale, ripple marks, fossils in 600 Ma old rock.
3. 3.96 billion years old
4. Explosion of life and diversity
5. Shale in southern Canada that preserves hard and soft body parts of 140 animal species.
6. 99%
7. Where the continents are during this time period.
8. 524 Ma
9. Trilobite, cephalopod, crinoid, gastropod, brachiopod (I say to list ones we saw in a fossil lab we do in the days before we visit the museum)
10. Dome shape of sedimentary rocks, reef – animals of different groups, limestone deposited in warm, shallow seas.
11. AWV (answers will vary)
12. Backbones (or vertebrates)
13. 450 Ma! Haven't changes a lot (AWV)
14. Layer 5
15. Any evidence of ancient life

16. Petrification/amber/impressions, etc.
17. 395 Ma
18. Don't dry out, don't collapse
19. Amphibians
20. When genetic traits are passed on in different combinations from generation to generation.
21. Moth (insect)
22. 295 Ma
23. Larger
24. Insects
25. Amphibians
26. Hard shelled eggs
27. Extinction; largest ever to occur in Earth's history
28. 66 Ma
29. Bony-headed dinosaurs, or *Stygliomoloch*
No although similar (AWV)
30. One of the earliest dinosaurs in N. America, hollow bones, slender, carnivore, fast, sharp teeth.
The phytosaur looks like a crocodile.
31. Pterosaurs
32. Archaeopteryx
33. Don't know – still debated
34. 75% fossil to 25% cast
35. Dinosaur Ridge, Garden Park, Picket Wire Trackways, Riggs Hill, Dry Mesa Quarry, Rabbit Hill, Dinosaur Hill.
36. Fish, fossil fish skeleton is trapped in its stomach (or between its ribs).
37. 130 Ma
38. No
39. A fossil that represents a specific time period (widespread but lived for a distinct period of time)
40. Layer between the Cretaceous (K) and Tertiary (T) age rocks; marks the end of the dinosaurs.
41. 50 Ma
42. Rainforest, warm and wet
43. Giant bird (*Diatryma gigantes*), Unitathere, Titanothera
44. Got bigger, new social behaviors
45. A group of individuals that have so many features in common that you recognize them as being the same.
They produce fertile offspring.
46. 20 Ma
47. AWV – some possible ideas - Animals trapped in a tar pit or mud hole or quicksand, bones gathered and buried by sand in a river bend, eaten by animal?
48. What happens to an animal from the time of its death to the discovery of its fossilized remains.
49. North America
50. On land
51. Cooler
52. Chimpanzees
53. C-14 (Lucy exhibit may be closed for remodeling – questions 53 & 54)
54. 2 million years ago
55. Ice age, very cold
Seattle and Manhattan
56. Mammoth skull; 12,000 years old
57. AWV

Lesson Plan Author & Contact Info:

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**Denver Museum of Nature and Science
Prehistoric Journey Tour**

The following is the order of each major exhibit in the Prehistoric Journey (PJ) tour. Under each of them, please write the time period of each section and the questions on each:

I. EARLY LIFE: Go to the diorama first and then right (clockwise)

1. Time period:
2. What is the evidence that the Australian desert was once a sea floor?
3. How old is the oldest rock on Earth?
4. What is the Cambrian explosion?
5. What is the Burgess Shale?
6. What percent of all life forms that have existed are now extinct?
7. Check out the Paleozoic Time Station as you are leaving this section. What does it show?

II. DIVERSITY IN THE SEA: go to the big underwater diorama first and then around to the right of it. (counter clockwise)

8. Time period:
9. Check out the Sea Lily Reef Diorama. This is my favorite diorama! Please list at least three of the creatures you see:
10. List some of the evidence that there was once an underwater reef where a limestone quarry exists today:
11. There are some fantastic fossil specimens showing how diverse life was in the sea before there was life on land. Below please sketch one of the trilobites and/or a brachiopod:

12. Fish are the first animals with _____.

13. Check out the sharks. When did they evolve?
How much have they changed since then?

14. Check out the relative dating display (remember that stuff?) Which layer held the white trilobites? (1 on top) 1 2 3 4 5

15. What is a fossil?

Describe how one of the living things becomes a fossil:

III. LEAVING THE WATER: As you come up stairs go to diorama on right and then around the exhibit counterclockwise.

16. Time period:

17. What does it take to stay alive on the land??

18. Where does the energy come from for life?

19. What were the first vertebrates to move onto the land?

20. How does evolution work?

21. See for yourself how natural selection works - check out the video game on it in center of room. What is the insect undergoing evolution?

IV. FORESTS AND FLIGHT: Go to diorama & then around clockwise.

22. Time period:

23. Check out the diorama - make sure you see the dragonflies and cockroaches. What is different about these ancient creatures?

24. What were the first animals to fly?

25. Reptiles evolved from _____.

26. Why are reptiles not tied to water for reproduction like amphibians?

27. What happened at the end of the Permian? How big was this event?

V. TIME OF THE DINOSAURS

28. Time period:

29. Check out the Cretaceous creekbed diorama. What are the creatures that are fighting over the female in the woods?

Look at the hand painted leaves. Do you recognize any of them?

30. See the first articulated *Coelophysis* skeletons in the world - one adult and one juvenile. What is a *coelophysis* (describe):

They are being chased by a phytosaur. What present day creature does the phytosaur look like?

31. What are flying reptiles called?

32. What was the first real bird (150 mya)?

33. Warm blooded or cold-blooded... which were dinosaurs?

34. What is the percent of fossil to cast of the *stegosaurus* skeleton on exhibit?

35. Name some of the places in Colorado where you can see dino bones:

36. Check out the giant *Xiphactinus* fish skeleton - what do you know that it ate? How do you know this?

37. At this time there were plants but there were no flowers. When did flowers evolve?

38. Look at the gorgeous ammonites. Do they still exist today?

39. **Index fossils** are very important for dating rocks. What is an index fossil?

40. What is the K-T boundary?

VI. TROPICAL ROCKIES: just follow the wall around to your right

41. Time period:

Check out the Cenozoic Time Station screen!

42. What was North America's climate during the Eocene?
43. There were some bizarre species during the Eocene. Name a few:
44. What happened to some mammals as the climate cooled?
45. What is a species?

VII. EXPANDING GRASSLANDS:

46. Time Period:
47. How do you think so many rhino bones ended up in one place?
48. What is taphonomy?
49. Where did horses evolve?
50. Where were the ancestors of whales 60 million years ago?
51. Over the past 50 million years, did Denver get colder or warmer?
52. Fossil evidence and molecular and DNA research demonstrate that humans are most closely related to (give DNA %):

(Lucy exhibit) 53. What type of radioactive element is useful for dating objects less than 50,000 years old?
54. Modern humans, the only remaining hominids, evolved very recently - when?
55. What was the climate here 2 million years ago?

What North American cities are listed that were buried in the ice?
56. What is the large skull near the exit of the exhibit? How old it is?
57. What are the scientists doing today in the Paleontology Lab??

