2010 Colorado Science Olympiad
Fossils Test
[* indicates tie-breaker question]

Station 1

1. Which statement(s) is/are not true regarding Neanderthal (*Homo neanderthalensis*)?

   A) Neanderthals are associated with stone tools.
   B) There is evidence to support that Neanderthals buried their dead.
   C) Neanderthals are associated with the famous Paleolithic cave paintings in France depicting wild animals and outlines of hands.
   D) Neanderthals had, on average, larger brain sizes than modern humans.

2. During which geologic epoch did Neanderthals live?

*3. From the following list, select all of the locations where Neanderthal fossils have been found:

   A) France
   B) Gibraltar
   C) Germany
   D) Namibia
   E) Canada
   F) Iraq

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Station 2

4. What is a half-life?

A) half of the time it takes a parent radioactive element to decay
B) the midpoint in the life of an organism
C) the midpoint in the duration of a species
D) the time it takes for half of the original quantity of daughter atoms to decay
E) the time it takes for half of the original quantity of radioactive atoms to decay

5. Which type of rock is best for age dating?

A) shale
B) igneous
C) metamorphic
D) coal
E) limestone

6. Match each radioactive parent isotope with its stable daughter isotope-

___ Carbon- 14	A) Argon-40
___ Potassium-40	B) Lead-206
___ Rubidium-87	C) Lead-207
___ Thorium-232	D) Lead-208
___ Uranium-235	E) Nitrogen-14
___ Uranium-238	F) Strontium-87

7. If a sandstone that is in contact with a granite contains fragments of the granite, what can you infer?

A) The sandstone and the granite are the same age.
B) The granite is younger than the sandstone.
C) The granite is older than the sandstone.
D) The granite was intruded into the sandstone.

8. What stratigraphic principle is used to determine this?

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Station 3

9. As part of a geologic mapping project, a geologist needs to determine the age of a limestone outcrop. She collects five different fossils from the outcrop. Paleontologists have already determined the geologic ranges for these fossils (listed below):

Fossil A = Silurian through Recent
Fossil B = Carboniferous through Recent
Fossil C = Cretaceous
Fossil D = Devonian through Tertiary
Fossil E = Cretaceous through Recent

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*Plot the geologic range of the five fossils in the chart on your answer sheet. Use arrows or shading to indicate the range for each fossil.

ERA	GEOLOGIC PERIOD	*Fossil A*	*Fossil B*	*Fossil C*	*Fossil D*	*Fossil E*
CENOZOIC	Recent (1.6-0 my)					
	Tertiary (65 -1.6 my)					
MESOZOIC	Cretaceous (142-65 my)					
	Jurassic (206-142 my)					
	Triassic (251-206 my)					
PALEOZOIC	Permian (290-206 my)					
	Carboniferous (363-290 my)					
	Devonian (418-362)					
	Silurian (443-418 my)					
	Ordovician (490-443 my)					
	Cambrian (544-490 my)					

Use your completed range chart to answer the following questions:

10. What is the age of the limestone outcrop?

11. Which fossil from this outcrop is the best index fossil? Explain your answer.

12. Of the five specimens at this station labeled 1-5, which two could possibly be "Fossil C" that was found in the limestone outcrop?

*13. Identify the Genus of each of the 5 specimens at this station.

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Station 4

14. Which specimen(s) did Alfred Wegener use as evidence that the land masses of today were once connected into the super continent Pangea?

*15. Which specimen(s) reproduced with seeds?

16. Which specimen(s) reproduced with spores?

17. Which specimen(s) were gymnosperms?

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Station 5

Specimen A belongs to *Mesohippus* and specimen B to *Equus*.
Which statements are true of A and which of B?

18. ___teeth adapted for browsing on leaves.

19. ___high crowned teeth adapted for vegetation with high silica content.

20. ___a small, primitive horse with three toes

21. ___adapted for grazing in the grasslands.

22. ___state fossil for Idaho

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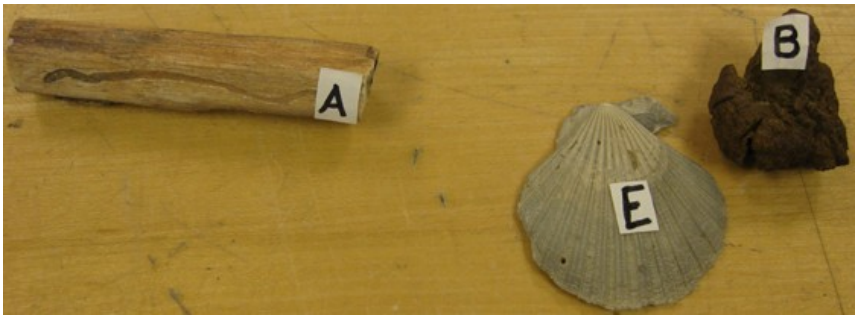
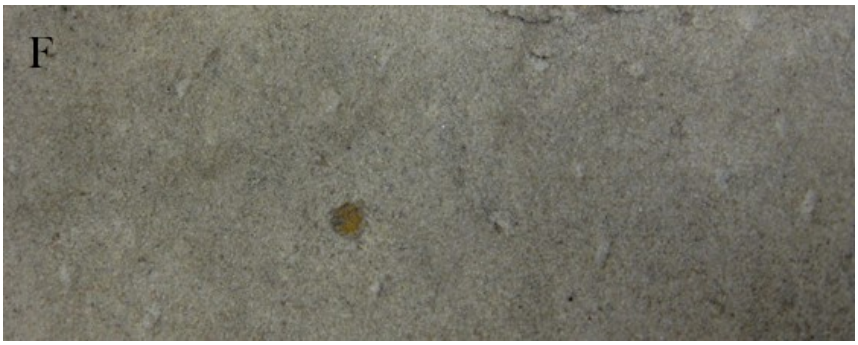
Station 6





23. What is a trace fossil?

24. What is the trace fossil evidence on Specimen A?

25. What kind of information about an organism can be determined from the type of trace fossil labeled B?

26. What is the relationship between Specimens C and D?

27. Identify the trace fossils in Specimens E and F.

28. True or False:

_____ Tracks are formed *in situ*, that is they are found in the place were the organism made them.

_____ Ichnofossils are the body remains of organisms that are found in conjunction with behavioral evidence.

_____ Coprolites often have a high calcium phosphate content.

_____ Ichnofossils are good indicators of original sedimentary environments and are useful in paleoenvironmental analyses.

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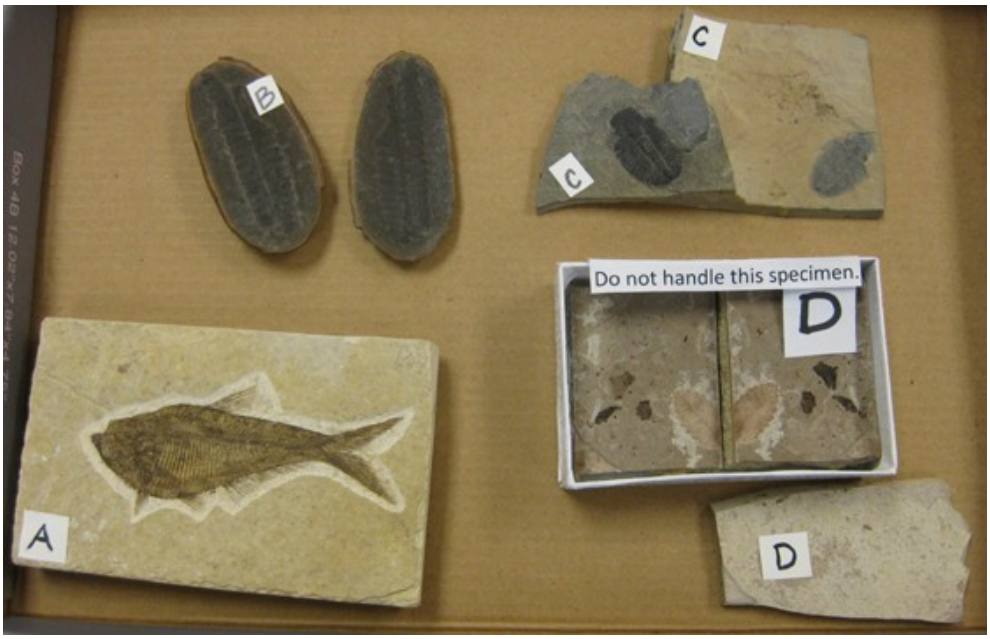

Station 7

29. What is a Lagerstatte?

30. The fossils from the Florissant Formation in Colorado (Specimen D) are preserved in what type of sedimentary rock?

31. Specimen A is from the Green River Formation of Wyoming. To what Class does this fossil belong?

32. What is the age of Specimen C?

33. Specimen B is an example of one of the many fossils found in siderite nodules in the Mazon Creek Lagerstatte. The state fossil of Illinois is from the same deposit.

A) What is the Illinois state fossil?

B) What age are the Mazon Creek deposits?

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Station 8

*34. Clastic sediments are categorized into groups such as sand, silt, or clay on the basis of:
A) sorting B) grain size C) minerals present D) grain shape E) arrangement of grains

35. Which of these rock specimens represents a high energy environment?

36. Which of these rock specimens preserves structure created by wind or water?

37. Which of these specimens represents a low energy environment?

38. Which one of these specimens would be the best subject for radiometric dating?

39. Look at Specimen E and the photo of a rock at this station. The linear features on the surface of these rocks:
A) are trace fossils of worm tracks through mud. B) are the preserved casts of mudcracks.
C) are caused by alternating wet/dry conditions when the sediments were deposited.
D) b and c. E) none of the above.

40. Black coloration in sedimentary rocks generally implies what about the character of the sedimentary environment?
A) presence of iron and abundant oxygen B) presence of iron and lack of oxygen
C) lack of iron and abundant oxygen D) abundant organic matter and lack of oxygen
E) lack of organic matter and abundant oxygen

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Station 9

*41. Which statement(s) are true of *Basilosaurus*?

A) *Basilosaurus* was initially thought to be a sea-going reptile, hence the name saurus.

B) *Basilosaurus* was a fully aquatic whale but retained vestigial hind limbs.

C) *Basilosaurus* is the state fossil for Alabama.

D) *Basilosaurus* is the state fossil for Mississippi.

42. Identify the fossils.

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Station 10 , Question 46
Photo Copyright Thomas McGuire

Station 10

43. Each of the five paper strips at this station represents a sedimentary rock layer formed during a certain time period. The oldest one has been marked for you. Put the layers in the correct order from oldest to youngest, with the oldest on the bottom. List the order of the layers from oldest to youngest in the space on your answer sheet. Go to the following website to print off the layers puzzle.
http://www.bigmoviezone.com/filmsearch/movies/teacher_guides/pdf/dinosalive_edguide.pdf
*44. Using your knowledge of the K-T Extinction, identify the layers that were formed after that extinction event.
45. What stratigraphic principle uses fossils to correlate rock layers?
A) Superposition B) Original Horizontality C) Faunal Succession D) Inclusions E) Cross-cutting relationships
46. A geologist is studying the rock outcrop shown in the photo at this station. What type of unconformity is present in this rock outcrop?
47. What is the correct sequence of events that the geologist can determine from that outcrop?

A) Deposition of horizontal sedimentary rock layers, erosion, folding of rock layers, deposition of horizontal sedimentary rock layers
B) Deposition of horizontal sedimentary rock layers, faulting, erosion, folding of rock layers, deposition of horizontal sedimentary rock layers
C) Deposition of horizontal sedimentary rock layers, folding of rock layers, erosion, deposition of horizontal sedimentary rock layers
D) Folding of rock layers, deposition of horizontal sedimentary rock layers, erosion, deposition of horizontal sedimentary rock layers

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Station 11

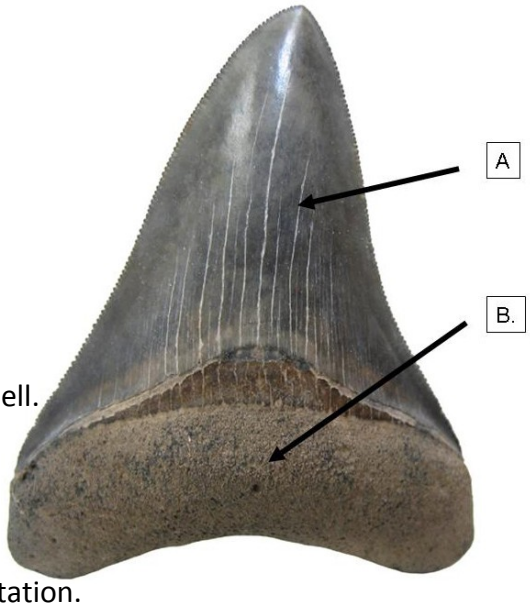
Scientists study fossil teeth to determine whether an animal was a carnivore or an herbivore. Look at the fossils at this station and answer the questions below.

48. Which of the specimens here are from carnivores?

49. Which of these specimens here are from herbivores?

50. Which specimens do not belong?

51. The function of Specimen B for eating was:
    A) To grind up tough vegetation.
    B) nothing; it is a fossilized hinge plate from a large bivalve shell.
    C) To crush hard shells.
    D) To filter or strain food from the ocean water.



52. Identify the parts of the shark tooth shown in the photo at this station.

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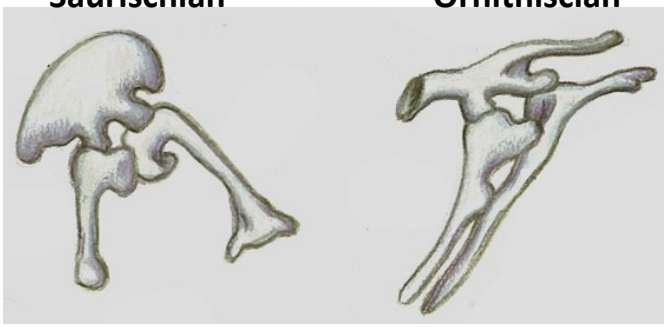
Station 12

53. Dinosaurs are divided into two Orders based on their pelvic structure.

Saurischian **Ornithiscian**



The Saurischian dinosaurs are referred to as "lizard-hipped" because their hip/pelvic structure was similar to that of lizards. The Ornithiscian dinosaurs are called "bird-hipped" because their hip/pelvic structure is similar to that of birds. Which Order of dinosaurs are the ancestors of birds?

54. Which dinosaur models at this station belongs to Order Saurischia?
55. Which dinosaur models at this station belongs to Order Ornithiscia?
56. Answer True or False-

____Generally the hip height of a bipedal dinosaur is roughly four times the footprint length.

____Dinosaur trackway fossils give clues about behaviors such as herding and hunting.

____Pterosaurs are the only known dinosaurs that had the ability to fly.

____The name *Deinonychus* means "terrible claw" in reference to a large, retractable claw on each of its feet.

____Specimen A at this station is an example of body remains.

____Specimen B at this station is an example of a trace fossil.

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Station 13

57. Which specimen(s) reproduced using flowers?

58. Which specimen(s) develop seeds inside cones?

*59. Which specimen(s) envelope their seeds inside fruits?

60. These specimens represent three major plant groups. In accordance with the plant divisions they represent, place the specimens in order of appearance in the fossil record.

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Station 14

61. Which geologic time period do the specimens at this station have in common?

62. Specimen G shows mural pores which were the connecting holes in the epitheca between adjacent corallites. What other specimen at this station is the same Genus as Specimen G?

63. To what Phylum does Specimen H belong?

64. Which specimens are Rugose corals?

65. Which specimens are colonial corals?

66. Specimen B is the state fossil of _____.

67. The name "trilobite" comes from the longitudinal pleural and axial lobes of its body. The trilobite body is also divided into three other major sections called tagmata. Give the name of each of these sections:

_____ head section containing the eyes, mouthparts, antenna
_____ body section of multiple articulated segments
_____ tail section of fused segments

68. Identify the Genus of the specimen labeled C.