2009 Colorado Science Olympiad
Fossils Test

Station 1:

1. Identify the genus for these specimens (diameters range from 2.5 to 5 mm).
2. In which Kingdom do these organisms belong?
3. What famous structures are made from rock containing these fossils?
4. When living, how many cells would have made up this organism?

Station 2:

1. Identify the genus for this specimen.
2. What are the star-shaped structures covering this fossil?
3. What does the presence of this organism indicate about the age of the deposit in which it is found?
4. In what type of environment would this organism have lived?

A.

B.

Station 3:

1. Identify the genus for specimen A and B.
2. How are these two specimens related?
3. What part of the plant does fossil A represent?
4. What is the common name for this group of plants?

A.

B.

C.

Station 4:

1. Identify the genus for these specimens.
2. Which one does not belong? Explain.
3. Compare the plane of symmetry between the shells of A and C?
4. Which of the above organisms is an index fossil for the Devonian period?

A.

B.

C.

D.

E.

Station 5:

1. Identify the mode of preservation exhibited by these fossils.
2. Which fossil specimens belong to the same phylum? (the amber has insects in it)
3. Which specimens have a connection to past plant life?
4. Which specimens lived in a marine environment?

Station 6:

1. What is amber?
2. Why do certain trees produce this substance?
3. What name is given to objects encased in amber?
4. Most insects preserved in amber are actually hollow on the inside T or F.

A.

B.

Station 7:

Examine the fossil in the box labeled **A** and answer the following questions:

1. What form of preservation does this fossil represent?

2. What name is given to this type of fossil?

3. Name the phylum and class for this specimen?

4. Many of these creatures, especially from the Paleozoic, are preserved this way. What characteristic of this class results in this common form of preservation?

Many species of the fossil labeled **B** are valuable guide or index fossils. *Nerinea*, found in Jurassic and Cretaceous rocks in the southwestern United States, is one of these.

5. Identify the phylum, class, and genus of fossil **B**.

6. List the five criteria of a perfect index fossil.

Station 8:

1. Which of these is not preserved in rocks of the Florissant Formation?

redwood tree stumps jellyfish tsetse flies butterflies cattails

2. The insect and leaf fossils at Florissant are preserved in what type of rock?

lahar deposits shale tuff conglomerate

3. What is the fossil-bearing rock at Florissant composed of?

Volcanic gravel in mud
Conglomerate stream deposits
Volcanic ash-clay with diatoms
Pikes Peak granite fragments in matrix

4. Approximately 36 million years ago, a series of large volcanic mudflows (called lahars) originated from the slopes of the Guffey volcanic center and flowed into the ancient valleys. One of these lahars flowed down a creek drainage and caused the formation of what feature?

5. This feature was formed during the _____ Epoch.

6. Mudflows generated by the volcanic activity buried the large redwoods and other trees in the ancient Florissant valley. The fossilized tree stumps found in the Florissant National Monument are valuable to scientists because:

A) The preservation by replacement preserved the outer features of the trees, much like the logs found at the Petrified Forest in Arizona, where the northern Black Forest portion contains *in situ* stumps.

B) The fossilized tree stumps are fossils of *Seguoia affinis*, extinct redwoods closely related to modern coast redwoods found in Oregon today.

C) Permineralization preserved the cellular structures and internal features of the tree stumps, many of which are believed to be *in situ* (haven't moved relative to each other in 35 million years).

Station 9:

Match the geologic time division with the correct description. Write the **letter** of the correct description in the blank on your answer sheet:

1. Permian Period	A. First fossil evidence of blue-green algae
2. Silurian Period	B. First dinosaurs appeared
3. Carboniferous	C. First vascular plants appear on land
4. Mesozoic Era	D. Megafauna, Neanderthals, and the last Ice Age
5. Cenozoic Era	E. Ediacaran fauna (multi-celled animals) appear
6. Devonian Period	F. "Explosion" of life occurs.
7. Quaternary Period	G. Age of Man
8. Jurassic Period	H. Archaeopteryx first appeared
9. Triassic Period	I. Ended with the K-T Extinction
10. Paleozoic Era	J. Ended with largest mass extinction event
11. Cambrian Period	K. Age of Amphibians
12. Proterozoic Eon	L. Age of Mammals
13. Pleistocene Epoch	M. Age of Fishes
14. Archean Eon	N. Wide-spread coal swamps

Station 10:

Nearly all fossils are found in sedimentary rocks. Answer the following questions using this list of sedimentary rocks; each rock name is used only once:

Shale Chalk Coal Coquina Sandstone Limestone

1. Which of these rocks would represent a swamp?
2. Which of these rocks would represent a moderately high-energy environment?
3. Which of these rocks would represent a low-energy environment?
4. Which of these rocks is composed chiefly of fossil shells, formed in a zone of high energy?
5. Which of these rocks is composed of microscopic shells of foraminiferans?
6. Which of these rocks might form from precipitation of calcium carbonate?
7. Identify the rocks labeled A, B, and C.

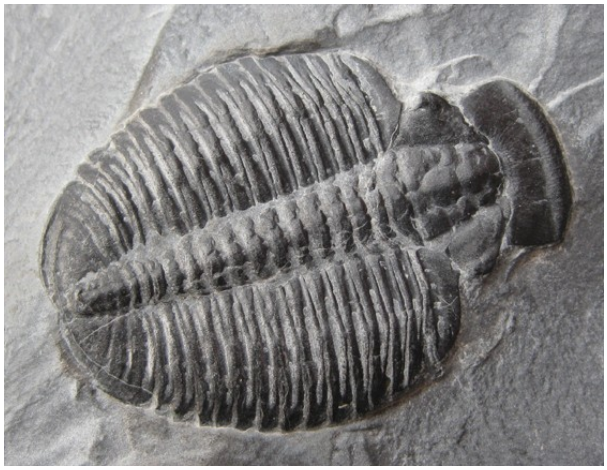
A.

B.

C.

Station 11:

Identify the specimens (Genus) at this station and order them according to age, oldest to most recent.



Station 12: For the following questions, identify the stratigraphic principle.

1. "Within a sequence of undisturbed sedimentary rocks, the oldest layers will be on the bottom and the rocks will get younger going toward the top."

A) Principle of Original Horizontality
B) Principle of Superposition
C) Principle of Cross-cutting Relationships
D) Principle of Inclusions
E) Principle of Faunal Succession

2. "Any pattern of sedimentary rock layers is older than any process that disrupts it."

A) Principle of Original Horizontality
B) Principle of Superposition
C) Principle of Cross-cutting Relationships
D) Principle of Inclusions
E) Principle of Faunal Succession

3. "In a stratigraphic sequence, different species of fossil organisms appear in a definite order; once a fossil species disappears in a sequence of strata, it never reappears higher in the sequence."

A) Principle of Original Horizontality
B) Principle of Superposition
C) Principle of Cross-cutting Relationships
D) Principle of Inclusions
E) Principle of Faunal Succession

4. "If a rock contains fragments of another rock, then the rock fragments must be older than the rock containing them."

A) Principle of Original Horizontality
B) Principle of Superposition
C) Principle of Cross-cutting Relationships
D) Principle of Inclusions
E) Principle of Faunal Succession

5. "Sediments deposited in water will form horizontal or nearly horizontal layers."

A) Principle of Original Horizontality
B) Principle of Superposition
C) Principle of Cross-cutting Relationships
D) Principle of Inclusions
E) Principle of Faunal Succession

Station 13:

Match each of the famous fossil discoveries/locations listed below with the correct site description:

Ediacara Hills **Mazon Creek** **Egg Mountain** **Burgess Shale**

Liaoning Province Fossil Beds **Rancho La Brea Tar Pits**

1) This site (Late Cretaceous age) revealed that baby dinosaurs were hatched in rookeries and stayed in the nest for extended periods while parents brought back food. Up to 40 bowl-shaped depressions with up to 25 grapefruit-sized eggs have been found here. These eggs are from Maiasaura, a large plant-eating duck-billed dinosaur.

2) This location's name is given to all of the "biota" of this time period. The fossils at this site provide a record of the first known multicellular animal life on Earth that predates the Cambrian Period. The abundant soft-bodied intertidal invertebrate marine fossils found here include jellyfishes, segmented worms such as *Dickinsonia*, featherlike soft corals or sea pens and early arthropod forms.

3) Predator fossils outnumber large prey fossils by six to one at this site, famous for its beautifully preserved large mammals. This ratio suggests that animals trapped here became the target of predators, who themselves were trapped and unable to escape the sticky tar pools.

4) A river delta advancing over extensive swamps preserved over 400 plant species and 320 animal species at this location. Flora include horsetails, ferns and club mosses. Tullimonstrum, a strange arthropod found here, is the Illinois' state fossil.

5) Consisting of layers of volcanic and sedimentary rock, the Yixian Formation has yielded an enormous variety of fossil fish, birds, insects, reptiles, shrimp, flowers, mammals, and dinosaurs dating back to late Jurassic and early Cretaceous times. Because they were buried so quickly by fine volcanic ash, with so little oxygen available to promote decay, the fossil animals found here have delicate features preserved (from feathers and fish scales to patterns on insect wings).

6) *Marrella* is the most common arthropod fossil found in these rocks. The creatures preserved here as fossils were swept off the edge of a steep reef-front by periodic underwater mudflows. Originally discovered by Charles D. Walcott in 1909, the fossils show excellent preservation of soft-bodied shallow marine invertebrates.

A.

B.

C.

Station 14:

1. Which of these are bivalves?
   A & B B & C A & C A, B, & C

2. What is the Phylum of specimen A?

3. What is the informal or common name of specimen C?

4. What is the Class of specimen B?

5. Which of these lived in a symbiotic association with crinoids?

6. Which of these can be found in Paleozoic-age rocks?

7. Which of these has a flattened right valve ornamented with concentric frills?

A.

B.

Station 15:

1. This dinosaur is Genus _____, Order _____

2. During what geologic time period did this dinosaur live?

3. This dinosaur is a state fossil of Wyoming and what other state?

Answer the following questions about fossils labeled A and B.

4. Which of these fossils is a blastoid?
   A B Both A and B

5. Which of these fossils is an echinoid?
   A B Both A and B

6. What is the Genus of fossil A?

7. Describe the symmetry of fossils A and B.