S T A T I O N O N E

Identification

Identify each specimen to the taxonomic level specified in the question.

One or more of these specimens may or may not be fossil. If that is the case, put "none" in the space on the answer sheet.

Each answer is worth 0.25 points.

1. Specimen 1: Class. Genus.
2. Specimen 2: Order. Genus.
3. Specimen 3: Class. Genus.
4. Specimen 4: Phylum. Genus.
5. Specimen 5: Phylum. Class.
6. Specimen 6: Class. Genus.
7. Specimen 7: Class. Genus.
8. Specimen 8: Class. Genus.
9. Specimen 9: Phylum. Class.
10. Specimen 10: Order. Genus.

S T A T I O N T W O

Modes of Preservation

Consider the five fossils at this station.

For each of the fossils (1-5), answer the following questions. (1 point per fossil, 0.5 points per sub-question)

1. Fossil 1.
    a. How was the fossil preserved? (What was the mode of preservation?)
    b. What was the environment of preservation? (What kind of environment promoted the mode of preservation?)

2. Fossil 2.
    a. How was the fossil preserved? (What was the mode of preservation?)
    b. What was the environment of preservation? (What kind of environment promoted the mode of preservation?)

3. Fossil 3.
    a. How was the fossil preserved? (What was the mode of preservation?)
    b. What was the environment of preservation? (What kind of environment promoted the mode of preservation?)

4. Fossil 4.
    a. How was the fossil preserved? (What was the mode of preservation?)
    b. What was the environment of preservation? (What kind of environment promoted the mode of preservation?)

5. Fossil 5.
    a. How was the fossil preserved? (What was the mode of preservation?)
    b. What was the environment of preservation? (What kind of environment promoted the mode of preservation?)

S T A T I O N T H R E E

Biostratigraphy

Suppose the following is true:

- Fossil A is from the order *Pterosauria*
- Fossil B is from the class *Chondrichthyes*
- Fossil C is from the genus *Ginkgo*

Answer the following questions about these fossils.

1. Shade in the boxes on your answer sheet to indicate the possible geologic range for each fossil group. *(1 point per fossil, 3 points total)*

Era	**Period**	**Fossil A**	**Fossil B**	**Fossil C**
Cenozoic	Quaternary			
	Neogene			
	Paleogene			
Mesozoic	Cretaceous			
	Jurassic			
	Triassic			
Paleozoic	Permian			
	Carboniferous			
	Devonian			
	Silurian			
	Ordovician			
	Cambrian			

Select the best answer to the question from the choices provided. Circle the appropriate letter on your answer sheet. (1 point each, 2 points total)

2. You find fossils A, B, C, and the newly discovered fossil D all in the same rock. Which of the following geologic periods could fossil D belong to?
   (A) Permian
   (B) Paleogene
   (C) Ordovician
   (D) Jurassic
   (E) Both (A) and (D)

3. Between fossils A, B, and C, which is the best index fossil?
   (A) Fossil A
   (B) Fossil B
   (C) Fossil C
   (D) They are all equally good index fossils
   (E) Both (A) and (C) are equally good index fossils.

S T A T I O N F O U R

Morphology

Examine the two scale models of skulls.

Describe two features of each skull you would you use to determine how each obtained food.

1. Skull A, feature 1 *(1 point)*

2. Skull A, feature 2 *(1 point)*

3. Skull B, feature 1 *(1 point)*

4. Skull B, feature 2 *(1 point)*

For each of the groups listed below and on your answer sheet, circle skull(s), if any, on your answer sheet that belong to that group.

5. I. Dinosauria

   II. Saurischian

   III. Ornithischian

   (1 point)

S T A T I O N F I V E

Lagerstätten

Imagine Boston Harbor became a lagerstätten.

1. Describe an event (caused by humans or nature) that would preserve a *Lagerstätten* assemblage of the Boston Harbor. *(2 points)*

2. What features would make this assemblage interesting to paleontologists of the distant future? *(3 points)*

S T A T I O N S I X

Diversity

Shade the squares that represent the types of organisms that were alive during the given time period.

The rows indicate possible habitats, and the columns indicate feeding mechanisms. For example, shading in square 18 would indicate that there was/is an organism that can move by flying and gathers nutrients by filter feeding.

Each correct square is worth 0.1 points.

1. Shade the squares that represent the types of organisms that were alive during the Cambrian.

	Predatory	Eating plants, or foods on a surface	Filter feeding	Eating buried food	Photosynthesis
Living on land	1	2	3	4	5
Living on the ocean surface	6	7	8	9	10
Burrowing into the ocean floor	11	12	13	14	15
Flying	16	17	18	19	20
Floating in the ocean	21	22	23	24	25

2. Shade the squares that represent the types of organisms that were alive during the present.

	Predatory	Eating plants, or foods on a surface	Filter feeding	Eating buried food	Photosynthesis
Living on land	1	2	3	4	5
Living on the ocean surface	6	7	8	9	10
Burrowing into the ocean floor	11	12	13	14	15
Flying	16	17	18	19	20
Floating in the ocean	21	22	23	24	25

S T A T I O N S E V E N

Mass Extinctions, I

Mass extinctions are commonly discussed in terms of triggers and kill mechanisms. Triggers are the larger overall cause of an extinction, whereas kill mechanisms are the events, factors, etc., that are caused by the trigger and actually kill individual organisms.

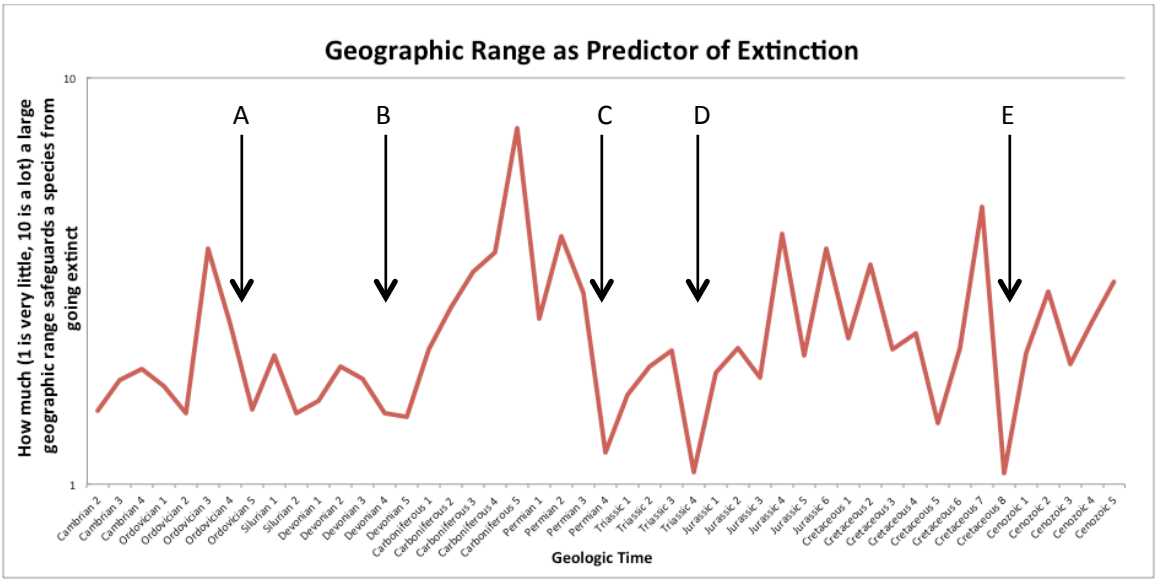
List the trigger and three kill mechanisms for the Cretaceous-Paleogene (K-Pg) mass extinction.

1. Trigger *(2 points)*
2. Kill Mechanism 1 *(1 point)*
3. Kill Mechanism 2 *(1 point)*
4. Kill Mechanism 3 *(1 point)*

S T A T I O N E I G H T

Mass Extinctions, II

Consider the graph below and the information provided.



(*Figure adapted from* Payne, J. L., & Finnegan, S. (2007). The effect of geographic range on extinction risk during background and mass extinction. *Proceedings of the National Academy of Sciences*, *104*(25), 10506-10511)

Points A-E mark the "Big Five" mass extinctions in Earth history.
A: End Ordovician, B: Late Devonian, C: Permo-Triassic, D: End Triassic, E: Cretaceous-Paleogene

Background information.
This graph shows how geographic range (how widely a species is found geographically) and extinction risk are related through time. Geologic periods are further subdivided ("Cambrian 1," Cambrian 2," etc.) so that greater detail can be shown.

Hint.
When values are high (example: Carboniferous 5), species with large geographic ranges are unlikely to go extinct relative to species with small geographic ranges. When values are low (example: Triassic 4), a wide geographic range does not help prevent a species from going extinct.

Select the best answer to the question from the choices provided. Circle the appropriate letter on your answer sheet. (1 point)

1. Generally speaking, when is a large geographic range more advantageous?
   (A) During a mass extinction
   (B) "Normal" times of typical background extinction

Answer the following question based on the information provided. (4 points)

2. Considering your response to #1, why do you think geographic range affects extinction risk differently during "normal" times compared to times of mass extinctions?

S T A T I O N N I N E

Environments

Answer the following questions regarding the four rocks (A, B, C, D) at this station.

For the following four questions, select the one rock that best fits the description by circling the appropriate letter on your answer sheet. (0.5 points each, 2 points total)

1. Select the rock that you would never contain a fossil.

2. Select the rock that was formed in the highest energy depositional environment.

3. Select the rock that was formed in the deep ocean.

4. Of these four rocks, select the one that would most likely contain a fossil of a tree branch.

Answer each of the following questions as succinctly as possible. (1 point each, 3 points total)

5. In a stratigraphic section, you find Rock A below Rock B. Explain what happened to sea level at this transition.

6. Explain what environmental event may have led to the formation of Rock C.

7. What is the name for the type of rock that composes Rock A?

S T A T I O N T E N

Trace Fossils

Answer the following questions regarding the three trace fossils (A, B, C) at this station.

For the following four questions, select the one trace fossil that best fits the description by circling the appropriate letter on your answer sheet. (0.5 points each, 2 points total)

1. Select the trace fossil that was created by a terrestrial animal.

2. Select the trace fossil that was created by a trilobite.

3. Select the trace fossil that was created by a worm.

4. Select the trace fossil that could be from the late Ediacaran.

Select the best answer to the question from the choices provided. Circle the appropriate letter on your answer sheet. (1 point each, 3 points total)

5. What can you determine from Trace Fossil B about the organism that produced this trace? (Assume this is the only trace fossil you have.)
   (A) Walking speed of the organism
   (B) Hip height of the organism
   (C) Gender of the organism
   (D) Both (A) and (B)
   (E) None one of the above

6. Which of the following is/are <u>definitely true</u> about the organism that produced Trace Fossil C?
   I. The organism had an exoskeleton.
   II. The organism had a sensory system.
   III. The organism had a motor system.
   (A) I, II and III
   (B) I and II only
   (C) II and III only
   (D) I and III only
   (E) None of the above.

7. Consider the bioturbation shown in the outcrop to the right. Select the answer that lists the outcrop sections from highest to lowest relative oxygen levels.

	Highest oxygen			Lowest oxygen
(A)	1	2	3	4
(B)	4	3	2	1
(C)	2	1	4	3
(D)	3	4	2	1

(E) Not enough information to answer this question.

S T A T I O N E L E V E N

Preservation Potential

Examine the specimens on the table.

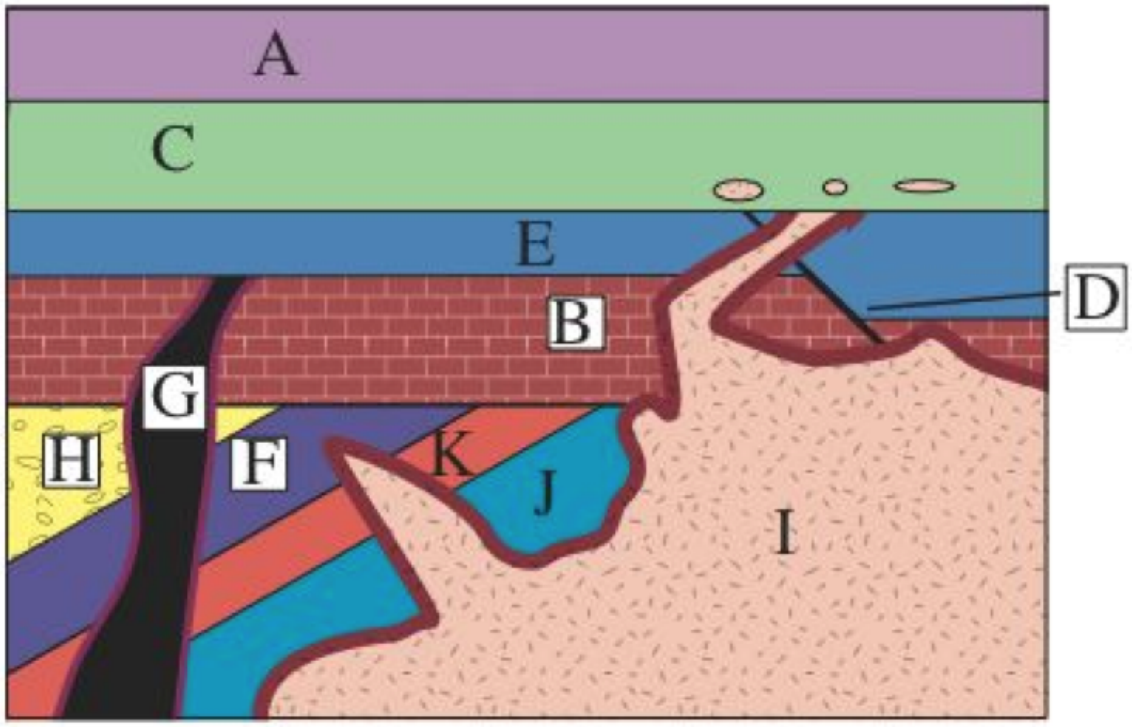
1. Order the specimens from LEAST likely to be preserved intact in the fossil record to MOST likely to be preserved intact in the fossil record. *(3 points)*

2. Briefly explain the reasoning behind your order. *(2 points)*

S T A T I O N T W E L V E

Relative Dating

This diagram shows an outcrop where sedimentary rocks are exposed.



Answer the following questions about the outcrop above.

1. Order the stratigraphic features from OLDEST to YOUNGEST. *(4 points)*

2. If you were trying to find an absolute age, give <u>two</u> examples of features would you look for. *(1 point)*