Name______________________
Group members______________________________________
Date_______________

Part I: Fossils and Relative Geologic Age Dating

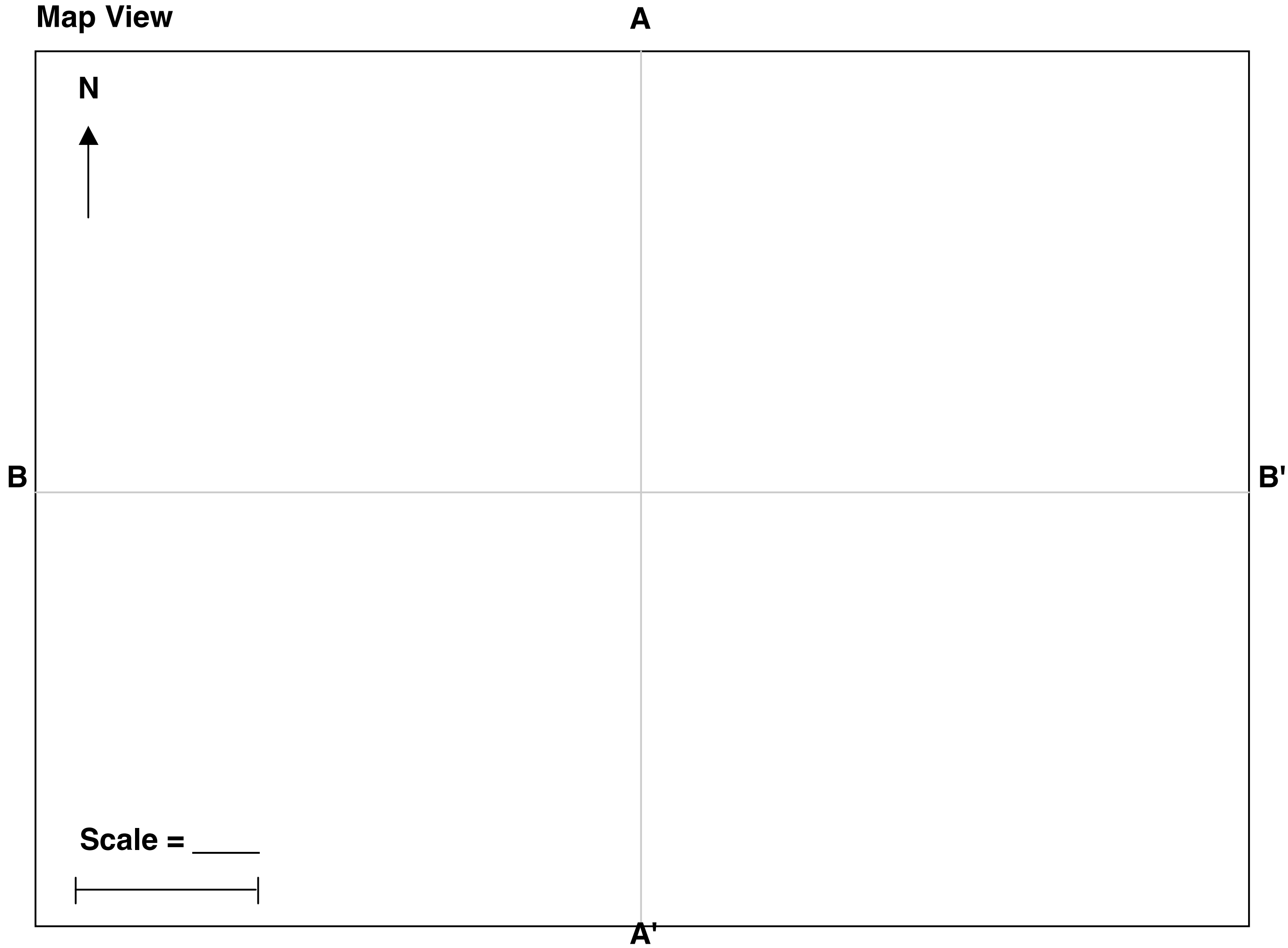
1. List what you already know about the process of excavating fossils from sediment or rock.

2. Devise a plan for how your group intends to excavate your outcrop. Who's going to do what? Why?

3. Before you begin excavating, share your plan with the class as if they were funding the project. Why is your plan the best?

4. As you excavate, carefully record the positions *and* orientations of the fossils you find on the map and cross-sections on the next page.

Map View



A **Cross-section** **A'**

B **Cross-section** **B'**

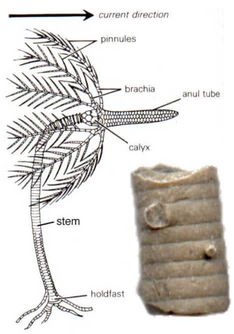
5. As you uncover fossils, compare them with the pictures on the next page and read the descriptions. Record the age range and environment of each fossil you find.

Fossil Name	Age Range	Environment
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________

6. What geological environment does this outcrop represent?

7. When were these creatures alive? Does your outcrop contain any anomalies? (Hint: an anomaly is something that does not belong with the rest of the group) If you do have an anomaly, what does it tell you about the age of your outcrop?

8. Speculate on how they were fossilized. What is your evidence? Be specific.



Crinoid You are looking at only a small piece of a the Crinoid's stem. Although it looks very plantlike, it is actually an animal related to modern-day star fish. In fact, you can see five-fold symmetry in the form of a star in the center of some of the stems.

Crinoids occur in nearly all subtidal marine environments. They attached themselves to the seafloor and used their branch-like arms to catch food in the passing current.

Turritella This is a relative of the modern-day snail. It lived in shallow marine water and moved around on the seafloor on its "foot." Some were predators. They would climb on the back of a clam, bore a hole through the shell, and suck out the contents.

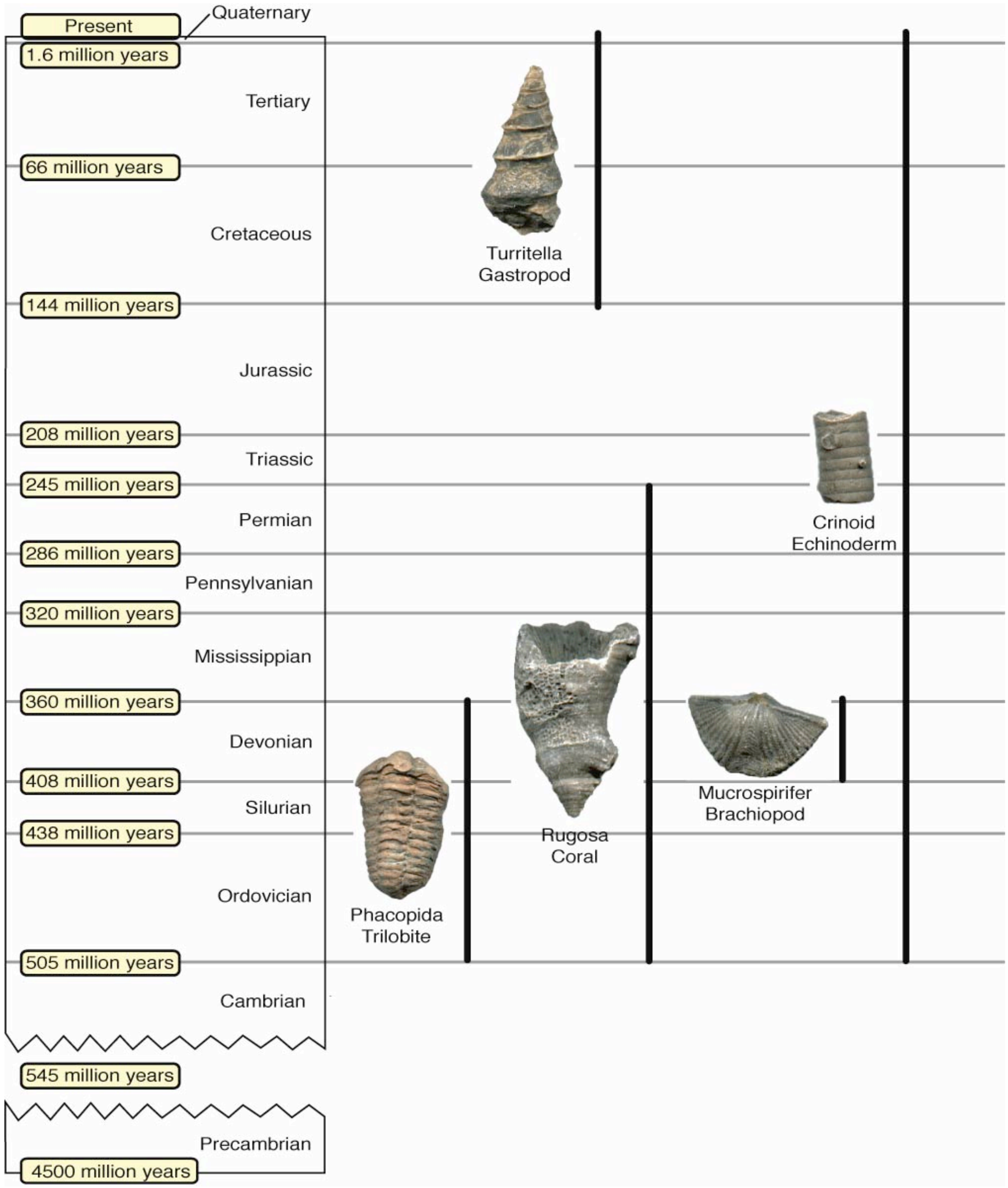
Rugosa This is a solitary coral. It lived in a shallow marine environment and was attached to the seafloor at the tip of its horn. It was a filter feeder.

Mucrospirifer This is a brachiopod. At first, it may resemble an odd shaped clam, but notice that the front and back shells are not symmetrical, as is the case with most clams. They dominated the shallow marine environment during the Paleozoic. They attached their hinge to a rock on the seafloor by means of a pedicle. They were filter feeders.

Phacopida This is a trilobite, one of the most popular invertebrate fossils. They lived in a shallow marine environment. They probably scurried around on the seafloor like a millipede scavenging food that fell from above.

9. Wait for the other groups to finish and then compare your results. There are two different outcrops (A and B), so some groups should get similar results, but other groups should get different results. List the differences between the two groups here:

10. What conclusions can you make about the *relative* ages of outcrop A vs. outcrop B? (Hint: Which one is older and which one is younger?) Explain your reasoning.

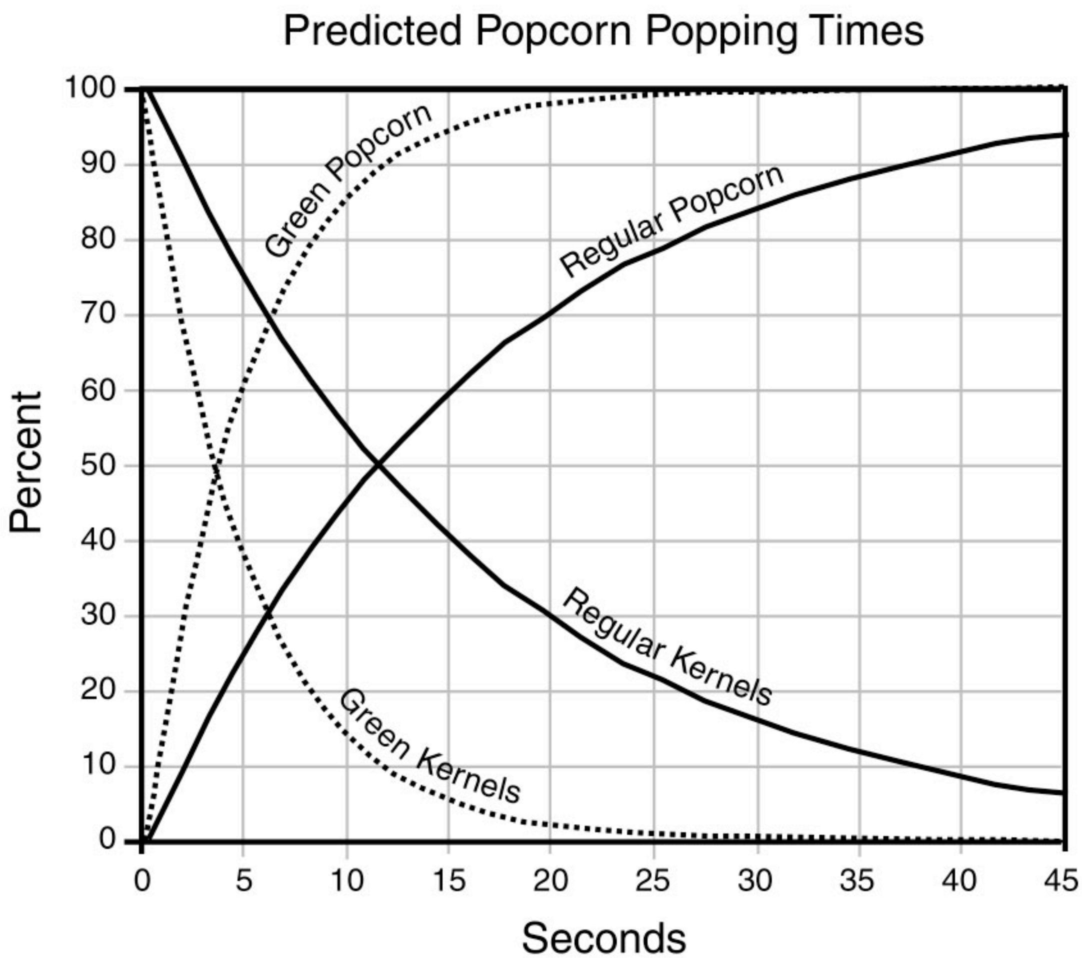

Present
Quaternary
1.6 million years
Tertiary
66 million years
Cretaceous
144 million years
Jurassic
208 million years
Triassic
245 million years
Permian
286 million years
Pennsylvanian
320 million years
Mississippian
360 million years
Devonian
408 million years
Silurian
438 million years
Ordovician
505 million years
Cambrian
545 million years
Precambrian
4500 million years
Turritella Gastropod
Crinoid Echinoderm
Rugosa Coral
Mucrospirifer Brachiopod
Phacopida Trilobite

Name______________________
Group members____
Date_______________

Part II: Radioactive Isotopes and Absolute Geologic Age Dating

First, let's set the stage with a fictitious story…

A committee at Jiffy Pop decides that popcorn sales can be improved if they can devise a way to genetically produce a faster popping breed of popcorn. They send their best genetic engineer (let's call her Lucille) into the lab to work on the problem. She manages to produce a variety that, in theory, should pop faster. Unfortunately, the new popcorn is green. The theory is based on the chemistry and physics involved in what actually makes popcorn pop. Using the principles of chemistry and physics, Lucille produces the following theoretical curves.



For each type of popcorn, she produced two curves that are mirror images of each other. They are pretty simple to interpret. You start out with all kernels and no popcorn. As you start to pop the kernels, they turn into popcorn until you end up with all popcorn and no kernels.

Unfortunately, Lucille's stopwatch is not working for some reason, and she has to present her results to the board within the hour. She could just show them the theoretical curves, but a multimillion dollar ad campaign is in the works and she doesn't want to lose her job if she is wrong. In the nick of time, she comes up with an ingenious way to test her theoretical curves without the aid of any kind of timing device. It turns out that they were indeed correct, and now the world is a better place.

1. How did she prove that the curves were correct without keeping track of time? (Not just approximately correct, but absolutely correct.)

2. Each pan represents the results of one of her last minute experiments. Open the pan and carefully empty its contents onto the table. The pompoms are meant to represent a popped kernel of corn. Since this is kind of a math problem, it might be useful for you to do some counting.

3. Are there any kernels present? If so, what does that indicate? If not, what does that indicate? (Hint: Does this give you a hint at what Lucille did during her experiment?)

4. Now that you have done your counting, how would you go about plotting your data on the graph above? Do it.

5. What do you notice about your plotted data points? Write a short paragraph explaining what this means.