Geology 101 Name __________________

**Reading Guide for**
**Ch. 8: Telling Time Geologically** (p. 230)

Please read the introduction to the chapter.

**<u>Geologic Time in Perspective</u>** (p.232)

We use two methods of examining time, __________________ dating and _______________ dating. Describe the difference between these two methods:

**<u>Determining Relative Age</u>** (p. 233)

*Principles of Relative Dating* (p.234)

Geologic processes that modify the Earth's surface today have acted in the same manner in the past. This principle is termed _____________________. This principle does not imply that the __________ at which processes occur is the same. Give an example of this principle:

Matching:

A. principle of uniformitarianism,
B. principle of original horizontality
C. principle of superposition
D. principle of crosscutting relationships
E. principle of inclusions
F. principle of faunal succession

________ 1. Any intrusive rock, such as a dike or a sill, must be younger than the rock it cuts.

________ 2. Geological processes operating today operated in a similar manner in the past.

________ 3. Animals on Earth have changed in a definite order: earlier forms were simpler than later forms.

________ 4. The rocks at the bottom of a sequence are older than the ones at the top.

________ 5. Fragments of other rocks contained in another rock, must be older than the host rock

________ 6. Most layers of sedimentary material are deposited in horizontal or near-horizontal layers.

What is meant by an index fossil?

Why are index fossils important in constructing the history of an area?

Please read the Highlight 8-1 (p 238-240) -- How Fossils Form

*Unconformities* (p. 237)

What is an unconformity?

You need to be able to recognize all types of unconformities listed in this section and know that they are unconformities, but I will not ask you to know the names of these different types of unconformities. Unconformities are an important part of the history of an area because they may be the only part of the record that is an evidence of erosion.

Make sure that you include unconformities in any geological history you complete.

*Relative Dating by Weathering Features* (p. 245)

Interesting section with some potential local application, but you will not be tested over this section.

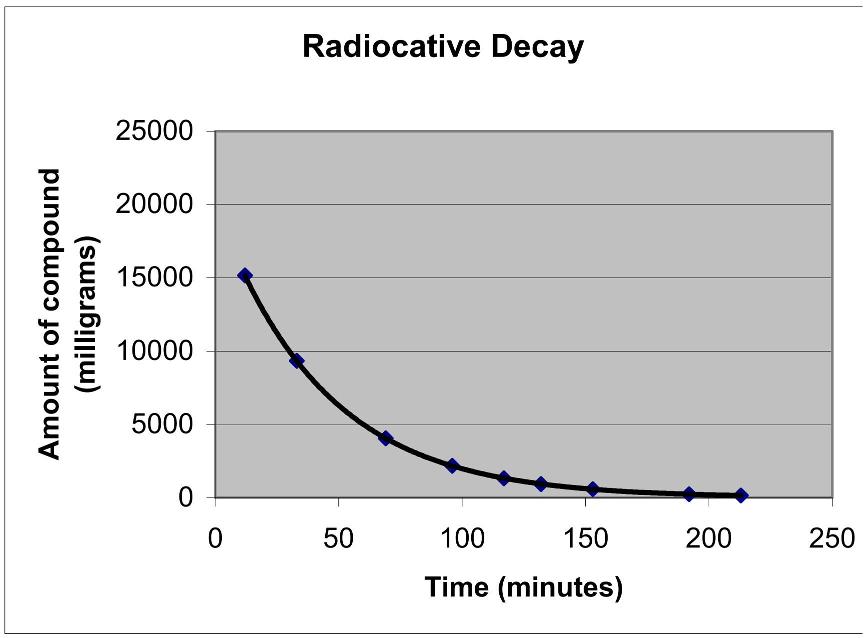
**Determining Numerical Age** (p.246)

*****_**Before you continue to read the text, read and answer this section of the reading guide, then read the book!**_***

Imagine that you have a job in a lab that measures the radioactive decay of isotopes. It is your job to determine the half-life of the compound. You are a busy person! You do not have time to watch the machine all the time, but occasionally you walk by and record the number the amount of the isotope remaining

The data you collected are graphed below:

| Minutes | Amount of isotope A (milligrams) |
|---|---|
| 12 | 15157 |
| 33 | 9330 |
| 69 | 4063 |
| 96 | 2177 |
| 117 | 1340 |
| 132 | 948 |
| 153 | 583 |
| 192 | 237 |
| 213 | 146 |
| 249 | 63 |
| 297 | 21 |
| 324 | 11 |
| 360 | 5 |




1. From this graph, at what **time** was the compound (let's call it **element A**) at 10,000 milligrams?

2. From this graph, at what time was the compound at 5,000 milligrams?

3. From this graph, at what time was the compound at 8000 milligrams?

4. From this graph, at what time was the compound at 4000 milligrams?

5. Subtract the time you found for question 1 from the time you found for question 2.

6. Subtract the time you found for question 3 from the time you found for question 4.

7. It may be that the answers to question 5 and question 6 are not the same, but if you have a computer draw the graph, you will find that the answers to questions 5 and 6 are the same time period! This time

period is called the **half-life** of the compound. The half-life is the **time** period required for half of the atoms to decay. What is the half-life for this compound?

This half-life concept has many applications to science and medicine. For example, if you take one aspirin, the amount of that drug in your blood will rise to a certain level in a period of time, but after the peak the decreasing amount of aspirin in your bloodstream follows this same half-life concept!

8. What are the units (meters, grams, minutes, etc.) of half-life values? (All half-lives are what units?)

9. How much (in milligrams) was there of this compound at time 0? (Extend your line back to time 0).

10. When element A decays it does not just disappear, it turns into a daughter product (element B). ***The total amount of element A plus element B must equal the original amount of element A.*** Assume that when you started measuring (at time 0), there was no element B present. Complete the open places in the table below.

| Minutes | Amount of isotope A (milligrams) | Amount of isotope B (milligrams) |
|---|---|---|
| 0 | 20000 | 0 |
| 12 | 15157 | (to get this subtract 15157 from 20000) |
| 33 | 9330 | |
| 69 | 4063 | |
| 96 | 2177 | |
| 117 | 1340 | |
| 132 | 948 | |
| 153 | 583 | |
| 192 | 237 | |
| 213 | 146 | |
| 249 | 63 | |
| 297 | 21 | |
| 324 | 11 | |
| 360 | 5 | |

**Now, go back to the text and read on from page 248. There is more detail in the book than you will be expected to know for the exam. The information on the types of radioactive decay will not be on the exam. There are several different methods used in radiometric dating, but concentrate on the carbon-14 and the potassium-argon methods for this class.**

*Isotope Dating* (p.246)

What types of samples are analyzed by carbon-14? Why is this method not used more widely in geology?

In what way is the potassium-argon method different than the carbon-14 method? What types of samples are analyzed by the potassium-argon dating method? Which isotope is the parent and which is the daughter in the potassium-argon method?

*Other Numerical-Dating Techniques* (p. 252)

These methods are interesting, but you will not be tested over this section

*Combining Relative and Numerical Dating* (p. 258)

The diagrams in Figure 8-32 are useful and you should be able to work through a similar diagram and determine the geological history.

**The Geological Time Scale** (p.259)

The geological time scale on page 259 will be of great benefit later in the quarter in lab, but I will **not** ask you on a test or in lab to know this scale. The terms are used to communicate events that occurred during an interval of time. For example, the Cambrian is a period of years, from 570 million years to 505 million years.

*Life on Earth* and *The Age of the Earth* (p.262 to 263)

Both of these sections are very interesting and I recommend that you read them, but I will not test you over the information in these two sections.