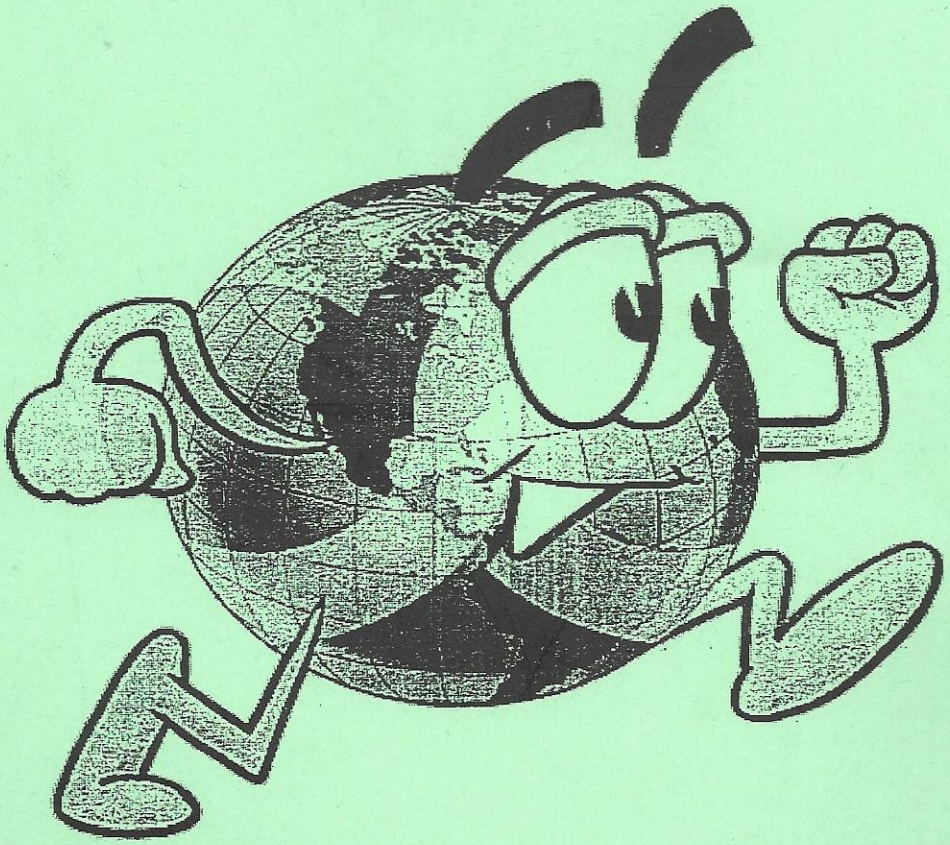
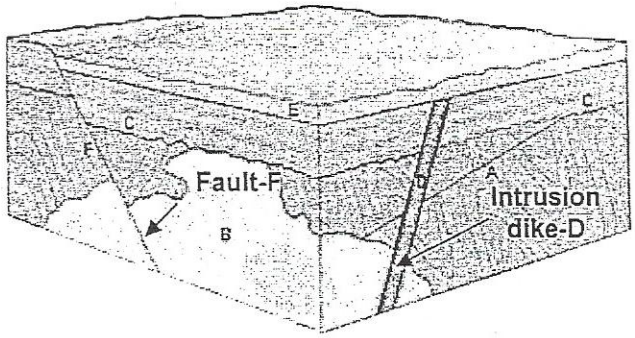
EARTH SCIENCE LABORATORY

ERSC B10L

1ST EDITION



J PIERCE, J MAY, C MEYER, N BURSZTYN, R GOODE

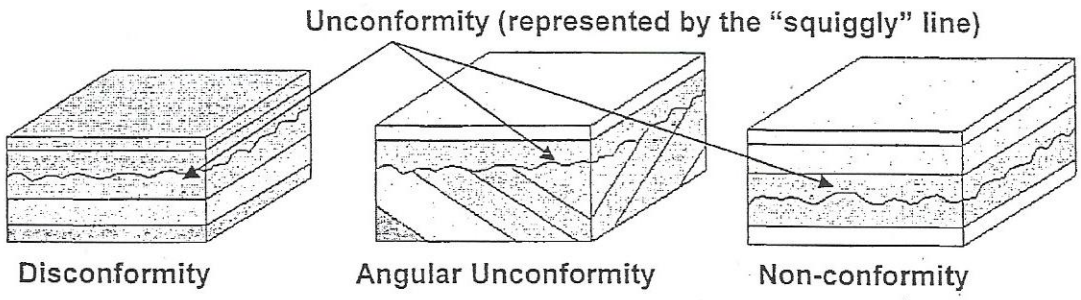


Fault F is cutting across intrusion B; therefore, fault F must be younger.

Intrusive dike D cuts across intrusion B, folded strata, and layers C and E; therefore, dike D must be younger.

The Principle of Unconformities

An unconformity is a rock surface that represents a gap in the geologic record or missing time (but does time really stop?). An unconformity is analogous to a page missing from a book. An unconformity can represent a period of ***non-deposition*** or a period of ***erosion.*** There are three major types of unconformities. The following diagrams illustrate the 3 major types of unconformities.



Disconformity:

a period of erosion or non-deposition within sedimentary layers that has not been disturbed

Angular Unconformity:

a period of erosion or non-deposition where strata are angled against overlying horizontal layers

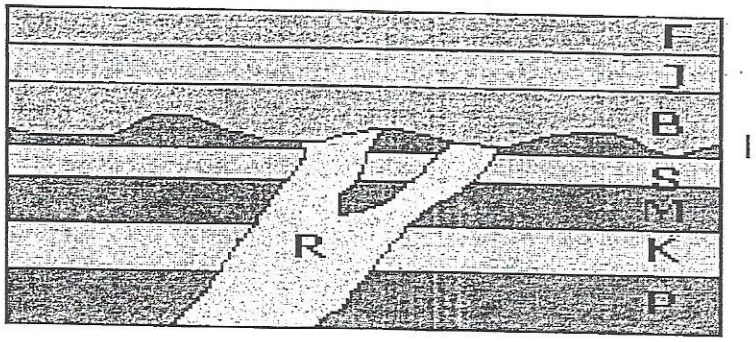
Non-Conformity:

a period of erosion or non-deposition where sedimentary strata overlie crystalline rocks (igneous or metamorphic rocks)

Applying the Principles to Unravel Geologic History

Observe the block diagram below, and use the above relative dating principles to unravel the geologic history. In other words, which came first? Start with the oldest event, and record your observation on the bottom line as you work your way up to the last event. When observing sedimentary or folded rock units, use the term "deposition

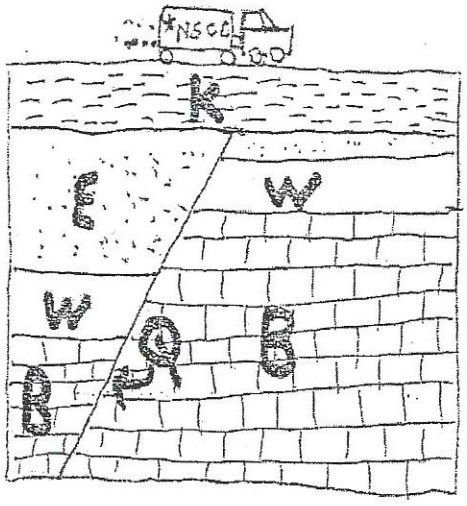
of." When observing igneous or metamorphic rock units, use the term "emplacement of." Study the block diagram below, and develop the geologic history using the various principles outlined above.



Deposition of B,J,F
Unconformity
Emplacement of intrusion dike R
Deposition of P,K,M,S

youngest
oldest

In the diagram below, use the previous example above to decipher the geologic history, starting with the oldest event to the youngest. Use the rock unit symbols at the back of the lab to denote igneous, metamorphic, and sedimentary rock types. Do this diagram before attempting diagrams in part B of the lab. Make sure you fully understand how to chronologically list the geologic events before moving to part B.



_____ Youngest

_____

_____

_____

_____

_____ oldest

Part A - Definitions

geologic time scale

relative dating

absolute dating

isotope

parent material

daughter material

half-life

stratigrapny

contact

principle of Original Horizontality

principle of Superposition

principle of Inclusions

principle of Cross-Cutting Relations

unconformity

disconformity

angular unconformity

non-conformity

LAB 8 & 9

Using Lab 9 (Geologic History), write out the definition for each geologic history term. Students are responsible for understanding each term prior to the Geologic Time Lab. A short vocabulary quiz will be administered at the beginning of the following lab.

Relative Dating:

Numerical Dating (Absolute dating):

Original Horizontality:

Law of Superposition:

Principle of Inclusions:

Cross-cutting Relationships:

Unconformity:

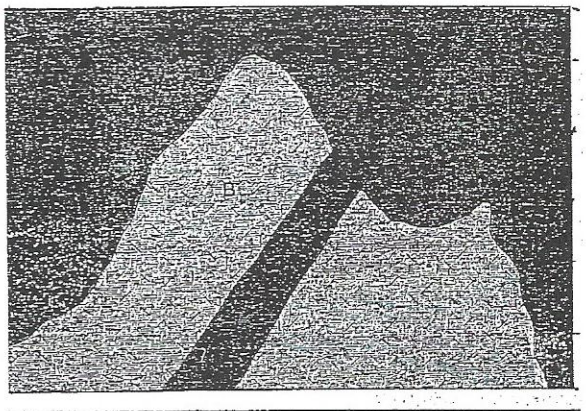
Half-life:

Paleontology:

Uniformitarianism:

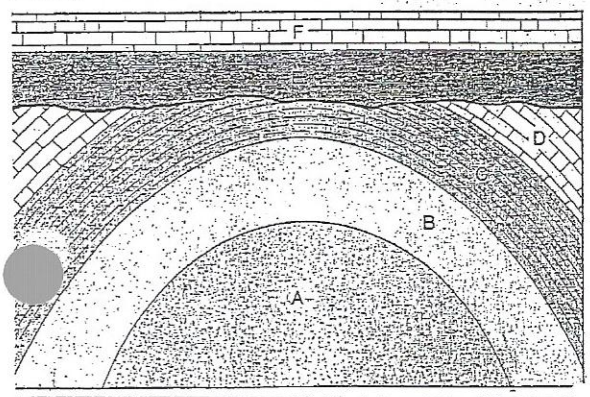
PART B - Unraveling earth History

Below are various diagrams representing geologic events. Using the dating principles, decipher the geologic history of events.



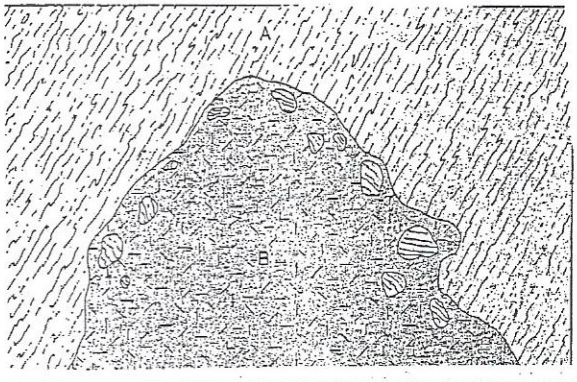
youngest

oldest



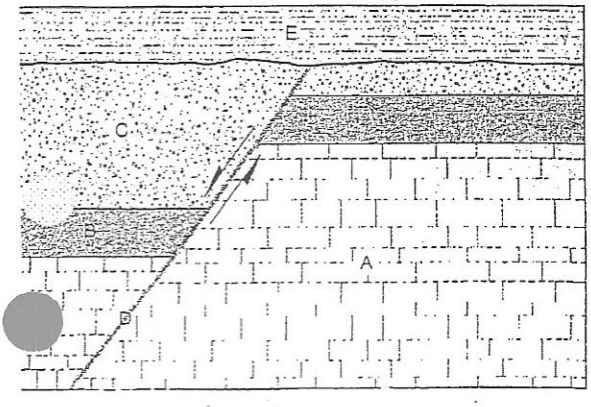
youngest

oldest



youngest

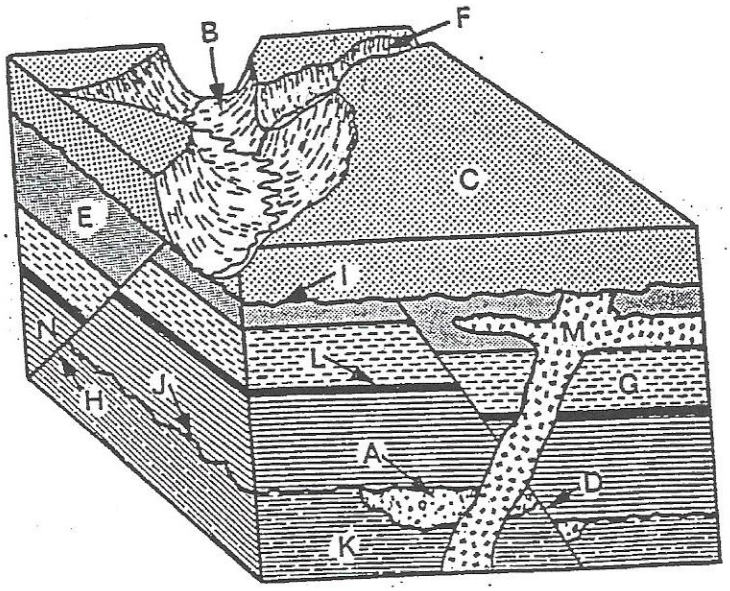
oldest



youngest

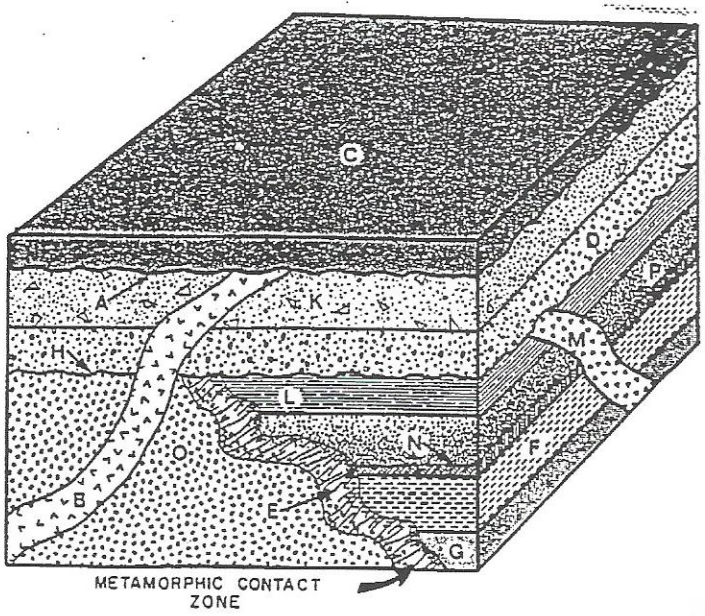
oldest

YOUNGEST



OLDEST

YOUNGEST



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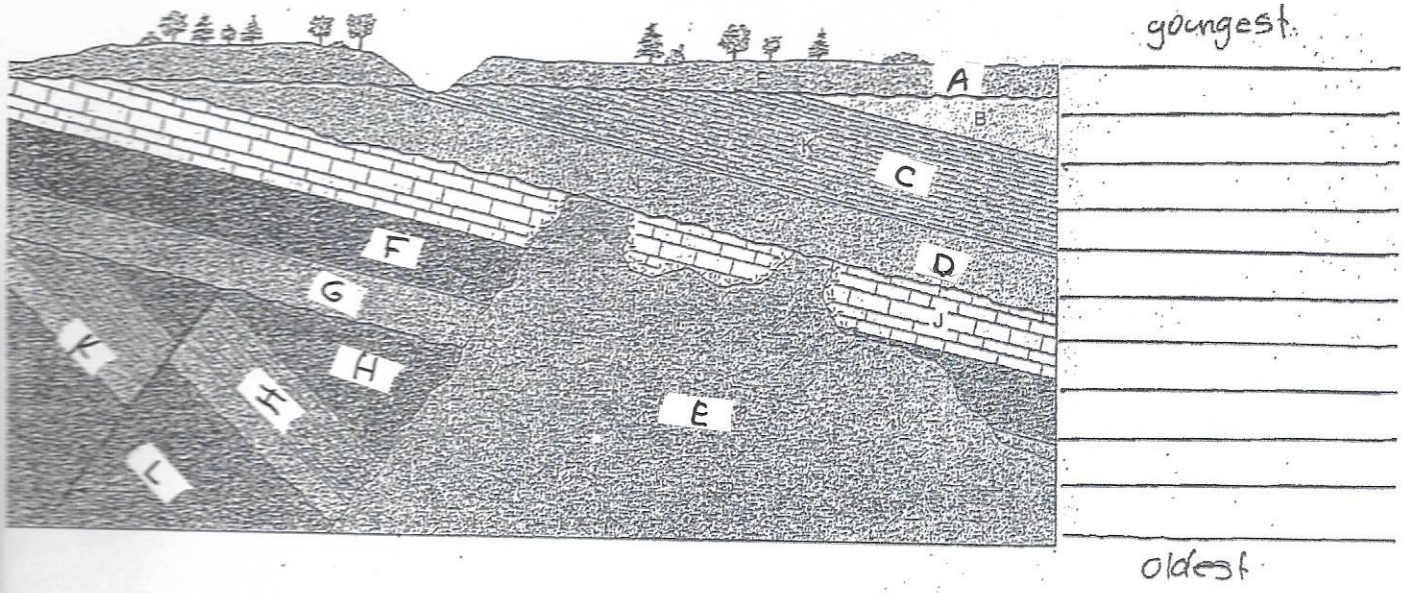
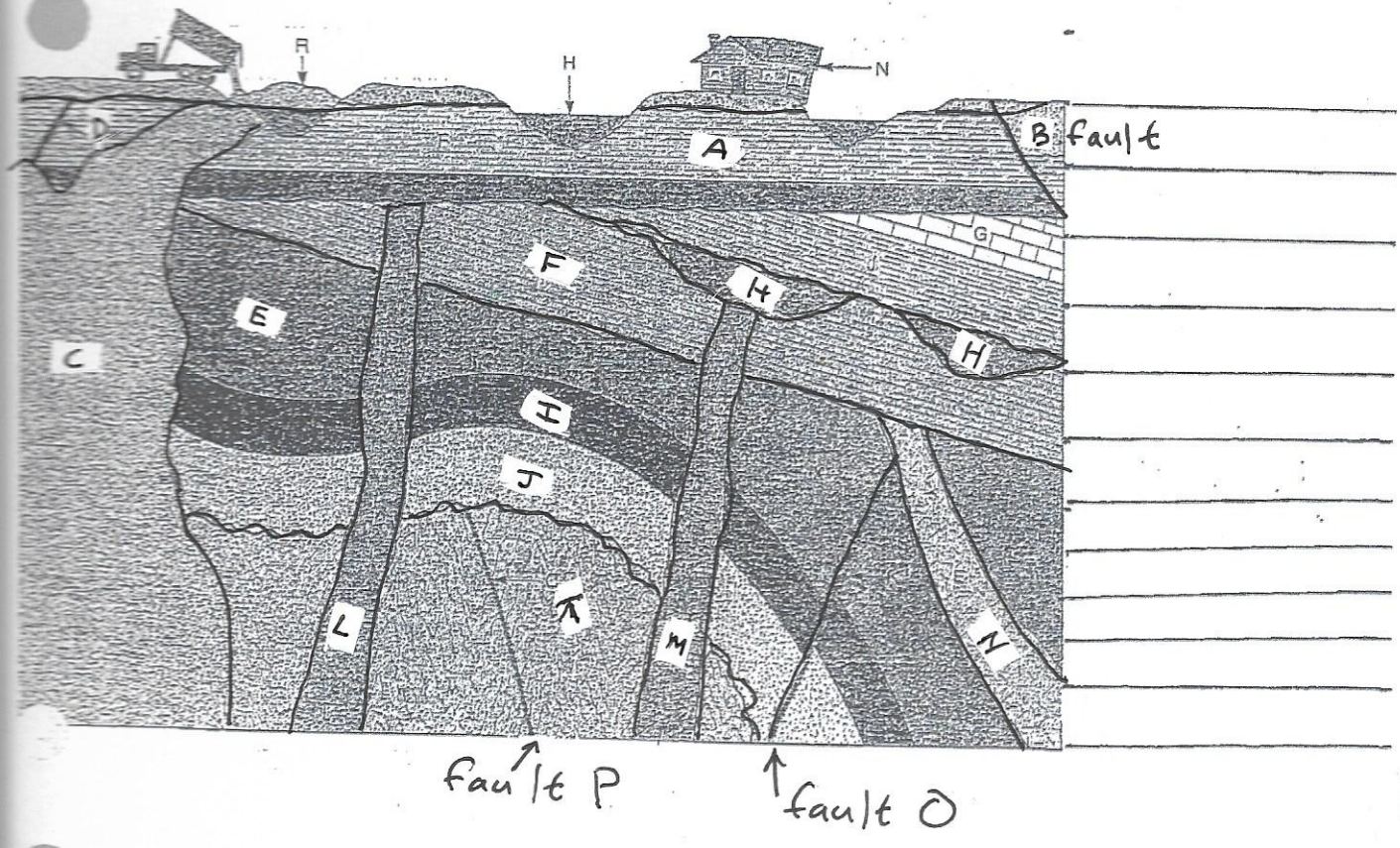
Below are additional challenging diagrams. Use the geologic principles to unravel the geologic history





Part C- Critical Thinking Questions and the Geologic Time Scale

1. Explain the difference between relative and absolute dating methods.

2. If the oldest rocks on Earth are dated at approximately 3.8 billion years old, how do scientists predict various half-lives of Rb_{87} – St_{87} at 48.8 billion years?

Introduction to the Geologic Time Scale

1. Memorize the periods and their associated eras. Also, know the epochs related to both the Quaternary and Tertiary Periods. Believe it or not, this is common knowledge for non-science majors!

2. Using absolute dates from the geologic time scale, record the absolute age between each era. How long are the Paleozoic, Mesozoic, and Cenozoic Eras?

3. What era and periods are associated with the presence of dinosaurs?

4. Using absolute dates, from the geologic time scale construct a time-scaled version of the geologic time scale showing the eras, periods, and epochs.

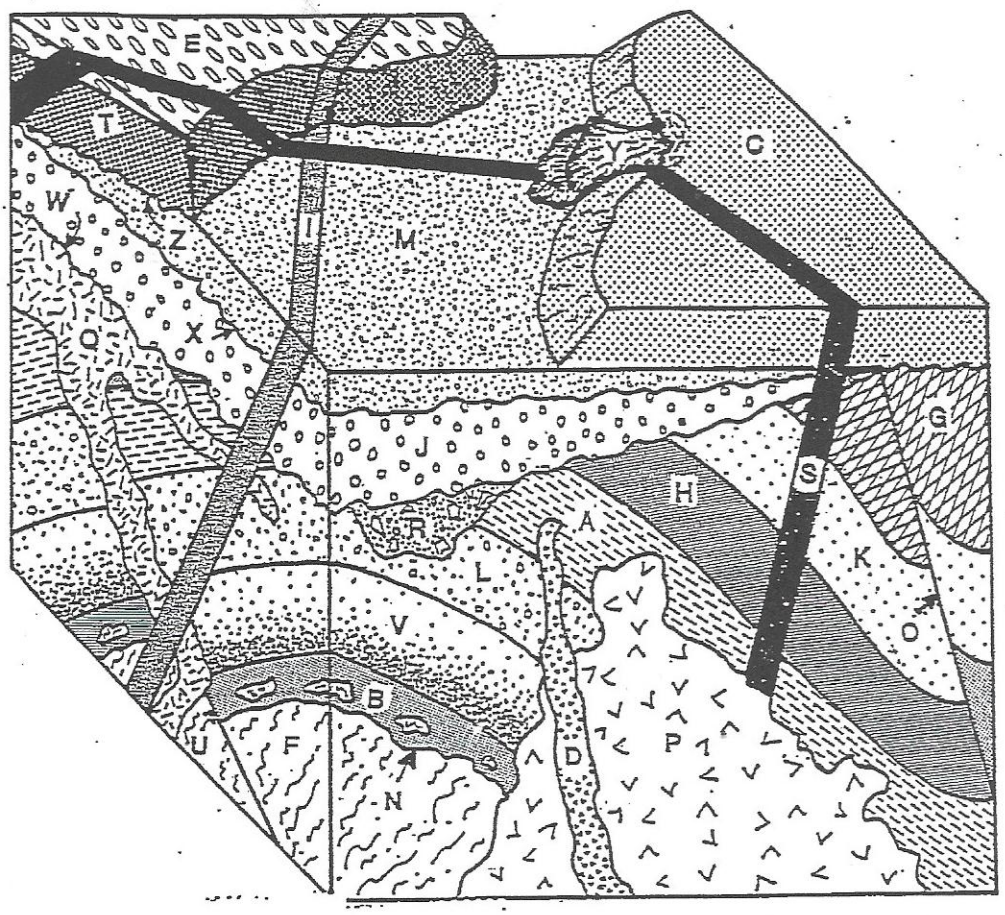
    a. Which part of the geologic time scale is dominant (time-wise)? Why?

    b. Why is the upper part of the geologic time scale subdivided in more detail than the lower part of the scale?

    c. What part of the scale represents the existence of humans?

    d. Is the existence of dinosaurs longer or shorter than that of man? How much shorter or longer?

5. Write down your mnemonic phrase for memorizing the periods of the geologic time scale **(NO NAUGHTY PHRASES!)**



Youngest