Student Name(s):   **Grade:**
Physical Geology 101 Laboratory
Relative Dating of Rocks Using Stratigraphic Principles

I. Introduction & Purpose:

   The purpose of this lab is to learn and apply the concepts of relative dating to rocks, fossils and geologic events.   The history and concepts of stratigraphy and the use of fossils for relative dating will be discussed. You will learn about the geologic timescale, how to determine relative ages, and the methods used by geologists to date events in Earth history. You will also get some practice in using the principles and techniques.

II. Knowing and Understanding the Six Principles of Stratigraphy:

   A. Define the seven basic laws of physical stratigraphy (see page 152 in your lab manual):
   <u>Stratigraphic Law</u>   <u>Definition</u>

   1) Superposition _____

   2) Cross-Cutting   _____

   3) Inclusion   _____

   4) Fossil Succession   _____

   5) Lateral Continuity   _____

   6) Original Horizontality   _____

   7) Unconformity   _____

B. Unconformities represent gaps in the time-rock record where non-deposition and/or erosion were occurring over a significant period of time in between periods of deposition. They typically appear as obvious irregularity surfaces between two sets or groups of rock units, termed formations. Note that an unconformity can also record other geologic events such as tilting, folding, faulting, intrusion, and uplift. Therefore, unconformities provide important rock-dating information.
List and define the three kinds of stratigraphic unconformities (examine Figure. 8.1, page 153):
   <u>Type of Unconformity</u>   <u>Definition</u>

   1) _____   _____
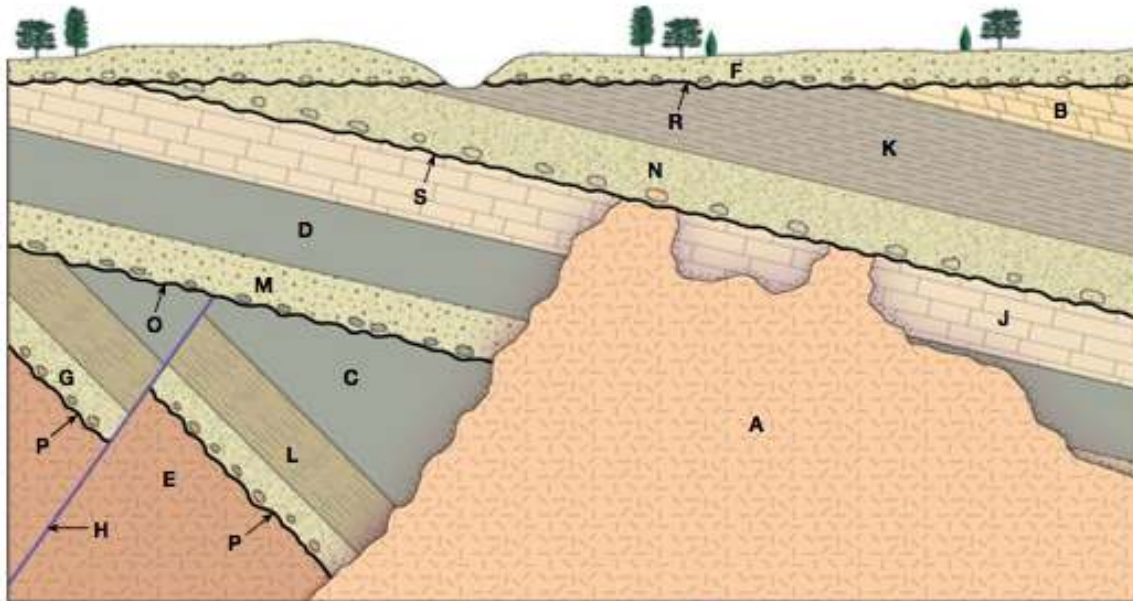
   2) _____   _____

   3) _____   _____

I. Determining Relative Ages of Rocks and Geologic Events Based on Stratigraphic Order
Directions: Complete the analysis and evaluation of the six geologic cross below. For each geologic cross section, do the following:
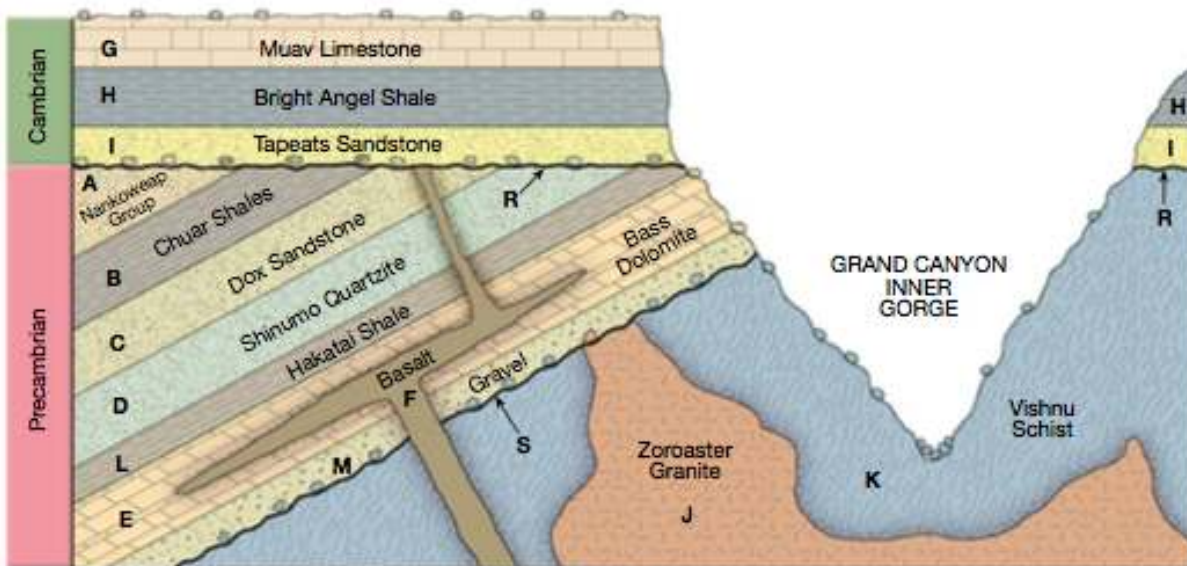
   1. Determine the relative ages for the rock bodies and other geologic features/events, including tilting, uplift, faulting, and erosional unconformities.

   2. List the sequence of geologic events (each one is labeled with a letter) in chronologic order by

writing down the letters from oldest (bottom of list) to youngest (top of list) in the column of blanks. For each dated event you must also indicate which stratigraphic law was used to place the event in its proper time slot. Use the following initials for the stratigraphic laws: **SP** = superposition, **IN** = inclusions; **CC** = cross-cutting, **UN** = unconformity.
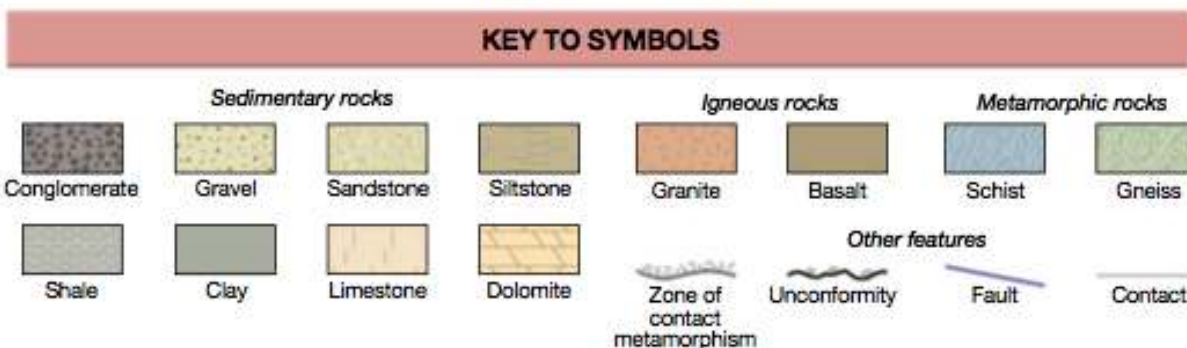
3. Determine and name (**by type**) all the lettered unconformities found in each cross-section.

Geologic Cross Section 1

Geologic Cross Section 2

KEY TO SYMBOLS

Sedimentary rocks

| Conglomerate | Gravel | Sandstone | Siltstone |

Igneous rocks

| Granite | Basalt |

Metamorphic rocks

| Schist | Gneiss |

| Shale | Clay | Limestone | Dolomite |

Other features

| Zone of contact metamorphism | Unconformity | Fault | Contact |

Geologic Cross-Section #1

Age Sequence	Stratigraphic Law
(Youngest) _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
(Oldest) _____	_____

Grand Canyon Cross-Section #2

Age Sequence	Stratigraphic Law
(Youngest) ____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
(Oldest) _____	_____

Type of Unconformities - X-Section #1

R _____

S _____

O _____

P_____

Type of Unconformities - X-section #2

R _____

S _____

Questions:

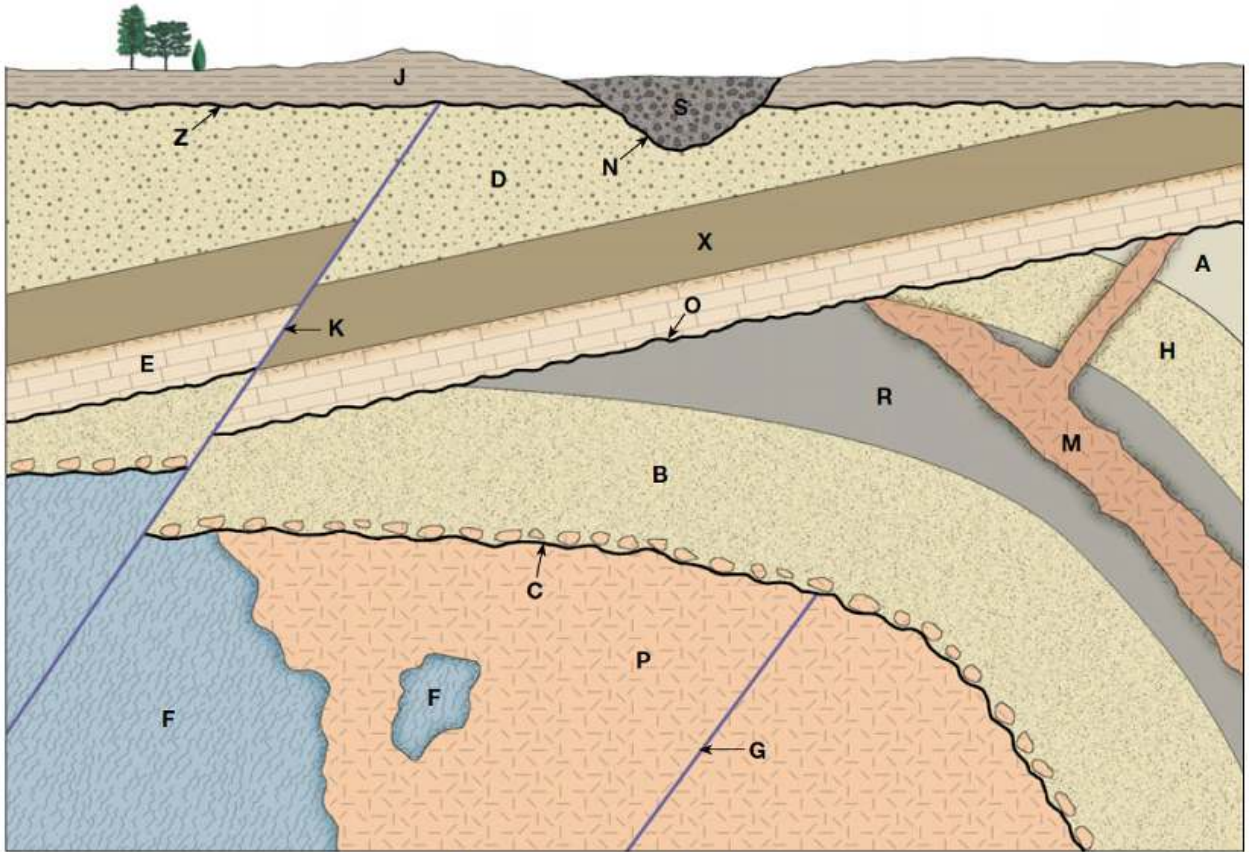**1)** Which stratigraphic principle did you primarily use for dating the sedimentary layers?

Answer: _____

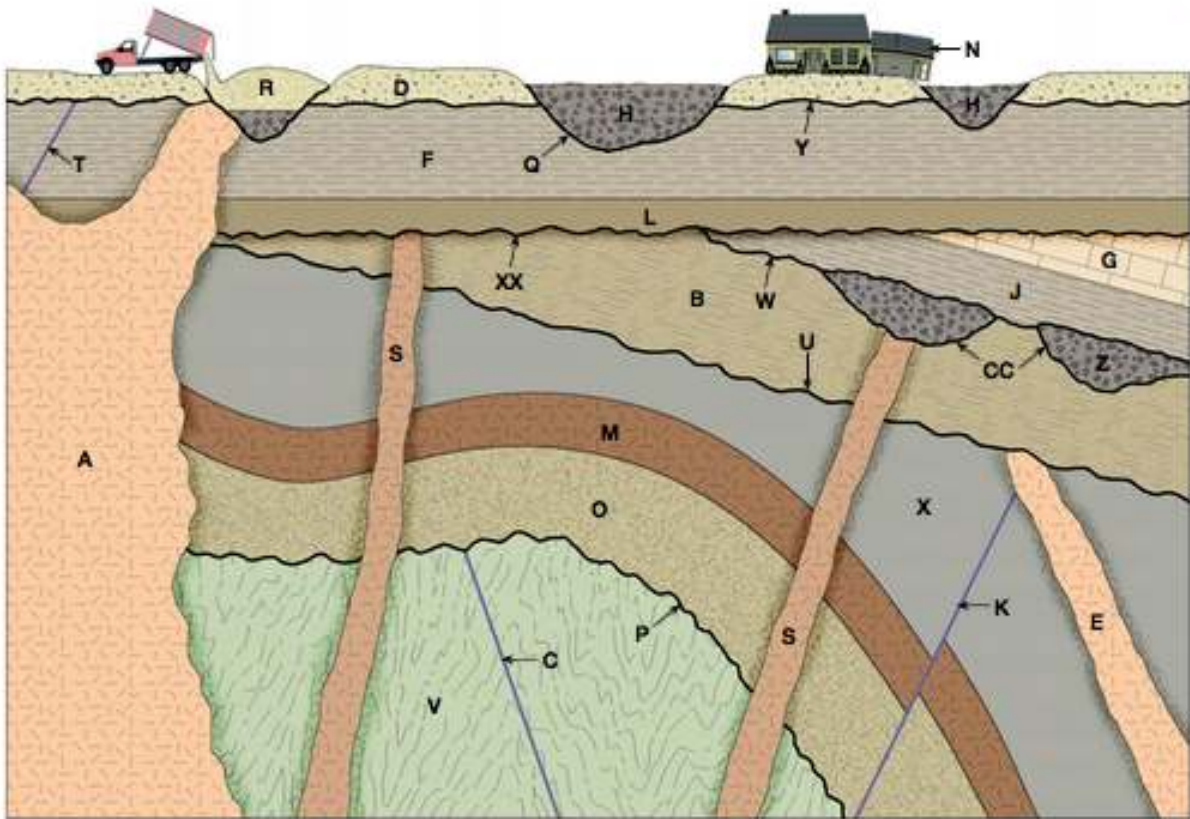**2)** Which stratigraphic principle did you primarily use for dating intrusions and faults?

Answer: _____

3) Which other stratigraphic principle did you use for dating rocks directly above and below an unconformity?

Answer: _____

Geologic Cross Section 3

Geologic Cross Section 4

Geologic Cross Section #3

Age Sequence	Stratigraphic Law
(Youngest) _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
(Oldest) _____	_____

Types of Unconformities in X-Section #3

N _____

O _____

C _____

W _____

Geologic Cross Section #4

Age Sequence	Stratigraphic Law
(Youngest) _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
(Oldest) _____	_____

Types of Unconformities in X-Section #4

Q _____   Y _____

XX _____   W _____

CC _____   U _____

P _____

IGNEOUS L.S. S.S. CONGL. SH. DOLO. TILL

Geologic Cross Section 5

Cross section legend

shale
mudstone
sandstone
shaly sandstone

limestone

igneous rocks (of different ages)

faults
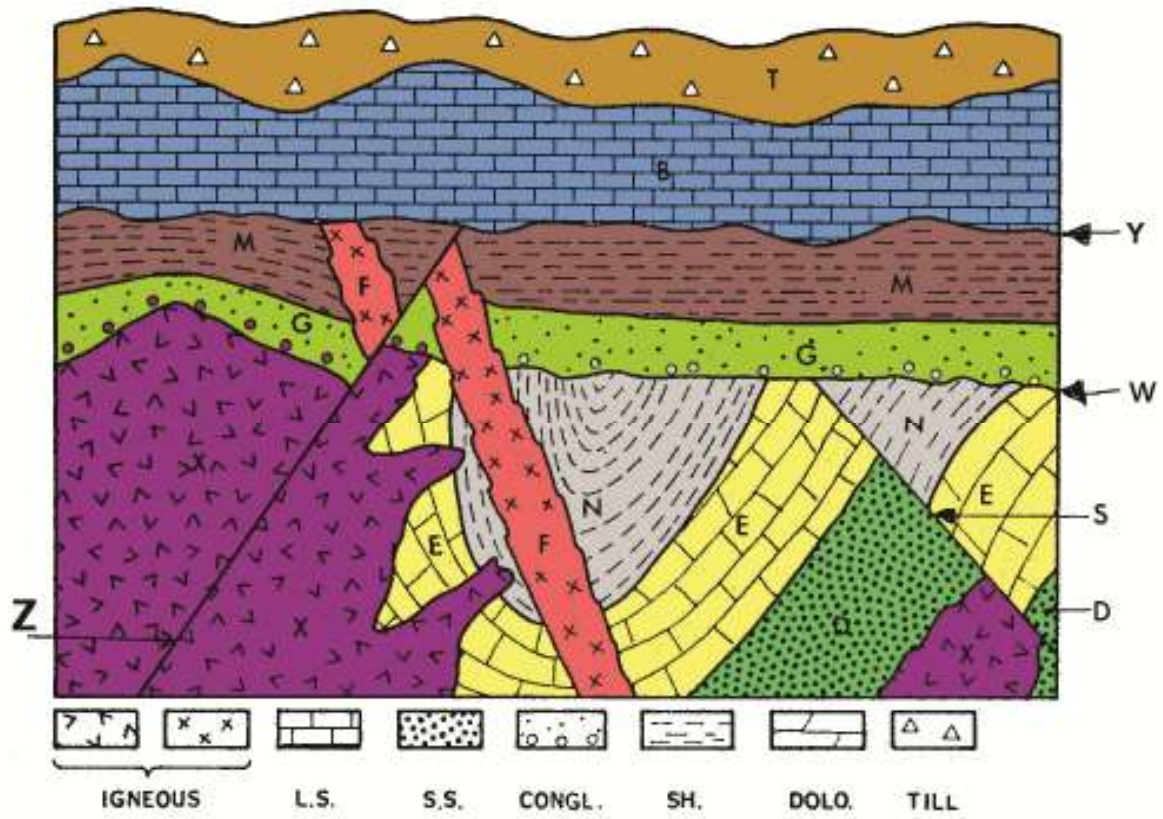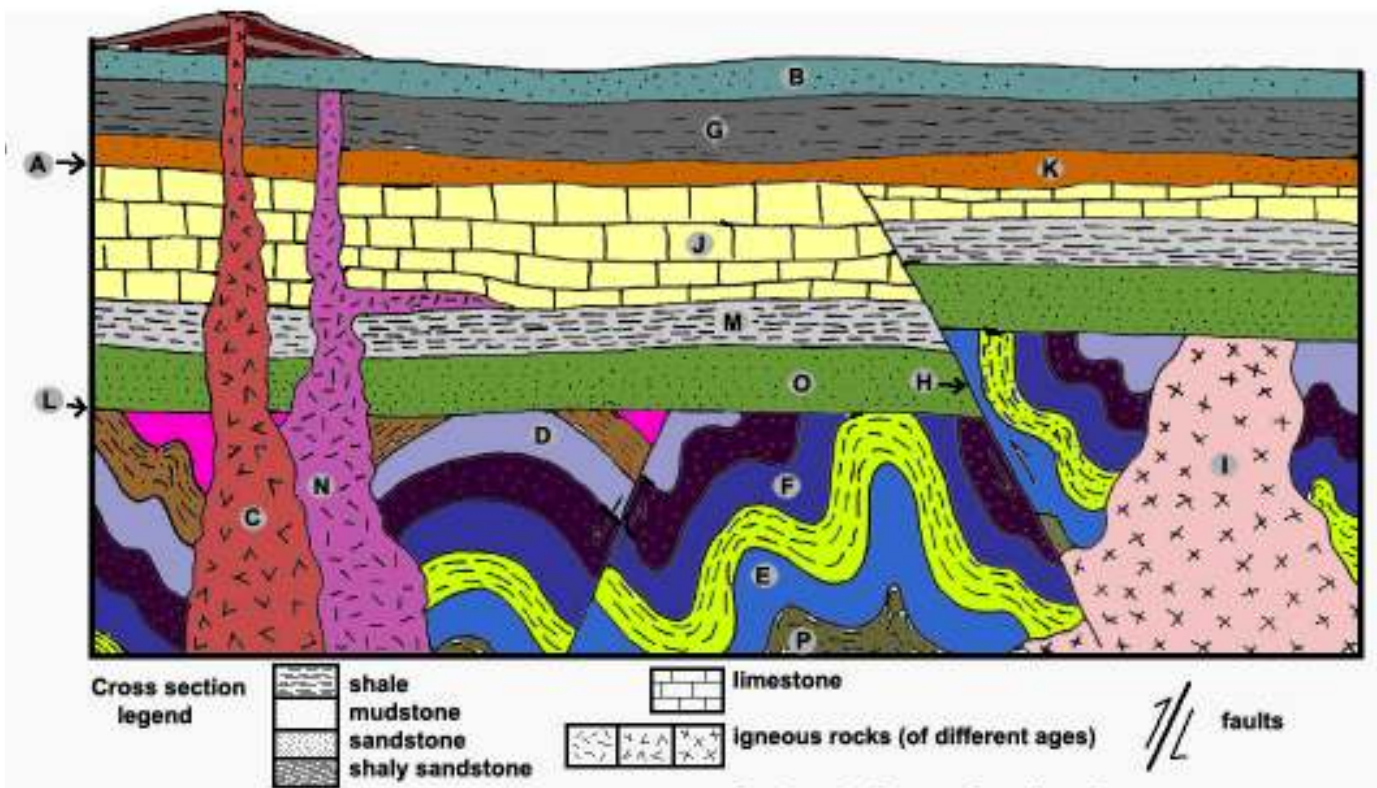
Geologic Cross Section 6

Geologic Cross Section #5

Age Sequence   **Stratigraphic Law**

(Youngest) _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

(Oldest) _____   _____

Types of Unconformities in X-Section #5

   Y _____

  W _____

Geologic Cross Section #6

Age Sequence   **Stratigraphic Law**

(Youngest) _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

        _____   _____

(Oldest) _____   _____

Types of Unconformities in X-Section #6

  A _____

  L _____

Questions:

1) **When did the folding event occur in Cross Section #5?**

    Answer: The folding event occurred right after layer _____, but just before layer _____.

2) **When did the folding event occur in Cross Section #6?**

    Answer: The folding event occurred right after layer _____, but just before layer _____.

RELATIVE GEO-DATING LABORATORY REFLECTION

 Directions: Write a 3-paragraph reflection of the lab activity, explaining its purpose, the methods used, the results obtained, and a brief personal reflection of what you enjoyed and learned about doing this lab (*3 points possible*).   Answer the following 3-point question reflection set on a separate sheet of paper:

1) *What was the purpose of this lab? What did you actually discover and learn during this lab?*

_____

_____

_____

2) *What did you enjoy most about this lab? Also, what was challenging or thought-provoking?*

_____

_____

_____

3) *What are your constructive comments about the design and execution of this lab? What's good? What's bad? Offer suggestions for making the lab better.*

_____

_____

_____