

SI Geology - Full Discipline Demo

Structural Geology and Geologic Maps

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Geology - Full Discipline Demo
Course	SI Geology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match each term to its definition.

⌘ Dip	Volume of specified rock with distinct features	1
⌘ Fault	Intersection of a tabular body with a horizontal reference plane	2
⌘ Geologic Contact	The angle the tabular layer makes with a horizontal reference plane	3
⌘ Geologic Unit	Patterns formed by a geologic unit that are dependent on an area's topography	4
⌘ Legend	Area where one geologic unit touches another	5
⌘ Outcrop Patterns	Key to all symbols used on a map	6
⌘ Strike	Surface contact between two bodies of rock across which motion occurs	7

Correct answers:

- 1 Geologic Unit 2 Strike 3 Dip 4 Outcrop Patterns
5 Geologic Contact 6 Legend 7 Fault

Classify the following statements as true or false.

⚡ Anticlines have a concave-up shape.	
⚡ Bends in a geologic bed are referred to as folds.	
⚡ Faults are categorized based on the type of force applied to them and the resulting strain that occurs.	
⚡ Faults are the surface contact between two bodies of rock across which relative motion occurs.	
⚡ If the position of a geologic contact is uncertain, it is marked with a solid line.	
⚡ The oldest rock beds in a syncline are located in the center of the fold.	
True	False
1	2

Correct answers:

1 Bends in a geologic bed are referred to as folds.

Faults are categorized based on the type of force applied to them and the resulting strain that occurs.

Faults are the surface contact between two bodies of rock across which relative motion occurs.

2 Anticlines have a concave-up shape.

If the position of a geologic contact is uncertain, it is marked with a solid line.

The oldest rock beds in a syncline are located in the center of the fold.

Exploration

Because geologic maps are constructed by interpreting data, there is some uncertainty associated with these maps.

- ☒ True ✓
- ☐ False

On a geologic map, the depositional period of a rock is indicated by a(n) ____.

- ☐ lowercase letter
- ☒ uppercase letter ✓
- ☐ number
- ☐ Roman numeral

____ is the intersection of a tabular body with a horizontal reference plane.

- ☒ Strike ✓
- ☐ Dip
- ☐ Alluvium
- ☐ Outcropping

A ____ fault is formed when compression compacts a block of rock, causing a shortening of the crust.

- ☐ normal
- ☐ strike-slip
- ☒ reverse ✓
- ☐ anticline

Folds are defined relative to their shape around a(n) ____.

- ☐ anticline
- ☐ strike-slip
- ☒ fold axis
- ☐ strike



Exercise 1

What is the oldest geologic unit present on the map? What type of rock is it and when was it deposited?

What is the youngest geologic unit present on the map? What type of rock is it and when was it deposited?

In what units do the karst features and sinkholes occur? What do all of these units have in common?

In what general direction are the units in the south east corner of the map dipping?

Is the middle of the Clover Hollow Anticline a valley or a ridge? Describe how this structure could have formed.

What are the three major faults (thrust sheets) in the area? Which one has the greatest amount of displacement?

Based on the types of faults present on the map, what major deformational force did this area experience: extension, compression, or shear? Explain your answer.

Data Table 1: Geology of the Newport, VA Quadrangle
(SAMPLE ANSWER BELOW)

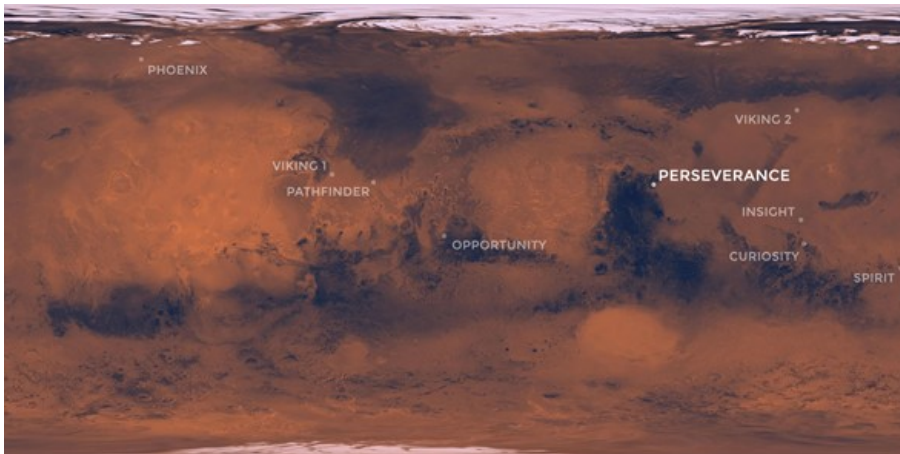
Map Feature	Number
Number of Geologic Units	24
Number of Folds	3 (4 if include minor antiform)
Number of Major Faults (exclude small faults less than a mile)	17
Number of landslides	3
Number of karst areas (not including sinkholes)	11
Number of abandoned mines/quarries (use the "Other data" layer)	1

Exercise 2

What site did you pick to land the next Mars rover? Why?

What are some of the differences between the geologic map of Mars and the geologic map you used in Exercise 1.

Here is an image of all of the Mars rover landing sites, including where NASA decided to land the Perseverance Rover. Which location did they choose?



Is this location the same as the location you choose? If not, why do you think NASA choose this site instead of the one you picked?

Data Table 2: Mars Landing Site Information
(SAMPLE ANSWER BELOW)

Site Name	Pros	Cons
Columbia Hills, Gusev Crater	No sample answer	No sample answer
Eberswalde	No sample answer	No sample answer
Holden Crater	No sample answer	No sample answer
Jezero Crater	No sample answer	No sample answer
Mawrth Vallis	No sample answer	No sample answer
NE Syrtis	No sample answer	No sample answer
Nili Fossae	No sample answer	No sample answer
SW Melas	No sample answer	No sample answer

Photo 1: Chosen Landing Site
(SAMPLE ANSWER BELOW)

No sample answer provided

Competency Review

On the geologic map, what did the T-shaped symbol with a number next to it represent?

- ☐ Karst areas
- ☐ Abandoned mines
- ☐ Anticlines
- ☒ Strike and dip



_____ faults have a vertical fault plane, and therefore no hanging wall or footwall.

- ☐ Normal
- ☒ Strike-slip
- ☐ Reverse
- ☐ Anticline



Which of the following geologic contacts might be present on a geologic map?

- ☐ Depositional contacts
- ☐ Intrusive contacts
- ☐ Faults
- ☒ All of the above

Geologic maps focus primarily on alluvium deposited by water or wind.

- ☐ True
- ☒ False

What type of fault is the Pulaski Thrust Sheet, observed on the geologic map in Exercise 1?

- ☐ Normal
- ☐ Strike-slip
- ☒ Reverse
- ☐ Anticline

How is the Elbrook formation designated on the geologic map from Exercise 1?

- ☐ Cco
- ☐ Cr
- ☐ Dm
- ☒ Ce

Anticlines have a convex-up shape, forming an arch with their oldest beds in the center fold.

- ☒ True
- ☐ False

The lowercase letter associated with a geologic unit indicates the ____.

- ☐ depositional period
- ☐ fault type
- ☒ formation name
- ☐ strike and dip



Extension Questions

Review the geologic map from Exercise 1. The topography of almost every region reflects an adjustment between the dominant surficial processes and the underlying lithology. Knowing this, describe the outcrop pattern of the St Unit (Tuscarora Formation) compared to the Db Unit (Braillier Formation) (Hint: look at the spacing of the contour lines and where it occurs in the topography). What do you think controls the way these two rock bodies appear in outcrop? (SAMPLE ANSWER BELOW)

In general, the Tuscarora Formation is present along the tops of ridges with steep sides. The Braillier Formation, however is present along large slopes and is cut by many river features. Students will have different ideas for how these two units appear in outcrop. According to the map, the Tuscarora Formation is composed of hard quartz sandstone and the Braillier Formation is composed of interbedded shales and sandstones. One would assume that the sandstone is more resistant to weathering and creates ridges, whereas the shales and interbedded sandstones weather easily and create steep slope topography.