**Student Name:** _____ **Grade:** _____

# Physical Geology 101 Laboratory
# Topographic Map Lab II

**Introduction & Purpose:**

Topographic maps are much scaled down two-dimensional paper models of the Earth's three-dimensional land surface. The characteristic that makes topographic maps unique are contour lines, which are map symbols that express surface relief – ground elevation changes across a given tract of land. Each contour line represents a continuous set of surface point locations that have equal elevation. The topographic ("topo" for short) map is an ingenious invention that helps humans navigate across the Earth's surface, and analyze the Earth's surface morphology, and geology.

Learning how to create and read topographic maps can be difficult, especially for those people who are not graphically and/or three-dimensionally minded. However, if the basic concepts of contour lines, map scale, and coordinate positioning systems are properly understood, then the ability to read topographic maps will come much easier. The purpose of this lab is to learn how to read, interpret, utilize, and create topographic maps and topographic map profiles.

**The major objectives of this laboratory exercise are as follows:**

a) Be able to interpret all the necessary map information, including map scale, declination, contour interval, map symbols, and map coordinates.
b) Be able to locate and identify features on a map, including the use of map coordinates, identifying geographic features, and reading and assigning compass bearings.
c) Be able to construct a simple topographic profile.
d) Be able to use a compass for orienteering purposes.

## PART I – Earthquake Valley Quadrangle Topographic Map

**Directions:** Study the topographic map provided to you by your instructor. Answer the following map questions.

**1)** What is the size of this map? It's a _____ minute by _____ minute map

**2)** The verbal scale is "One inch of map distance equals _____mile(s) of real ground distance

**3)** The magnetic declination for this mapped region is _____ _____

**4)** What sort of vegetation covers this region? _____

**5)** Name the geographic location listed on the map with the following **UTM** coordinates.
Northing: 3.662,000 m N, Easting: 549,000 m E NOTE: **This is** Location "A" **.**

Name of location A: _____

**6)** What are the **latitude-longitude** coordinates for the Airstrip in Earthquake Valley?

Location B: Latitude = _____ Longitude = _____

**7)** What is the distance from Location A **(Question 5)** to Location B **(Question 6)**?

Distance is _____ miles

**8)** What is the **AZIMUTH** bearing from **Location A** (Question 5) to **Location B** (Question 6)?

Azimuth bearing from locations A to B is _____ degrees

**9)** Which of the following ***quadrant*** compass bearings is the most accurate for the direction starting from **Location A** (Question 3) and heading to **Location B** (Question 4)?

Quadrant bearing from locations A to B is _____

**10)** What's the **slope gradient** from top of Granite Mountain to the Spring at its base (north side)?

Calc: The slope gradient is roughly _____ feet per mile.

**11)** The total relief of this mapped region is roughly _____ feet

**12)** Which direction does Felipe Creek flow?

The creek flows towards the _____ direction

**13)** What type of active geologic structure do you think runs down Earthquake Valley?

## PART II. ANALYSIS OF THE YOSEMITE VALLEY TOPOGRAPHIC MAP

**Instructions:** Complete the following map analysis activities for the Yosemite Topographic Map

**General Topographic Information of this Map**

**1)** What is the exact name of this map? _____

**2)** What type of map projection was used to make this map? _____

**3)** The size of the map is _____ minutes by _____ minutes

**4)** What is the fractional ratio scale of this map? 1: _____

**5)** What is the verbal scale of this map? 1 inch of map = _____ miles of real ground

**6)** What is the contour interval? _____

**7)** What is the index contour interval between the thicker index contour lines? _____

**8)** What is the base level datum (the "zero" elevation used to establish all contour and point elevations on this map? _____

**9)** What is the highest measured elevation (benchmark) on this map? _____ feet

**10)** What is the lowest measured elevation (benchmark) on this map? _____ feet

**11)** What is the maximum relief of the map? (Subtract lowest map elevation from highest elev. )

Total relief = _____ feet

**12)** What's the name of the adjacent topo map to the northeast of this map? _____

**13)** How many square miles does this map cover?

Calculation: Total area of map = _____square miles

**14)** What is the amount and direction of magnetic declination? _____ _____

**Map Features and Symbols**

**15)** What's the difference between the *solid* green pattern and *small dotted* green pattern on this map? _____

**16)** What's the difference between black dashed single lines and black dashed double lines?

_____

**17)** What's the difference between black dashed double lines and black solid double lines?

_____

**18)** What type of symbols represents buildings on the map? _____

**Map Coordinate Systems**

**19)** What are the black longitude and latitude tick mark intervals along the edge of map? _____

**20)** Which UTM zone is this map area located in? _____

**21)** What are the blue UTM tick mark intervals along the edge of the map? _____ meters apart

**Establishing Location**

**22)** What are the **longitude and latitude** for each of these two opposite corners of this map?

| | NW Corner | SE Corner |
|---|---|---|
| Longitude: | _____ | _____ |
| Latitude: | _____ | _____ |

**23)** What are the **UTM coordinates** for each of the two opposite corners of this map?

| | NW Corner | SE Corner |
|---|---|---|
| Easting: | _____ | _____ |
| Northing: | _____ | _____ |

**24)** Interpolate the best approximate **longitude and latitude** for these locations:

| | Half Dome | El Capitan |
|---|---|---|
| Longitude: | _____ | _____ |
| Latitude: | _____ | _____ |

**25)** Interpolate the best approximate **UTM coordinates** for these locations:

| | Clouds Rest | Mt Star King |
|---|---|---|
| Easting: | _____ | _____ |
| Northing: | _____ | _____ |

**Establishing Bearing and Distance**

**26)** Calculate the bearing and distance from Half Dome to Clouds Rest.

Quadrant bearing: _____

Azimuth bearing: _____

Distance (miles): _____

**27)** Calculate the bearing and distance from Glacier Point to Bridalveil Falls.

Quadrant bearing: _____

Azimuth bearing: _____

Distance (miles): _____

**Geographic Features**

**28)** Which direction does the Merced River Flow through Yosemite? East or West? Explain.

Answer: _____

**29)** What special name is used in Yosemite Valley for high promontories that form rounded, flat-topped "bulls-eye" patterns? (hint: rhymes with "home") _____

## Section D: Topographic Profiles of Yosemite Valley

**Directions:** Follow the steps on page 187 to create a topographic profile (see Figure 9.22). Note that the vertical exaggeration of a topographic profile is defined as the difference between the vertical (elevation) scale and the horizontal (lateral ground distance) scale.

**30)** Construction of the Tanaya Creek Profile A-A'

**Instructions:** Construct a topographic profile of the eastern end of Yosemite Valley across Tanaya Creek from the top of Mt. Watkins (A) to the top of Clouds Rest (A').

a. Review the instructions for creating profiles in your lab manual (Part 9B 0pg. 189)
b. Use only the dark/bold contour lines
c. Do not vertically exaggerate (your vertical scale is the same as your horizontal)

**31)** Construction of the El Capitan Meadow Profile B-B'

**Instructions:** Construct a topographic profile of the central portion of Yosemite Valley across The Merced River from the top of KP Pinnacle on El Capitan (B) to the top of Cathedral Rocks (B'). Review points a-b-c above used for Tanaya Creek profile.

**32)** Comparison between the Tanaya Creek and the El Capitan Meadow Profiles

Describe the general shape of each of the profiles across Yosemite Valley. ("V" or "U"?)

Tanaya Creek Profile A-A' - _____

El Capitan Meadow Profile B-B' - _____

**33)** Compare the two profiles described above in terms of "V" shaped versus "U" shaped. Explain which type of erosional agent you think is primarily responsible for the shaping of each of these two sections of Yosemite Valley? Choose between flowing water (rivers) and ice (glaciers). Briefly explain your choice. Hint: Check the back of the map for info.

_____

_____

## Part III. Topographic Map II Laboratory Reflection

**Directions:** Write a 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 (fill in all the lines for full credit.)

**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.*

_____

_____

_____