

Name: _____

Grade: _____

ENVI110 Laboratory - Preparatory Lab for Final Exam

Introduction & Purpose: In this lab, you will review and improve upon the geologic concepts and skills covered in the second half of the semester, and ultimately tested for in the final exam that you will be taking next week. This worksheet is designed to simulate the final exam material and format. Be sure to also record your answers on a scantron for grading.

PART I - Mt Laguna Quadrangle Topographic Map

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

1. Verbal map scale? 1 centimeter of map distance equals ____ kilometer(s) of real ground distance.
 - a. 10
 - b. 5
 - c. 1
 - d. 0.5
2. The contour interval is _____ meters.
 - a. 80
 - b. 60
 - c. 40
 - d. 20
3. The INDEX contour interval is _____ meters.
 - a. 40
 - b. 80
 - c. 140
 - d. 200
4. The magnitude (degrees) and direction of magnetic declination for mapped region is _____
 - a. 13 W
 - b. 13 N
 - c. 13 E
 - d. 13 S
5. Which direction do Kitchen Creek flow?
 - a. Northward
 - b. Southward
 - c. Impossible to tell.
 - d. Either northward or southward - depends on the time of year.
6. Which direction do flashfloods run in Canebrake Wash?
 - a. Eastward
 - b. Westward
 - c. Impossible to tell.
 - d. Either eastward or westward - depends on the time of year.
7. What are the directions of latitude and longitude on this map?
 - a. North Latitude; South Longitude
 - b. West Latitude; East Longitude
 - c. North Latitude; West Longitude
 - d. South Latitude; East Longitude

8. What is the geographic location name listed on the map with the following UTM coordinates?
Northing: 3.646,000 m N, Easting 565,000 m E NOTE: This is Location "A" for later questions.

- a. Posta Indian Reservation
- b. Al Bahr Shrine Camp
- c. Vallecito Stage Station
- d. Cibbets Flat La
- e. Agua Caliente Springs

9. What are the latitude-longitude coordinates for Mount Laguna Air Force Station? Note: This is Location "B" for later questions.

- a. Latitude = 33° 47' 45"N Longitude = 115° 20' 00"W
- b. Latitude = 32° 37' 45"N Longitude = 116° 00' 00"W
- c. Latitude = 32° 52' 30"N Longitude = 116° 25' 00"W
- d. Latitude = 32° 48' 40"N Longitude = 116° 28' 10"W
- e. Latitude = 31° 37' 45"N Longitude = 117° 10' 00"W

10. What is the distance from Location A (Question 8) to Location B (Question 9)?

- a. 17 kilometers
- b. 13 kilometers
- c. 10 kilometers
- d. 6 kilometers
- e. 3 kilometers

11. What is the AZIMUTH bearing from Location A (above question)? to Location B (above question)?

- a. 330
- b. 240
- c. 190
- d. 60
- e. 10

12. Which of the following *quadrant* compass bearings is the most accurate for the direction starting from Location A (question 6) and heading to Location B (question 7)?

- a. Bearing = S60W
- b. Bearing = S60E
- c. Bearing = N45W
- d. Bearing = N45E

13. The Sawtooth Mountains are _____ sloped, and the slopes face _____.

- a. gradually-; west-east
- b. steeply-; west-east
- c. gradually-; north-south
- d. steeply-; north-south

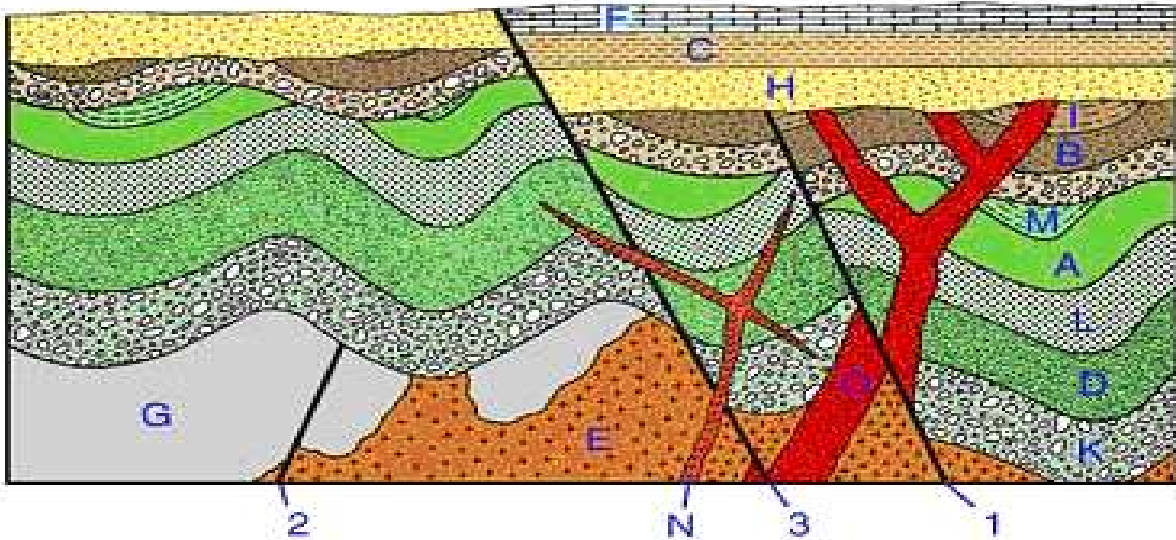
14. Calculate average slope gradient (m/km) between Aqua Caliente Springs and north edge of map.

- a. Greater than 300 m/km
- b. Between 300 m/km and 200 m/km
- c. Between 200 m/km and 100 m/km
- d. Between 100 m/km and 50 m/km
- e. Less than 50 m/km

15. What is the geographic location name listed on the map with the following Lat-Long coordinates?
Latitude = 32° 53' 30"N Longitude = 116° 25' 15"W NOTE: This is Location "C" for later questions.
- Monument Peak
 - Channing Meadow
 - Garnet Mountain
 - Cibbets Flats
 - Sombrero Peak
16. What's the approximate UTM coordinates for Vallecito Stage Station County Park? NOTE: This is Location "D" for later questions.
- Northing: 3.651,000 m N, Easting 570,000 m E
 - Northing: 3.649,000 m N, Easting 561,000 m E
 - Northing: 3.641,000 m N, Easting 560,000 m E
 - Northing: 3.637,000 m N, Easting 555,000 m E
 - Northing: 3.626,000 m N, Easting 550,000 m E
17. What is the approximate distance from Location C (Question 15) to Location D (Question 16)?
- 27 kilometers
 - 16 kilometers
 - 11 kilometers
 - 7 kilometers
 - 3 kilometers
18. What is the AZIMUTH bearing from Location C (question 15) to Location D (question 16)?
- 355
 - 270
 - 215
 - 80
 - 35
19. Which of the following *quadrant* compass bearings is the most accurate for the direction starting from Location C (question 12) and heading to Location D (question 13)?
- Bearing = S80W
 - Bearing = S25E
 - Bearing = N35E
 - Bearing = N5W
 - Bearing = N75W
20. The Tierra Blanca Mountains are _____ sloped, and the mountain chain trends _____.
- gradually-; northwest-southeast
 - steeply-; west-east
 - gradually-; northeast-southwest
 - steeply-; north-south
 - steeply-; northwest-southeast
21. The topographic rule of the "V"'s states that a set of "V"-shaped contour patterns that point towards highest elevations indicates what sort of landform?
- Stream channel/valley
 - Ridge line

PART II. Relative Age - Geologic Block Diagram

Directions: Study the stratigraphic block to answer questions 22 through 26.



22. The illustration above shows a geologic cross section. On a piece of paper, figure out the correct order, from oldest to youngest, in which the various rock units and faults were created. Choose the list from the selection below that has the correct temporal order of the seventeen lettered and numbered geologic features --- ordered from **OLDEST (left) to YOUNGEST (right)**

a.	E, G, 2, N, O, K, D, L, A, M, B, I, 1, H, C, F, 3
b.	E, G, K, 2, D, L, A, M, B, I, N, 1, O, 3, H, C, F
c.	F, C, H, O, 3, 1, N, B, I, M, A, L, D, 2, K, G, E
d.	G, E, 2, K, D, L, O, 1, H, C, A, M, B, I, F, 3, N
e.	G, E, 2, K, D, L, A, M, B, I, O, 1, H, C, F, 3, N
a. + b.	G, 2, E, K, D, L, 1, O, H, C, A, M, B, I, N, 3, F
b. + c.	B, I, O, 1, H, C, F, 3, N, G, E, 2, K, D, L, A, M
c. + d.	2, G, D, K, O, N, A, L, E, 3, F, C, H, 1, I, B, M
d. + e.	3, F, C, H, 1, I, B, M, A, L, D, K, O, N, 2, G, E

23. The key stratigraphic principle that you used to date geologic items K, D, L, A, M, B and I?

a.	Superposition
b.	Original horizontality
c.	Inclusion
d.	Cross-cutting

24. The key stratigraphic principle that you used to date geologic items 1, 2, 3, E, N, and O?

a.	Original horizontality
b.	Superposition
c.	Cross-cutting Inclusion
d.	Inclusion

25. The type of unconformity lying directly beneath layer H, in the region to the left of fault 3?

a.	Angular unconformity
b.	Disconformity
c.	Nonconformity
d.	Misconformity
e.	Angular incomformity

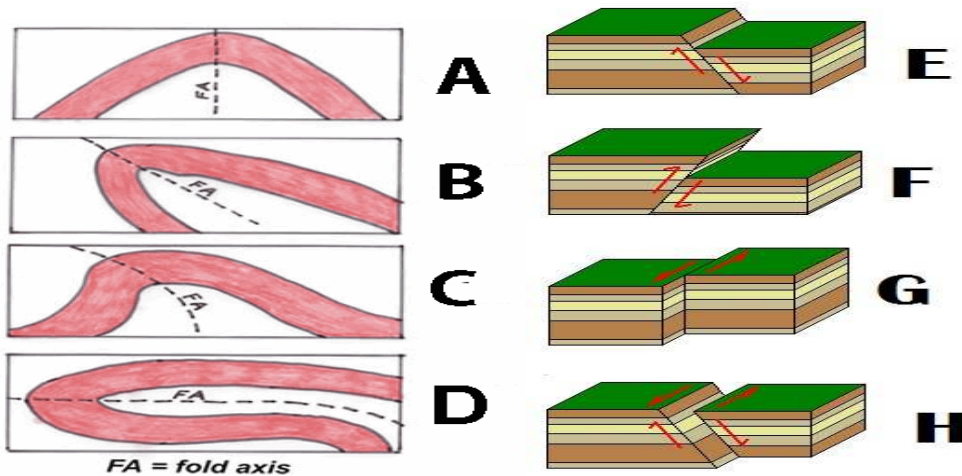
26. When did the folding event occur?

a.	After Formation H, but before Intrusion N
b.	After Fault 1, but before Intrusion O
c.	After Formation I, but before Formation H
d.	After Formation G, but before Formation I
e.	After Intrusion N, but before Fault 3

Section III. Structural Geology

Directions: Match the geologic feature (Capital Letter) with its associated geologic term (small-case letter(s)). Note: For answers with two letters, bubble in two letters as a single answer.

- | | |
|--------------------|---------------------------|
| a. Recumbent fold | a. + b. Strike-slip fault |
| b. Reverse fault | b. + c. Asymmetrical fold |
| c. Overturned fold | c. + d. Oblique fault |
| d. Normal fault | d. + e. Symmetrical fold |



- ___ 27. Feature A
- ___ 28. Feature B
- ___ 29. Feature C
- ___ 30. Feature D
- ___ 31. Feature E
- ___ 32. Feature F
- ___ 33. Feature G
- ___ 34. Feature H

- ___ 35. Feature I
- ___ 36. Feature J
- ___ 37. Feature K
- ___ 38. Feature L
- ___ 39. Feature M
- ___ 40. Feature N

Part IV. Determining Strike and Dip

Directions: Use the Compass and Inclinator, provided by your instructor, to determine the strike and dip of an inclined board that are setup in the classroom. **Note:** Use the boards labeled “A” , “B” and “C” for your measurement.

41. What is the strike of the inclined board labeled “A”?

a.	NE-SW - closer to N-S than E-W
b.	NE-SW - closer to W-E than N-S
c.	NW-SE - closer to N-S than E-W
d.	NW-SE - closer to W-E than N-S

42. What is the dip of the inclined board labeled “A”?

a.	Dipping at a high angle to the West
b.	Dipping at a low angle to the West
c.	Dipping at a high angle to the East
d.	Dipping at a low angle to the East

43. What is the strike of the inclined board labeled “B”?

a.	NE-SW - closer to N-S than E-W
b.	NE-SW - closer to W-E than N-S
c.	NW-SE - closer to N-S than E-W
d.	NW-SE - closer to W-E than N-S

44. What is the dip of the inclined board labeled “B”?

a.	Dipping at a high angle to the West
b.	Dipping at a low angle to the West
c.	Dipping at a high angle to the East
d.	Dipping at a low angle to the East

45. What is the strike of the inclined board labeled “A”?

a.	NE-SW - closer to N-S than E-W
b.	NE-SW - closer to W-E than N-S
c.	NW-SE - closer to N-S than E-W
d.	NW-SE - closer to W-E than N-S

46. What is the dip of the inclined board labeled “A”?

a.	Dipping at a high angle to the West
b.	Dipping at a low angle to the West
c.	Dipping at a high angle to the East
d.	Dipping at a low angle to the East

Part V. Southern Inyo Mountains Geology Map Analysis

Directions: Study the geology map of the Southern Inyo Mountains region, including the cross-sections and map explanation. The following questions (47 to 39) pertain to the geology of this mapped region. Choose the answer that best completes the statement or answers the question.

47. The verbal scale is 1 inch of map equals _____mile(s) of real ground.

- a. exactly two miles
- b. exactly one mile
- c. 0.4 mile
- d. 0.2 mile

48. The contour interval is _____ feet.

- a. 100
- b. 80
- c. 60
- d. 40
- e. 20

49. The topographic elevations across this region vary roughly from _____ feet to _____ feet.

- a. Sea level; 3000
- b. 1000; 5000
- c. 2000; 6000
- d. 4000; 8000
- e. 5000; 10,000

50. The width (West to East) across this mapped region is roughly _____ miles (wide).

- a. 52
- b. 39
- c. 25
- d. 14
- e. 6

51. Which direction does the extensive alluvial fan on the west side of the Inyo Mountains dip?

- a. Eastward
- b. Westward
- c. Depends on what time of the year.
- d. No such alluvial fan on this map

52. What is the *oldest* mapped rock formation?

- a. Inyo Mountain Volcanic Complex
- b. Owens Valley Group
- c. Eureka Quartzite
- d. Hunter Mountain Quartz Monzonite
- e. Rest Spring Shale

53. What is the *age of the Fanglomerate*?

- a. Quaternary
- b. Tertiary
- c. Cretaceous
- d. Jurassic
- e. Triassic

54. What is the *age of the Intrusive Rocks and Veins*?

- a. Cenozoic
- b. Mesozoic
- c. Paleozoic
- d. Younger Precambrian
- e. Older Precambrian

55. Which formation (group) consists mostly of Permian-age limestone?

- a. Intrusive Rocks and Veins
- b. Inyo Mountain Complex?
- c. Union Wash Formation
- d. Owens Valley Group
- e. Keeler Canyon Formation

56. What is the most common listed **SEDIMENTARY** rock type that are listed in the map explanation?
- Shale
 - Sandstone
 - Limestone
 - Conglomerate
 - Siltstone
57. Which general rock type formed in this region during the Jurassic Period?
- Igneous
 - Sedimentary
 - Metamorphic
 - All three types
 - No rocks found here with a Jurassic age.
58. During which Era did most of the **SEDIMENTARY** rock formations form?
- Cenozoic
 - Mesozoic
 - Paleozoic
 - Younger Precambrian
 - Older Precambrian
59. Which *of following* rock formations appears to be the thickest on this map? Hint: Check the geologic cross-sections.
- Rest Spring Shale
 - Santa Rosa Hills Limestone
 - Union Wash Formation
 - Lost Burro Formation
 - Eureka Quartzite
60. What type of fold is mapped between the in the eastern region of the map? Hint: Check the geologic cross-sections.
- Syncline
 - Anticline
 - There is no folded rock in the eastern region of this map
61. What is the general strike of most of the fold axes across the map?
- North-South
 - Northwest-Southeast
 - West-East
 - Northeast-Southwest
 - Fold axes strikes in all sorts of crazy directions
62. The Flagstaff Thrust Fault dips in which general direction?
- East
 - West
 - It's vertical
 - It's horizontal
63. Where are the largest exposures of basalt on this map?
- Northern part of map
 - Southern part of map
 - Western part of map.
 - Eastern part of map
 - Found pretty much everywhere

64. Most of the high-angle faults on this map are _____ faults? Hint: Check the geologic cross-sections!
- normal
 - reverse
 - thrust
 - strike-slip
65. Which group of faults formed first? Thrust or normal faults? Hint: Check the geologic cross-sections.
- Thrust faults first; then normal faults
 - Normal faults first; then thrust faults
 - Both occurs at the exact same time.
66. Which type of faults on this map are most likely related with the folding event? Hint: Check the geologic cross-sections.
- Normal faults
 - Thrust faults
 - Strike slip faults
67. When did the region's folding event most likely occur? Hint: Check the geologic cross-sections
- Cenozoic
 - Mesozoic
 - Paleozoic
 - Precambrian
 - What folding event???
68. What's the likelihood that the period of igneous activity coincides with the folding event?
Hint: Compare rock ages with deformation age.
- Likely
 - Unlikely

Part VI. BATHOLITH-DESERT FIELDTRIP

Directions: Choose answer that best completes the statement or answers questions.

69. What is the inferred tectonic setting for the western zone of the PRB?
- ocean-continent subduction system
 - ocean-ocean subduction system
 - mid-ocean ridge system
 - continent-continent collision system
 - continental transform system
70. What is the inferred tectonic setting for the eastern zone of the PRB?
- ocean-continent subduction system
 - ocean-ocean subduction system
 - mid-ocean ridge system
 - continent-continent collision system
 - continental transform system
71. Which of the following rock types is abundant in the western zone of the PRB, but virtually absent in the eastern zone of PRB?
- Granite
 - Granodiorite
 - Tonalite
 - Gabbro
 - Pegmatites

- 72. Why is there so much hornblende (a water-rich mineral) in the gabbroic rocks of the PRB?**
- Weathering changes pyroxene to hornblende
 - Mid-ocean ridge gabbros hydrated by sea water.
 - Ancient seawater released by down-going slab incorporates into subduction zone magmas.
 - PRB magmas poor in water
 - Hey, wait, the PRB gabbros have little to no hornblende!
- 73. What is the most likely reason why the subduction stage was followed by a period of great crustal extension in Southern California (prior to the development of the San Andreas Fault system)?**
- Collision between an PRB island arc and edge of North America
 - Subduction angle suddenly steepens
 - Excessive release of seawater in down-going slab in subduction zone.
 - Spreading center encounters the subduction zone
 - Hey, wait, there never was a period of extension in Southern California!
- 74. Basin-and-Range-style geography in the Western Salton Trough is due to what tectonic process?**
- Crustal compression and shortening
 - Crustal tension and extension
 - Transform faulting
 - Volcanism
 - Hot spot
- 75. What sort of crustal condition occurs where an active right-lateral fault has a left-jogging kink?**
- Transtension (transform shear with extension)
 - Transpression (transform shear with compression)
 - Simple transform shear
 - Simple extension
 - Simple compression
- 76. Which of the following chronologic lists of geologic events correctly describes the geologic history of the observed rocks and structures in Canyon Sin Nombre? First item is oldest, last is youngest.**
- Meta rock protoliths - Igneous intrusions - Graben sedimentary rocks - Transpression faulting
 - Igneous intrusions - Meta rock protoliths - Graben sedimentary rocks - Transpression faulting
 - Graben sedimentary rocks - Transpression faulting - Meta rock protoliths - Igneous intrusions
 - Transpression faulting - Meta rock protoliths - Igneous intrusions - Graben sedimentary rocks
 - Meta rock protoliths - Graben sedimentary rocks - Igneous intrusions - Transpression fault

Part VII. – Tourmaline Beach Geology – True-False and Multiple Choice

True or False: *Answer true or false to the following statements. Mark "a" for True and "b" for False on your scantron.*

- 77. T/F** The exotic Poway clasts are basaltic in composition.
- 78. T/F** The "cut-and-fill" river channel deposits are found in the fossil-rich Mount Soledad Formation.
- 79. T/F** The Scripps Formation was deposited in a shoreline (beach) environment.
- 80. T/F** Parts of the San Diego Formation layers have abundant trilobite and brachiopod fossils.
- 81. T/F** The San Diego Formation has soft-sediment deformation in the turbidite layers and gypsum veins.
- 82. T/F** The Cretaceous-age Cabrillo Formation DOES NOT contain exotic Poway clasts.

Multiple Choice: *Identify the letter of choice that BEST completes the statement or answers the question.*

- 83. What is the correct order (OLDEST TO YOUNGEST) for the rock formations at Tourmaline Beach?**
- San Diego; Mt. Soledad; Scripps; Cabrillo; Bay Point
 - Scripps; Cabrillo; Bay Point; San Diego; Mt. Soledad
 - Scripps; Mt. Soledad; Cabrillo; Bay Point; San Diego
 - Cabrillo; Mt. Soledad; Bay Point; San Diego; Scripps
 - Cabrillo; Mt. Soledad; Scripps; San Diego; Bay Point

- 84. The Scripps Formation was originally formed in what kind of depositional environment?**
- Low-energy shallow offshore shelf
 - High-energy open-ocean beach
 - High-energy mouth of submarine canyon
 - Low-energy submarine canyon fan
 - Low-energy lagoon
- 85. The locally-active, right-lateral, strike-slip Rose Canyon Fault has a left-jogging kink where it runs through Mount Soledad. Does the Tourmaline Beach fault movement appear related to the type of stress that would occur along the kinked section of this fault? What kind of stress?**
- Yes – they seem related! Fault and kink both under tensional stress.
 - Yes – they seem related! Fault and kink both under compressional stress.
 - No they don't seem to compliment! Fault had compressional stress; kink under tensional stress.
 - No they don't seem to compliment! Fault under tensional stress; kink under compressional stress.
- 86. The cut-and-fill channel deposits of the Mount Soledad Formation is good evidence for what sort of depositional environment?**
- River delta, tidal channel, or upper submarine canyon
 - Deep sea submarine canyon fan
 - Shallow continental shelf
 - Lagoon or estuary
 - Lake bottom