

Name:

Class:

Grade:

GEOL101 Laboratory - Preparatory Lab for Midterm Exam

Introduction & Purpose: In this lab you will review and improve upon the geologic concepts and skills covered in the first half of this geology laboratory course. The purpose of this laboratory is to best prepare for the laboratory midterm exam that you will be taking next week. This worksheet is designed to simulate the midterm exam material and format. Grade yourself when you are finished.

Part I. ISOSTASY: *MODELING CRUSTAL BUOYANCY WITH THE MANTLE*

Directions: The following set of questions pertains to a wood block floating in the water bath. Use the principles of isostasy and the density of pure water to answer the questions below. *Identify the letter of choice that BEST completes the statement or answers the question.*

- 1. Which of the following densities is closest to that of Block A? If density between two choices, choose higher**
 - a. Greater than 0.8 g/cm³
 - b. Between 0.8 and 0.6 g/cm³
 - c. Between 0.6 and 0.3 g/cm³
 - d. 0.3 g/cm³ or less
- 2. Imagine if Block A was twice as thick as its present thickness. The thicker Block A would _____, compared to thinner Block A.**
 - a. extend *higher* out of the water.
 - b. extend *lower* into the water.
 - c. still have the same percentages out and in the water as the thinner block.
 - d. All of the above would be true.
 - e. Both b. and c. are true
- 3. Imagine if Block A was twice as dense as its present density. The denser Block A would _____, compared to less dense Block A.**
 - a. extend *higher* out of the water.
 - b. extend *lower* into the water.
 - c. still have the same percentages out and in the water as the thinner block.
 - d. Both b. and c. are true
- 4. If the top 1/4 of Block A's thickness were removed, Block A would _____.**
 - a. rise upward out of the water.
 - b. sink lower into the water
 - c. just sit there - neither rise nor sink.
 - d. start spinning like a top.
- 5. What happens when a continent undergoes a major ice cap-building glacial event?**
 - a. The continent will rise up out of the mantle.
 - b. The continent will sink lower into the mantle.
 - c. The continent will just sit there - neither rise nor sink.
 - d. The continent will begin to move away from the pole toward the equator
- 6. What happens after a major continental mountain building event ends, but heavy erosion continues?**
 - a. The continent will rise up out of the mantle.
 - b. The continent will sink lower into the mantle.
 - c. The continent will just sit there - neither rise nor sink.
 - d. The continent will begin to move away from the pole toward the equator

Part IV. Plate Movement Over a "Fixed" Hotspot - Louisville Seamount Chain Hot Spot Track

Directions: The Louisville Seamount (LS) chain is found in the South Pacific Ocean and is one of the longest seamount chains in the world, rivaling the Emperor Seamount - Hawaiian Island (ES-HI) chain in the North Pacific. Assume that the Louisville Seamount chain was created by a stationary mantle hotspot – like the Hawaiian Island chain that you studied in lab. Below are several questions that address both of these oceanic volcanic chains, in terms of their inferred Pacific Plate movement, direction and speed. Use the Louisville Hot Spot Plate Motion Diagram to calculate the average plate speed and direction of the Pacific Plate.

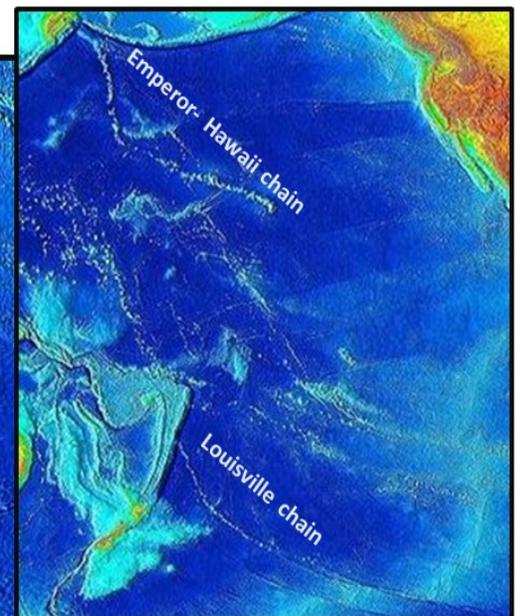
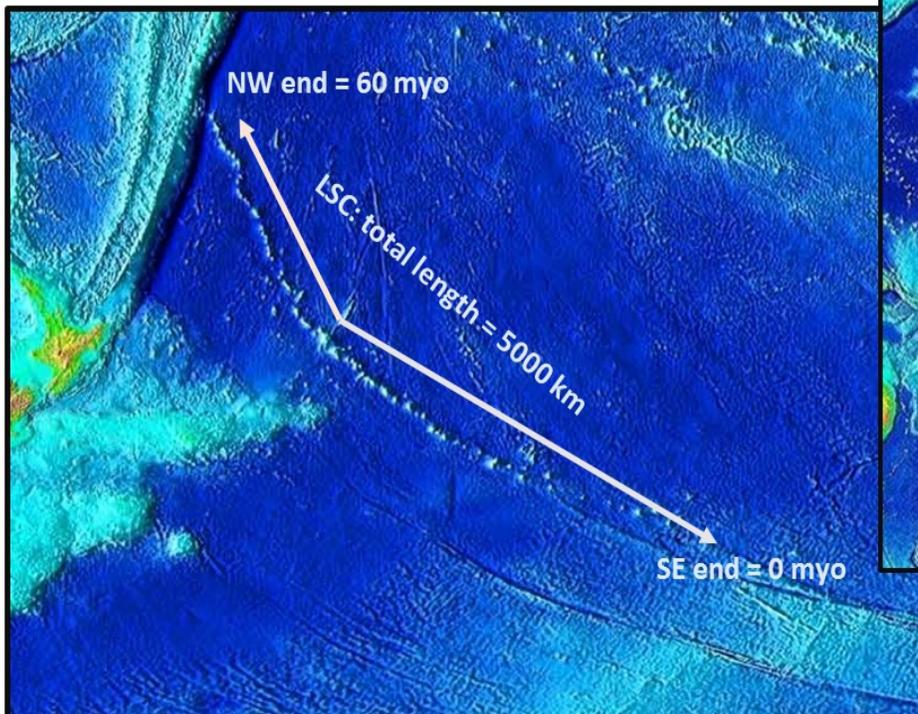
Speed Formula: Speed = distance/time (cm's/year) **Conversion Factor:** 1 km = 100,000 (1×10^5) cm

7. What is **average speed** for the Pacific plate associated with the Louisville Hotspot?
 - a. 10 cm/yr or greater
 - b. Between 6 and 9 cm/yr
 - c. Between 3 and 6 cm/yr
 - d. Between 1 and 3 cm/yr
 - e. Less than 1 cm/yr
8. What's the **average direction** of motion of the Louisville Seamount chain (Pacific plate) over the hot spot?
 - a. North; b. Northeast; c. East; d. Southeast; e. South; a. + b. Northwest; b. + c. Southwest; c. + d. West;
9. How do the LS and ES-HI hot spot tracks compare, based *on* a comparison of hot spot **ages, directions and speeds**, in terms of whether they are on the same plate or on different plates?

The two hot spot traces appear to _____.

- a. be moving on the same tectonic plate.
- b. be moving on different tectonic plates
- c. have formed from the same hot spot.
- d. None of the above.

Louisville Seamount Chain South Pacific



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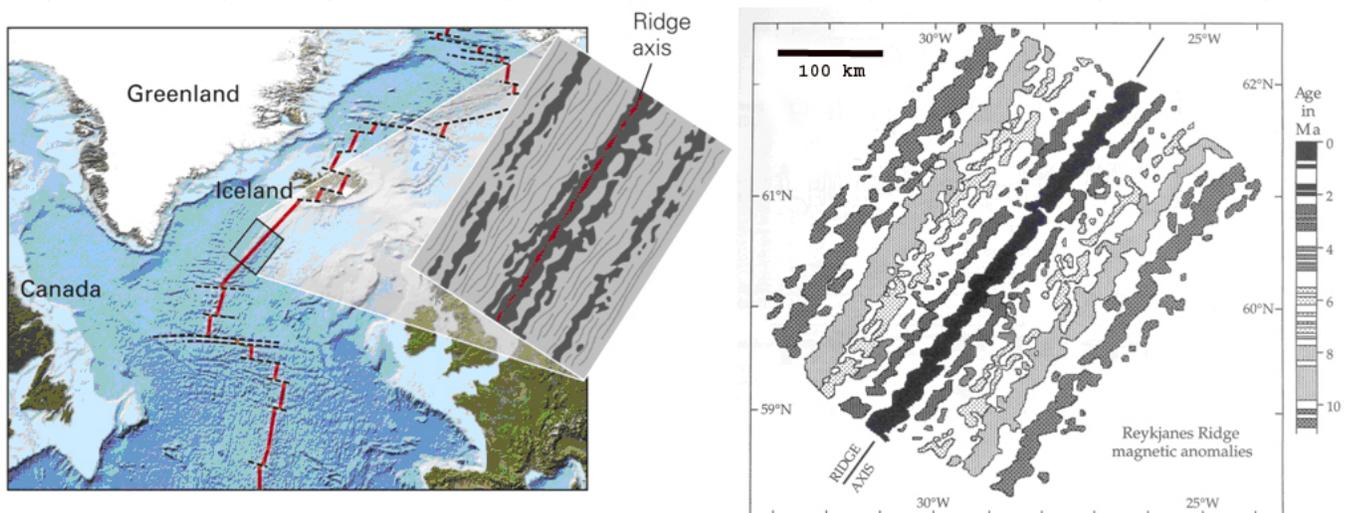
Part IV. North Atlantic Seafloor Spreading Rate – Using Paleomagnetic Seafloor Anomalies

Directions: The North Atlantic mid-ocean ridge is the site of seafloor spreading along the center of the North Atlantic Ocean basin. Absolute age-dated paleomagnetic seafloor anomalies on each side of the ridge axis can be used to determine the direction and average rate of seafloor spreading of the North Atlantic ocean basin. Below are several questions that address seafloor spreading velocities in the North Atlantic for a portion of the ridge south of Iceland. Use the two illustrations that document the paleomagnetic seafloor anomalies below to determine plate motions.

Speed Formula: Speed = distance/time (cm's/year)

Conversion Factors: 1 km = 100,000 (1 x 10⁵) cm

10. What is **average seafloor spreading rate** for the seafloor **EAST of the ridge axis** for the time period between 10 million years ago to today?
- Greater than 10 cm/yr
 - Between 10 and 7 cm/yr
 - Between 7 and 5 cm/yr
 - Between 5 and 2 cm/yr
 - 2 cm/yr or less
11. What is **average seafloor spreading rate** for the seafloor **WEST of the ridge axis** for the time period between 10 million years ago to today?
- Greater than 10 cm/yr
 - Between 10 and 7 cm/yr
 - Between 7 and 5 cm/yr
 - Between 5 and 2 cm/yr
 - 2 cm/yr or less
12. What is the **direction** of seafloor spreading **EAST of the ridge axis?**
- a. North; b. Northeast; c. East; d. Southeast; e. South; a. + b. Northwest; b. + c. Southwest; c. + d. West;
13. What is the **direction** of seafloor spreading **WEST of the ridge axis?**
- a. North; b. Northeast; c. East; d. Southeast; e. South; a. + b. Northwest; b. + c. Southwest; c. + d. West;



14. How do the calculated spreading rates on opposite sides of the ridge axis compare to each other?
- They have roughly the same spreading rates.
 - They have significantly different spreading rates.
15. Based on measured seafloor spreading movement, the seafloor on opposite sides of the ridge axis appear to be _____
- all on the same tectonic plate.
 - on different tectonic plates.
 - No way to telling how many tectonic plate there are.
16. The inferred crustal stress along the ridge axis south of Iceland appears to be _____.
- compressional
 - sheer
 - tensional

17. The ridge axis south of Iceland appears to represent a _____.

- a. the interior of a single plate.
- b. a divergent plate boundary.
- c. a convergent plate boundary.
- d. a transform plate boundary.

PART V. MINERAL & ROCK RECOGNITION

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

Use hand lens,, Microscope and Hardness Test OFTEN!!

SAMPLE SET 1

18. Name this trio of mineral samples (labeled "1A", "1B" and "1C"); not necessarily in respective order.

- a. gypsum, muscovite & biotite; b. tourmaline, quartz & K-spar; c. magnetite, augite & hornblende;
- d. calcite, halite & gypsum; e. plag, K-spar & quartz; a + b. calcite, quartz & plagioclase;
- b + c. augite, hornblende & olivine c + d. tourmaline, quartz & garnet d + e. magnetite, biotite & garnet

19. What is the cleavage direction(s) for sample "1A"?

- a. None; b. 1 direction; c. 2 directions; NOT @ 90°; d. 2 directions; @ 90°;
- e. 3 directions; NOT @ 90°; a + b. 3 directions; @ 90°; b + c. More than 3 directions

20. Give cleavage direction(s) or pattern for sample "1B".

- a. None; b. 1 direction; c. 2 directions; NOT @ 90°; d. 2 directions; @ 90°;
- e. 3 directions; NOT @ 90°; a + b. 3 directions; @ 90°; b + c. More than 3 directions

21. What is the general hardness of these minerals?

- a. all three are soft; b. all three are hard; c. one is soft; the other two are hard
- d. two are soft; the other is hard

22. **ALL THREE** minerals (labeled "1A", "1B" and "1C") are most common in which major rock type?

- a. Igneous; b. Sedimentary; c. Metamorphic

SAMPLE SET 2

23. Name this trio of mineral samples (labeled "2A", "2B" and "2C"); not necessarily in respective order.

- a. gypsum, muscovite & biotite; b. tourmaline, quartz & K-spar; c. magnetite, augite & hornblende;
- d. calcite, halite & gypsum; e. plag, K-spar & quartz; a + b. calcite, quartz & plagioclase;
- b + c. augite, hornblende & olivine a + d. tourmaline, quartz & garnet d + e. magnetite, muscovite & garnet

24. Give cleavage direction(s) or pattern for sample "2B".

- a. None; b. 1 direction; c. 2 directions; NOT @ 90°; d. 2 directions; @ 90°;
- e. 3 directions; NOT @ 90°; a + b. 3 directions; @ 90°; c + d. More than 3 directions

25. Which single physical property allows you to BEST helps to identify mineral "2A"?

- a. color b. cleavage angle; c. hardness; d. fizzes with acid e. luster; a + b. magnetism

26. Which of these minerals is in the "mica" family?

- a. Sample "2A"; b. Sample "2B" c. Sample "2C" d. All three minerals are in the "mica" family.

SAMPLE SET 3

27. Name these three mineral samples (labeled "3A", "3B" and "3C"); not necessarily in respective order.
- a. gypsum, muscovite & biotite; b. tourmaline, quartz & K-spar; c. magnetite, augite & hornblende;
d. calcite, halite & gypsum; e. plag, K-spar & quartz; a + b. calcite, quartz & plagioclase;
b + c. augite, hornblende & olivine c + d. tourmaline, quartz & garnet d + e. magnetite, biotite & garnet
28. What one, single, definitive property sets two of these minerals apart from the third?
- a. luster; b. cleavage (or lack of); c. acid test d. magnetism e. color; a + b. hardness;
29. What is the general hardness of these minerals?
- a. all three are soft; b. all three are hard; c. one is soft; other two are hard d. two are soft; other is hard
30. ALL THREE minerals in Sample Set 3 are very abundant in which of the following rock pairs?
- a. gabbro & basalt; b. granite & rhyolite; c. siltstone & claystone; d. chert & quartzite;
e. limestone & marble; a + b. obsidian and peridotite b + c. None of these pairs

SAMPLE SET 4

31. Name this trio of mineral samples (labeled "4A", "4B" and "4C"); not necessarily in respective order.
- a. gypsum, muscovite & biotite; b. tourmaline, quartz & K-spar; c. magnetite, augite & hornblende;
d. calcite, halite & gypsum; e. plag, K-spar & quartz; a + b. calcite, quartz & plagioclase;
b + c. augite, hornblende & olivine c + d. tourmaline, quartz & garnet d + e. magnetite, biotite & garnet
32. Describe the cleavage pattern for sample "4B".
- a. None; b. 1 direction; c. 2 directions; NOT @ 90°; d. 2 directions; @ 90°;
e. 3 directions; NOT @ 90°; a + b. 3 directions; @ 90°; c + d. More than 3 directions
33. What is the general hardness of these minerals?
- a. all three are soft; b. all three are hard; c. one is soft; other two are hard d. two are soft; other is hard
34. Mineral "4A" is most abundant in which of the following rock pairs?
- a. gabbro & basalt; b. granite & rhyolite; c. siltstone & claystone; d. chert & quartzite;
e. limestone & marble; a + b. obsidian and tuff

SAMPLE SET 5

35. Name these four rock samples (labeled "5A", "5B", "5C" & "5D"), not necessarily in respective order.
- a. sandstone and siltstone; schist and gneiss; b. gabbro and granite; quartzite and marble
c. limestone and chert; diorite and andesite d. schist and gneiss; shale and sandstone
e. granite and gabbro; rhyolite and basalt a + b. sandstone and quartzite; limestone and marble;
b + c. basalt and gabbro; schist and gneiss; c + d. basalt and gabbro; shale and sandstone
36. Name of rock sample "5A"?
- a. breccia; b. marble; c. granite; d. gneiss; e. gabbro; a + b. rhyolite; b + c. sandstone; c + d. basalt
37. Select correct rock classification for samples "5B" and "5D"
- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic

38. Select correct rock classification for samples "5C"

- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic

SAMPLE SET 6

39. Name this trio of rock samples (labeled "6A", "6B" and "6C"), not necessarily in respective order.

- a. sandstone, granite, & chert; b. gabbro, limestone, & granite; c. limestone, schist, & basalt;
d. schist, conglomerate, & gneiss; e. basalt, slate, & gneiss a + b. conglomerate; sandstone, & shale
b + c. marble, granite, & siltstone; c. + d. quartzite, limestone, & diorite; d. + e. slate, schist, & gneiss

40. Solid-state mineralization processes that change parent (protolith) rock into the daughter rock occurs under _____ conditions.

- a. igneous; b. sedimentary c. metamorphic;

41. Select correct rock classification for "Parent" (original protolith) for rock sample "6A".

- a. Extrusive Igneous; b. Intrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a + b. Foliated metamorphic; b + c. Nonfoliated metamorphic

42. Select correct rock classification name for all three of these rock samples.

- a. Extrusive Igneous; b. Intrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a + b. Foliated metamorphic; b + c. Nonfoliated metamorphic

43. Name of rock sample "6B"?

- a. breccia; b. marble; c. gneiss; d. sandstone e. slate; a + b. granite; b + c. schist;
c + d. limestone; d + e. quartzite

SAMPLE SET 7

44. Name this trio of rock samples (labeled "7A", "7B" and "7C"), not necessarily in respective order.

- a. sandstone, granite, and chert; b. gabbro, limestone, and granite; c. limestone, schist, and basalt;
d. schist, conglomerate, & gneiss; e. basalt, slate, & gneiss a + b. conglomerate; sandstone, and shale
b + c. marble, granite, & siltstone; c. + d. quartzite, limestone, & diorite; d. + e. slate, schist, & gneiss

45. Which rock sample is a silici-clastic rock?

- a. Sample "7A"; b. Sample "7B"; c. Sample "7C"; d. All are Silici-clastic e. None of them

46. Which rock sample has the largest amount of clay?

- a. Sample "7A"; b. Sample "7B"; c. Sample "7C"; d. All have the same amount of clay;
e. None have clay

47. Which rock sample most likely has the highest percentage of quartz?

- a. Sample "7A"; b. Sample "7B"; c. Sample "7C"; d. All are quartz rich e. All quartz poor

48. Which rock sample most likely deposited in calm, quiet waters (low-energy environment)?

- a. Sample "7A"; b. Sample "7B"; c. Sample "7C"; d. None of them e. No way to tell

SAMPLE SET 8

49. Name these four rock samples (labeled "8A", "8B", "8C" & "8D"), not necessarily in respective order.
- a. sandstone and siltstone; schist and gneiss; b. gabbro and granite; quartzite and marble
 - c. limestone and chert; diorite and andesite d. schist and gneiss; shale and sandstone
 - e. granite and gabbro; rhyolite and basalt a + b. sandstone and siltstone; breccia and conglomerate;
 - b + c. basalt and gabbro; schist and gneiss; c. + d. basalt and gabbro; shale and sandstone
50. Name of rock sample "8A"?
- a. breccia; b. marble; c. granite; d. gneiss; e. gabbro; a + b. rhyolite; b + c. sandstone; c + d. basalt
51. Select correct rock classification for samples "8A" and "8B"
- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
 - e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic
52. Select correct rock classification for samples "8C" and "8D"
- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
 - e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic
53. Cooling history of the *magma* of Samples "8A" and "8B" is inferred to be relatively _____, whereas the cooling history of the *magma* of Samples "8C" and "8D" is inferred to be relatively _____.
- a. slow (1st blank); fast (2nd blank) b. fast (1st blank); slow (2nd blank) c. all four slow d. all four fast
54. Rock Sample "8A" most likely formed at which one of the three major plate boundary settings?
- a. Convergent; b. Divergent; c. Transform

SAMPLE SET 9

55. Name these four rock samples (labeled "9A", "9B", "9C" & "9D"), not necessarily in respective order.
- a. basalt and gabbro; schist and gneiss; b. gabbro and granite; quartzite and marble
 - c. limestone and chert; diorite and andesite d. schist and gneiss; shale and sandstone
 - e. granite and gabbro; rhyolite and basalt a + b. sandstone and quartzite; limestone and marble;
 - b + c. sandstone and siltstone; schist and gneiss; c. + d. basalt and gabbro; shale and sandstone
56. Name of rock sample "9D"?
- a. breccia; b. marble; c. granite; d. gneiss; e. gabbro; a + b. rhyolite; b + c. sandstone;
 - c + d. basalt
57. Select correct rock classification for samples "9A" and "9B".
- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
 - e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic
58. Select correct rock classification for samples "9C" and "9D".
- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
 - e. Biochemical sedimentary; a + b. Foliated metamorphic; c + d. Nonfoliated metamorphic

59. Most likely protolith (parent) of rock for sample "9C"?

- a. basalt; b. limestone; c. mudstone; d. chert; e. gabbro; a+ b. rhyolite; b+ c. sandstone;

SAMPLE SET 10

60. Name the four rock samples (labeled "10A", "10B", "10C" & "10D"), not necessarily in respective order.

- a. sandstone and siltstone; schist and gneiss; b. basalt and gabbro; limestone and slate;
c. limestone and chert; diorite and andesite; d. schist and gneiss; shale and sandstone;
e. granite and gabbro; rhyolite and basalt; a + b. sandstone and quartzite; limestone and marble;
b + c. diorite and granite; quartzite and marble; c + d. basalt and gabbro; shale and sandstone

61. Name of rock sample "10A"?

- a. breccia; b. basalt; c. granite; d. gneiss; e. gabbro; a+ b. rhyolite; b+ c. sandstone; c+ d. marble

62. Select correct rock classification for sample "10B".

- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a+ b. Foliated metamorphic; c+ d. Nonfoliated metamorphic

63. Select correct rock classification for samples "10D".

- a. Intrusive Igneous; b. Extrusive Igneous; c. Detrital sedimentary; d. Chemical sedimentary;
e. Biochemical sedimentary; a+ b. Foliated metamorphic; c+ d. Nonfoliated metamorphic

64. Most likely protolith (parent) of rock for sample "10D"?

- a. basalt; b. limestone; c. mudstone; d. chert; e. gabbro; a+ b. andesite; b+ c. sandstone;

END of PRACTICE TEST