

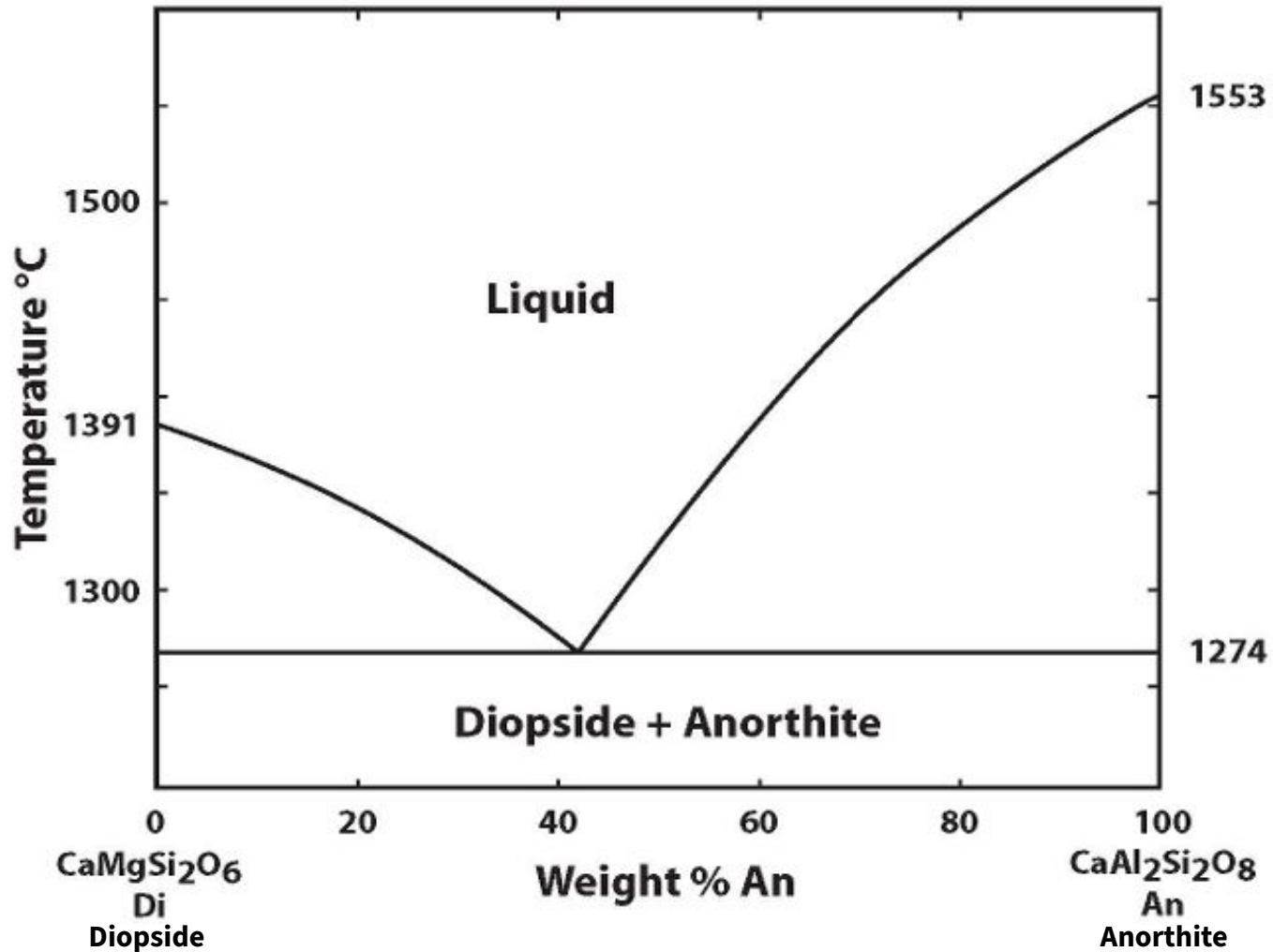
Station 1

1. Identify the **rock**.
2. Give an identifying feature of specimen 1.
3. Identify the **rock**.
4. Give an identifying feature of specimen 3.

Using the phase diagram, answer the following questions. The peritectic is the point where the melt remains liquid at the lowest temperature possible.

5. Approximate the composition at the peritectic in terms of diopside (% Di).
6. Based on your answer to 5, explain what igneous rock shares a similar composition.
7. Assume the starting rock is mostly plagioclase/anorthite. How might the rock from question 6 be formed?

Station 1



Note: Diopside (Di) is a pyroxene and anorthite (An) is a feldspar. For the purposes of this station, you can treat “diopside” to be any pyroxene and “anorthite” to mean any feldspar.

Station 2

8. Identify the **mineral**.

9. Give an identifying feature of specimen 8.

10. Identify the **mineral**.

11. Give an identifying feature of specimen 10.

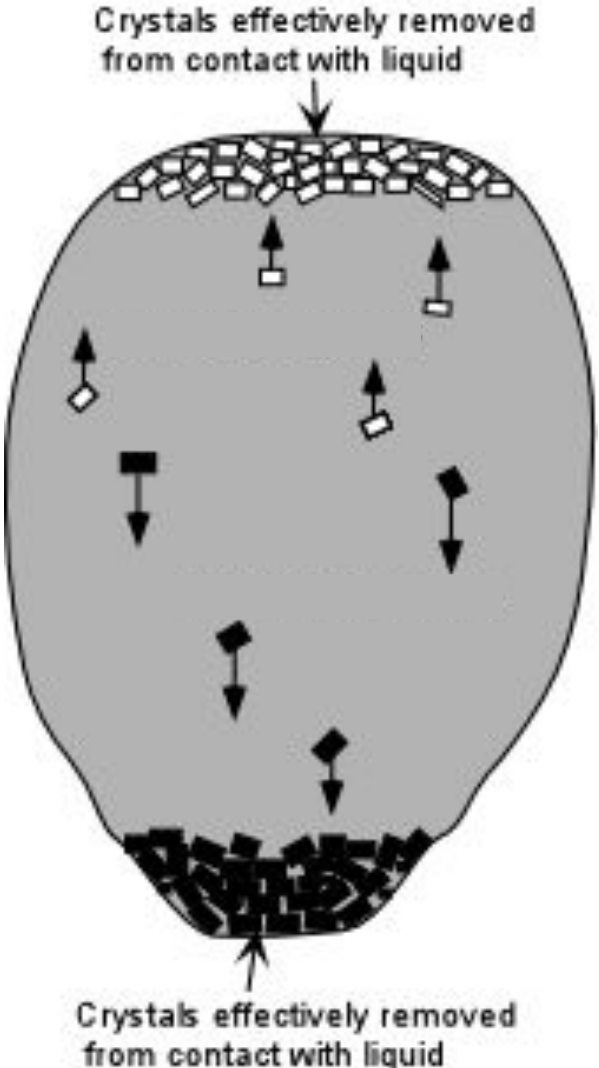
Use the diagram to answer the following questions.

12. Layered igneous intrusions are an important source for ores such as chromite. Chromite shares some similar physical properties to specimen 8. An igneous melt is approximated at a large scale to have similar density to specimen 10. As chromite crystallizes in an igneous body, is it better represented by the **dark** crystals (bottom) or **light** crystals (top)?

13. What process best describes what is happening in the diagram?

A. Intrusion **B.** Partial Melting **C.** Crystallization **D.** Magmatic Differentiation

Station 2



Station 3

14. Identify the **rock**.

15. Give an identifying feature of specimen 14.

16. Identify the **rock**.

17. Give an identifying feature of specimen 16.

18. Where/how did Specimen 14 most likely form?

A. Ejected from volcano **B.** Lava flow **C.** Batholith **D.** Sill

19. What was the relative speed at which specimen 16 was cooled?

20. Explain your answer to 19.

21. If specimen 16 was cooled extremely quickly, what rock would form?

Station 4

22. Identify the **rock**.

23. Give an identifying feature of specimen 22.

24. Identify the **rock**.

25. Give an identifying feature of specimen 24.

26. Is specimen 22 considered **ultramafic**, **mafic**, **intermediate**, or **felsic**?

27. What textural term best describes specimen 24?

A. Vesicular **B.** Fine-grained **C.** Large-grained **D.** Frothy

Station 5

28. Identify the **rock**.

29. Give an identifying feature of specimen 28.

30. Identify the **rock**.

31. Give an identifying feature of specimen 30.

32. Would you rather try and outrun a lava flow that is similar in composition to **komatiite** or one that is similar in composition to **28**? Hint: think about their relative viscosities.

33. Would melt of similar composition to specimen **28** or specimen **30** be more likely to cause an explosive volcanic eruption?

Station 6

34. Identify the **rock**.

35. Give an identifying feature of specimen 34.

36. Identify the **rock**.

37. Give an identifying feature of specimen 36.

38. Which mineral is unlikely to found in specimen 36?

A. Plagioclase Feldspar **B.** Chlorite **C.** Muscovite **D.** Garnet (almandine)

39. Which of the following best describes the cause of alignment of mineral grains in specimens 34 and 36?

A. Bedding Planes

B. Flow Banding

C. Deviatoric Stress

D. Faulting (slickensides)

Station 7

40. Identify the **rock**.

41. Give an identifying feature of specimen 40.

42. Identify the **rock**.

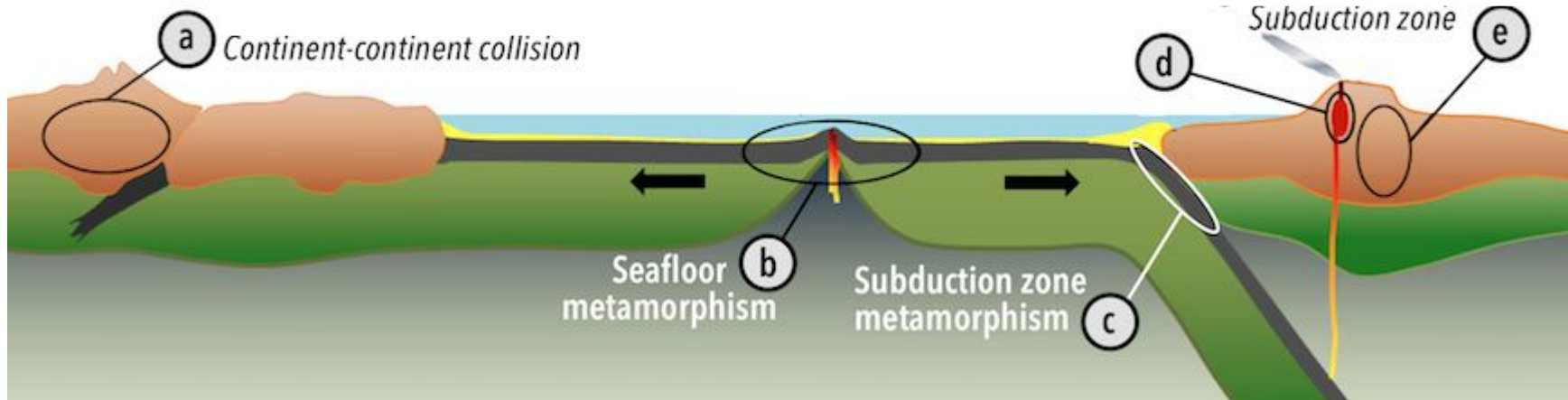
43. Give an identifying feature of specimen 42.

44. Looking at the diagram, which environment is closest to the conditions that would form specimen 40?

A. B. C. D. E.

45. What is the protolith (original rock) of specimen 42?

Station 7



Station 8

46. Identify the **rock**.

47. Give an identifying feature of specimen 46.

48. Identify the **mineral**.

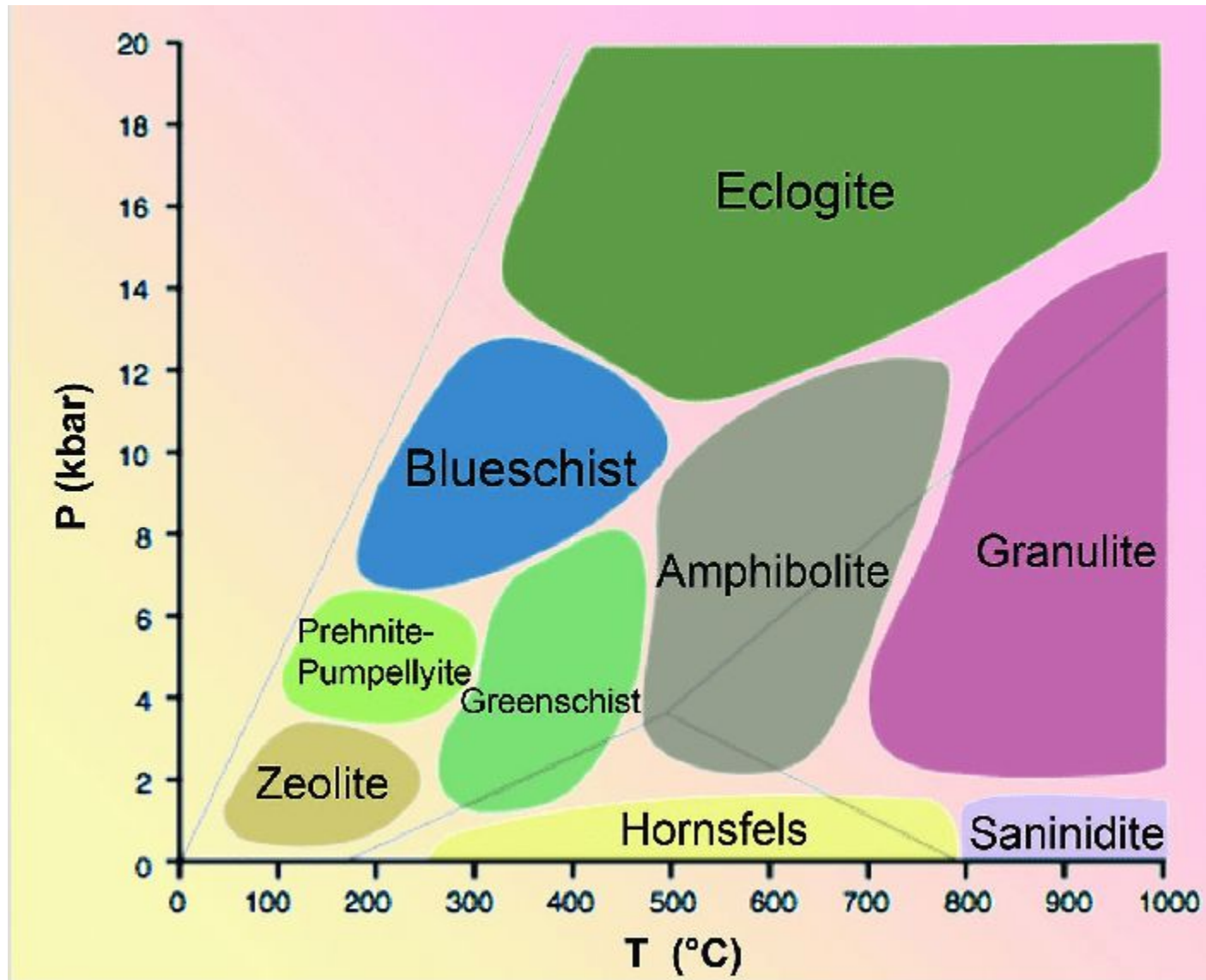
49. Give an identifying feature of specimen 48.

Use the metamorphic facies diagram to answer the following questions.

50. Based on the conditions that **hornfels** forms under, describe how the texture of a rock belonging to the hornfels facies would be expected to look. Why?

51. A rock is found to be almost entirely chlorite with small (~1mm) grains. It appears to be foliated. What facies does it most likely belong to?

Station 8



Station 9

52. Identify the **mineral**.

53. Give an identifying feature of specimen 52.

54. Identify the **rock** shown in the image.

55. Give an identifying feature of specimen 54.

56. Under which of the following sets of conditions would you expect specimen 52 to form in?

- A. Low pressure, low temperature
- B. Low pressure, high temperature
- C. High pressure, high temperature
- D. Plutonic igneous (from a melt)

Station 9

54



Station 10

Use the two images to answer the following two questions. Both images are thin sections of metamorphic rocks. Focus on the texture/arrangement of the grains.

57. Which image, **A** or **B**, is more likely to be considered a schist?

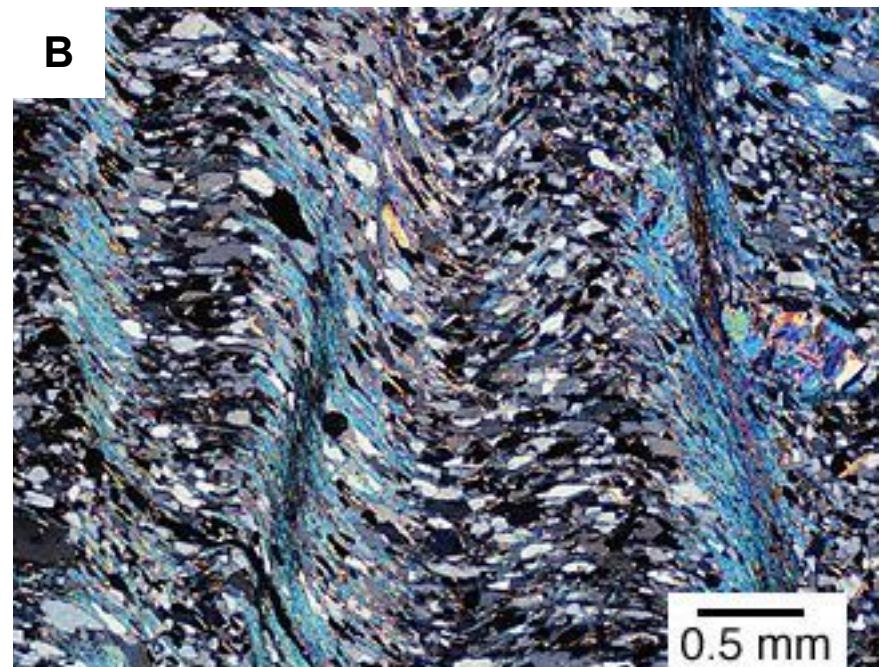
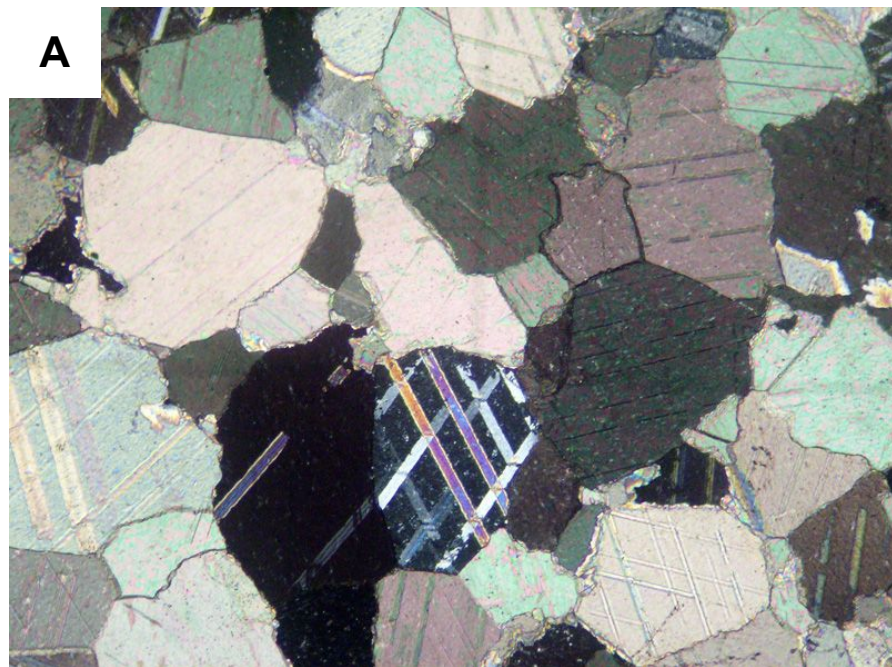
58. Explain your answer to 57.

59. A marble is found to contain diopside, a calcium magnesium silicate. Which counselor has the best explanation for the rock's history?

- A. Yuchen says that the rock used to be a high-purity dolostone/limestone.
- B. Chloe agrees, but thinks the rock was later altered to form the diopside.
- C. Emmy believes it was a carbonate with sand or clay grains mixed in.
- D. Peter disagrees with everyone and thinks it began as a Ca-rich igneous rock (anorthosite).

60. Explain your answer to 59.

Station 10



Station 11

61. Identify the **rock**.

62. Give an identifying feature of specimen 61.

63. Identify the **rock**.

64. Give an identifying feature of specimen 63.

Use the diagram to answer the following questions.

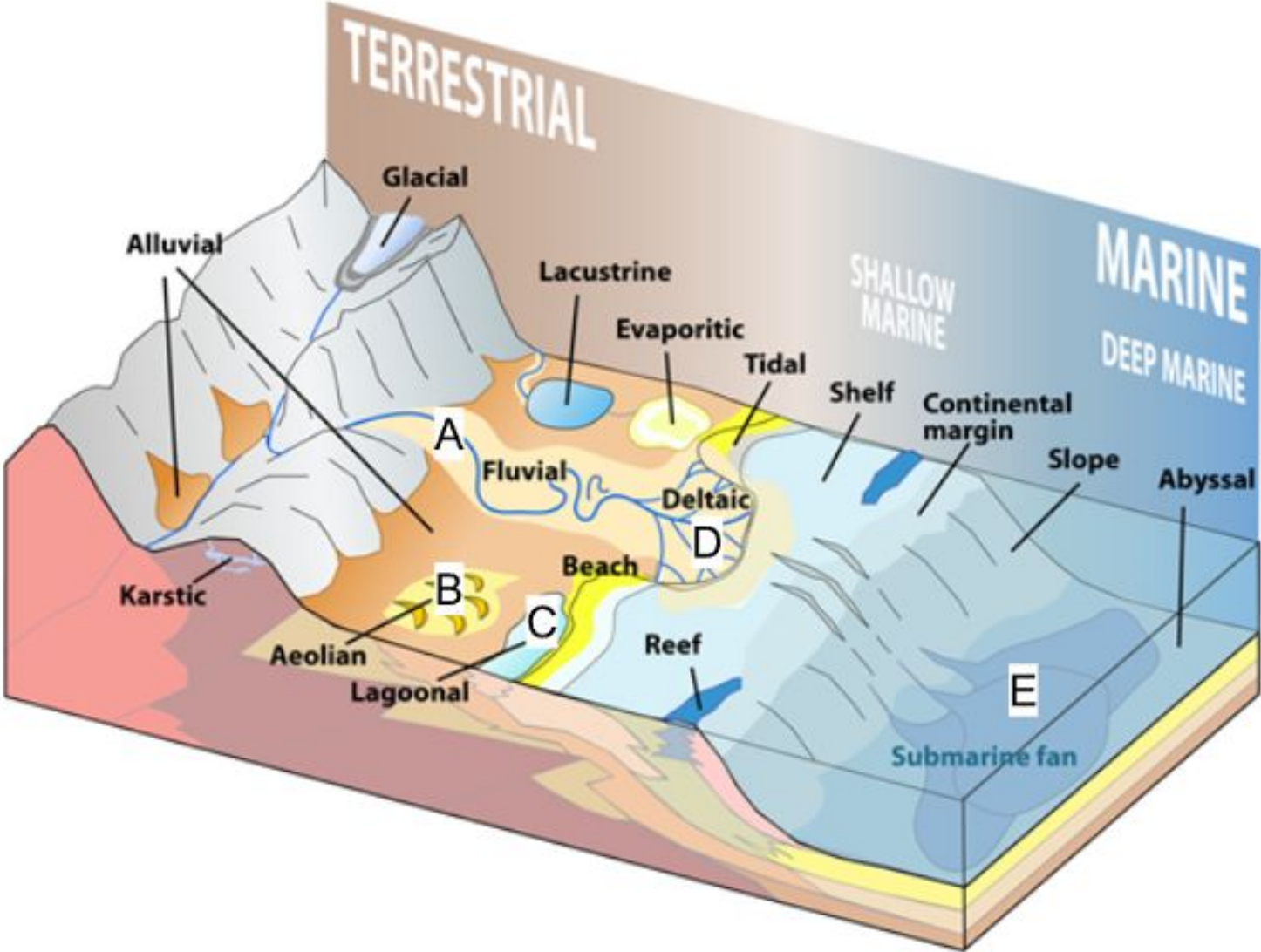
65. Which environment of deposition is most likely indicated by specimen 63?

A. B. C. D. E.

66. Which environment of deposition is most associated with greywacke?

A. B. C. D. E.

Station 11



Station 12

67. Identify the **rock**.

68. Give an identifying feature of specimen 67.

69. Identify the **rock**.

70. Give an identifying feature of specimen 69.

71. An outcrop shows rock similar to specimen 67 at the base that grades into a dark, fine-grained rock that effervesces with HCl at the top. What does this indicate about the environment of deposition? Hint: think about sea levels.

72. Explain your answer to 71.

Station 13

73. Identify the **rock**.

74. Give an identifying feature of specimen 73.

75. Identify the **rock**.

76. Give an identifying feature of specimen 75.

77. What is true about **both** specimens?

- A. They formed in marine environments.
- B. They formed in terrestrial environments.
- C. They formed in low energy environments.
- D. They formed in high energy environments.
- E. None of the above.

Station 14

78. Identify the **mineral**.

79. Give an identifying feature of specimen 78.

80. Identify the **mineral**.

81. Give an identifying feature of specimen 80.

82. What is true about both specimens?

- A. They can be found in evaporite deposits.
- B. They are defining minerals on the Mohs scale.
- C. They can scratch calcite.
- D. They are very water soluble.

Station 15

83. Identify the **mineral**.

84. Identify the **mineral**.

85. Which of the following tests/properties would be the best way to differentiate these two minerals?

A. Streak **B.** Heft **C.** Scratch test with glass **D.** Cleavage

86. Which mineral family is most likely to react with HCl?

- A. Silicates
- B. Carbonates
- C. Oxides
- D. Sulfates
- E. Halides

87. What two mineral families (other than Native Elements) are the most likely to have a metallic luster?

Station 16

88. Identify the **mineral**.

89. Give an identifying feature of specimen 88.

90. Identify the **mineral**.

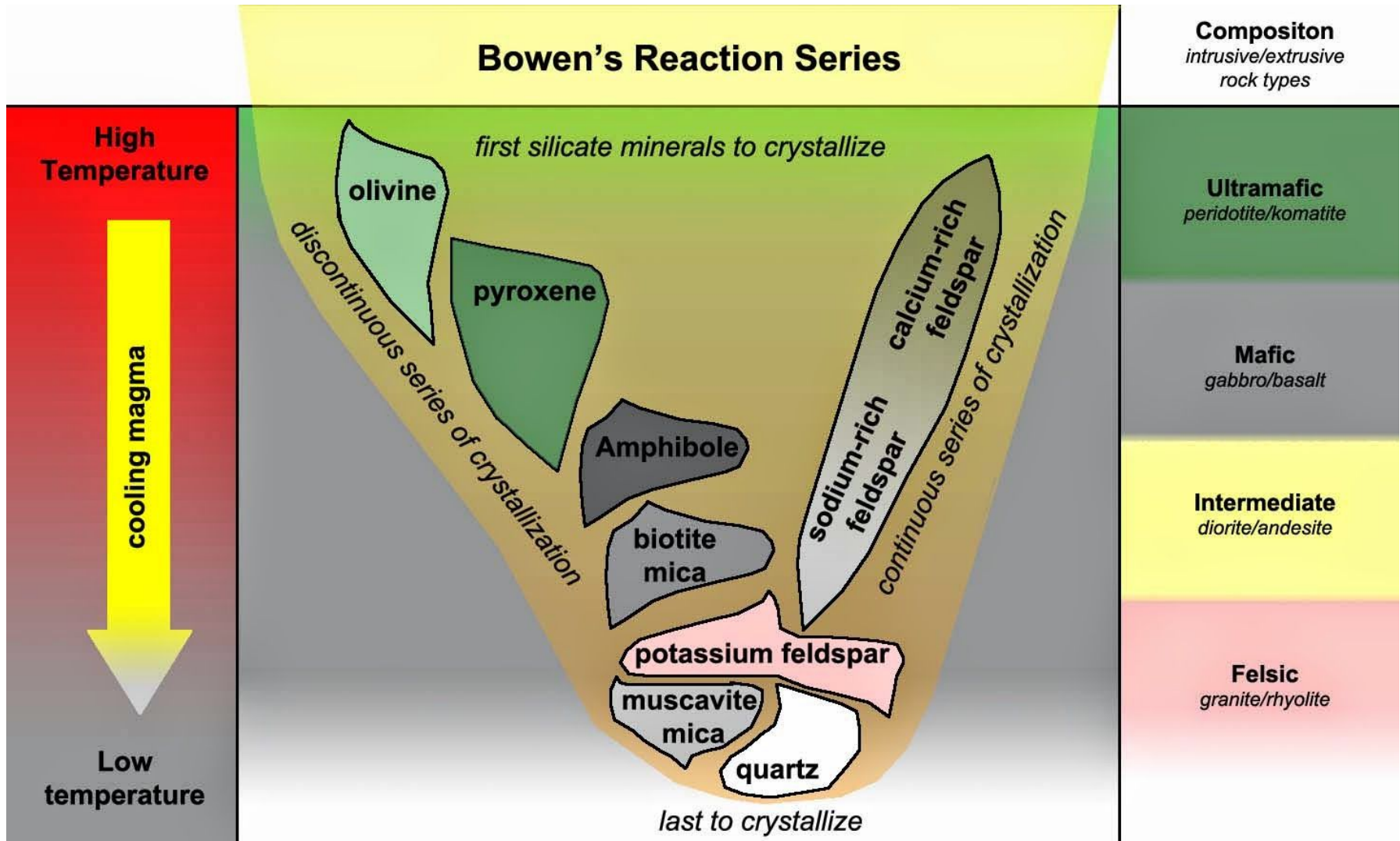
91. What crystal system does specimen 88 belong to?

92. What is the hardness of specimen 90?

Station 17

93. Using Bowen's reaction series (or other knowledge) briefly explain why quartz and olivine are rarely found in the same rock. (2 pts)
94. Lava with a higher silica (SiO_2) content tends to be more viscous. Provide one reason why increasing SiO_2 may increase viscosity of a melt. (2 pts)
95. On the discontinuous series of Bowen's reaction series, the resistance to chemical weathering increases from olivine to quartz. Briefly explain why. (2 pts)

Station 17



Station 18

96. Identify the **mineral**.

97. Give an identifying feature of specimen 96.

98. Identify the **mineral**.

99. What color streak does specimen 98 exhibit?

100. Based on the crystal system of specimen 98, which of the following habits could it **NOT** have under normal circumstances?

- A. Cubic
- B. Dodecahedral
- C. Massive
- D. Rhombohedral
- E. Octahedral

Station 19

101. Identify the **mineral**.

102. Give an identifying feature of specimen 96.

103. Identify the **mineral**.

104. Identify the **mineral**.

105. What rock type is specimen 101 **least** likely to be found in?

A. Igneous **B.** Metamorphic **C.** Sedimentary

106. Which mineral is specimen 103 least likely to be associated with?

A. Calcite **B.** Muscovite **C.** Beryl **D.** Feldspar

Station 20

USES0 alumni are doing field work and found some rocks and minerals they could not identify. Using their descriptions, identify the rock/mineral.

107. Rohit - A light grey rock with small, spherical ~1mm grains. Reacts strongly to HCl. Not fossiliferous.

108. Brian - Mineral found in an igneous outcrop. Black in color, cleavage in two directions at ~120/60°. Broken surfaces look “glittery.”

109. David - Thinly laminated and fissile rock with clay-sized grains. Beds slightly wavy. Pyrite nodules found sparingly. Does not effervesce with HCl.

110. Jaime - Cluster of orange/peach-tinted, pseudo-hexagonal crystals. Reacts strongly with HCl. Does not scratch glass. Nonmagnetic.