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CHAPTER 5 STUDY GUIDE

Igneous Rocks

SECTION 5.1 *What are igneous rocks?*

In your textbook, read about the nature of igneous rocks.
Use each of the terms below just once to complete the following statements.

A) **basaltic** B) **igneous rock** C) **rhyolitic**
D) **lava** E) **magma**

1. Molten rock inside Earth's crust is called _____.

2. A(n) _____ is formed from the crystallization of magma.

3. Magma that flows out onto Earth's surface is called _____.

4. Magma that has a low silica content is called _____.

5. _____ magma has the highest silica content .

In your textbook, read about the composition and origins of magma.
For each statement below, write *true* or *false*.

(A) (B)

A B **6.** Magma is often a slushy mix of molten rock, gases, and mineral crystals.

A B **7.** The elements found in magma are quite different from those found in Earth's crust.

A B **8.** Silica is the most abundant compound found in magma.

A B **9.** Magmas are classified as basaltic, andesitic, or rhyolitic.

A B **10.** In the laboratory, rocks must be heated from 8000°C to 12 000°C before they melt.

A B **11.** Heat in the upper mantle and lower crust may come, in part, from the decay of radioactive elements.

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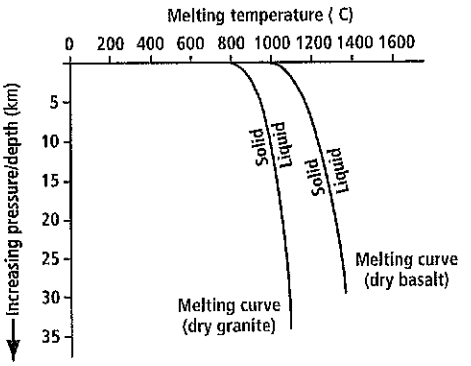
CHAPTER 5 STUDY GUIDE

SECTION 5.1 *What are igneous rocks?, continued*

In your textbook, read about factors that affect magma formation.
Use the diagram to answer the following questions.



12. How does pressure affect the melting point of rock?

As pressure [(A) increases (B) decreases (C) remains the same] so does the melting point.

13. Do all minerals have the same melting point?

A) YES B) NO

14. How does temperature change with depth in Earth's crust?

Temperature [(A) increases (B) decreases (C) remains the same] with depth

15. How does pressure change with depth, and why?

Pressure [(A) increases (B) decreases (C) remains the same] with depth, due to the overlying rock

In your textbook, read about how rocks melt.
Use each of the terms below just once to complete the passage.

A) **elements** B) **fractional crystallization** C) **reverse**
D) **melting points** E) **partial melting**

Because different minerals have different **(16)** _____, not all parts of a rock melt at the same time. The process whereby some minerals melt at low temperatures while other minerals remain solid is called **(17)** _____. As each group of minerals melts, different **(18)** _____ are added to the magma mixture changing its composition. When the magma cools, it crystallizes in the **(19)** _____ order of partial melting. The process wherein different minerals form at different temperatures is called **(20)** _____. As each group of minerals crystallizes, it removes elements from the remaining magma instead of adding new elements.

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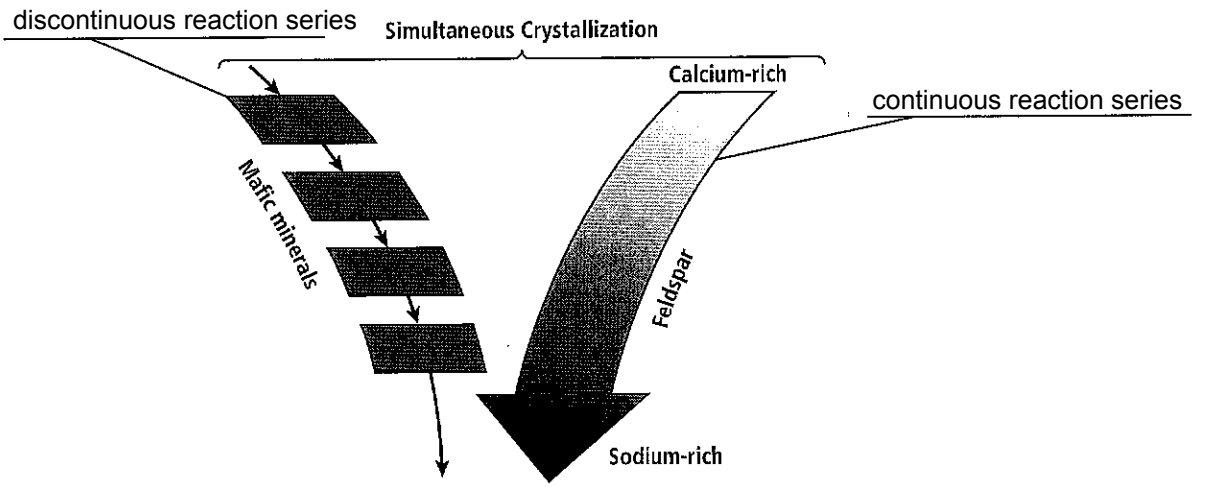
SECTION 5.1 *What are igneous rocks?, continued*

In your textbook, read about Bowen's reaction series.
Label the diagram using either *continuous reaction series* or *discontinuous reaction series*.



Answer the following questions. Use the diagram to answer questions 24 and 25.

21. The first feldspars to form are rich in what mineral?

A) Calcium rich B) Sodium rich C) Mafic rich D) Feldspar rich

22. The second feldspars to form are rich in what mineral?

A) Calcium rich B) Sodium rich C) Mafic rich D) Feldspar rich

omit What causes a zoned crystal?

when magma cools to quickly and the calcium rich cores cannot react completely, a zoned crustal forms.

omit How is quartz formed?

As more magma separates from crystals, it becomes more concentrated in silica, aluminum and potassium make quartz.

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CHAPTER 5 STUDY GUIDE

SECTION 5.2 *Classification of Igneous Rock*

In your textbook, read about the mineral composition of igneous rocks.
Complete the table by filling in one of the following terms: *granitic*, *basaltic*, *intermediate*, or *ultramafic*.

	Description	Type of Igneous Rock
23	. May be formed by fractional crystallization of olivine and pyroxene	A B C D
24	. Contains moderate amounts of biotite, amphibole, and pyroxene	A B C D
25	. Light-colored, high silica content, contains quartz	A B C D
26	. Contains plagioclase, biotite, amphibole, pyroxene, and olivine	A B C D
27	. Peridotite and dunites are examples.	A B C D
28	. Dark-colored, low silica content, rich in iron and magnesium	A B C D
29	. Diorite in an example.	A B C D
30	. Gabbro is an example.	A B C D
31	. Granite is an example.	A B C D
32	. Low silica content, very high iron and magnesium content	A B C D

(A) (B) (C) (D)

In your textbook, read about the grain size of igneous rocks.
Answer the following questions.

33 . Does obsidian, a glassy rock, have a large grain size or a small grain size?

A) Large grain size B) Small grain size

34 . Is obsidian an intrusive or extrusive igneous rock? How do you know?

A) Intrusive igneous rock B) Extrusive igneous rock

skip How does the texture of gabbro compare to that of obsidian?

The texture of gabbro would be rough for it b/c it has a large grain size, where OBSIDIAN would be smooth

35. . Is gabbro an intrusive or extrusive igneous rock?

A) INTRUSIVE B) EXTRUSIVE

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SECTION 5.2 *Classification of Igneous Rocks, continued*

In your textbook, read about classifying igneous rocks.
For each item in Column A, write the letter of the matching item in Column B.

Column A		Column B
36	Rock such as peridotite, which has low silica content and very high levels of iron and magnesium	**a.** granitic
37	Rock with two different-sized grains of the same mineral	**b.** basaltic
38	Rock such as gabbro, which is dark-colored, has low silica content, and is rich in iron and magnesium.	**c.** ultramafic
39	Vein of extremely large-grained minerals	**d.** porphyritic
F	Rare type of ultramafic rock that can contain diamonds	**e.** pegmatite
40	Rock such as granite, which is light-colored and has high silica content	**f.** kimberlite

In your textbook, read about the texture of igneous rocks.
Answer the following questions.

. Why do geologists make thin sections?

to identify minerals by grain size

. Describe the differences in how an intrusive igneous rock and an extrusive igneous rock form.

intrusive has time to form with more fractional crystallization (crystal have time to grow),
Extrusive DOES NOT have time to form fractional crystallization nor have time to grow

. Why can minerals that form early in fractional crystallization grow distinct crystal shapes?

There is insufficient time to grow large crystals

. What does a rock with a porphyritic texture look like?

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A) It has large size phenocryst surrounded by groundmass
B) it has small size phenocryst surrounded by groundmass

. How do porphyritic textures form?

slowly cooling magma would rise and cover large crystals with groundmass

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SECTION 5.2 *Classification of Igneous Rocks, continued*

In your textbook, read about igneous rocks as resources.
Circle the letter of the choice that best completes the statement or answers the question.

42. Igneous rocks are strong because of their
a. temperature.
b. color.
c. water content.
d. interlocking grain textures.

43. Which of the following is one of the most durable igneous rocks?
a. granite
b. sandstone
c. marble
d. limestone

44. Igneous rocks tend to be
a. radioactive.
b. full of gold.
c. resistant to weathering.
d. vulnerable to weathering.

45. Igneous intrusions often are associated with valuable
a. radioactive elements.
b. ore deposits.
c. oil reservoirs.
d. fossil deposits

46. Ore deposits such as gold sometimes are found as a(n)
a. vein.
b. extrusion.
c. obsidian deposit.
d. molten rock.

47. Metal-rich quartz veins are formed at the end of
a. volcanic eruptions.
b. radioactive decay.
c. magma crystallization
d. the cooling of Earth's crust.

48. What are pegmatites?
a. veins of extremely large-grained minerals
b. magmas of differing densities
c. microscopic, interlocking crystal grains
d. small volcanoes

49. What are kimberlites?
a. felsic rocks
b. mafic rocks
c. intermediate rocks
d. ultramafic rocks

50. Diamonds can form only
a. under very low pressure.
b. under very high pressure.
c. above ground.
d. near radioactive elements.

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CHAPTER 5 CHAPTER ASSESSMENT

Igneous Rocks

Reviewing Vocabulary

Write the term that best completes the statement.

Bowen's reaction series	**igneous rock**	**kimberlite**
pegmatite	**porphyritic**	**ultramafic**

1. Rock formed from the crystallization of magma is called _____.
2. _____ illustrates the relationship between cooling magma and mineral formation.
3. A(n) _____ rock, such as dunite, has low silica content and very high iron and magnesium content.
4. A rock that has grains of two different sizes has _____ texture.
5. A(n) _____ is a vein of extremely large-grained minerals.
6. A rare, ultramafic rock that might contain diamonds is a(n) _____.

Compare and contrast each pair of related terms.

7. intrusive igneous rock, extrusive igneous rock

_____

_____

_____

8. magma, lava

_____

_____

9. granitic, basaltic

_____

_____

_____

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CHAPTER 5 CHAPTER ASSESSMENT

Understanding Main Ideas (Part A)

Circle the letter of the choice that best completes the statement.

1. Igneous rocks are formed when magma
   a. erodes.
   b. undergoes radioactive decay.
   c. crystallizes.
   d. weathers.

2. Igneous rocks that cool slowly beneath Earth's crust are
   a. extrusive. **b.** intrusive. **c.** sedimentary. **d.** always magnetic.

3. Igneous rocks that cool quickly on Earth's surface are
   a. extrusive. **b.** intrusive. **c.** metamorphic. **d.** always magnetic.

4. Extrusive rocks, which cool more rapidly than intrusive rocks, are generally more
   a. coarsely grained. **b.** finely grained. **c.** radioactive. **d.** magnetic.

5. Factors that affect a rock's melting point include
   a. pressure and water content.
   b. value as a gem.
   c. rarity.
   d. usefulness as a building material.

6. Valuable ore deposits and gem crystals are often associated with
   a. oceans.
   b. oil deposits.
   c. thin crustal areas.
   d. igneous intrusions.

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

_____ **7.** Different minerals melt and crystallize at *different* temperatures.

_____ **8.** Igneous rocks can be identified by their *physical properties* of crystal size and texture.

_____ **9.** Igneous rocks are *rarely* used as building materials because of their strength, durability, and beauty.

_____ **10.** Diamonds are sometimes found in igneous intrusions known as *kimberlites*.

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Understanding Main Ideas (Part B)

Answer the following questions.

1. What is partial melting? Explain how partial melting affects igneous rock formation.

2. What is fractional crystallization? Does it add or remove elements from magma? Explain your answer.

3. What relationship does Bowen's reaction series illustrate? What crystallization patterns did Bowen discover in feldspars and iron-rich minerals?

4. What are the three main groups of igneous rocks? What are the characteristics of each group?

5. Why would crystals formed early in magma crystallization have larger, better-shaped crystals than those that formed later?

6. What is porphyritic texture? What sequence of events produces porphyritic texture in rocks?

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