Chapter 9

Checkpoint 9.1 Examine the photos. Both images show granite outcrops in the Sierra Nevada Mountains, California. Which outcrop contains pressure release cracks? Explain your choice.
   a) Outcrop A
   b) Outcrop B

Checkpoint 9.2 Outcrops of granite are examined in California at similar elevations in the interior of the state more than 100 kilometers (63 miles) from the Pacific Ocean and in outcrops along the coast. The granites have identical compositions and textures. On the basis of the following information, which granite outcrop would weather most rapidly?
   a) Outcrop A; located at coast, contains fractures spaced 1 meter apart
   b) Outcrop B; located at coast, does not have fractures
   c) Outcrop C; located in interior, contains fractures spaced 1 meter apart
   d) Outcrop D; located in interior, does not have fractures

Checkpoint 9.4 Imagine that you have been appointed to a team of researchers charged with determining which of the five World Heritage Sites in Figure 9.1 is at greatest risk from physical weathering. Identify at least three general questions you will ask as you begin to gather data for your study. Describe how you will use the information to plan your next steps.

Checkpoint 9.5 Look at Figure 9.10b. According to this map, is there a cave near where you live? Why, or why not?

Checkpoint 9.6 Weathering Analogies Matrix
Many simple occurrences in our daily lives are similar to geologic processes. The following table contains some everyday events that you may have experienced. Match these actions to specific weathering processes. Complete the table by placing an “X” in the columns on the right-hand side where appropriate. For each characteristic in the left-hand column write in whether it is analogous (similar) to physical, chemical, or biological weathering.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Physical Weathering</th>
<th>Chemical Weathering</th>
<th>Biological Weathering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint on house gradually disappears</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Spilled drink stains carpet</td>
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<tr>
<td>Ground hog digs a hole under your garage</td>
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<tr>
<td>Sugar disappears in hot coffee</td>
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<tr>
<td>Fungus forms on a fallen tree in the woods</td>
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<tr>
<td>Tree root pushes up paving slab</td>
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<tr>
<td>Rust forms on an old car</td>
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<tr>
<td>Bleach changes color of clothes</td>
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<tr>
<td>Pot holes form on road in winter</td>
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<tr>
<td>Nail polish remover removes nail polish</td>
<td></td>
<td></td>
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<tr>
<td>Paper weight holds down stack of bills</td>
<td></td>
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<tr>
<td>Compost rots in your garbage can</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper weight holds down stack of bills</td>
<td></td>
<td></td>
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</tbody>
</table>
Checkpoint 9.7
If you were to analyze the sand on a typical beach along the Atlantic coast, you would find that most of the sand grains are composed of the mineral quartz. In contrast, if you analyzed sand on some beaches in Hawaii you might find that the dominant grains contain minerals such as pyroxene or olivine. Quartz, pyroxene, and olivine are all silicate minerals. Use weathering processes to explain why the compositions of these beaches differ.

Checkpoint 9.8
Imagine that you have been appointed to a team of researchers charged with determining which of the five World Heritage Sites in Figure 9.1 is at greatest risk from chemical weathering. Identify at least three general questions you will ask as you begin to gather data for your study. Describe how you will use the information in combination with data on physical weathering to plan your next steps.

Checkpoint 9.13
Assuming that the rock type is similar in each of the locations on the following map, predict whether physical or chemical weathering (or neither) dominates in each location. Explain your answers.

Checkpoint 9.14
During a study of weathering, a scientist examines two tombstones marking graves in separate cemeteries. The inscription on one tombstone is almost unreadable, whereas the inscription on the other is sharp and clear. Provide three potential explanations for the differences in the present state of the inscriptions.
**Checkpoint 9.15**
Analyze four of the World Heritage Sites described in Table 9.1. (Omit Angkor Wat, which is analyzed in the upcoming case study.) Rank the locations from 1 through 4 on their potential for weathering. Justify your ranking scheme.

**Checkpoint 9.17**
How is the thickness of soil in a region related to weathering?

a) Weathering breaks down materials near Earth’s surface and therefore reduces the thickness of soil.

b) Weathering increases the thickness of soil because it provides more materials to be incorporated into the soil.

c) Soil thickness is dependent on the character of the regolith and therefore is not related to weathering.

**Checkpoint 9.18**
From what you learned about geologic time in Chapter 8, approximately when did the first regolith form on Earth?

When did the first soils form?

**Checkpoint 9.19**
A “system” is defined as a group of independent but interrelated components comprising a unified whole. Support the following statement: *Soil is an example of a system and soil type is controlled by the balance of inputs and outputs to and from the system.*

**Checkpoint 9.22 Venn Diagram: Water and Wind Soil Erosion**
Complete the following Venn diagram to compare and contrast the factors that affect soil erosion due to water and wind. Identify characteristics that are shared by both systems (e.g., characteristic 1) or are different for each group (e.g., characteristic 2). Place the numbers in the most suitable locations on the diagram. Two have been inserted for you as examples.

1. Rate dependent on vegetation cover
2. Occurs in regions of warm, dry climate
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

**Checkpoint 9.23**
An average-sized U.S. farm has an area of 176 hectares (440 acres). Design an experiment to get an accurate measurement of soil erosion for a farm of this size.
Geologic Time Concept Map, p. 241
Complete the following concept map to evaluate your understanding of the interactions between the Earth system and geologic time. Label as many interactions as you can, using information from this chapter.

A
B
C
D
E
F
G
H
I
J
K
L
M
N