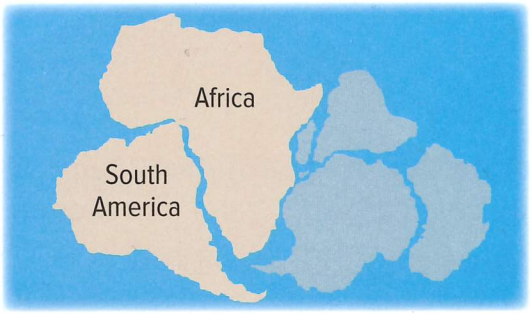
UNIT 4

Review

What Do You Know?
Connecting to Concepts

Visualizing Ideas

1. How does the image below relate to the continental drift hypothesis?



2. A teacher used cake frosting, Fruit Roll-Ups®, and graham crackers to demonstrate plate tectonics. The photo below shows one concept that the teacher demonstrated.

   a) What geologic feature does each of the following represent? Explain your answer for each.
      - the graham cracker
      - the Fruit Roll–Up
      - the cake frosting

   b) What process was the teacher demonstrating? How do you know?

3. There is a continent named Africa and a tectonic plate named the African plate.
   a) In what ways are they similar? In what ways are they different?
   b) Sketch a diagram to show the relationship between the African continent and the African plate. In your diagram, label important geologic features that help show the difference between the two.

Using Key Terms

4. Use a labelled diagram to show how the energy of an earthquake travels from the focus to the epicentre.

5. Develop a diagram that shows each of the following layers of Earth. Make sure each of the terms appears as a label in your diagram.
   - continental crust
   - oceanic crust
   - upper mantle
   - lower mantle
   - outer core
   - inner core
   - asthenosphere
   - lithosphere

Communicating Concepts

6. In this unit, you have learned about the continental drift hypothesis and the theory of plate tectonics.
   a) Describe two examples of evidence that supported the continental drift hypothesis. Are they direct or indirect evidence? Explain how you know.
   b) Describe two pieces of evidence that supported the theory of plate tectonics. Are they indirect or direct evidence? Explain how you know.
   c) Do you agree with the ideas presented in the theory of plate tectonics? Provide at least three reasons that support your opinion.

7. Draw a sketch that represents what happens when each of the following occurs. Name the type of plate boundary in each case.
   a) a plate with continental crust collides with another plate with continental crust
   b) a plate with oceanic crust collides with another plate with oceanic crust
   c) a plate with oceanic crust collides with continental crust

8. Wegener collected geologic and fossil evidence to support the idea that the continents may have once fit together in a supercontinent.
   a) What do you think his reasons might have been for collecting this type of evidence?
   b) Describe evidence that Wegener might have found that would have disproved the idea.
   c) Why was Wegener's hypothesis rejected? If you were a scientist at that time, would you have rejected the hypothesis? Why or why not?

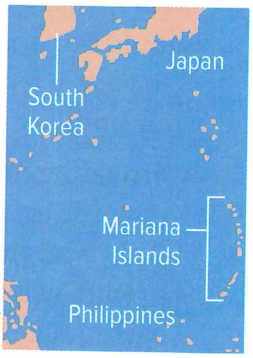
9. What evidence can scientists collect and refer to when determining whether an earthquake has occurred? Include both qualitative and quantitative evidence in support of your answer.

10. Sketch a diagram that shows each of the following.
    - mantle convection
    - slab pull
    - ridge push

    a) Describe what occurs in each process.
    b) How do these processes support the theory of plate tectonics?

11. What is a geohazard?
    a) Name an example of a geohazard that exists in B.C.
    b) Describe social and economic impacts that the geohazard in part a) can have on the area where it happens.
    c) Describe two actions people can take to reduce the risk or effect of this geohazard.

12. The Mariana Islands in the North Pacific Ocean are an example of a volcanic island arc. Describe how they formed according to the theory of plate tectonics.



What Do You Know? Connecting to Competencies

Developing Skills

13. Scientists often must rely on both direct and indirect evidence when investigating different phenomena.
    a) What do the terms "direct evidence" and "indirect evidence" mean? Give an example of each that you have learned about in this unit and also in a subject other than earth science.
    b) How do you think the type of investigation and what is being investigated influences how much scientists must rely on indirect evidence?

Thinking Critically and Creatively

14. Do you agree or disagree with the following statement? "Mountain ranges are only produced from the collision between tectonic plates." Be sure to support your answer.

15. An opinion editorial, or op-ed, is an essay of the writer's thoughts about an issue. Op-eds are often written to raise awareness about a topic. Write an op-ed on one of the following topics, or choose one of your own that is related to the topics covered in this unit. The article should be one or two paragraphs long. Use your scientific knowledge to support your opinion.
    - Providing money to study the plate tectonic activity near the coast of B.C., with the aim of being able to predict when a large and devastating earthquake will occur. Is this a proper use of funds?
    - Providing money to upgrade older buildings, such as schools and hospitals, to make them more earthquake proof. Is this a fair use of funds when it is only for certain regions of the province?
    - Covering the cost of rescuing people who remain in or enter areas of known danger due to geohazards such as earthquakes, avalanches, or landslides.

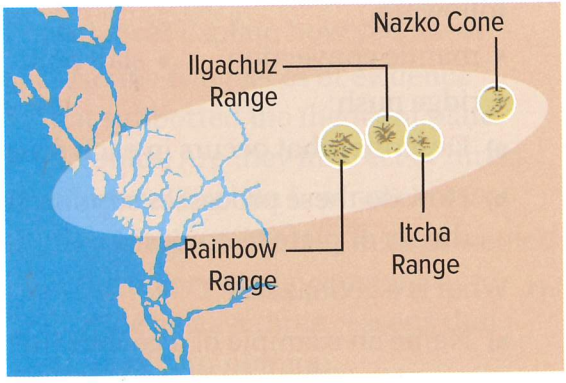
Understanding Big Ideas
Making New Connections

Applying Your Understanding

16. Is the following statement true or false? "The continual formation of new rock on the ocean floor means that Earth must be getting larger." Provide two reasons that support your answer.
17. The Burgess Shale is one of the most important fossil discoveries in the world. Fossil remains of organisms that once lived in ancient seas are found high up in the Canadian Rockies of B.C. within Yoho and Kootenay National Parks. Using your knowledge of plate tectonics, describe how fossils of these organisms could end up on mountain tops.

Thinking Critically and Creatively

18. Do you think Pangaea could have been the only supercontinent that ever existed on Earth? Explain why or why not. Describe evidence that would support or disprove this.
19. In this unit, you have learned about mantle convection. However, convection is an important part of other processes on Earth.
    a) Describe what convection is.
    b) Where else on Earth do you think it occurs? Explain how it occurs there and what effect it has.
20. Central B.C. is home to a volcanic hot spot called the Anahim hot spot. The Anahim Volcanic Belt is a 600-km-long line of volcanoes that runs just north of Vancouver Island to near Quesnel, B.C. The major volcanoes are shown in the map below. The Nazko Cone is the youngest and Rainbow Range is the oldest. What evidence could scientists collect to determine which of the volcanoes is youngest and which is oldest?



Connecting to Self and Society

21. Plan an imaginary field trip to a geologic feature that interests you or that you have visited previously. You need to organize all the parts of the trip. Some things to find out include the following:

- You will also be a guide for the trip, so you need to perform research on the geologic feature, and be able to describe your relationship to the feature (why you chose it, what type of connection you have with it).
- What needs to be done to arrange the vehicle for travel? Will it be an overnight trip and will accommodations be needed?
- A breakdown of the cost of everything. Identify how the cost of the trip will be covered.

Collect the information in the form of a presentation of your choice. It could be a display of any type, a brochure, or even a website.

22. Create a script for a one minute commercial highlighting a geologic feature in B.C. that you think would be a great new place for tourists to visit. If your teacher allows, film the commercial using your script. Keep the following points in mind:

- The geological history of the feature
- Who you want your target audience to be
- What type of tourist destination you want to showcase it as—rugged and remote, or scenic and easily accessible by everyone, young and old

23. B.C. is one of the most popular tourist destinations in Canada.

a) What role do you think places like mountainous areas play in the economy? Describe types of businesses that may be involved.

b) Describe one or two negative effects of tourism in these areas.

24. The province strongly encourages all its citizens to be prepared for hazards that may occur in the region a person lives in.

a) It is common to hear people use words like "the Big One" and talk about "Earth being ripped open like a zipper" when referring to potential earthquakes in B.C. Why do you think such dramatic statements are made? Do you think it helps get people prepared? Why or why not?

b) Every year, Public Safety Canada works with provinces and territories to promote Emergency Preparedness Week, which runs during the first full week of May. In 2016, several areas hosted an earthquake simulator that people could enter and experience what a magnitude-8 earthquake would feel like. Why do you think such events are held?

25. Reflect on how your studies of science this year have helped you learn about yourself, your community, people elsewhere in your province and country, and the world as a whole. What understandings do you have now that you didn't have before? What are three new things you would like to learn or inquire about, and why?