Name: _____ Date: _____

CONTENT 17.1

17.1 Magnetic Earth

READ CPO Science

Earth's magnetic field is very weak compared with the strength of the field on the surface of the ceramic magnets you probably have in your classroom. The gauss is a unit used to measure the strength of a magnetic field. A small ceramic permanent magnet has a field of a few hundred up to 1,000 gauss at its surface. At Earth's surface, the magnetic field averages about 0.5 gauss. Of course, the field is much stronger nearer to the core of the planet.

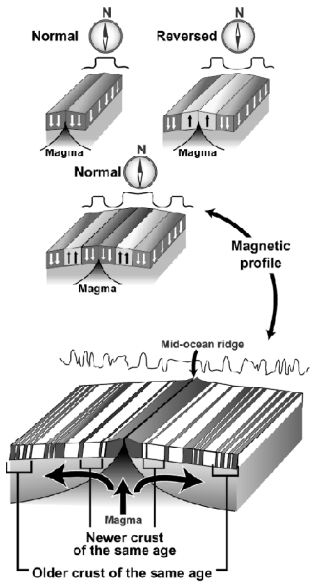
PRACTICE

1. What is the source of Earth's magnetic field according to what you have read in chapter 17?

2. Today, Earth's magnetic field is losing approximately 7 percent of its strength every 100 years. If the strength of Earth's magnetic field at its surface is 0.5 gauss today, what will it be 100 years from now?

3. Describe what you think might happen if Earth's magnetic field continues to lose strength.

4. The graphic to the right illustrates one piece of evidence that proves the reversal of Earth's poles during the past millions of years. The 'crust' of Earth is a layer of rock that covers Earth's surface. There are two kinds of crust—continental and oceanic. Oceanic crust is made continually (but slowly) as magma from Earth's interior erupts at the surface. Newly formed crust is near the site of eruption and older crust is at a distance from the site. Based on what you know about magnetism, why might oceanic crust rock be a record of the reversal of Earth's magnetic field? (HINT: What happens to materials when they are exposed to a magnetic field?)



5. The terms *magnetic south pole* and *geographic north pole* refer to locations on Earth. If you think of Earth as a giant bar magnet, the magnetic south pole is the point on Earth's surface above the south end of the magnet. The geographic north pole is the point where Earth's axis of rotation intersects its surface in the northern hemisphere. Explain these terms by answering the following questions.

   a. Are the locations of the magnetic south pole and the geographic north pole near Antarctica or the Arctic?

   b. How far is the magnetic south pole from the geographic north pole?

   c. In your own words, define the difference between the magnetic south pole and the geographic north pole.

6. A compass is a magnet and Earth is a magnet. How does the magnetism of a compass work with the magnetism of Earth so that a compass is a useful tool for navigating?

7. The directions—north, east, south, and west—are arranged on a compass so that they align with 360 degrees. This means that zero degrees (0°) and 360° both represent north. For each of the following directions by degrees, write down the direction in words. The first one is done for you.

   a. 45° *Answer:* The direction is northeast.

   b. 180°

   c. 270°

   d. 90°

   e. 135°

   f. 315°

Magnetic declination

Earth's geographic north pole (true north) and magnetic south pole are located near each other, but they are not at the same exact location. Because a compass needle is attracted to the magnetic south pole, it points slightly east or west of true north. The angle between the direction a compass points and the direction of the geographic north pole is called *magnetic declination*. Magnetic declination is measured in degrees and is indicated on topographical maps.

8. Let's say you were hiking in the woods and relying on a map and compass to navigate. What would happen if you didn't correct your compass for magnetic declination?

9. Are there places on Earth where magnetic declination equals 0°? Use the Internet or your local library to find out where on Earth there is no magnetic declination.