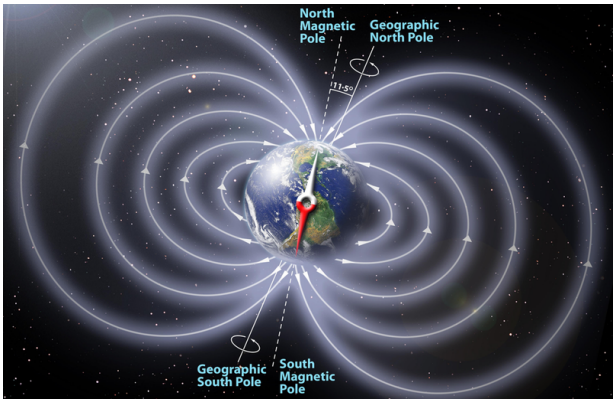
E3. Magnetic Field

Magnetic Field

Have you ever wondered how a compass always points north or how we are protected from harmful solar winds and cosmic rays from space? The answer lies in the magnetic field of our planet! Let's learn about this invisible force that surrounds Earth and plays a crucial role in our daily lives.



What is a Magnetic Field?
A magnetic field is an invisible force that is created by magnets or electric currents. It is a region around a magnet or a current where the force of magnetism can be detected. Earth itself acts like a giant magnet, generating its own magnetic field.

The Earth's Magnetic Field
The Earth's magnetic field is like a huge bubble surrounding the planet, extending far out into space. It is believed to be generated by the movement of molten iron and nickel in the outer core of the Earth.

Magnetic Poles
Similar to a bar magnet, the Earth has two magnetic poles - a North Magnetic Pole and a South Magnetic Pole. These poles are not exactly aligned with the geographic North and South Poles.

Compass and Navigation
One of the most famous uses of the Earth's magnetic field is in navigation. A compass is a small magnetic tool that always points towards the Earth's magnetic North Pole. Sailors and explorers have used compasses for centuries to find their way and explore the world.

Magnetosphere
The magnetic field around the Earth creates a protective shield called the magnetosphere. The magnetosphere protects us from the solar wind - a stream of charged particles released by the Sun - and from harmful cosmic rays coming from outer space.

Auroras
The interaction between the solar wind and the Earth's magnetic field results in beautiful light displays called auroras. Auroras, also known as the Northern and Southern Lights, appear as colorful shimmering lights in the sky near the polar regions.

Electromagnets
Magnetic fields are not only generated naturally but can also be created by humans. Electromagnets are devices that use electricity to create a magnetic field. They are used

in various applications, such as in electric motors, generators, and MRI machines in hospitals.

Magnetic Field Strength
The strength of a magnetic field is measured in units called teslas. The Earth's magnetic field is relatively weak, measuring around 25 to 65 microteslas on the surface.

Reversal of the Magnetic Field
Did you know that the Earth's magnetic field has flipped its direction in the past? This is known as a magnetic reversal. Scientists have found evidence of several magnetic reversals in Earth's history, where the North and South Magnetic Poles switch places.

1. What is a magnetic field?
    A) An invisible force created by magnets or electric currents
    B) A region where the force of gravity can be detected
    C) A type of energy generated by the Sun
    D) A magnetic tool used for navigation

2. What generates the Earth's magnetic field?
    A) The movement of molten iron and nickel in the outer core
    B) The rotation of the Earth around the Sun
    C) The presence of mountains and valleys on the Earth's surface
    D) The solar wind coming from the Sun

3. What are the two magnetic poles of the Earth?
    A) North Pole and South Pole
    B) East Pole and West Pole
    C) Magnetic Pole and Geographical Pole
    D) Electric Pole and Neutral Pole

4. How does a compass use the Earth's magnetic field?
    A) It points towards the geographic North Pole
    B) It points towards the geographic South Pole
    C) It points towards the magnetic North Pole
    D) It points towards the magnetic South Pole

5. What does the Earth's magnetic field protect us from?
    A) Harmful solar wind and cosmic rays
    B) Earthquakes and volcanic eruptions
    C) Rain and thunderstorms
    D) Cold temperatures in winter

6. What are the colorful light displays near the polar regions called?
    A) Solar flares
    B) Lunar eclipses
    C) Auroras
    D) Shooting stars

7. What is the unit used to measure the strength of a magnetic field?
    A) Watts
    B) Volts
    C) Amperes
    D) Teslas

8. What are devices that use electricity to create a magnetic field?
    A) Magnifiers
    B) Electromagnets
    C) Thermometers
    D) Telescopes

9. What is the strength of the Earth's magnetic field on the surface?
    A) 10 to 20 teslas
    B) 25 to 65 microteslas
    C) 100 to 200 teslas
    D) 500 to 1000 microteslas

10. What do we call the event when the Earth's magnetic field flips its direction?
    A) Magnetic reversal
    B) Magnetic boost
    C) Magnetic switch
    D) Magnetic drift

ANSWERS & EXPLANATIONS

1. A - An invisible force created by magnets or electric currents.
    - A magnetic field is an invisible force that is created by magnets or electric currents.

2. A - The movement of molten iron and nickel in the outer core.
    - The Earth's magnetic field is generated by the movement of molten iron and nickel in the outer core.

3. A - North Pole and South Pole.
    - The Earth has two magnetic poles - a North Magnetic Pole and a South Magnetic Pole.

4. C - It points towards the magnetic North Pole.
    - A compass uses the Earth's magnetic field to point towards the magnetic North Pole.

5. A - Harmful solar wind and cosmic rays.
    - The Earth's magnetosphere protects us from harmful solar wind and cosmic rays.

6. C - Auroras.
    - The colorful light displays near the polar regions are called auroras.

7. D - Teslas.
    - The strength of a magnetic field is measured in units called teslas.

8. B - Electromagnets.
    - Devices that use electricity to create a magnetic field are called electromagnets.

9. B - 25 to 65 microteslas.
    - The strength of the Earth's magnetic field on the surface is around 25 to 65 microteslas.

10. A - Magnetic reversal.
    - When the Earth's magnetic field flips its direction, it is called a magnetic reversal.