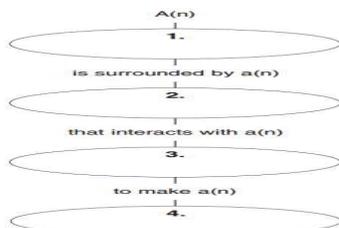


| Universal forces | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Electromagnetic Forces | <ul style="list-style-type: none"> Associated with charged particles Electric and magnetic force are the only forces that can both attract and repel |
| Electric forces | <ul style="list-style-type: none"> Act between charged objects or particles such as protons and electrons (parts of the atom) Objects with opposite charges (+ and -) attract one another Objects with like charges (+ and + or - and -) repel one another |
| Magnetic forces | <ul style="list-style-type: none"> act on certain metals, on poles of magnets, and on moving charges Have two poles, north and south, that attract each other Two poles that are alike repel each other Two opposite poles attract each other |
| 2. Nuclear Forces | <ul style="list-style-type: none"> Two forces act within the nucleus of the atom to hold it together <ul style="list-style-type: none"> Strong Nuclear force: force of attraction that acts only on the neutrons and protons holding them together <ul style="list-style-type: none"> Overcomes the electric force of repulsion that acts among the protons in the nucleus Weak Nuclear force: acts only over a short range <ul style="list-style-type: none"> Involved in certain types of radioactive processes |
| 3. Gravitational Force | <ul style="list-style-type: none"> An attractive force between any two masses Newton's law of universal gravitation states that every object in the universe attracts every other object Mass needs to be very large to have a noticeable pull of gravity <ul style="list-style-type: none"> So that's why you don't notice a pull of gravity between your textbook and your body Gravity acts over large distances However, the force between two objects is proportional to their masses and decreases rapidly as the distance between them increases Gravity is the weakest universal force but it is the most effective force over long distances <ul style="list-style-type: none"> It keeps you on Earth, the moon in orbit around Earth, the planets in orbit around the sun, and the stars in orbit around their galaxies |
| 4. Centripetal force | <ul style="list-style-type: none"> A center-directed force that continuously changes the direction of an object to make it move in a circle Like the earth and moon and satellites |
| 5. Satellites | <ul style="list-style-type: none"> Much like the moon, satellites only need the centripetal force provided by gravity and its inertia to maintain its orbit If the satellite loses speed it loses altitude and will eventually reenter Earth's atmosphere <ul style="list-style-type: none"> It will either burn up or fall to Earth's surface |

Directions: Use the following terms to complete the concept map below.

electromagnet iron bar electric current magnetic field

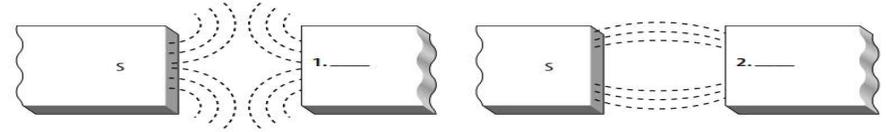


Directions: Circle the term that correctly completes each sentence below.

- When an electric current is created, (waves/electrons) flow in a wire.
- Earth's magnetic (field/domain) extends into space and is called the magnetosphere.
- A/An (aurora/compass needle) will align itself along Earth's magnetic field lines, pointing toward the north or south pole.

Directed Reading for Section 1 - What is magnetism? Content Mastery

Directions: The lines in the illustration show magnetic forces acting between two pairs of bar magnets. Correctly label the unlabeled poles of the magnets: **N** for north and **S** for south. Then answer the questions that follow.



- What generalization can you make about the reaction between like poles?

- What generalization can you make about the reaction between unlike poles?

Directions: Circle the term that correctly completes each sentence.

- The magnetic field is strongest near (the poles/the center) of a bar magnet.
- Materials that can become magnetized include steel and (copper/iron).
- The needle of a compass lines up with Earth's magnetic field and points to (Earth's poles/Earth's equator).
- Magnetic field lines that curve toward each other show (repulsion/attraction).
- Some animals have tiny pieces of (magnetite/magnetosphere) in their brains to help them find their way.
- A magnet contains a large number of magnetic (domains/poles) that are lined up and pointing in the same direction.

Directions: Match the following terms with the correct descriptions below.

| | | | |
|----------------|---------------|--------------------|---------------------|
| aurora | compass | electric generator | electric motor |
| electromagnet | magnetosphere | magnetic domain | |
| magnetic field | magnetism | transformer | alternating current |

- a group of atoms with their magnetic poles pointed the same direction
- imaginary lines of force around a magnet
- a force created through a magnetic field
- a magnetic needle that is free to turn
- a current-carrying wire wrapped around an iron core
- a device that uses the interaction between electricity and magnetism to produce motion
- colored lights in the sky created by the interaction of Earth's magnetic field and charged particles in the solar wind
- the magnetic field around Earth that extends into space
- a device that uses induction to produce electric power
- an electrical device that changes the voltage of alternating current
- in the United States, it changes from positive to negative to positive 60 times each second