MAGNETS AND MAGNETIC FIELDS

Review Questions

1. What is the minimum number of poles for a magnet?
2. When you break a magnet in half, how many poles does each piece have?
3. The north pole of a magnet is attracted to the geographic North Pole of Earth, yet like poles repel. Can you explain this?
4. Which way would a compass needle point if you were at the magnetic north pole?
5. What is a magnetic domain?
6. Why are iron atoms so strongly affected by magnetic fields?
7. When a magnetized steel needle is strongly heated in a Bunsen burner flame, it becomes demagnetized. Explain why.
8. If an unmagnetized piece of iron is attracted to one pole of a magnet, will it be repelled by the opposite pole?

Conceptual Questions

9. In the figure below, two permanent magnets with holes bored through their centers are placed one over the other. Because the poles of the upper magnet are the reverse of those of the lower, the upper magnet levitates above the lower magnet. If the upper magnet were displaced slightly, either up or down, what would be the resulting motion? Explain. What would happen if the upper magnet were inverted?



10. You have two iron bars and a ball of string in your possession; one iron bar is magnetized, and one iron bar is not. How can you determine which iron bar is magnetized?
11. Why does a very strong magnet attract both poles of a weak magnet?
12. A magnet attracts a piece of iron. The iron can then attract another piece of iron. Explain, on the basis of alignment of domains, what happens in each piece of iron.
13. When a small magnet is repeatedly dropped, it becomes demagnetized. Explain what happens to the magnet at the atomic level.

MAGNETISM FROM ELECTRICITY

Review Questions

14. A conductor carrying a current is arranged so that electrons flow in one segment from east to west. If a compass is held over this segment of the wire, in what direction is the needle deflected? (Hint: Recall that current is defined as the motion of *positive* charges.)
15. What factors does the strength of the magnetic field of a solenoid depend on?

Conceptual Questions

16. A solenoid with ends marked *A* and *B* is suspended by a thread so that the core can rotate in the horizontal plane. A current is maintained in the coil so that the electrons move clockwise when viewed from end *A* toward end *B*. How will the coil align itself in Earth's magnetic field?
17. Is it possible to orient a current-carrying loop of wire in a uniform magnetic field so that the loop will not tend to rotate?

Review

ANSWERS

1. two
2. two
3. The geographic North Pole is near the magnetic south pole.
4. perpendicular to Earth's surface
5. a group of atoms whose magnetic fields are aligned in a common direction
6. They have unpaired electron spins.
7. The added energy causes the domains to become less aligned.
8. No, unmagnetized iron is attracted to either pole of a magnet.
9. a damped periodic oscillation; Gravitational force and the repulsive force along with a displacement from equilibrium result in periodic motion. When inverted, the two magnets would attract each other.
10. Hang each of the bars by the string. The magnetized bar will align itself with Earth's magnetic field.
11. It realigns the domains of the weaker magnet.
12. first piece: the domains align with the magnetic field of the magnet; second piece: the domains align with the magnetic field of the first piece
13. The energy absorbed disturbs the alignment of the domains.
14. south
15. number of coils per unit length, amount of current
16. End *A* will point toward the geographic South Pole.