Review

ELECTRIC CHARGE

Review Questions

1. How are conductors different from insulators?
2. When a conductor is charged by induction, is the induced surface charge on the conductor the same or opposite the charge of the object inducing the surface charge?
3. A negatively charged balloon has 3.5 μC of charge. How many excess electrons are on this balloon?

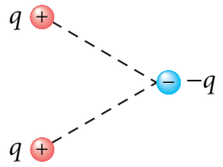
Conceptual Questions

4. Would life be different if the electron were positively charged and the proton were negatively charged? Explain your answer.
5. Explain from an atomic viewpoint why charge is usually transferred by electrons.
6. Because of a higher moisture content, air is a better conductor of charge in the summer than in the winter. Would you expect the shocks from static electricity to be more severe in summer or winter? Explain your answer.
7. A balloon is negatively charged by rubbing and then clings to a wall. Does this mean that the wall is positively charged?
8. Which effect proves more conclusively that an object is charged, attraction to or repulsion from another object? Explain.

ELECTRIC FORCE

Review Questions

9. What determines the direction of the electric force between two charges?
10. In which direction will the electric force from the two equal positive charges move the negative charge shown below?



11. The gravitational force is always attractive, while the electric force is both attractive and repulsive. What accounts for this difference?
12. When more than one charged object is present in an area, how can the total electric force on one of the charged objects be predicted?
13. Identify examples of electric forces in everyday life.

Conceptual Questions

14. According to Newton's third law, every action has an equal and opposite reaction. When a comb is charged and held near small pieces of paper, the comb exerts an electric force on the paper pieces and pulls them toward it. Why don't you observe the comb moving toward the paper pieces as well?

Practice Problems

For problems 15–17, see Sample Problem A.

15. At the point of fission, a nucleus of ^{235}U that has 92 protons is divided into two smaller spheres, each of which has 46 protons and a radius of 5.90×10^{-15} m. What is the magnitude of the repulsive force pushing these two spheres apart?
16. What is the electric force between a glass ball that has +2.5 μC of charge and a rubber ball that has −5.0 μC of charge when they are separated by a distance of 5.0 cm?

Review

ANSWERS

1. conductors transfer charge easily, insulators do not
2. opposite
3. 2.2×10^{13} electrons
4. no; *Positive* and *negative* are arbitrary designations.
5. Protons are relatively fixed in the nucleus, whereas the surrounding electrons can be transferred from one atom to another.
6. winter; because more charge can accumulate before electric discharge occurs
7. The balloon induces a local surface charge on the wall, but the wall as a whole is not charged.
8. repulsion; because attraction can be the result of an induced surface charge, but repulsion occurs only when two objects each have a net charge
9. the signs of the charges
10. to the left
11. mass is positive, charges are positive or negative
12. Each force exerted on an object is found, and then the forces are added together vectorially.
13. Answers will vary but may include the force between hair and a comb or the force that acts when people receive a "shock" by touching an object.
14. The comb has a significantly greater mass, so its acceleration is much less.
15. 3.50×10^{3} N
16. 45 N (attractive)