

CHAPTER 18 | *ELECTRIC FORCES AND ELECTRIC FIELDS*

PROBLEMS

7. **SSM** **WWW** **REASONING** Initially, the two spheres are neutral. Since negative charge is removed from the sphere which loses electrons, it then carries a net positive charge. Furthermore, the neutral sphere to which the electrons are added is then negatively charged. Once the charge is transferred, there exists an electrostatic force on each of the two spheres, the magnitude of which is given by Coulomb's law (Equation 18.1), $F = kq_1q_2/r^2$.

SOLUTION

a. Since each electron carries a charge of -1.60×10^{-19} C, the amount of negative charge removed from the first sphere is

$$(3.0 \times 10^{13} \text{ electrons}) \left(\frac{1.60 \times 10^{-19} \text{ C}}{1 \text{ electron}} \right) = 4.8 \times 10^{-6} \text{ C}$$

Thus, the first sphere carries a charge $+4.8 \times 10^{-6}$ C, while the second sphere carries a charge -4.8×10^{-6} C. The magnitude of the electrostatic force that acts on each sphere is, therefore,

$$F = \frac{kq_1q_2}{r^2} = \frac{(8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2)(4.8 \times 10^{-6} \text{ C})^2}{(0.50 \text{ m})^2} = \boxed{0.83 \text{ N}}$$

b. Since the spheres carry charges of opposite sign, the force is **attractive**.

15. **SSM** **WWW** **REASONING** Each particle will experience an electric force due to the presence of the other charge. According to Coulomb's law (Equation 18.1), the magnitude of the force felt by each particle can be calculated from $F = kq_1q_2/r^2$, where q_1 and q_2 are the respective charges on particles 1 and 2 and r is the distance between them. According to Newton's second law, the magnitude of the force experienced by each particle is given by $F = ma$, where a is the acceleration of the particle.

SOLUTION

a. Since the two particles have identical positive charges, $q_1 = q_2 = q$, and we have, using the data for particle 1,

$$\frac{kq^2}{r^2} = m_1a_1$$

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Holt Physics Raymond A. Serway, 2002 *Holt Physics*, 2000-12 **Problems in Elementary Physics** Edwin Dana Pierce, 1896 *Physics* Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 2006 Tstgen Holt Rinehart & Winston, 1998-04 *Physics for the Inquiring Mind* Eric M. Rogers, 2011-04-17 In our scientific age an understanding of physics is part of a liberal education Lawyers bankers governors business heads administrators all wise educated people need a lasting understanding of physics so that they can enjoy those contacts with science and scientists that are part of our civilization both materially and intellectually They need knowledge and understanding instead of the feelings all too common that physics is dark and mysterious and that physicists are a strange people with incomprehensible interests Such a sense of understanding science and scientists can be gained neither from sermons on the beauty of science nor from the rigorous courses that colleges have offered for generations when the headache clears away it leaves little but a confused sense of mystery Nor is the need met by survey courses that offer a smorgasbord of tidbit they give science a bad name as a compendium of information or formulas The non scientist needs a course of study that enables him to learn real science and make its own with delight For lasting benefits the intelligent non scientist needs a course of study that enables him to learn genuine science carefully and then encourages him to think about it and use it He needs a carefully selected framework of topics not so many that learning becomes superficial and hurried not so few that he misses the connected nature of scientific work and thinking He must see how scientific knowledge is built up by building some scientific knowledge of his own by reading and discussing and if possible by doing experiments himself He must think his own way through some scientific arguments He must form his own opinion with guidance concerning the parts played by experiment and theory and he must be shown how to develop a taste for good theory He must see several varieties of scientific method at work And above all he must think about science for himself and enjoy that These are the things that this book encourages readers to gain by their own study and thinking *Physics for the Inquiring Mind* is a book for the inquiring mind of students in college and for other readers who want to grow in scientific wisdom who want to know what physics really is **Advanced Physics for You** Keith Johnson, Simmone Hewett, Sue Holt, John Miller, 2000 Designed to be motivating to the student this title includes features that are suitable for individual learning It covers the AS Level and core topics of almost all A2 specifications **The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science**, 1912 Spectral Theory and Mathematical Physics: A Festschrift in Honor of Barry Simon's 60th Birthday Fritz Gesztesy, 2007 This Festschrift had its origins in a conference called SimonFest held at Caltech March 27-31 2006 to honor Barry Simon's 60th birthday It is not a proceedings volume in the usual sense since the emphasis of the majority of the contributions is on reviews of the state of the art of certain fields with particular focus on recent developments and open problems The bulk of the articles in this Festschrift are of this survey form and a few review Simon's contributions to a particular area Part 1 contains surveys in the

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