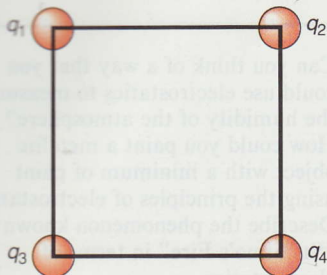†18. Three charges of 2.00 μC, -4.00 μC, and 6.00 μC are placed at the vertices of an equilateral triangle of length 10.0 cm on a side. Find the resultant force on each charge.

†19. If $q_1 = 5.00 \mu C = q_2 = q_3 = q_4$ are located on the corners of a square of length 20.0 cm, find the resultant force on q_3.

†20. Charges of 2.54 μC, -7.86 μC, 5.34 μC, and -3.78 μC are placed on the corners of a square of side 23.5 cm. Find the resultant force on the first charge.

†21. Find the force on charge q_3 in the diagram. The distance separating charges q_1 and q_2 is 5.00 cm.
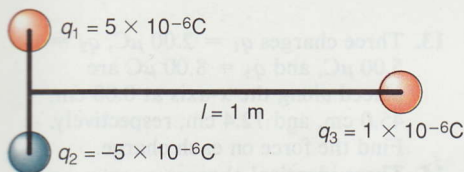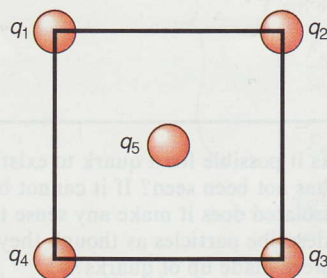

†22. Find the resultant force on charge q_3 in the diagram if $q_1 = 2.00 \mu C$, $q_2 = -7 \mu C$, and $q_3 = 5.00 \mu C$.
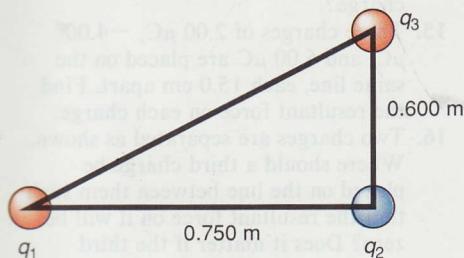

Additional Problems

†23. Find the force on charge $q_5 = 5.00$ μC, located at the center of a square 25.0 cm on a side if $q_1 = q_2 = 3.00$ μC and $q_3 = q_4 = 6.00$ μC.


24. Four electrons are located at the corners of a rectangle, 4.00 cm by 3.00 cm, one electron at each corner. Find the magnitude and direction of the net force on each electron due to the other three.

†25. Two small, equally charged spheres of mass 0.500 g are suspended from the same point by a silk fiber 50.0 cm long. The repulsion between them keeps them 15.0 cm apart. What is the charge on each sphere?

†26. Two pith balls of 10.0-g mass are hung from ends of a string 25.0 cm long, as shown. When the balls are charged with equal amounts of charge, the threads separate to an angle of 30.0°. What is the charge on each ball?
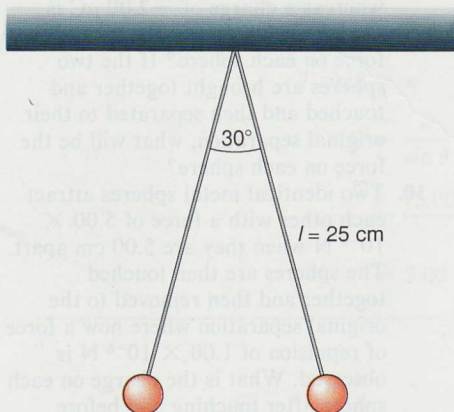
†27. Two 10.0-g pith balls are hung from the ends of two 25.0-cm long strings as shown. When an equal and opposite charge is placed on each ball, their separation is reduced from 10.0 cm to 8.00 cm. Find the tension in each string and the charge on each ball.
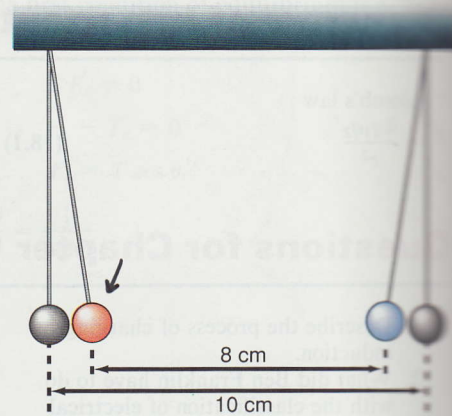
28. Suppose that equal charges are to be placed on the earth and on a 54.5-kg woman so as to render the woman effectively weightless. How much would the charge on each body have to be?

†29. Find the force on q_3 in the diagram if $q_1 = 8.00 \mu C$, $q_2 = -8.00 \mu C$, and $q_3 = 8.00 \mu C$.
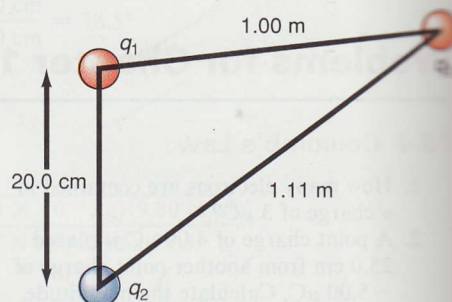
†30. A charge of 15.0 μC is on a metallic sphere 10.0-cm radius. It is then touched to a sphere of 5.00-cm radius, until the surface charge density is the same on both spheres. What is the charge on each sphere after they are separated?

†31. Two small spheres carrying charges $q_1 = 7.00 \mu C$ and $q_2 = 5.00 \mu C$ are separated by 20.0 cm. If q_2 were free to move, what would its initial acceleration be? Sphere 2 has the mass $m_2 = 15.0$ g.