WS # 7 Chapter 25 pr 43,44,45,47,50,51,75

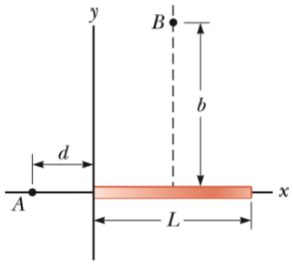
Problems

43. Consider a ring of radius R with the total charge Q spread uniformly over its perimeter. What is the potential difference between the point at the center of the ring and a point on its axis a distance $2R$ from the center?

44. A uniformly charged insulating rod of W length 14.0 cm is bent into the shape of a semicircle as shown in Figure P25.44. The rod has a total charge of $-7.50\ \mu$C. Find the electric potential at O, the center of the semicircle.

Figure P25.44

45. A rod of length L (Fig. P25.45) lies along the x axis with its left end at the origin. It has a nonuniform charge density $\lambda = \alpha x$, where α is a positive constant. (a) What are the units of α? (b) Calculate the electric potential at A.



47. A wire having a uniform linear charge density λ is bent W into the shape shown in Figure P25.47. Find the electric potential at point O.

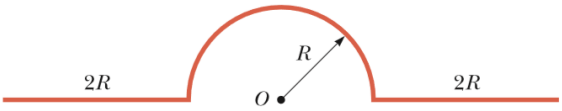


Figure P25.47

50. A spherical conductor has a radius of 14.0 cm and a M charge of 26.0 μC. Calculate the electric field and the electric potential at (a) $r = 10.0$ cm, (b) $r = 20.0$ cm, and (c) $r = 14.0$ cm from the center.

51. Electric charge can accumulate on an airplane in flight. You may have observed needle-shaped metal extensions on the wing tips and tail of an airplane. Their purpose is to allow charge to leak off before much of it accumulates. The electric field around the needle is much larger than the field around the body of the airplane and can become large enough to produce dielectric breakdown of the air, discharging the airplane. To model this process, assume two charged spherical conductors are connected by a long conducting wire and a 1.20-μC charge is placed on the combination. One sphere, representing the body of the airplane, has a radius of 6.00 cm; the other, representing the tip of the needle, has a radius of 2.00 cm. (a) What is the electric potential of each sphere? (b) What is the electric field at the surface of each sphere?

75. (a) A uniformly charged cylindrical shell with no end caps has total charge Q, radius R, and length h. Determine the electric potential at a point a distance d from the right end of the cylinder as shown in Figure P25.75.

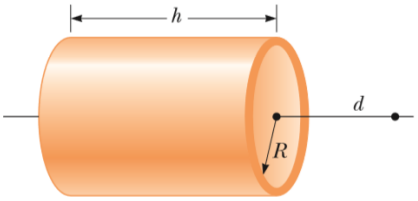


Figure P25.75

Suggestion: Use the result of Example 25.5 by treating the cylinder as a collection of ring charges.

43)-0.533 kQ/R 44) 1.51E6 V 45) V = kα(L-D ln(1+L/D)) 47) $k\lambda(2ln3 + \pi)$

50) 0, 1.67E6 V, 5.84E6 N/C, 1.17E6 V, 11.9E6 N/C, 1.67E6 V 51) 1.35E5 V, 2.25E6 V/m, 6.74E6 V/m 75) see solution