Suggested problems: Chapter 24- HRW-Principles of Physics- ISV 10th Edition.

12. The electric potential V in the space between two flat parallel plates 1 and 2 is given (in volts) by $V = 1500x^2$, where x (in meters) is the perpendicular distance from plate 1. At $x = 1.8\ cm$, (a) what is the magnitude of the electric field and (b) is the field directed toward or away from plate 1?

Answer: (a) 54 V/m ; (b) Toward plate 1

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37. Two tiny metal spheres A and B, $mass\ m_A = 5.00\ g$and $m_B = 10.0\ g$, have equal positive charge q = 5.00 μC.The spheres are connected by a massless nonconducting string of length d =3.00 m, which is much greater than the radii of the spheres. (a) What is the electric potential energy of the system? (b) Suppose you cut the string. At that instant, what is the acceleration of each sphere? (c) Along time after you cut the string, what is the speed of each sphere?

Answer: (a) 74.9 mJ ; (b) a_A = 4.99 m/s^2 and a_B = 2.50 m/s^2 ; (c) v_A = 4.47 m/s and v_B = – 2.24 m/s

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45. A metal sphere of radius 30 cm has a net charge of 3.0×10^{-8} C. (a) What is the electric field at the sphere's surface? (b) If V = 0 at infinity, what is the electric potential at the sphere's surface? (c) At what distance from the sphere's surface has the electric potential decreased by 500 V?

Answer: (a) 3×10^3 V/m; (b) 9×10^2 V; (c) 0.376 m

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51. The ammonia molecule NH_3 has a permanent electric dipole moment equal to 1.47 D, where 1 D = 1 debye unit = 3.34×10^{-30}C.m. Calculate the electric potential due to an ammonia molecule at a point 103 nm away along the axis of the dipole. (Set V = 0 at infinity.)

Answer:4.16×10^{-6} V

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52. A graph of the x component of the electric field as a function of x in a region of space is shown in Fig. 24-44. The scale of the vertical axis is set byE_{xs} = 10.0 N/C. The y and z components of the electric field are zero in this region. If the electric potential at the origin is 10 V, (a) what is the electric potential at x = 2.0 m, (b) what is the greatest positive value of the electric potential for points on the x axis for which $0 \leq x \leq 6.0\ m$, and (c) for what value of x is the electric potential zero?

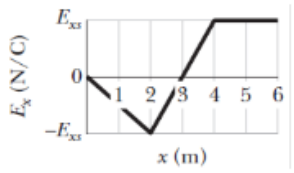

Fig. 24-44 Problem 52

Answer: (a) 20 V ; (b) 25 V ; (c) 6.0 m

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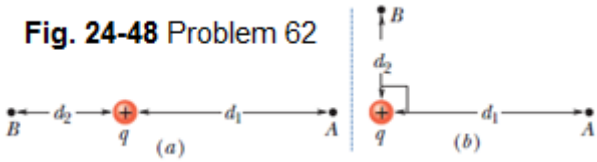
58. Two large, parallel, metal plates are 1.5 cm apart and have charges of equal magnitude and opposite sign on their facing surfaces. Take the potential of the negative plate to be zero. If the potential halfway between the plates is then + 10.0 V, what is the electric field between the plates?

Answer:1.33×10^3 V/m

62.Consider a point charge q = 3.0 nC, point A at distance d_1 = 2.0 m from q, and point B at distance d_2 = 1.0 m. (a) If A and B are diametrically opposite each other, as in Fig. 24-48a, what is the electric potential difference$V_A = V_B$? (b) What is that electric potential difference if Aand B are located as in Fig.24-48b?

Fig. 24-48 Problem 62



Answer: (a) – 13 V (b) –13 V
