Second Major T-041

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1  Q0 What is the electric force between two protons which are
   Q0 separated by 1.6*10**(-15) m.
41 Q0
   Q0
   A1  90  N, repulsive.
   A2  90  N, attractive.
   A3  2.2 N, repulsive.
   A4  2.2 N, attractive.
   A5  zero.
   Q0
 2 Q0 The electric field produced by a +3.0 C charge at a point 1000 m
 23Q0 to the left of the charge is
41 Q0
   Q0
   A1  2.7*10**4 N/C toward the left.
   A2  2.7*10**4 N/C toward the right.
   A3  3.0*10**4 N/C toward the left.
   A4  3.0*10**4 N/C toward the right.
   A5  1.7*10**7 N/C toward the left.
   Q0
 3 Q0 Two positive charges (+8.0 C and +2.0 C) are separated by 300 m.
 23Q0 A third charge is placed a distance r from the +8.0 C charge so
41 Q0 that the resultant electric force on the third charge due to the
   Q0 other two charges is zero. The distance r is
   Q0
   A1  200 m.
   A2  100 m.
   A3  300 m.
   A4  400 m.
   A5  500 m.
   Q0
 4 Q0 An imaginary closed spherical surface S of radius R is centered
 24Q0 on the origin. A positive charge is originally at the origin,
41 Q0 and the flux through the surface is “Phi”. The positive charge
   Q0 is slowly moved from the origin to a point 2*R away from the
   Q0 origin. In doing so the flux through S
   Q0
   A1  decreases to zero.
   A2  increases to 4*Phi.
   A3  increases to 2*Phi.
   A4  decreases to  Phi/4.
   A5  remains the same Phi.
   Q0
5  Q0 An electron is shot directly toward the center of a large metal
 24Q0 plate that has excess negative charge with surface charge
41 Q0 density 2.0*10**(-6) C/m**2. If the initial kinetic energy
   Q0 of the electron is 1.6*10**(-13)J and if the electron is to
   Q0 stop(owing to electrostatic repulsion from the plate) just
   Q0 as it reaches the plate, how far from the plate must it be shot?
   Q0
   A1   4.4 m.
   A2   1.2 m.
   A3   3.4 m.
   A4   8.0 m.
   A5   22  m.
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   Q0
6  Q0 Figure 1 shows three situations in which a Gaussian cube sits
 24Q0 in an electric field. The arrows and the values indicates the
41 Q0 directions(in N*m**2/C)of the flux through the six sides of each
   Q0 cube. In which situations does the cube enclose, a positive
   Q0 net charge, a negative net charges and zero net charge?
   Q0 respectively.
   Q0
   A1  2,3 and 1.
   A2  1,2 and 3.
   A3  3,2 and 1.
   A4  2,1 and 3.
   A5  1,3 and 2.
   Q0
7  Q0 In figure 2, the magnitude of the electric field at point A, due
 24Q0 to an infinite line charge density of 9.0*10**(-6)  C/m, is
41 Q0 7.2*10**4 N/C. If the point A is at a distance R from the line
   Q0 charge, what is R?
   Q0
   A1   2.3 m.
   A2   1.2 m.
   A3   3.4 m.
   A4   0.3 m.
   A5   25  m.
   Q0
8  Q0 A non conducting sphere, of radius 4.0 m, has a charge density
 24Q0 of 2.0 micro-C/m**3. What is the electric field at a distance
41 Q0 1.7 m from the center?
   Q0
   A1  1.3*10**5   N/C.
   A2  2.5*10**5   N/C.
   A3  1.9*10**5   N/C.
   A4  4.8*10**3   N/C.
   A5  6.2*10**3   N/C.
   Q0
9  Q0 In figure 3, two large horizontal metal plates are separated
 25Q0 by 4 mm. The lower plate is at a potential of -6.0 V. What
41 Q0 potential should be applied to the upper plate to create
   Q0 an electric field of strength 4000 V/m UPWARDS in the
   Q0 space between the plates?
   Q0
   A1 -22 V.
   A2  22 V.
   A3 -10 V.
   A4  10 V.
   A5 -16 V.
   Q0
10 Q0 In figure 4, the point charge Q1 causes an electric potential
25 Q0 of 60 V and an electric field strength of 30 V/m at P, and the
41 Q0 the point charge Q2, separately, causes an electric potential
   Q0 of 120 V and electric field strength of 40 V/m at P. Which of
   Q0 the following gives possible values of potential and field
   Q0 strength at P due to the joint action of Q1 and Q2?
   Q0
   A1  180 V,    50 V/m.
   A2  180 V,    70 V/m.
   A3  135 V,    50 V/m.
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A4 -600 V,   10 V/m.
A5 135 V,   70 V/m.
Q0
11 Q0 In the xy plane, a charge q1 = 3.0 micro-C located at
25 Q0 (3.0 cm, 0.0) and another charge q2 = -4.0 micro-C located at
41 Q0 (0.0 cm, 4.0 cm). How much work must be done, by an external
Q0 agent, to bring these charges to their fixed positions starting
Q0 from infinite separation. [Consider V = 0 at infinity]
Q0
A1   -2.2 J.
A2   2.2 J.
A3   -3.5 J.
A4   3.5 J.
A5   1.5 J.
Q0
12 Q0 If an isolated metal sphere of radius r = 10 cm has a net charge
25 Q0 of 4.0 micro-C. What is the potential on the surface of the
41 Q0 sphere? [Consider V = 0 at infinity]
Q0
A1   3.6*10**5 V.
A2   3.6*10**6 V.
A3   4.2*10**5 V.
A4 -4.2*10**6 V.
A5   zero.
Q0
13 Q0 It is required 1.0 mJ of work to move two identical positive
25 Q0 charges +q from infinite separation so that they are separated
41 Q0 by a distance a. How much work is required to move four
Q0 identical positive charges +q from infinite separation so that
Q0 they are arranged at the corner of a square with edge length a?
Q0 [Consider V = 0 at infinity]
Q0
A1   5.4 mJ.
A2   2.0 mJ.
A3   3.5 mJ.
A4   4.0 mJ.
A5   6.5 mJ.
Q0
14 Q0 A parallel-plate capacitor (with plates A and B) has circular
26 Q0 shape of radius 6.0 cm separated by 2.0 mm. Find the total
41 Q0 charges on both plates (A and B) when a 12 V battery is
Q0 connected.
Q0
A1 zero
A2 400 pico-C
A3 10 pico-C
A4 600 pico-C
A5 700 pico-C
Q0
15 Q0 The three capacitors in figure 5 have an equivalent capacitance
26 Q0 of 12.4 micro-F, find the capacitance of C1.
41 Q0
Q0
A1 6.0 micro-F
A2 4.0 micro-F
A3 10 micro-F
A4 5.0 micro-F

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   A5  7.0 micro-F
   Q0
16 Q0 In figure 6, a capacitor of capacitance C = 9.0 micro-F is
26 Q0 charged to a potential difference Vo = 10.0 volts. The charging
41 Q0 battery is disconnected and the capacitor is connected to
   Q0 uncharged capacitor of unknown capacitance Cx. The potential
   Q0 difference across the combination is reduced to V = 3.0 volts.
   Q0 Find the value of Cx.
   Q0
   A1   21 micro-F.
   A2   42 micro-F.
   A3   11 micro-F.
   A4   8.0  micro-F.
   A5   3.0 micro-F.
   Q0
17 Q0 A parallel-plate capacitor has plates of area A and separation
26 Q0 d and is charged by a battery of a potential difference V. If
41 Q0 the charging battery is disconnected, then the work required,
   Q0 by external agent, to separate the plates of the capacitor to
   Q0 infinite distance is:
   Q0 [Take A = 2.0 m**2, V = 12 Volts,  d = 3.0 cm]
   Q0
   A1   42 nano-J.
   A2   12 nano-J.
   A3   22 nano-J.
   A4   65 nano-J.
   A5  -89 nano-J.
   Q0
18 Q0 The resistivity of nichrome wire is 1.0*10**(-6) Ohm.m.
27 Q0 Calculate the length of wire needed for a 1200 watt electric
41 Q0 heater that is connected across a 120 V potential difference.
   Q0 [The wire’s radius is 0.40 mm]
   Q0
   A1   6.0  m.
   A2   3.0  m.
   A3   1.5  m.
   A4   4.5  m.
   A5   8.0  m.
   Q0
19 Q0 A heating coil is immersed in a 0.2 kg of cold water. The coil
27 Q0 is connected to a 12 V supply and a current of 5 A flows for
41 Q0 140 seconds. Calculate the temperature increase of the water.
   Q0 [Specific heat of water is 4200 J/(kg*K)]
   Q0
   A1   10  K.
   A2   30  K.
   A3    5  K.
   A4   12  K.
   A5   15  K.
   Q0
20 Q0 Figure 7 shows three cylindrical copper conductors along with
27 Q0 their face areas and length. Rank them according to the current
41 Q0 through them, greatest first, when the same potential difference
   Q0 V is placed across their lengths.
   Q0
   A1  1,3 and 2.
   A2  1,2 and 3.
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A3 3,2 and 1.
A4 2,1 and 3.
A5 1,3 and 3.

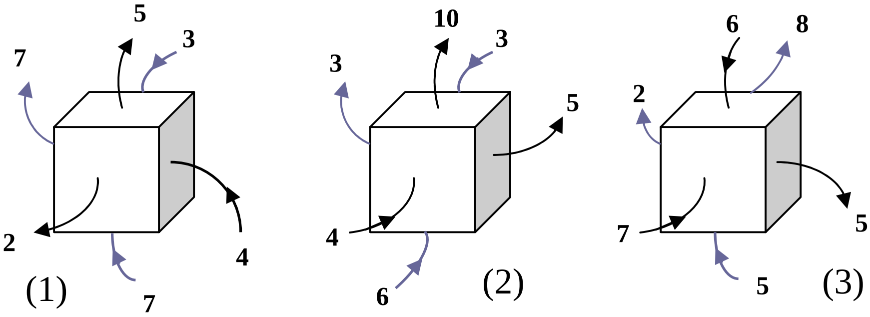
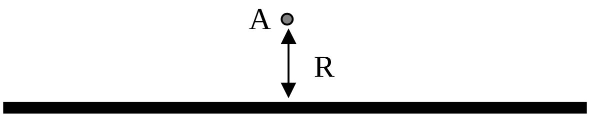


Figure (1)



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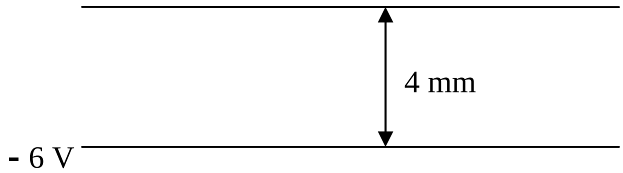

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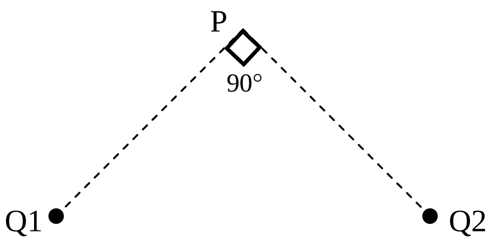

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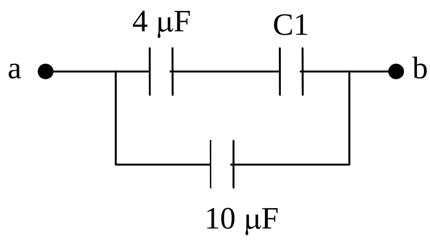

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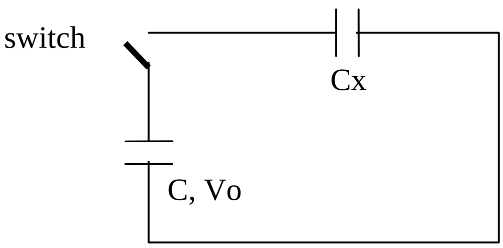

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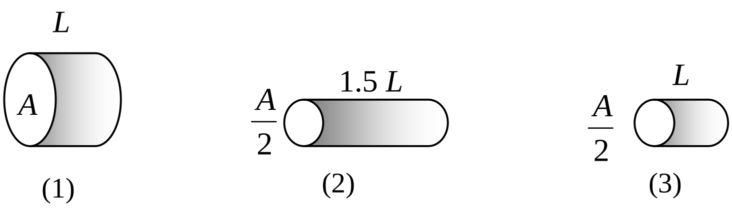

Figure (7)