

Chapter 22 Electric Charge

22-4 Coulomb's Law

22-04

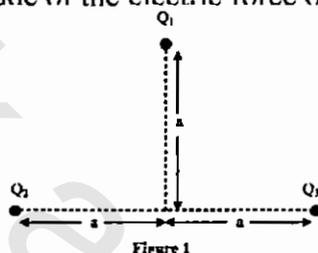
Question 429

Suppose that isolated charges Q and q attract each other with a force F . If the separation between these charges were made half as great, each charge would then experience a force

- (a) $2F/3$.
- (b) F .
- (c) Can not be determined unless we know the magnitude of Q and q .
- (d) $4F$.
- (e) $F/2$.

Question 430

Three charges are located as shown in Figure 1. If $a = 3.0$ m, $Q_1 = 2.0$ micro-C, and $Q_2 = Q_3 = 8.0$ micro-C, what is the magnitude of the electric force on charge Q_1 ?



- (a) 0.023 N
- (b) 0.090 N
- (c) 0.046 N
- (d) 0.011 N
- (e) 0.055 N

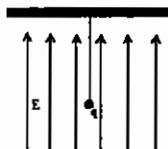
Question 431

Three point charges are located on the x - y plane as follows: $Q_1 = -10$ micro-C at $(4$ m, $0)$, $Q_2 = 20$ micro-C at $(0, 10$ m), and Q_3 at $(4$ m, 10 m). If the net force on Q_1 points in the negative x -direction, find the charge Q_3 .

- (a) -24 micro-C
- (b) $+16$ micro-C
- (c) 0 micro-C
- (d) -16 micro-C
- (e) $+24$ micro-C

Question 432

A 0.2 g metallic ball hangs from an insulating string in a vertical electric field of 3000 N/C and directed upward as shown in Figure 1. If the tension in the string is 0.004 N, then the charge on the ball is:



- (a) -1.0 micro-C
- (b) -0.7 micro-C
- (c) 1.0 micro-C
- (d) -2.0 micro-C
- (e) 0.7 micro-C

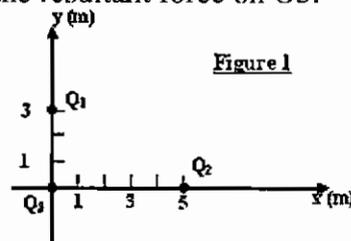
Question 43322-04
0.10-44%

A charge $+2q$ is placed at the origin and a charge $-q$ is placed at $x = 0.200$ m on the x -axis. Where, on the x -axis, can a third charge $+q$ be placed so that the force on it is zero?

- (a) 0.327 m
- (b) -0.740 m
- (c) -0.440 m
- (d) 0.112 m
- (e) 0.683 m

Question 43422-04
0.39-40%

Consider three point charges, $Q_1 = Q_2 = 2$ micro-C and $Q_3 = 4$ micro-C, located as shown in Figure 1. Find the magnitude of the resultant force on O_3 .



- (a) $10 \cdot 10^{(-3)}$ N
- (b) $2.9 \cdot 10^{(-3)}$ N
- (c) $6.0 \cdot 10^{(-3)}$ N
- (d) $8.5 \cdot 10^{(-3)}$ N
- (e) zero

Question 435

22-04

A negative charge is placed at the center of a square. Each corner of the square has a fixed charge of $1.00 \cdot 10^{(-6)}$ C. If the resulting force acting on each charge is zero, the magnitude of the negative charge is:

- (a) $9.60 \cdot 10^{(-6)}$ C.
- (b) $0.77 \cdot 10^{(-6)}$ C.
- (c) $0.69 \cdot 10^{(-6)}$ C.
- (d) $0.96 \cdot 10^{(-6)}$ C.
- (e) $6.92 \cdot 10^{(-6)}$ C.

Question 436

22-04

Two neutral metal spheres are separated by 0.3 km. How much electric charge must be transferred from one sphere to the other so that their electrical attraction is 10^{*3} N?

- (a) 0.2 C.
- (b) 0.9 C.
- (c) 0.4 C.
- (d) 0.6 C.
- (e) 0.1 C.

Question 43722-04
0.43-57%

A charge of $+3.2 \cdot 10^{(-6)}$ C is placed at the origin. A second charge (q_2) is placed at $x = 3.0$ m. If a charge of $1.0 \cdot 10^{(-6)}$ C experiences no force if placed at $x = 4.0$ m, then q_2 is:

- (a) $+0.2 \cdot 10^{(-6)}$ C.
- (b) $-3.3 \cdot 10^{(-6)}$ C.
- (c) $-0.2 \cdot 10^{(-6)}$ C.
- (d) $+2.1 \cdot 10^{(-6)}$ C.
- (e) $-2.1 \cdot 10^{(-6)}$ C.

22-04

0.37-35%

Question 438

Two small charged objects repel each other with a force F when separated by a distance d . If the charge on each object is reduced to one-fourth of its original value and the distance between them is reduced to $d/2$ the force becomes:

- (a) F .
- (b) $F/4$.
- (c) $F/16$.
- (d) $F/8$.
- (e) $F/2$.

22-04

Question 439

Two fixed particles, of charges $q_1 = +1.0 \times 10^{-6} \text{ C}$ and $q_2 = -9.0 \times 10^{-6} \text{ C}$, are 10 cm apart. How far from each should a third charge be located so that no net electrostatic force acts on it?

- (a) 1.1 cm from q_1 and 11.1 cm from q_2 .
- (b) 5 cm from q_1 and 15 cm from q_2 .
- (c) 3 cm from q_1 and 7 cm from q_2 .
- (d) 1 cm from q_1 and 11 cm from q_2 .
- (e) 1 cm from q_1 and 9 cm from q_2 .

22-04

Question 440

A mass with a charge " Q " is suspended in equilibrium from a beam balance. A point charge $q = +10 \text{ micro-C}$ is then fixed at a distance $d = 5.0 \text{ cm}$ below " Q " and an extra mass $m = 4.0 \text{ g}$ has to be placed on the pan to obtain equilibrium, see figure (3). Find the value of the charge " Q ".

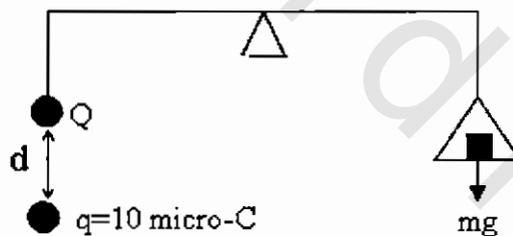


Figure 3

- (a) $+6.2 \times 10^{-9} \text{ C}$.
- (b) $-1.1 \times 10^{-9} \text{ C}$.
- (c) $+3.3 \times 10^{-9} \text{ C}$.
- (d) $+1.1 \times 10^{-9} \text{ C}$.
- (e) $-3.3 \times 10^{-9} \text{ C}$.

22-04

0.49-55%

Question 441

Charges q_1 and q_2 are on the x -axis. q_1 is at $x = a$ and q_2 is at $x = 2a$. The net force on a third charge at the origin is zero. Which of the following is TRUE ?

- (a) $q_2 = -4q_1$
- (b) $q_2 = 2q_1$
- (c) $q_2 = 4q_1$
- (d) $q_2 = -q_1$
- (e) $q_2 = -2q_1$

Question 442

22-04
0.50-45%

Two point charges q_1 and q_2 lie along the x-axis. $q_1 = +16.0$ micro-Coulombs is at $x = 2.00$ m and $q_2 = +9.00$ micro-Coulombs is at the origin. Where must a negative charge q_3 be placed on the x-axis such that the net electrostatic force on it is zero?

- (a) $x = +0.857$ m
- (b) $x = -0.857$ m
- (c) $x = +1.14$ m
- (d) $x = +2.86$ m
- (e) $x = -1.14$ m

Question 443

22-04
0.39-76%

As in figure (1), a charge Q is fixed at each of two opposite corners of a square. A charge q is fixed at each of the other two corners. If the resultant electrical force on Q is zero, then Q and q are related as:

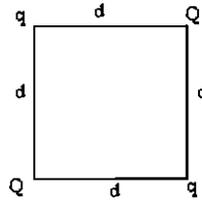


Figure (1)

- (a) $Q = -2 \sqrt{2} q^{**2}$
- (b) $Q = -2 \sqrt{2} q$
- (c) $Q = q^{**2}$
- (d) $Q = q$
- (e) $Q = -4 q$

Question 444

22-04
0.48-70%

Consider two identical conductor spheres, A and B. Initially, sphere A has a charge of $-80 Q$ and sphere B has a charge of $+20 Q$. If the spheres touched and then are separated by a distance of 0.3 m, what is the resultant force between them? [Take $Q = 5.7 \times 10^{**(-8)} C$]

- (a) 0.3 N, repulsive.
- (b) 0.4 N, attractive.
- (c) 0.2 N, attractive.
- (d) 0.2 N, repulsive.
- (e) 0.3 N, attractive.

Question 445

22-04
0.44-42%

In figure 3, $Q = 60$ micro-C, $q = 20$ micro-C, $a = 3.0$ m, and $b = 4.0$ m. Calculate the total electric force on q . [i and j are the unit vectors in the positive direction of x-axis and y-axis, respectively].

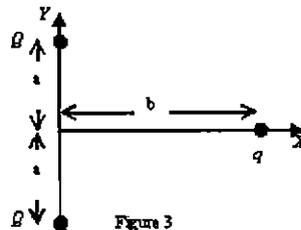


Figure 3

- (a) $1.12 j$ (N).
- (b) $-0.34 i$ (N).
- (c) $-0.69 i$ (N).
- (d) $0.34 i$ (N).
- (e) $0.69 i$ (N).

Question 446

22-04

1.44-21%

In figure (1), if $Q = 30$ micro-C, $q = 5.0$ micro-C and $d = 0.3$ m, find the net force on q . [\hat{i} and \hat{j} are the unit vectors in the positive direction of x-axis and y-axis, respectively].

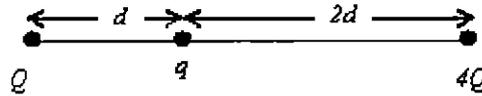


Figure 1

- (a) $-7.5 \hat{i}$ (N).
- (b) $7.5 \hat{i}$ (N).
- (c) $3.8 \hat{i}$ (N).
- (d) $-3.8 \hat{j}$ (N).
- (e) zero.

Question 447

22-04

1.43-29%

What is the electric force between two protons which are separated by 1.6×10^{-15} m.

- (a) zero.
- (b) 90 N, attractive.
- (c) 2.2 N, repulsive.
- (d) 2.2 N, attractive.
- (e) 90 N, repulsive.

Question 448

22-04

1.39-53%

Two positive charges (+8.0 C and +2.0 C) are separated by 300 m. A third charge is placed a distance r from the +8.0 C charge so that the resultant electric force on the third charge due to the other two charges is zero. The distance r is

- (a) 500 m.
- (b) 100 m.
- (c) 300 m.
- (d) 200 m.
- (e) 400 m.

Question 449

22-04

0.40-29%

Two positively charged particles q_1 and q_2 (with $q_2 > q_1$) are fixed in place on the x-axis at the positions shown in figure 1. A third charge q_3 is to be placed somewhere on the x-axis such that the net electrostatic force on q_3 is zero. Which one of the following statements is TRUE?

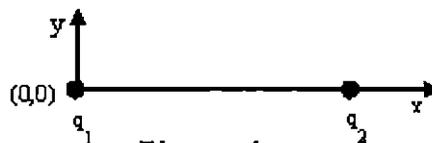


Figure 1

- (a) q_3 should be placed at a point between q_1 and q_2 but closer to q_2 .
- (b) q_3 should be placed to the left of q_1 .
- (c) q_3 should be placed to the right of q_2 .
- (d) q_3 should be placed at the mid point between q_1 and q_2 .
- (e) q_3 should be placed at a point between q_1 and q_2 but closer to q_1 .