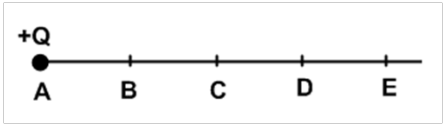
Electric Charge and Field Multiple Choice

1 An isolated conducting sphere is charged negatively. Which of the following is correct about charge distributions?

- A the negative charge is distributed uniformly throughout the volume
- B the negative charge is distributed uniformly on the surface
- C the density of the negative charge is greater on the bottom of the sphere
- D the density of the negative charge is greater on the top of the sphere
- E the sphere is neutral because the negative charge is balanced by an equal positive charge

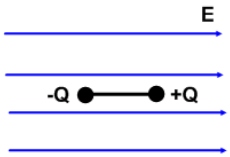
2 An electric field is created by a positive charge +Q located at point A. If the electric field at point B is $\vec{E}$, what is the electric field at point E in terms of $\vec{E}$?

- A E_o
- B $E_o/2$
- C $E_o/4$
- D $E_o/8$
- E $E_o/16$



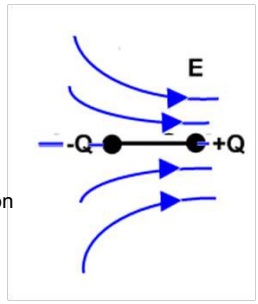
3 A dipole is placed in a uniform electric field as shown. Which of the following is true about the net force on the dipole?

- A net force is directed to the left
- B net force is directed to the right
- C net force causes the dipole to rotate in clockwise direction
- D net force causes the dipole to rotate in counterclockwise direction
- E the net force is zero



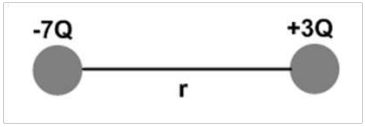
4 A dipole is placed in a non-uniform electric field as shown. Which of the following is true about the net force on the dipole?

- A net force is directed to the left
- B net force is directed to the right
- C net force causes the dipole to rotate in clockwise direction
- D net force causes the dipole to rotate in counterclockwise direction
- E the net force is zero



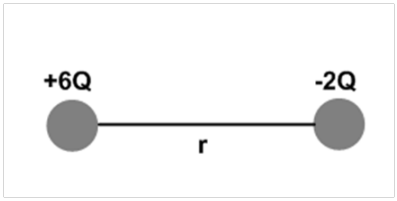
5 Two identical conducting spheres are charged to -7Q and +3Q respectively, and are separated by a distance r. The spheres are made to touch each other and then separated to the same distance. What is the new charge on each sphere?

- A -7Q
- B +3Q
- C -2Q
- D -10Q
- E +10Q



6 Two identical conducting spheres are charged to +6Q and -2Q respectively, and are separated by a distance r. The electrostatic force between the charges is Fo. The charges are made to touch each other and then separated to the same distance. What is the new force between the charges?

- A $F = F_o$
- B $F = F_o/3$
- C $F = F_o/4$
- D $F = 3F_o$
- E $F = 4F_o$



7 Two small spheres have equal charges Q and are separated by a distance r. The resulting force exerted on each sphere has a magnitude F_o. If the charge on each sphere is doubled and r is quartered, the force on each sphere has a magnitude of

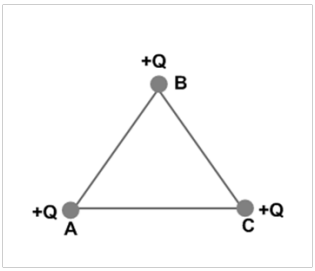
- A $64F_o$
- B $16F_o$
- C F_o
- D $F_o/16$
- E $F_o/64$

8 A positively charged particle traveling with a velocity v enters a uniform electric field E that is perpendicular to the initial velocity. Which of the following paths the particle will describe in the field?

- A parabolic
- B circular
- C straight line parallel to the field
- D straight line perpendicular to the field
- E helical

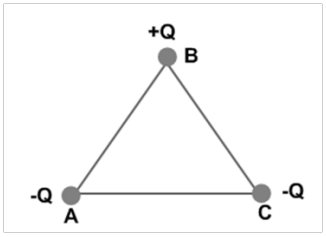
9 Three equal positive charges are placed in the corners of an equilateral triangle. What is the net electric field at the center of triangle?

- A $(3kQ^2)/r^2$
- B $(kQ^2)/r^2$
- C zero
- D $(\sqrt{3}\ kQ^2)/r^2$
- E $(\sqrt{2}\ kQ^2)/r2$



10 Three equal by magnitude charges are placed in the corners of an equilateral triangle as shown. What is the direction of the net electric field at the center of triangle?

- A Right
- B Left
- C Net field is zero
- D Top of the page
- E Bottom of the page



11 Which of the following is the unit of electric field?

- A $(kgm) / (s^2C)$
- B $(sm^2) / (kg^2\ C)$
- C $(kgs^2) / (m^2\ C)$
- D $(C\ kgm^2) / (s^2)$
- E $(C\ m^2) / (kg\ s^2)$

12 A semicircular ring is made of an insulating material carries a positive charge uniformly distributed along its length. Which of the following represents the direction of the electric field at the center of the ring C?

A

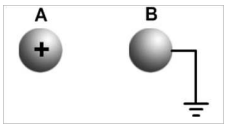
B 

C 

D

E

13 Spheres B is neutral and grounded. A positively charged sphere A is brought close to, but does not make contact with, sphere B. Which of the following is true?



A Negative charge flows from sphere B to the ground

B Negative charge flows from the ground to sphere B

C Negative charge moves neither direction because sphere B is neutral

D Positive flows from sphere B to the ground

E Positive flows from the ground to sphere B

14 As shown above, two particles, each of charge +Q, are fixed at opposite corners of a square that lies in the plane of the page. A positive test charge +q is placed at a third corner. What is the direction of the force on the test charge due to the two other charges?

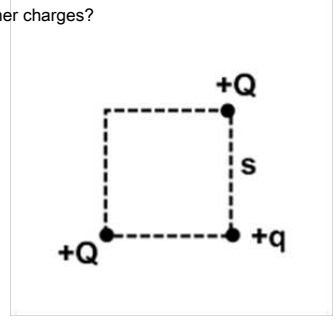
A 

B

C 

D

E 



15 As shown above, two particles, each of charge +Q, are fixed at opposite corners of a square that lies in the plane of the page. A positive test charge +q is placed at a third corner. What is the magnitude of the net force on charge +q?

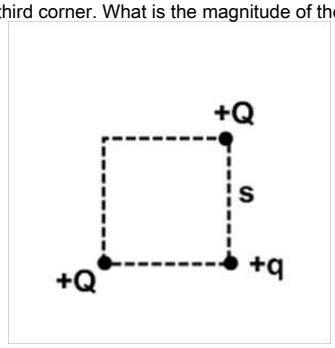
A Zero

B $kqQ / (s^2)$

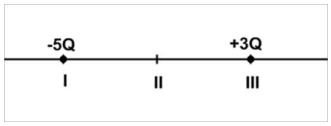
C $(\sqrt{2}\, kqQ) / (s^2)$

D $(\sqrt{3}\, kqQ) / (s^2)$

E $2kqQ / (s^2)$



16 Two charges are located on the line shown in the figure below, one on point I and the other on point III. The charge at point I is -5Q and the charge at point III is +3Q. Point II is halfway between points I and III. Other than at infinity, the electric field strength is zero at a point on the line in which of the following ranges?



A To the left of I

B Between I and II

C Between II and III

D To the right of III

E None; the field is zero only at infinity

17 If the only force acting on an electron is due to a uniform electric field, the electron moves with constant

A acceleration in a direction opposite to that of the field

B acceleration in the direction of the field

C acceleration in a direction perpendicular to that of the field

D speed in a direction opposite to that of the field

E speed in the direction of the field

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18 A negative charge Q1 = -8 μC is placed at point x1 = -4 m, a second unknown charge is placed a point x2 = 5 m. What must the sign and magnitude of the second charge be in order to cancel the electric field at the origin?

A -12.5 μC

B +12.5 μC

C -16 μC

D +8 μC

E -8 μC

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19 Positive electric charge +Q is uniformly distributed over insulating ring of radius R that lies in a plane perpendicular to the x-axis. A positive test charge +q is placed at the center of the ring. What is the net force on the test charge?

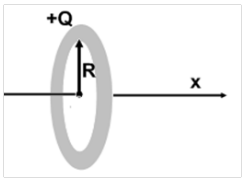
A $(kQqx) / (x^2+R^2)^{(3/2)}$

B $(\sqrt{2}\, kQqx) / (x^2+R^2)^{(3/2)}$

C $(\sqrt{3}\, kQqx) / (x^2+R^2)^{(3/2)}$

D $(kQq) / (x^2+R^2)^{(3/2)}$

E zero



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20 Positive charge Q is uniformly distributed over a thin ring of radius R that lies in a plane perpendicular to the x-axis. Which of the following formulas best represents the electric field along the positive x-axis?

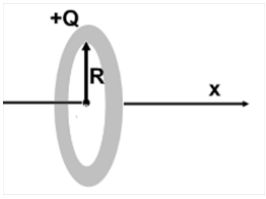
A $(kqx) / (x^2+R^2)^{(3/2)}$

B $(\sqrt{2}\, kqx) / (x^2+R^2)^{(3/2)}$

C $(\sqrt{3}\, kqx) / (x^2+R^2)^{(3/2)}$

D $(kq) / (x^2+R^2)^{(3/2)}$

E $(kqR) / (x^2+R^2)^{(3/2)}$



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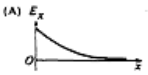
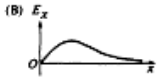
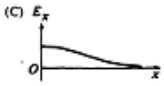
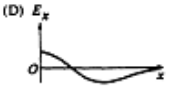
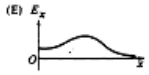
21 Positive charge Q is uniformly distributed over a thin ring of radius R that lies in a plane perpendicular to the x-axis. Which of the following graphs best represents the electric field along the positive x-axis?

A 

B 

C 

D 

E 

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22 A negatively charged rod is brought near without touching a neutral, grounded electroscope. With the rod held in place, the wire is removed from the ground. Which of the following is now true of electroscope?

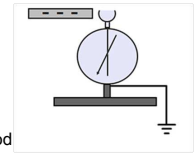
A It is uncharged because it was originally neutral

B It is positively charged

C It is negatively charged

D It is charged, but its sign cannot be predicted

E It is uncharged because it wasn't touch to the rod



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23 Two charges are arranged on the corners of a square as shown below. What is the direction of the net electric field at the center of the square?

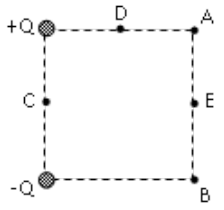
A

B 

C

D

E 



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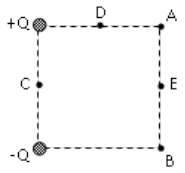
24 Two charges are arranged on the corners of a square as shown below. At which point is the magnitude of the field is strongest?

- A A
- B B
- C C
- D D
- E E



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25 A 2 μC charge of mass 0.1 g accelerates at 4 m/s2 in a uniform electric field. The magnitude of the field is most nearly

- A 2000 N/C
- B 20 N/C
- C 2 N/C
- D 0.2 N/C
- E 200 N/C

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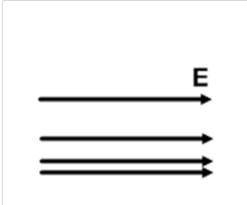
26 The electric field E shown in the diagram below increases:

- A to the right
- B to the left
- C to the bottom of the page
- D to the top of the page
- E out of the page



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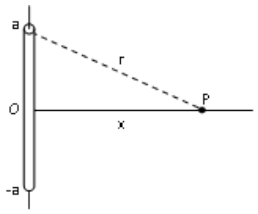
27 The diagram below depicts a line of charge Q with length 2a. Which of the following represents the y component of the electric field E at point P?

- A 0
- B $Q / (4\pi\varepsilon_o x^2)$
- C $Q / [(4\pi\varepsilon_o)\sqrt{(x^2+a^2)}]$
- D $Q / [(4\pi\varepsilon_o x)\sqrt{(x^2+a^2)}]$
- E $Q / [(2\pi\varepsilon_o)(x(x^2+a^2)^{(3/2)}]$



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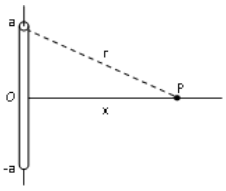
28 The diagram below depicts a line of charge Q with length 2a. Which of the following represents the x component of the electric field E at point P?

- A 0
- B $Q / (4\pi\varepsilon_o x^2)$
- C $Q / [(4\pi\varepsilon_o)\sqrt{(x^2+a^2)}]$
- D $Q / [(4\pi\varepsilon_o x)\sqrt{(x^2+a^2)}]$
- E $Q / [(2\pi\varepsilon_o)(x(x^2+a^2)^{(3/2)}]$



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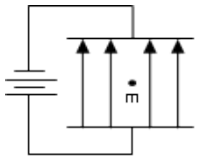
29 Two small spheres have charges Q and 3Q and are separated by a distance d. The force exerted on the charge Q has magnitude F. What is the force on the other charge?

- A F/9
- B F/3
- C F
- D 3F
- E 9F

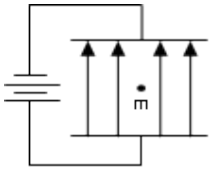
30 A battery is hooked up to a parallel plate capacitor and creates an electric field E between the plates. Between the plates exists a small particle of mass m that is levitated by the electric field. What is the charge on the particle?

- A No charge
- B Positive
- C Negative
- D The charge does not matter
- E Not enough information provided



31 A battery is hooked up to a parallel plate capacitor and creates an electric field E between the plates. Between the plates exists a small particle of mass m that is levitated by the electric field. Which of the following represents the charge on the particle?

- A mgE
- B mg/E
- C E/mg
- D Em/g
- E zero



32 A battery is hooked up to a parallel plate capacitor and creates an electric field E between the plates. Between the plates exists a small particle of mass m that is levitated by the electric field. If the charge was replaced with a charge -q, what is the direction of electric force on the particle?

- A down
- B up
- C left
- D right
- E force is zero