EdLoop

EdLoop JEE

PHYSICS · JEE MAIN

Electrostatics

Previous Year Questions with answers

297 questions · **186** papers · **2002–2026** · newest paper first

Step-by-step solutions for every question: free in the EdLoop JEE app (Google Play) · pyq.edloop.in

What is in this PDF: every Electrostatics question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

Step-by-step solutions for every question are free in the EdLoop JEE app (Google Play) and on app.edloop.in. More chapters: pyq.edloop.in/free-pdfs/

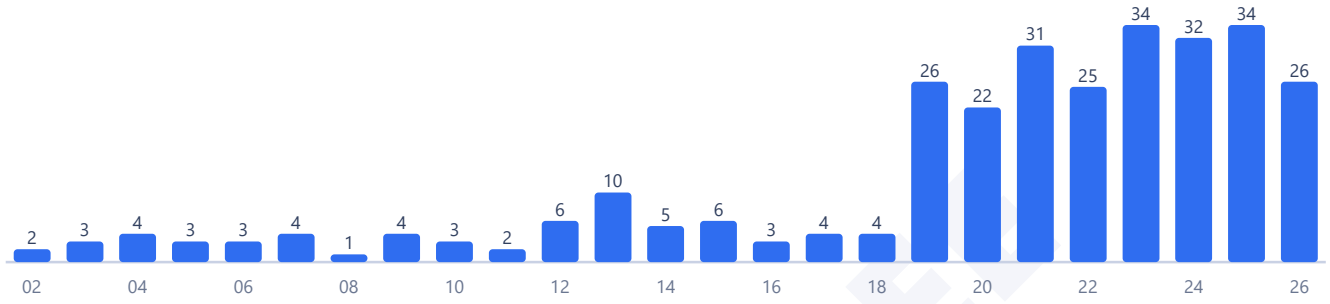
EdLoop

Chapter at a glance

5%	297	149 of 162	244 / 53
of Physics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Steady: 1.6 questions per paper in 2024–2026 against 1.3 in 2019–2023.

Questions per year



Counts are the questions we hold: 297 in 186 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Electrostatics forms the starting point for electromagnetic theory in the Class 12 syllabus under NTA Unit 11 (Electrostatics). It ranks 5 among the 29 physics chapters by total weight. In the modern computerized testing window from 2019 to 2026, electrostatics delivered 230 questions across 162 papers, an average of 1.4 problems in every sitting. A student encounters questions from this chapter in most tests, as 149 of those 162 test shifts included at least one problem. Testing has taken place every single year without interruption. Looking at recent testing cycles, the chapter's presence has shifted up: across the 58 papers set between 2024 and 2026, candidates tackled 92 questions, lifting its subject share to 5.9 percent with an average rate of 1.6 questions per shift. In the earlier paper-based window from 2002 to 2018, the chapter contributed 67 questions across 38 papers, yielding a 5.0 percent share. In the 2026 exam cycle alone, 19 papers featured 26 questions, appearing in 16 separate shifts. Across the 2019 to 2026 timeline, 53 questions required numerical answers without multiple options, meaning students regularly calculate exact numerical values for electrostatic field, flux, and energy.

Most-asked topics

Six distinct concepts structure the questions from this chapter:

- **Gauss's Law**: 75 total questions since 2002, with 57 asked between 2019 and 2026, tested up to 2026. Problems demand flux calculations through geometric surfaces like cubes, cylinders, and spheres, as well as field determinations for infinite sheets, wire distributions, and non-uniform volume charge densities.
- **Electric Potential**: 73 problems overall, including 54 in the 2019 to 2026 period and appearing in 2026. This area tests work done moving charges through electric fields, potential profiles of concentric conducting shells, and the calculation of potential from field gradients.

- **Electric Field**: 54 total questions, with 41 coming between 2019 and 2026, continuing into 2026. Typical questions evaluate vector superpositions from discrete charge arrangements, circular arcs, and ring axes.
- **Charge & Coulomb's Law**: 44 lifetime questions, with 33 asked from 2019 to 2026, tested in 2026. Questions explore pairwise forces, null points, equilibrium of suspended hanging pith balls, and integration over continuous linear rods.
- **Electric Dipole**: 33 problems across all years, with 31 concentrated between 2019 and 2026, tested through 2026. Core themes involve axial and equatorial field strengths, torque in uniform fields, and potential energy of rotating dipoles.
- **Conductors**: 18 problems overall, including 14 between 2019 and 2026, tested in 2026. Questions probe charge redistribution between connected metal spheres, surface charge densities, and cavity shielding.

What the questions look like

JEE Main tests electrostatics through both algebraic deductions and direct multi-step arithmetic:

- **Flux through closed geometric shells**: A charge placed at an apex, edge, or face center of a prism or cube requires symmetry arguments or solid angle apportioning to determine the net escaping flux.
- **Concentric conducting spherical systems**: Multiple concentric spherical shells carry specified charges or potentials. Questions ask for potential values on each shell surface or the charge shifted after earthing or interconnecting them.
- **Vector superposition of fields**: Point charges arranged symmetrically around circles, pentagons, or squares create composite field vectors at the geometric center or along a perpendicular axis.
- **Continuous charge distributions**: Calculating the electrostatic force on a point charge positioned along the extension of a uniformly charged thin rod requires setting up an integral over infinitesimal elements.

How to practise it

Begin by establishing strong vector fluency. Coulomb's law and electric field evaluations are vector operations, so writing unit vectors and resolving components along coordinate axes prevents sign mistakes.

Next, master the fundamental integral relationships connecting field and potential. When given a position-dependent electric field vector, integrate along the path to calculate work and potential difference. For continuous objects like charged rings, discs, and rods, practice setting up differential charge elements dq and evaluating the definite integrals.

Dedicate focused time to Gauss's law and conductor electrostatics. Learn how to enclose charges using symmetric Gaussian surfaces and apply the principle that all static excess charge sits on the outer conductor boundary. Solve past numerical questions to build precision in converting prefixes like microcoulombs and centimeters without arithmetic slips.

EdLoop JEE

Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

Two point charges $q_1 = 3\ \mu$C and $q_2 = -4\ \mu$C are placed at points $\left(2\hat{i} + 3\hat{j} + 3\hat{k}\right)$ and $\left(\hat{i} + \hat{j} + \hat{k}\right)$ respectively. Force on charge q_2 is _____ N. $\left(\text{Take } \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ SI Units}\right)$

(A) $\left(12\hat{i} + 24\hat{j} + 24\hat{k}\right) \times 10^{-3}$
(B) $\left(4\hat{i} + 8\hat{j} + 8\hat{k}\right) \times 10^{-3}$
(C) $\left(3\hat{i} + 6\hat{j} + 6\hat{k}\right) \times 10^{-3}$
(D) $\left(-4\hat{i} - 8\hat{j} - 8\hat{k}\right) \times 10^{-3}$

Answer: (B) $\left(4\hat{i} + 8\hat{j} + 8\hat{k}\right) \times 10^{-3}$ · Official NTA final key

Q2 JEE Main 2026 · 6 Apr · Shift 1 MCQ

A thin half ring of radius 35 cm is uniformly charged with a total charge of Q coulomb. If the magnitude of the electric field at centre of the half ring is 100 V/m, then the value of Q is _____ nC. ($\epsilon_o = 8.85 \times 10^{-12}$ C^2/Nm^2 and $\pi = 3.14$)

(A) 2.14
(B) 2.44
(C) 3.25
(D) 0.7

Answer: (A) 2.14 · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 Numerical

A three coulomb charge moves from the point $(0, -2, -5)$ to the point $(5, 1, 2)$ in an electric field expressed as $\vec{E} = 2x\hat{i} + 3y^2\hat{j} + 4\hat{k}$ N/C. The work done in moving the charge is _____ J.

Numerical value type: the answer is a number.

Answer: 186. · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

The electric potential as a function of x, y is given by $V = 5(x^2 - y^2)$ V. The electric field at a point (2, 3) m is _____ V/m.

(A) $\left(-20\hat{i} + 30\hat{j}\right)$
(B) $\left(20\hat{i} - 30\hat{j}\right)$
(C) $\left(20\hat{i} + 45\hat{j}\right)$
(D) $\left(-4\hat{i} + 6\hat{j}\right)$

Answer: (A) $\left(-20\hat{i} + 30\hat{j}\right)$ · Official NTA final key

Q5 JEE Main 2026 · 4 Apr · Shift 2 MCQ

A rigid dipole undergoes a simple harmonic motion about its centre in the presence of an electric field $\vec{E}_1 = E_0\,\hat{x}$. If another electric field $\vec{E}_2 = 2E_0\,(\hat{y}+\hat{z})$ is introduced to the system, what will be the percentage change in the frequency of the oscillation (approximate)?

(A) 73%
(B) 63%
(C) 83%
(D) 53%

Answer: (A) 73% · Official NTA final key

Q6 JEE Main 2026 · 4 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A: In electrostatics, a conductor does not store any net charge inside.

Reason R: Inside the capacitor (with no dielectric medium), the free charge carriers, if placed between the plates of capacitor, experience force and drift.

Choose the *__correct__* answer from the options given below

(A) Both **A** and **R** are true and **R** is the correct explanation of **A**
(B) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**
(C) **A** is true but **R** is false
(D) **A** is false but **R** is true

Answer: (B) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A** · Official NTA final key

Q7 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Two charged conducting spheres S_1 and S_2 of radii 8 cm and 18 cm are connected to each other by a wire. After equilibrium is established, the ratio of electric fields on S_1 and S_2 spheres are E_{S1} and E_{S2} respectively. The value of $\frac{E_{S1}}{E_{S2}}$ is _____.

(A) $\frac{3}{2}$
(B) $\frac{2}{3}$
(C) $\frac{4}{9}$
(D) $\frac{9}{4}$

Answer: (D) $\frac{9}{4}$ · Official NTA final key

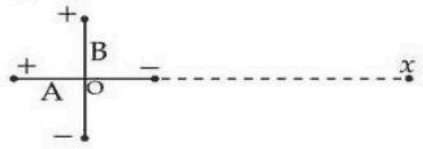
Q8 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Two short electric dipoles A and B having dipole moment p_1 and p_2 respectively are placed with their axis mutually perpendicular as shown in the figure. The resultant electric field at a point x is making

an angle of 60° with the line joining points O and x. The ratio of the dipole moments p_2/p_1 is _____.

(see the figure above)

Two short electric dipoles A and B having dipole moment p_1 and p_2 respectively are placed with their axis mutually perpendicular as shown in the figure. The resultant electric field at a point x is making an angle of 60° with the line joining points O and x. The ratio of the dipole moments p_2/p_1 is _____.



Options :

691121126. $\frac{\sqrt{3}}{2}$

691121127. $2\sqrt{3}$

691121128. $\frac{1}{\sqrt{3}}$

691121129. $\sqrt{3}$

(A) $\frac{\sqrt{3}}{2}$

(B) $2\sqrt{3}$

(C) $\frac{1}{\sqrt{3}}$

(D) $\sqrt{3}$

Answer: (B) $2\sqrt{3}$ · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 2 MCQ

Two metal plates (A, B) are kept horizontally with separation of $\left(\frac{12}{\pi}\right)$ cm, with plate A on the top. An atomizer jet sprays oil (density 1.5 g/cm^3) droplets of radius 1 mm horizontally. All oil droplets carry a charge 5 nC. The potentials V_A and V_B are required on plates A and B respectively in order to ensure the droplets do not descend. The values of V_A and V_B are _____.
(Neglect the air resistance to the droplets and take g = 10 m/s^2)

(A) 100 V and 580 V

(B) 580 V and 100 V

(C) 60 V and 400 V

(D) 0 V and -200 V

Answer: (A) 100 V and 580 V · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 2 MCQ

Two point charges 8 μC and -2 μC are located at $x = 2$ cm and $x = 4$ cm, respectively on the x-axis. The ratio of electric flux due to these charges through two spheres of radii 3 cm and 5 cm with their centers at the origin is _____.

(A) $4 : 1$
(B) $3 : 4$
(C) $4 : 3$
(D) $4 : 5$

Answer: (C) $4 : 3$ · Official NTA final key

Q11 JEE Main 2026 · 28 Jan · Shift 1 MCQ

Two point charges of 1 nC and 2 nC are placed at the two corners of equilateral triangle of side 3 cm. The work done in bringing a charge of 3 nC from infinity to the third corner of the triangle is _____ μJ.

$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ N.m^2/C^2

(A) 5.4
(B) 27
(C) 3.3
(D) 2.7

Answer: (D) 2.7 · Official NTA final key

Q12 JEE Main 2026 · 28 Jan · Shift 2 MCQ

Which one of the following is **not** a measurable quantity ?

(A) Voltage difference
(B) Voltage
(C) Resistance
(D) Displacement current

Answer: (B) Voltage · Official NTA final key

Q13 JEE Main 2026 · 28 Jan · Shift 2 MCQ

Identify the correct statements :

A. Electrostatic field lines form closed loops .

B. The electric field lines point radially outward when charge is greater than zero.

C. The Gauss - Law is valid only for inverse - square force.

D. The workdone in moving a charged particle in a static electric field around a closed path is zero.

E. The motion of a particle under Coulomb's force must take place in a plane.

Choose the **correct** answer from the options given below :

(A) A, B, C, D Only

(B) A, C, E Only

(C) B, C, D, E Only

(D) A, B, D, E Only

Answer: (C) B, C, D, E Only · Official NTA final key

Q14 JEE Main 2026 · 24 Jan · Shift 1 MCQ

There are three co-centric conducting spherical shells A, B and C of radii a, b and c respectively ($c > b > a$) and they are charged with charge q_1, q_2 and q_3 respectively. The potentials of the spheres A, B and C respectively, are :

(A) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(B) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(C) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(D) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$

Answer: (C) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$ · Official NTA final key

Q15 JEE Main 2026 · 24 Jan · Shift 1 MCQ

The electrostatic potential in a charged spherical region of radius r varies as $V = ar^3 + b$, where a and b are constants. The total charge in the sphere of unit radius is $\alpha \times \pi a\epsilon_0$. The value of α is _____.

(permittivity of vacuum is ϵ_0)

(A) -8

(B) -12

(C) -9

(D) -6

Answer: (B) -12 · Official NTA final key

Q16 JEE Main 2026 · 24 Jan · Shift 1 MCQ

Three charges $+2q$, $+3q$ and $-4q$ are situated at $(0, -3a)$, $(2a, 0)$ and $(-2a, 0)$ respectively in the xy plane. The resultant dipole moment about origin is _____.

EdLoop JEE

(A) $2qa\left(7\hat{i}-3\hat{j}\right)$

(B) $2qa\left(3\hat{j}-7\hat{i}\right)$

(C) $2qa\left(3\hat{j}-\hat{i}\right)$

(D) $2qa\left(3\hat{i}-7\hat{j}\right)$

Answer: (A) $2qa\left(7\hat{i}-3\hat{j}\right)$ · Official NTA final key

---

Q17 JEE Main 2026 · 24 Jan · Shift 2 Numerical

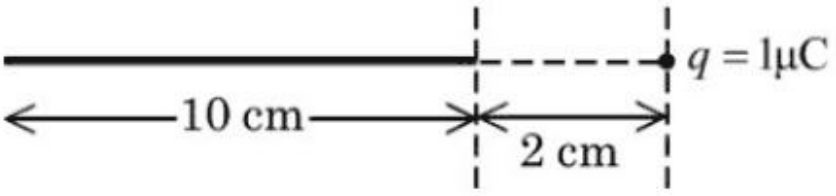
A point charge $q = 1\ \mu$C is located at a distance 2 cm from one end of a thin insulating wire of length 10 cm having a charge $Q = 24\ \mu$C, distributed uniformly along its length, as shown in figure. Force between q and wire is _____ N.

(Use : $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ N.m^2/C^2)

(see the figure above)

Q.50 A point charge $q = 1$ μC is located at a distance 2 cm from one end of a thin insulating wire of length 10 cm having a charge $Q = 24$ μC, distributed uniformly along its length, as shown in figure. Force between q and wire is _____ N.

(Use : $\frac{1}{4\pi\epsilon_0} = 9\times10^9$ N.m^2/C^2)



Numerical value type: the answer is a number.

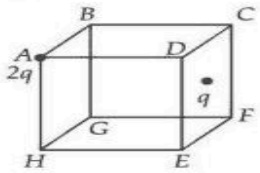
Answer: 90. · Official NTA final key

Q18 JEE Main 2026 · 23 Jan · Shift 1 MCQ

Two point charges $2q$ and q are placed at vertex A and centre of face $CDEF$ of the cube as shown in figure. The electric flux passing through the cube is :

(see the figure above)

Q.36 Two point charges $2q$ and q are placed at vertex A and centre of face $CDEF$ of the cube as shown in figure. The electric flux passing through the cube is :



Options

1. $\frac{3q}{\epsilon_0}$
2. $\frac{3q}{4\epsilon_0}$
3. $\frac{q}{\epsilon_0}$
4. $\frac{3q}{2\epsilon_0}$

(A) $\frac{3q}{\epsilon_0}$
(B) $\frac{3q}{4\epsilon_0}$
(C) $\frac{q}{\epsilon_0}$
(D) $\frac{3q}{2\epsilon_0}$

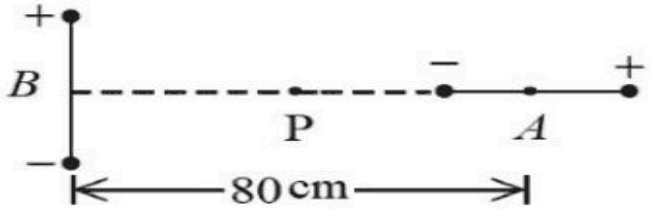
Answer: (B) $\frac{3q}{4\epsilon_0}$ · Official NTA final key

Q19 JEE Main 2026 · 23 Jan · Shift 2 MCQ

Two shorts dipoles (A, B), A having charges $\pm 2\,\mu$C and length 1 cm and B having charges $\pm 4\,\mu$C and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P, equi-distant from the centres of both dipoles is _____ N/C.

(see the figure above)

Q.33 Two shorts dipoles (A, B), A having charges $\pm$ 2 μC and length 1 cm and B having charges $\pm$ 4 μC and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P, equi-distant from the centres of both dipoles is _____N/C.



Options

1. $4.5\sqrt{2} \times 10^4$
2. $9\sqrt{2} \times 10^4$
3. $\frac{9}{16}\sqrt{2} \times 10^5$
4. $\frac{9}{16}\sqrt{2} \times 10^4$

(A) $4.5\sqrt{2} \times 10^4$
(B) $9\sqrt{2} \times 10^4$
(C) $\frac{9}{16}\sqrt{2} \times 10^5$
(D) $\frac{9}{16}\sqrt{2} \times 10^4$

Answer: (D) $\frac{9}{16}\sqrt{2} \times 10^4$ · Official NTA final key

Q20 JEE Main 2026 · 23 Jan · Shift 2 MCQ

Two charges $7\,\mu$C and $-2\,\mu$C are placed at $(-9, 0, 0)$ cm and $(9, 0, 0)$ cm respectively in an external field $E = \frac{A}{r^2}\hat{r}$, where $A = 9 \times 10^5$ N/C.m^2. Considering the potential at infinity is 0, the electrostatic energy of the configuration is _____ J.

(A) 24.3
(B) 49.3
(C) -90.7
(D) 1.4

Answer: (B) 49.3 · Official NTA final key

Q21 JEE Main 2026 · 22 Jan · Shift 1 MCQ

Electric field in a region is given by $\vec{E} = Ax\hat{i} + By\hat{j}$, where $A = 10$ V/m^2 and $B = 5$ V/m^2. If the electric potential at a point $(10, 20)$ is 500 V, then the electric potential at origin is _____ V.

(A) 1000
(B) 500
(C) 2000
(D) 0

Answer: (C) 2000 · Official NTA final key

Q22 JEE Main 2026 · 22 Jan · Shift 1 MCQ

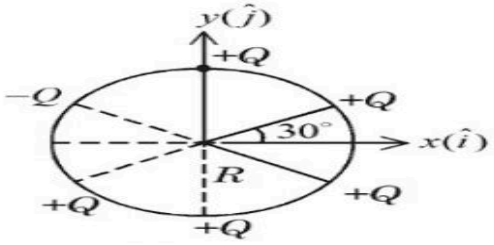
Six point charges are kept 60° apart from each other on the circumference of a circle of radius R as shown in figure. The net electric field at the center of the circle is _____.

(ϵ_0 is permittivity of free space)

(see the figure above)

Q.42 Six point charges are kept 60° apart from each other on the circumference of a circle of radius R as shown in figure. The net electric field at the center of the circle is _____.

($\in_o$ is permittivity of free space)



Options

1. $\frac{Q}{4\pi \in_o R^2}\left(\sqrt{3}\,\hat{i}-\hat{j}\right)$
2. $-\frac{Q}{4\pi \in_o R^2}\left(\sqrt{3}\,\hat{i}-\hat{j}\right)$
3. $-\left(\frac{5Q}{8\pi \in_o R^2}\right)\left(\hat{i}-3\hat{j}\right)$
4. $-\frac{5Q}{8\pi \in_o R^2}\left(\hat{i}+\sqrt{3}\hat{j}\right)$

(A) $\frac{Q}{4\pi\epsilon_0 R^2}\left(\sqrt{3}\hat{i}-\hat{j}\right)$
(B) $-\frac{Q}{4\pi\epsilon_0 R^2}\left(\sqrt{3}\hat{i}-\hat{j}\right)$
(C) $-\left(\frac{5Q}{8\pi\epsilon_0 R^2}\right)\left(\hat{i}-3\hat{j}\right)$
(D) $-\frac{5Q}{8\pi\epsilon_0 R^2}\left(\hat{i}+\sqrt{3}\hat{j}\right)$

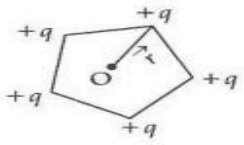
Answer: (B) $-\frac{Q}{4\pi\epsilon_0 R^2}\left(\sqrt{3}\hat{i}-\hat{j}\right)$ · Official NTA final key

Q23 JEE Main 2026 · 22 Jan · Shift 2 MCQ

Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) and the electric field ($\vec{E}$) at the center O of the pentagon due to these five positive charges are :

(see the figure above)

Q.37 Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) and the electric field ($\vec{E}$) at the center O of the pentagon due to these five positive charges are :



Options

1. $V=\frac{5q}{4\pi\varepsilon_o r}$ and $\vec{E}=\frac{5\sqrt{3}q}{8\pi\varepsilon_o r^2}\hat{r}$
2. $V=0$ and $\vec{E}=0$
3. $V=\frac{5q}{4\pi\varepsilon_o r}$ and $\vec{E}=\frac{5q}{4\pi\varepsilon_o r^2}\hat{r}$
4. $V=\frac{5q}{4\pi\varepsilon_o r}$ and $\vec{E}=0$

(A) $V=\frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E}=\frac{5\sqrt{3}q}{8\pi\varepsilon_0 r^2}\hat{r}$
(B) $V=0$ and $\vec{E}=0$
(C) $V=\frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E}=\frac{5q}{4\pi\varepsilon_0 r^2}\hat{r}$
(D) $V=\frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E}=0$

Answer: (D) $V=\frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E}=0$ · Official NTA final key

Q24 JEE Main 2026 · 22 Jan · Shift 2 MCQ

Three small identical bubbles of water having same charge on each coalesce to form a bigger bubble. Then the ratio of the potentials on one initial bubble and that on the resultant bigger bubble is :

(A) $1:2^{2/3}$
(B) $1:3^{1/3}$
(C) $1:3^{2/3}$
(D) $3^{2/3}:1$

Answer: (C) $1:3^{2/3}$ · Official NTA final key

Q25 JEE Main 2026 · 21 Jan · Shift 1 MCQ

A point charge of 10^{-8} C is placed at origin. The work done in moving a point charge 2 μC from point $A(4,4,2)$ m to $B(2,2,1)$ m is _____ J. $\left(\frac{1}{4\pi\epsilon_o}=9\times10^9 \text{ in SI units}\right)$

(A) 45×10^{-6}

(B) 0

(C) 30×10^{-6}

(D) 15×10^{-6}

Answer: (C) 30×10^{-6} · Official NTA final key

Q26 JEE Main 2026 · 21 Jan · Shift 2 MCQ

Consider two identical metallic spheres of radius R each having charge Q and mass m. Their centers have an initial separation of $4R$. Both the spheres are given an initial speed of u towards each other. The minimum value of u, so that they can just touch each other is :

(Take $k = \dfrac{1}{4\pi\epsilon_0}$ and assume $kQ^2 > Gm^2$ where G is the Gravitational constant)

(A) $\sqrt{\frac{kQ^2}{4mR}\left(1 - \frac{Gm^2}{kQ^2}\right)}$

(B) $\sqrt{\frac{kQ^2}{2mR}\left(1 - \frac{Gm^2}{kQ^2}\right)}$

(C) $\sqrt{\frac{kQ^2}{2mR}\left(1 - \frac{Gm^2}{2kQ^2}\right)}$

(D) $\sqrt{\frac{kQ^2}{4mR}\left(1 + \frac{Gm^2}{kQ^2}\right)}$

Answer: (A) $\sqrt{\frac{kQ^2}{4mR}\left(1 - \frac{Gm^2}{kQ^2}\right)}$ · Official NTA final key

---

Q27 JEE Main 2025 · 8 Apr · Shift 2 MCQ

An infinitely long wire has uniform linear charge density $\lambda = 2\,nC/m$. The net flux through a Gaussian cube of side length $\sqrt{3}\,cm$, if the wire passes through any two corners of the cube, that are maximally displaced from each other, would be $x\,Nm^2C^{-1}$, where x is :

[Neglect any edge effects and use $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ SI units]

(A) 0.72π

(B) 1.44π

(C) 6.48π

(D) 2.16π

Answer: (D) 2.16π · Key from source paper

Q28 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R

Assertion A : Work done in moving a test charge between two points inside a uniformly charged spherical shell is zero, no matter which path is chosen.

Reason R : Electrostatic potential inside a uniformly charged spherical shell is constant and is same as that on the surface of the shell.

In the light of the above statements, choose the correct answer from the options given below

(A) A is false but R is true

(B) A is true but R is false

(C) Both A and R are true and R is the correct explanation of A

(D) Both A and R are true but R is NOT the correct explanation of A

Answer: (C) Both A and R are true and R is the correct explanation of A · Key from source paper

---

Q29 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Two metal spheres of radius R and 3 R have same surface charge density σ. If they are brought in contact and then separated, the surface charge density on smaller and bigger sphere becomes σ_1 and σ_2, respectively. The ratio $\frac{\sigma_1}{\sigma_2}$ is _____.

(A) 3

(B) 9

(C) $\frac{1}{9}$

(D) $\frac{1}{3}$

Answer: (A) 3 · Key from source paper

Q30 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Electric charge is transferred to an irregular metallic disk as shown in figure. If $\sigma_1, \sigma_2, \sigma_3$ and σ_4 are charge densities at given points then, choose the correct answer from the options given below :

(see the figure above)

A. $\sigma_1 > \sigma_3; \sigma_2 = \sigma_4$

B. $\sigma_1 > \sigma_2; \sigma_3 > \sigma_4$

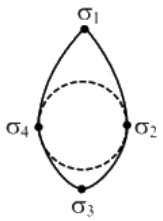
C. $\sigma_1 > \sigma_3 > \sigma_2 = \sigma_4$

D. $\sigma_1 < \sigma_3 < \sigma_2 = \sigma_4$

E. $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4$

EdLoop JEE

16. Electric charge is transferred to an irregular metallic disk as shown in figure. If $\sigma_1, \sigma_2, \sigma_3$ and σ_4 are charge densities at given points then, choose the correct answer from the options given below :



A. $\sigma_1 > \sigma_3; \sigma_2 = \sigma_4$

B. $\sigma_1 > \sigma_2; \sigma_3 > \sigma_4$

C. $\sigma_1 > \sigma_3 > \sigma_2 = \sigma_4$

D. $\sigma_1 < \sigma_3 < \sigma_2 = \sigma_4$

E. $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4$

(1) B and C Only (2) A, B and C Only (3) A and C Only (4) D and E Only

(A) B and C Only
(B) A, B and C Only
(C) A and C Only
(D) D and E Only

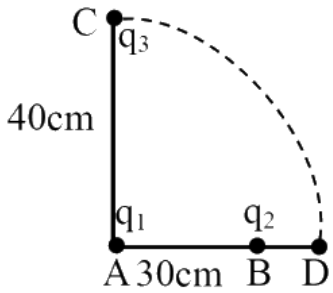
Answer: (B) A, B and C Only · Key from source paper

Q31 JEE Main 2025 · 7 Apr · Shift 1 MCQ

Two charges q_1 and q_2 are separated by a distance of 30 cm. A third charge q_3 initially at 'C' as shown in the figure, is moved along the circular path of radius 40 cm from C to D. If the difference in potential energy due to movement of q_3 from C to D is given by $\frac{q_3 K}{4\pi\epsilon_0}$, the value of K is:

(see the figure above)

7. Two charges q_1 and q_2 are separated by a distance of 30 cm. A third charge q_3 initially at 'C' as shown in the figure, is moved along the circular path of radius 40 cm from C to D. If the difference in potential energy due to movement of q_3 from C to D is given by $\frac{q_3 K}{4\pi\epsilon_0}$, the value of K is:



(1) $8q_1$ (2) $6q_2$ (3) $6q_1$ (4) $8q_2$

(A) $8q_1$
(B) $6q_2$
(C) $6q_1$
(D) $8q_2$

Answer: (D) $8q_2$ · Key from source paper

Q32 JEE Main 2025 · 7 Apr · Shift 2 MCQ

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : The outer body of an air craft is made of metal which protects persons sitting inside from lightning-strikes.

Reason (R): The electric field inside the cavity enclosed by a conductor is zero.

In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(B) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(C) (A) is correct but (R) is not correct
(D) (A) is not correct but (R) is correct

Answer: (B) Both (A) and (R) are correct and (R) is the correct explanation of (A) · Key from source paper

---

Q33 JEE Main 2025 · 7 Apr · Shift 2 MCQ

A dipole with two electric charges of $2\mu C$ magnitude each, with separation distance $0.5\mu m$, is placed between the plates of a capacitor such that its axis is parallel to an electric field established between the plates when a potential difference of 5 V is applied. Separation between the plates is 0.5 mm. If the dipole is rotated by 30° from the axis, it tends to realign in the direction due to a torque. The value of torque is :

(A) $2.5 \times 10^{-9} Nm$
(B) $5 \times 10^{-9} Nm$
(C) $2.5 \times 10^{-12} Nm$
(D) $5 \times 10^{-3} Nm$

Answer: (B) $5 \times 10^{-9} Nm$ · Key from source paper

Q34 JEE Main 2025 · 7 Apr · Shift 2 Numerical

The electric field in a region is given by $\vec{E} = \left(2\hat{i} + 4\hat{j} + 6\hat{k}\right) \times 10^3 N/C$. The flux of the field through a rectangular surface parallel to x-z plane is $6.0 Nm^2C^{-1}$. The area of the surface is _____ cm^2.

Numerical value type: the answer is a number.

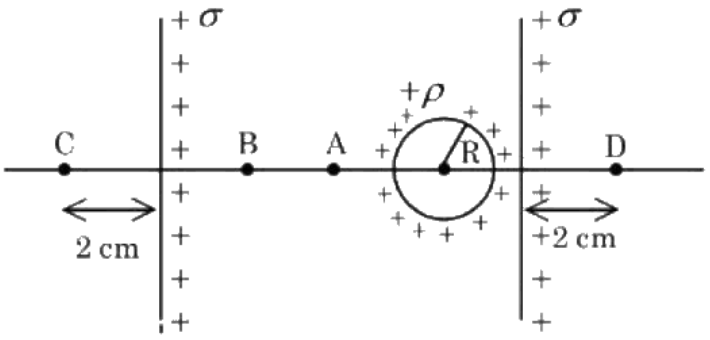
Answer: 15. · Key from source paper

Q35 JEE Main 2025 · 4 Apr · Shift 1 MCQ

Two infinite identical charged sheets and a charged spherical body of charge density ' ρ ' are arranged as shown in figure. Then the correct relation between the electrical fields at A, B, C and D points is:

(see the figure above)

13. Two infinite identical charged sheets and a charged spherical body of charge density ' ρ ' are arranged as shown in figure. Then the correct relation between the electrical fields at A, B, C and D points is:



(1) $\vec{E}_A > \vec{E}_B; \vec{E}_C = \vec{E}_D$

(2) $\vec{E}_C \neq \vec{E}_D; \vec{E}_A > \vec{E}_B$

(3) $\left|\vec{E}_A\right| = \left|\vec{E}_B\right|; \vec{E}_C > \vec{E}_D$

(4) $\vec{E}_A = \vec{E}_B; \vec{E}_C = \vec{E}_D$

(A) $\vec{E}_A > \vec{E}_B; \vec{E}_C = \vec{E}_D$

(B) $\vec{E}_C \neq \vec{E}_D; \vec{E}_A > \vec{E}_B$

(C) $\left|\vec{E}_A\right| = \left|\vec{E}_B\right|; \vec{E}_C > \vec{E}_D$

(D) $\vec{E}_A = \vec{E}_B; \vec{E}_C = \vec{E}_D$

Answer: (B) $\vec{E}_C \neq \vec{E}_D; \vec{E}_A > \vec{E}_B$ · Key from source paper

Q36 JEE Main 2025 · 4 Apr · Shift 1 MCQ

Two small spherical balls of mass 10 g each with charges $-2\mu C$ and $2\mu C$, are attached to two ends of very light rigid rod of length 20 cm. The arrangement is now placed near an infinite nonconducting charge sheet with uniform charge density of $100\mu C/m^2$ such that length of rod makes an angle of 30° with electric field generated by charge sheet. Net torque acting on the rod is: (Take ϵ_o : $8.85 \times 10^{-12} C^2 Nm^2$)

(A) 11.2 Nm
(B) 112 Nm
(C) 1.12 Nm
(D) 2.24 Nm

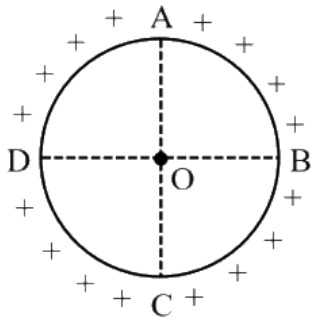
Answer: (C) 1.12 Nm · Key from source paper

Q37 JEE Main 2025 · 4 Apr · Shift 2 MCQ

A metallic ring is uniformly charged as shown in figure. AC and BD are two mutually perpendicular diameters. Electric field due to arc AB at ' O ' is ' E ' in magnitude. What would be the magnitude of electric field at ' O ' due to arc ABC ?

(see the figure above)

13. A metallic ring is uniformly charged as shown in figure. AC and BD are two mutually perpendicular diameters. Electric field due to arc AB at ' O ' is ' E ' in magnitude. What would be the magnitude of electric field at ' O ' due to arc ABC ?



(1) 2E (2) Zero (3) $E/2$ (4) $\sqrt{2}E$

(A) 2E
(B) Zero
(C) E / 2
(D) $\sqrt{2}E$

Answer: (D) $\sqrt{2}E$ · Key from source paper

Q38 JEE Main 2025 · 3 Apr · Shift 1 MCQ

The electrostatic potential on the surface of uniformly charged spherical shell of radius R = 10 cm is 120 V . The potential at the centre of shell, at a distance r = 5 cm from centre, and at a distance $r = 15$ cm from the centre of the shell respectively, are:

(A) $40V, 40V, 80V$
(B) $0V, 0V, 80V$
(C) $0V, 120V, 40V$
(D) $120V, 120V, 80V$

Answer: (D) $120V, 120V, 80V$ · Key from source paper

Q39 JEE Main 2025 · 2 Apr · Shift 1 MCQ

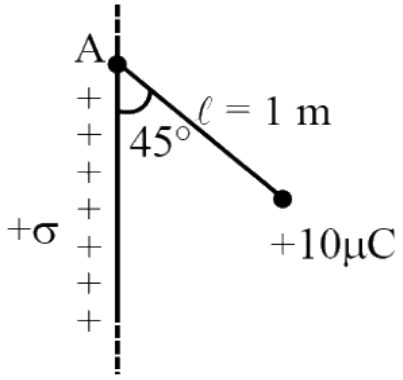
A small bob of mass 100 mg and charge $+10\mu C$ is connected to an insulating string of length 1 m. It is brought near to an infinitely long non-conducting sheet of charge density ' σ ' as shown in figure. If string subtends an angle of 45° with the sheet at equilibrium the charge density of sheet will be.

(Given, $\epsilon_0 = 8.85 \times 10^{-12} \frac{F}{m}$ and acceleration due to gravity, $g = 10 \frac{m}{s^2}$)

(see the figure above)

7. A small bob of mass 100 mg and charge $+10\mu C$ is connected to an insulating string of length 1 m. It is brought near to an infinitely long non-conducting sheet of charge density ' σ ' as shown in figure. If string subtends an angle of 45° with the sheet at equilibrium the charge density of sheet will be.

(Given, $\epsilon_0 = 8.85 \times 10^{-12} \frac{F}{m}$ and acceleration due to gravity, $g = 10 \frac{m}{s^2}$)



(1) $1.77nC/m^2$ (2) $17.7nC/m^2$ (3) $885nC/m^2$ (4) $0.885nC/m^2$

(A) $1.77nC/m^2$
(B) $17.7nC/m^2$
(C) $885nC/m^2$
(D) $0.885nC/m^2$

Answer: (A) $1.77nC/m^2$ · Key from source paper

Q40 JEE Main 2025 · 2 Apr · Shift 1 MCQ

A point charge + q is placed at the origin. A second point charge +9 q is placed at $(d, 0, 0)$ in Cartesian coordinate system. The point in between them where the electric field vanishes is :

(A) $(d/4, 0, 0)$
(B) $(d/3, 0, 0)$
(C) $(4d/3, 0, 0)$
(D) $(3d/4, 0, 0)$

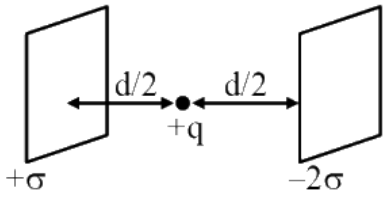
Answer: (A) $(d/4, 0, 0)$ · Key from source paper

Q41 JEE Main 2025 · 2 Apr · Shift 1 MCQ

Consider two infinitely large plane parallel conducting plates as shown below. The plates are uniformly charged with a surface charge density $+\sigma$ and -2σ. The force experienced by a point charge + q placed at the mid point between two plates will be :

(see the figure above)

18. Consider two infinitely large plane parallel conducting plates as shown below. The plates are uniformly charged with a surface charge density $+\sigma$ and -2σ. The force experienced by a point charge + q placed at the mid point between two plates will be :



(1) $\frac{3\sigma q}{4\epsilon_0}$ (2) $\frac{3\sigma q}{2\epsilon_0}$ (3) $\frac{\sigma q}{4\epsilon_0}$ (4) $\frac{\sigma q}{2\epsilon_0}$

(A) $\frac{3\sigma q}{4\epsilon_0}$
(B) $\frac{3\sigma q}{2\epsilon_0}$
(C) $\frac{\sigma q}{4\epsilon_0}$
(D) $\frac{\sigma q}{2\epsilon_0}$

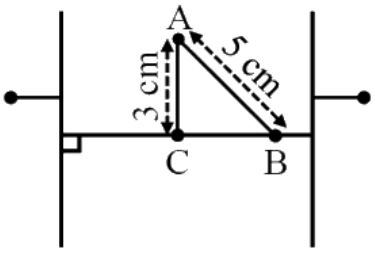
Answer: (B) $\frac{3\sigma q}{2\epsilon_0}$ · Key from source paper

Q42 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Two large plane parallel conducting plates are kept 10 cm apart as shown in figure. The potential difference between them is V. The potential difference between the points A and B (shown in the figure) is :

(see the figure above)

1. Two large plane parallel conducting plates are kept 10 cm apart as shown in figure. The potential difference between them is V. The potential difference between the points A and B (shown in the figure) is :



(1) $\frac{1}{4}V$ (2) $\frac{2}{5}V$ (3) 1 V (4) $\frac{3}{4}V$

(A) $\frac{1}{4}V$
(B) $\frac{2}{5}V$
(C) 1 V
(D) $\frac{3}{4}V$

Answer: (B) $\frac{2}{5}V$ · Key from source paper

Q43 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Consider a circular loop that is uniformly charged and has a radius $a\sqrt{2}$. Find the position along the positive z -axis of the cartesian coordinate system where the electric field is maximum if the ring was assumed to be placed in xy plane at the origin :

(A) $a/\sqrt{2}$
(B) a
(C) 0
(D) $a/2$

Answer: (B) a · Key from source paper

Q44 JEE Main 2025 · 29 Jan · Shift 1 MCQ

An electric dipole of mass m, charge q, and length l is placed in a uniform electric field $\vec{E} = E_0\hat{i}$. When the dipole is rotated slightly from its equilibrium position and released, the time period of its oscillations will be:

(A) $\frac{1}{2\pi}\sqrt{\frac{ml}{2qE_0}}$
(B) $2\pi\sqrt{\frac{ml}{qE_0}}$
(C) $\frac{1}{2\pi}\sqrt{\frac{2ml}{qE_0}}$
(D) $2\pi\sqrt{\frac{ml}{2qE_0}}$

Answer: (D) $2\pi\sqrt{\frac{ml}{2qE_0}}$ · Key from source paper

Q45 JEE Main 2025 · 29 Jan · Shift 1 MCQ

Match List - I with List - II.

	List - I		List - II
(A)	Electric field inside (distance $r > 0$ from center) of a uniformly charged spherical shell with surface charge density σ, and radius R.	(I)	σ/ϵ_0
(B)	Electric field at distance r>0 from a uniformly charged infinite plane sheet with surface charge density σ.	(II)	$\sigma/2\epsilon_0$
(C)	Electric field outside (distance r>0 from center) of a uniformly charged spherical shell with surface charge density σ, and radius R.	(III)	0
(D)	Electric field between 2 oppositely charged infinite plane parallel sheets with uniform surface charge density σ.	(IV)	$\frac{\sigma R^2}{\epsilon_0 r^2}$

Choose the correct answer from the options given below :

(A) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)

(B) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

(C) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

(D) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

Answer: (A) (A)-(III), (B)-(II), (C)-(IV), (D)-(I) · Key from source paper

Q46 JEE Main 2025 · 29 Jan · Shift 2 MCQ

A point charge causes an electric flux of $-2 \times 10^4\ \mathrm{Nm^2C^{-1}}$ to pass through a spherical Gaussian surface of 8.0 cm radius, centred on the charge. The value of the point charge is : (Given $\epsilon_0 = 8.85 \times 10^{-12}\ \mathrm{C^2\,N^{-1}\,m^{-2}}$)

(A) 15.7×10^{-8}C

(B) 17.7×10^{-8}C

(C) -15.7×10^{-8}C

(D) -17.7×10^{-8}C

Answer: (D) -17.7×10^{-8}C · Key from source paper

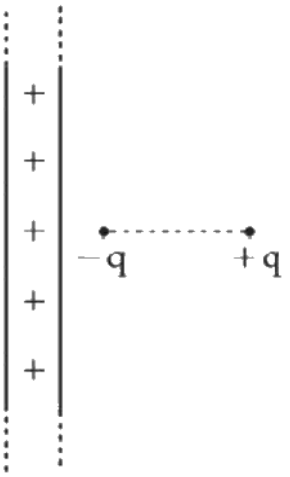
Q47 JEE Main 2025 · 29 Jan · Shift 2 MCQ

An electric dipole is placed at a distance of 2 cm from an infinite plane sheet having positive charge density σ_o

(see the figure above)

. Choose the correct option from the following.

Q45. An electric dipole is placed at a distance of 2 cm from an infinite plane sheet having positive charge density σ_o



. Choose the correct option from the following.

(1) Potential energy and torque both are maximum.

(2) Torque on dipole is zero and net force is directed away from the sheet.

(3) Torque on dipole is zero and net force acts towards the sheet.

(4) Potential energy of dipole is minimum and torque is zero.

(A) Potential energy and torque both are maximum.

(B) Torque on dipole is zero and net force is directed away from the sheet.

(C) Torque on dipole is zero and net force acts towards the sheet.

(D) Potential energy of dipole is minimum and torque is zero.

Answer: (D) Potential energy of dipole is minimum and torque is zero. · Key from source paper

---

Q48 JEE Main 2025 · 28 Jan · Shift 1 MCQ

Three infinitely long wires with linear charge density λ are placed along the $x-axis$, y-axis and $z-$ axis respectively. Which of the following denotes an equipotential surface?

(A) xyz = constant

(B) $xy+yz+zx$ = constant

(C) $\left(x^2+y^2\right)\left(y^2+z^2\right)\left(z^2+x^2\right)$ = constant

(D) $(x+y)(y+z)(z+x)$ = constant

Answer: (C) $\left(x^2+y^2\right)\left(y^2+z^2\right)\left(z^2+x^2\right)$ **= constant** · Key from source paper

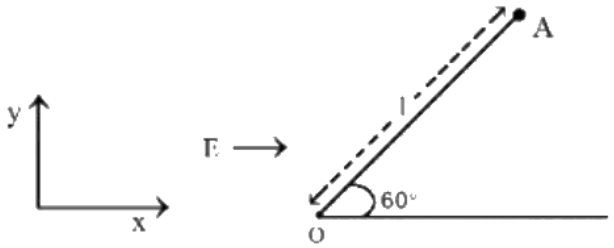
---

Q49 JEE Main 2025 · 28 Jan · Shift 1 MCQ

A particle of mass ' m ' and charge ' q ' is fastened to one end ' A ' of a massless string having equilibrium length l, whose other end is fixed at point ' O '. The whole system is placed on a frictionless horizontal plane and is initially at rest. If uniform electric field is switched on along the direction as shown in figure, then the speed of the particle when it crosses the x -axis is

(see the figure above)

Q30. A particle of mass ' m ' and charge ' q ' is fastened to one end ' A ' of a massless string having equilibrium length l, whose other end is fixed at point ' O '. The whole system is placed on a frictionless horizontal plane and is initially at rest. If uniform electric field is switched on along the direction as shown in figure, then the speed of the particle when it crosses the x -axis is



(1) $\sqrt{\frac{\mathrm{qEl}}{2\,\mathrm{m}}}$
(2) $\sqrt{\frac{\mathrm{qEl}}{\mathrm{m}}}$
(3) $\sqrt{\frac{\mathrm{qEl}}{4\,\mathrm{m}}}$
(4) $\sqrt{\frac{2q\mathrm{El}}{\mathrm{m}}}$

(A) $\sqrt{\frac{qEl}{2\,m}}$
(B) $\sqrt{\frac{qEl}{m}}$
(C) $\sqrt{\frac{qEl}{4\,m}}$
(D) $\sqrt{\frac{2qEl}{m}}$

Answer: (B) $\sqrt{\frac{qEl}{m}}$ · Key from source paper

Q50 JEE Main 2025 · 28 Jan · Shift 2 Numerical

An electric dipole of dipole moment 6×10^{-6}Cm is placed in uniform electric field of magnitude 10^6 V/m. Initially, the dipole moment is parallel to electric field. The work that needs to be done on the dipole to make its dipole moment opposite to the field, will be _____ J.

Numerical value type: the answer is a number.

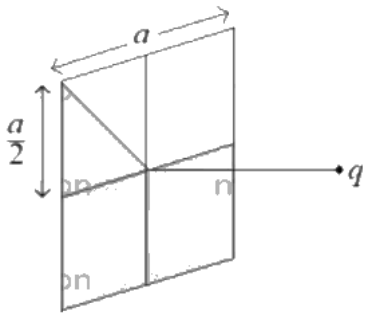
Answer: 12. · Key from source paper

Q51 JEE Main 2025 · 24 Jan · Shift 1 Numerical

A square loop of sides $a = 1$ m is held normally in front of a point charge q = 1C. The flux of the electric field through the shaded region is $\frac{5}{\mathrm{p}} \times \frac{1}{\varepsilon_0} \frac{\mathrm{Nm}^2}{\mathrm{C}}$, where the value of p is _____ .

(see the figure above)

Q47. A square loop of sides $a = 1$ m is held normally in front of a point charge $q = 1C$. The flux of the electric field through the shaded region is $\frac{5}{p} \times \frac{1}{\varepsilon_0} \frac{Nm^2}{C}$, where the value of p is _____.



Numerical value type: the answer is a number.

Answer: 48. · Key from source paper

Q52 JEE Main 2025 · 24 Jan · Shift 2 MCQ

A small uncharged conducting sphere is placed in contact with an identical sphere but having 4×10^{-8}C charge and then removed to a distance such that the force of repulsion between them is 9×10^{-3} N. The distance between them is (Take $\frac{1}{4\pi\epsilon_o}$ as 9×10^9inSI units)

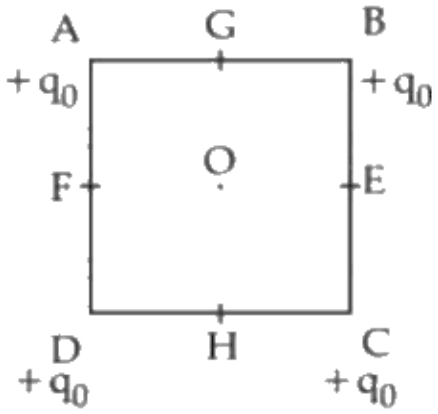
(A) 3 cm
(B) 2 cm
(C) 4 cm
(D) 1 cm

Answer: (B) 2 cm · Key from source paper

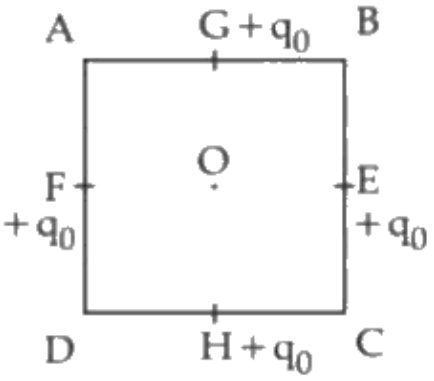
Q53 JEE Main 2025 · 24 Jan · Shift 2 MCQ

see figure

Q38.



Configuration (1)



Configuration (2)

(1) $\frac{Kq_0^2}{a}(4-2\sqrt{2})$

(2) $\frac{Kq_0^2}{a}(3-\sqrt{2})$

(3) $\frac{Kq_0^2}{a}(4\sqrt{2}-2)$

(4) $\frac{Kq_0^2}{a}(3\sqrt{2}-2)$

(A) $\frac{Kq_0^2}{a}(4-2\sqrt{2})$

(B) $\frac{Kq_0^2}{a}(3-\sqrt{2})$

(C) $\frac{Kq_0^2}{a}(4\sqrt{2}-2)$

(D) $\frac{Kq_0^2}{a}(3\sqrt{2}-2)$

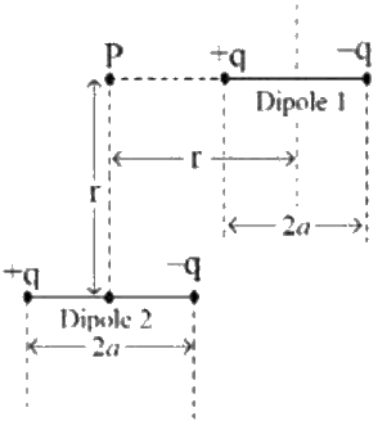
Answer: (D) $\frac{Kq_0^2}{a}(3\sqrt{2}-2)$ · Key from source paper

Q54 JEE Main 2025 · 23 Jan · Shift 1 MCQ

A point particle of charge Q is located at P along the axis of an electric dipole 1 at a distance r as shown in the figure. The point P is also on the equatorial plane of a second electric dipole 2 at a distance r . The dipoles are made of opposite charge q separated by a distance $2a$. For the charge particle at P not to experience any net force, which of the following correctly describes the situation ?

(see the figure above)

Q26. A point particle of charge Q is located at P along the axis of an electric dipole 1 at a distance r as shown in the figure. The point P is also on the equatorial plane of a second electric dipole 2 at a distance r . The dipoles are made of opposite charge q separated by a distance $2a$. For the charge particle at P not to experience any net force, which of the following correctly describes the situation?



(1) $\frac{a}{r} \sim 10$
(2) $\frac{a}{r} \sim 20$
(3) $\frac{a}{r} \sim 0.5$
(4) $\frac{a}{r} \sim 3$

(A) $\frac{a}{r} \sim 10$
(B) $\frac{a}{r} \sim 20$
(C) $\frac{a}{r} \sim 0.5$
(D) $\frac{a}{r} \sim 3$

Answer: (D) $\frac{a}{r} \sim 3$ · Key from source paper

Q55 JEE Main 2025 · 23 Jan · Shift 1 Numerical

A positive ion A and a negative ion B has charges 6.67×10^{-19}C and 9.6×10^{-10}C, and masses 19.2×10^{-27} kg and 9×10^{-27} kg respectively. At an instant, the ions are separated by a certain distance r. At that instant the ratio of the magnitudes of electrostatic force to gravitational force is $P \times 10^{45}$, where the value of $10P$ is _____ (Take $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \mathrm{Nm^2C^{-1}}$ and universal gravitational constant as $6.67 \times 10^{-11}\ \mathrm{Nm^2\ kg^{-2}}$) Assume that charge may not be an integral multiple of electrons.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q56 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Two charges $7\mu c$ and $-4\mu c$ are placed at $(-7\ \mathrm{cm}, 0, 0)$ and $(7\ \mathrm{cm}, 0, 0)$ respectively. Given, $\epsilon_0 = 8.85 \times 10^{-12}\mathrm{C^2\ N^{-1}\ m^{-2}}$, the electrostatic potential energy of the charge configuration is :

(A) -1.8 J
(B) -2.0 J
(C) -1.5 J
(D) -1.2 J

Answer: (A) -1.8 J · Key from source paper

Q57 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Two point charges $-4\mu c$ and $4\mu c$, constituting an electric dipole, are placed at $(-9,0,0)$cm and $(9,0,0)$cm in a uniform electric field of strength $10^4 \mathrm{NC}^{-1}$. The work done on the dipole in rotating it from the equilibrium through 180° is :

(A) 18.4 mJ
(B) 14.4 mJ
(C) 12.4 mJ
(D) 16.4 mJ

Answer: (B) 14.4 mJ · Key from source paper

Q58 JEE Main 2025 · 22 Jan · Shift 1 MCQ

An electron is made to enter symmetrically between two parallel and equally but oppositely charged metal plates, each of 10 cm length. The electron emerges out of the electric field region with a horizontal component of velocity 10^6 m/s. If the magnitude of the electric field between the plates is 9.1 V/cm, then the vertical component of velocity of electron is (mass of electron $= 9.1 \times 10^{-31}$ kg and charge of electron $= 1.6 \times 10^{-19}$C)

(A) 0
(B) 1×10^6 m/s
(C) 16×10^6 m/s
(D) 16×10^4 m/s

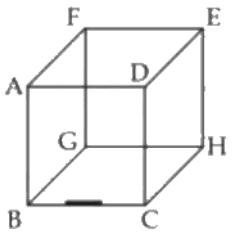
Answer: (C) 16×10^6 m/s · Key from source paper

Q59 JEE Main 2025 · 22 Jan · Shift 1 MCQ

A line charge of length $\frac{a}{2}$ is kept at the center of an edge BC of a cube $ABCDEFGH$ having edge length ' a ' as shown in the figure. If the density of line charge is λ C per unit length, then the total electric flux through all the faces of the cube will be _____ . (Take, ϵ_0 as the free space permittivity)

(see the figure above)

Q38. A line charge of length $\frac{'a'}{2}$ is kept at the center of an edge BC of a cube $ABCDEFGH$ having edge length ' a ' as shown in the figure. If the density of line charge is λ C per unit length, then the total electric flux through all the faces of the cube will be _____ . (Take, ϵ_0 as the free space permittivity)



(1) $\frac{\lambda a}{2\epsilon_0}$
(2) $\frac{\lambda a}{4\epsilon_0}$
(3) $\frac{\lambda a}{16\epsilon_0}$
(4) $\frac{\lambda a}{8\epsilon_0}$

(A) $\frac{\lambda a}{2\epsilon_0}$
(B) $\frac{\lambda a}{4\epsilon_0}$
(C) $\frac{\lambda a}{16\epsilon_0}$
(D) $\frac{\lambda a}{8\epsilon_0}$

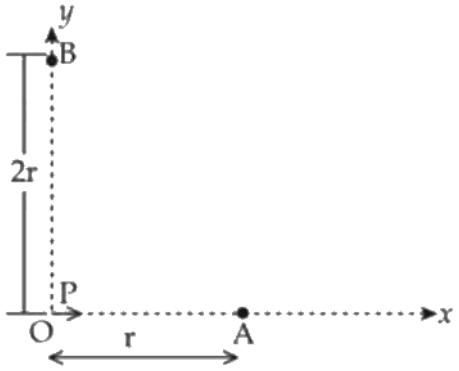
Answer: (D) $\frac{\lambda a}{8\epsilon_0}$ · Key from source paper

Q60 JEE Main 2025 · 22 Jan · Shift 2 MCQ

For a short dipole placed at origin O, the dipole moment P is along x-axis, as shown in the figure. If the electric potential and electric field at A are V_0 and E_0, respectively, then the correct combination of the electric potential and electric field, respectively, at point B on the y-axis is given by

(see the figure above)

Q30. For a short dipole placed at origin O, the dipole moment P is along x-axis, as shown in the figure. If the electric potential and electric field at A are V_0 and E_0, respectively, then the correct combination of the electric potential and electric field, respectively, at point B on the y-axis is given by



(1) V_0 and $\frac{E_0}{4}$
(2) zero and $\frac{E_0}{16}$
(3) zero and $\frac{E_0}{8}$
(4) $\frac{\mathrm{V}_0}{2}$ and $\frac{\mathrm{E}_0}{16}$

(A) V_0 and $\frac{E_0}{4}$
(B) zero and $\frac{E_0}{16}$
(C) zero and $\frac{E_0}{8}$
(D) $\frac{V_0}{2}$ and $\frac{E_0}{16}$

Answer: (B) zero and $\frac{E_0}{16}$ · Key from source paper

Q61 JEE Main 2024 · 9 Apr · Shift 1 Numerical

At the centre of a half ring of radius R = 10 cm and linear charge density 4nCm^{-1}, the potential is $x\pi$ V. The value of x is _____

Numerical value type: the answer is a number.

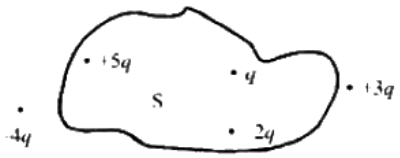
Answer: 36. · Key from source paper

Q62 JEE Main 2024 · 9 Apr · Shift 2 MCQ

Five charges $+q$, $+5q$, $-2q$, $+3q$ and $-4q$ are situated as shown in the figure. The electric flux due to this configuration through the surface S is :

(see the figure above)

Q9. Five charges $+q, +5q, -2q, +3q$ and $-4q$ are situated as shown in the figure. The electric flux due to this configuration through the surface S is :



(1) $\frac{4q}{\epsilon_0}$ (2) $\frac{5q}{\epsilon_0}$
(3) $\frac{q}{\epsilon_0}$ (4) $\frac{3q}{\epsilon_0}$

(A) $\frac{4q}{\epsilon_0}$
(B) $\frac{5q}{\epsilon_0}$
(C) $\frac{q}{\epsilon_0}$
(D) $\frac{3q}{\epsilon_0}$

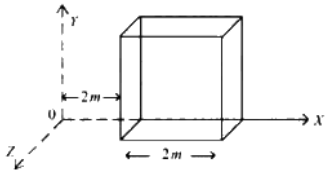
Answer: (A) $\frac{4q}{\epsilon_0}$ · Key from source paper

Q63 JEE Main 2024 · 9 Apr · Shift 2 Numerical

An electric field $\vec{E} = (2x\hat{i})\,\mathrm{NC}^{-1}$ exists in space. A cube of side 2 m is placed in the space as per figure given below. The electric flux through the cube is _____ Nm^2/C.

(see the figure above)

Q26. An electric field $\vec{E} = (2x\hat{i})NC^{-1}$ exists in space. A cube of side 2 m is placed in the space as per figure given below. The electric flux through the cube is _____ Nm^2/C.



Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q64 JEE Main 2024 · 8 Apr · Shift 1 MCQ

Two charged conducting spheres of radii a and b are connected to each other by a conducting wire. The ratio of charges of the two spheres respectively is:

(A) $\frac{a}{b}v$
(B) $\sqrt{ab}$
(C) $\frac{b}{a}$
(D) ab

Answer: (A) $\frac{a}{b}v$ · Key from source paper

Q65 JEE Main 2024 · 8 Apr · Shift 1 Numerical

An electric field, $\vec{E} = \frac{2\hat{i}+6\hat{j}+8\hat{k}}{\sqrt{6}}$ passes through the surface of 4 m^2 area having unit vector $\hat{n} = \left(\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}\right)$. The electric flux for that surface is _____ Vm.

Numerical value type: the answer is a number.

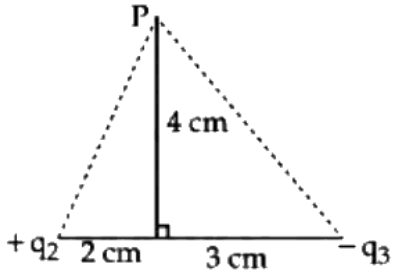
Answer: 12. · Key from source paper

Q66 JEE Main 2024 · 8 Apr · Shift 2 Numerical

If the net electric field at point P along Y axis is zero, then the ratio of $\left|\frac{q_2}{q_3}\right|$ is $\frac{8}{5\sqrt{x}}$, where x = _____.

(see the figure above)

Q25. If the net electric field at point P along Y axis is zero, then the ratio of $\left|\frac{q_2}{q_3}\right|$ is $\frac{8}{5\sqrt{x}}$, where $x =$ _____.



Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q67 JEE Main 2024 · 6 Apr · Shift 1 MCQ

Ques: σ is the uniform surface charge density of a thin spherical shell of radius R. The electric field at any point on the surface of the spherical shell is :

(A) $\sigma/\epsilon_o R$
(B) σ/ϵ_o
(C) $\sigma/4\epsilon_o$
(D) $\sigma/2\epsilon_o$

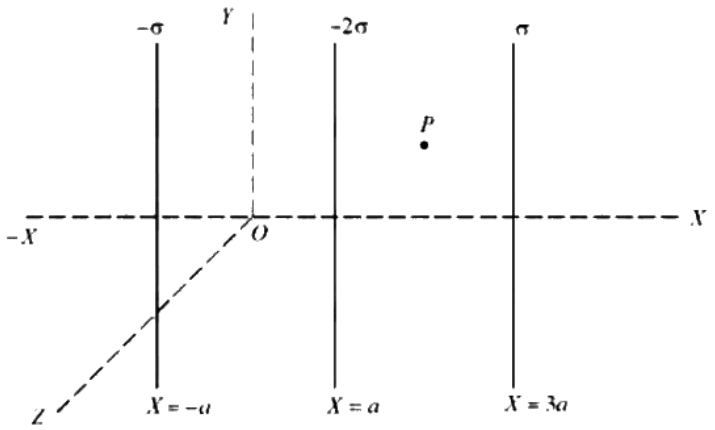
Answer: (B) σ/ϵ_o · Key from source paper

Q68 JEE Main 2024 · 6 Apr · Shift 1 Numerical

Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\frac{x\sigma}{\epsilon_o}$. The value of x is _____ (all quantities are measured in SI units).

(see the figure above)

Q25. Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\frac{x\sigma}{\epsilon_o}$. The value of x is _____ (all quantities are measured in SI units).



Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q69 JEE Main 2024 · 6 Apr · Shift 2 MCQ

Two identical conducting spheres P and S with charge Q on each, repel each other with a force 16 N. A third identical uncharged conducting sphere R is successively brought in contact with the two spheres. The new force of repulsion between P and S is :

(A) 1 N
(B) 6 N
(C) 12 N
(D) 4 N

Answer: (B) 6 N · Key from source paper

Q70 JEE Main 2024 · 5 Apr · Shift 1 MCQ

In hydrogen like system the ratio of coulombian force and gravitational force between an electron and a proton is in the order of :

(A) 10^{39}
(B) 10^{29}
(C) 10^{19}
(D) 10^{36}

Answer: (A) 10^{39} · Key from source paper

Q71 JEE Main 2024 · 5 Apr · Shift 2 MCQ

The vehicles carrying inflammable fluids usually have metallic chains touching the ground :

(A) To protect tyres from catching dirt from ground
(B) To alert other vehicles
(C) It is a custom
(D) To conduct excess charge due to air friction to ground and prevent sparking

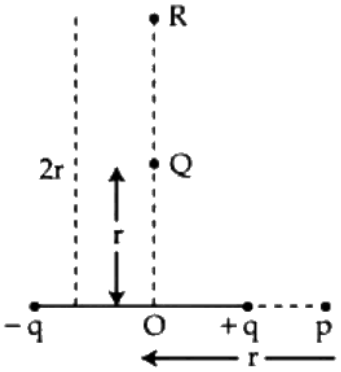
Answer: (D) To conduct excess charge due to air friction to ground and prevent sparking · Key from source paper

Q72 JEE Main 2024 · 5 Apr · Shift 2 Numerical

The electric field at point p due to an electric dipole is E. The electric field at point R on equitorial line will be $\frac{E}{x}$. The value of x :

(see the figure above)

Q25. The electric field at point p due to an electric dipole is E. The electric field at point R on equitorial line will be



$\frac{E}{x}$. The value of x :

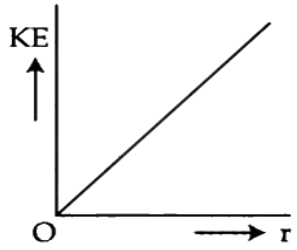
Numerical value type: the answer is a number.

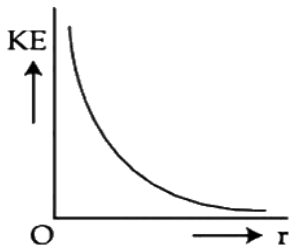
Answer: 16. · Key from source paper

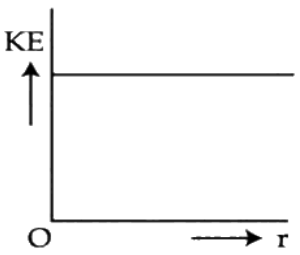
Q73 JEE Main 2024 · 4 Apr · Shift 1 MCQ

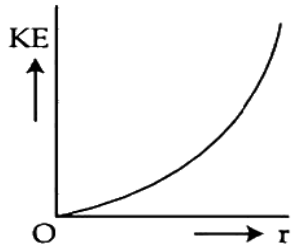
An infinitely long positively charged straight thread has a linear charge density $\lambda\,\mathrm{Cm}^{-1}$. An electron revolves along a circular path having axis along the length of the wire. The graph that correctly represents the variation of the kinetic energy of electron as a function of radius of circular path from the wire is :

Q12. An infinitely long positively charged straight thread has a linear charge density $\lambda \mathrm{Cm}^{-1}$. An electron revolves along a circular path having axis along the length of the wire. The graph that correctly represents the variation of the kinetic energy of electron as a function of radius of circular path from the wire is :

(1)


(2)


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q74 JEE Main 2024 · 4 Apr · Shift 1 Numerical

An infinite plane sheet of charge having uniform surface charge density $+\sigma_s \mathrm{C/m}^2$ is placed on $x-y$ plane. Another infinitely long line charge having uniform linear charge density $+\lambda_e \mathrm{C/m}$ is placed at $z=4$ m plane and parallel to y-axis. If the magnitude values $|\sigma_s| = 2\,|\lambda_e|$ then at point $(0,0,2)$, the ratio of magnitudes of electric field values due to sheet charge to that of line charge is $\pi\sqrt{n} : 1$. The value of n is _____.

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q75 JEE Main 2024 · 4 Apr · Shift 2 MCQ

A charge q is placed at the center of one of the surface of a cube. The flux linked with the cube is:

(A) $\frac{q}{2\epsilon_0}$
(B) $\frac{q}{8\epsilon_0}$
(C) Zero
(D) $\frac{q}{4\epsilon_0}$

Answer: (A) $\frac{q}{2\epsilon_0}$ · Key from source paper

Q76 JEE Main 2024 · 1 Feb · Shift 1 Numerical

Two identical charged spheres are suspended by strings of equal lengths. The strings make an angle θ with each other. When suspended in water the angle remains the same. If density of the material of the sphere is 1.5 g / cc, the dielectric constant of water will be _____.
(Take density of water = 1 g / cc)

Numerical value type: the answer is a number.

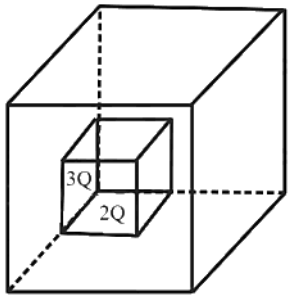
Answer: 3. · Key from source paper

Q77 JEE Main 2024 · 1 Feb · Shift 2 MCQ

C_1 and C_2 are two hollow concentric cubes enclosing charges $2Q$ and $3Q$ respectively as shown in figure. The ratio of electric flux passing through C_1 and C_2 is:

(see the figure above)

Q10. C_1 and C_2 are two hollow concentric cubes enclosing charges $2Q$ and $3Q$ respectively as shown in figure. The ratio of electric flux passing through C_1 and C_2 is:



(1) 2 : 5
(2) 5 : 2
(3) 2 : 3
(4) 3 : 2

(A) 2 : 5
(B) 5 : 2
(C) 2 : 3
(D) 3 : 2

Answer: (A) 2 : 5 · Key from source paper

Q78 JEE Main 2024 · 1 Feb · Shift 2 Numerical

Suppose a uniformly charged wall provides a uniform electric field of $2 \times 10^4\ \mathrm{N\ C^{-1}}$ normally. A charged particle of mass 2 g being suspended through a silk thread of length 20 cm and remain stayed at a distance of 10 cm from the wall. Then the charge on the particle will be $\frac{1}{\sqrt{x}}\mu$C where x = _____ [use $g = 10\ \mathrm{m\ s^{-2}}$]

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q79 JEE Main 2024 · 31 Jan · Shift 1 MCQ

Two charges q and $3q$ are separated by a distance 'r' in air. At a distance x from charge q, the resultant electric field is zero. The value of x is :

(A) $\frac{(1+\sqrt{3})}{r}$

(B) $\frac{r}{3(1+\sqrt{3})}$

(C) $\frac{r}{(1+\sqrt{3})}$

(D) $r(1+\sqrt{3})$

Answer: (C) $\frac{r}{(1+\sqrt{3})}$ · Key from source paper

Q80 JEE Main 2024 · 31 Jan · Shift 2 MCQ

Force between two point charges q_1 and q_2 placed in vacuum at r cm apart is F. Force between them when placed in a medium having dielectric $K = 5$ at $\frac{r}{5}$ cm apart will be:

(A) $\frac{F}{25}$

(B) $5F$

(C) $\frac{F}{5}$

(D) $25F$

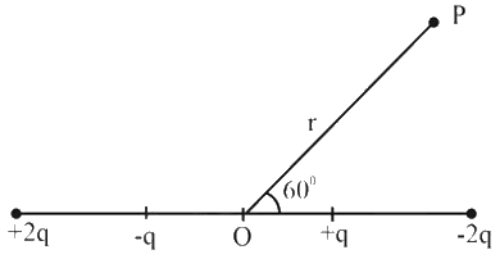
Answer: (B) $5F$ · Key from source paper

Q81 JEE Main 2024 · 31 Jan · Shift 2 Numerical

The distance between charges $+q$ and $-q$ is $2l$ and between $+2q$ and $-2q$ is $4l$. The electrostatic potential at point P at a distance r from centre O is $-\alpha\frac{ql}{r^2} \times 10^9$ V, where the value of α is _____. (Use $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2})

(see the figure above)

Q25. The distance between charges $+q$ and $-q$ is $2l$ and between $+2q$ and $-2q$ is $4l$. The electrostatic potential at point P at a distance r from centre O is $-\alpha\frac{ql}{r^2} \times 10^9$ V, where the value of α is _____. (Use $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2})



Numerical value type: the answer is a number.

Answer: 27. · Key from source paper

Q82 JEE Main 2024 · 30 Jan · Shift 1 MCQ

The electrostatic potential due to an electric dipole at a distance r varies as :

(A) r
(B) $\frac{1}{r^2}$
(C) $\frac{1}{r^3}$
(D) $\frac{1}{r}$

Answer: (B) $\frac{1}{r^2}$ · Key from source paper

Q83 JEE Main 2024 · 30 Jan · Shift 2 MCQ

A particle of charge $-q$ and mass m moves in a circle of radius r around an infinitely long line charge of linear density $+\lambda$. Then time period will be given as: (Consider k as Coulomb's constant)

(A) $T^2 = \frac{4\pi^2 m}{2k\lambda q} r^3$
(B) $T = 2\pi r \sqrt{\frac{m}{2k\lambda q}}$
(C) $T = \frac{1}{2\pi r} \sqrt{\frac{m}{2k\lambda q}}$
(D) $T = \frac{1}{2\pi} \sqrt{\frac{2k\lambda q}{m}}$

Answer: (B) $T = 2\pi r \sqrt{\frac{m}{2k\lambda q}}$ · Key from source paper

Q84 JEE Main 2024 · 30 Jan · Shift 2 Numerical

Two identical charged spheres are suspended by strings of equal lengths. The string make an angle of 37° with each other. When suspended in a liquid of density 0.7 g cm^{-3}, the angle remains same. If density of material of the sphere is 1.4 g cm^{-3}, the dielectric constant of the liquid is _____ $\tan 37^\circ = \frac{3}{4}$

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q85 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Two charges of $5Q$ and $-2Q$ are situated at the points $(3a,\ 0)$ and $(-5a,\ 0)$ respectively. The electric flux through a sphere of radius $4a$ having centre at origin is:

(A) $\frac{2Q}{\varepsilon_0}$
(B) $\frac{5Q}{\varepsilon_0}$
(C) $\frac{7Q}{\varepsilon_0}$
(D) $\frac{3Q}{\varepsilon_0}$

Answer: (B) $\frac{5Q}{\varepsilon_0}$ · Key from source paper

Q86 JEE Main 2024 · 29 Jan · Shift 1 · Numerical

An electron is moving under the influence of the electric field of a uniformly charged infinite plane sheet S having surface charge density $+\sigma$. The electron at $t = 0$ is at a distance of 1 m from S and has a speed of 1 m s^{-1}. The maximum value of σ, if the electron strikes S at $t = 1$ s is $\alpha \left[\frac{m\epsilon_0}{e}\right] \frac{C}{m^2}$. The value of α is _____.

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q87 JEE Main 2024 · 29 Jan · Shift 2 · MCQ

An electric field is given by $\left(6\hat{i} + 5\hat{j} + 3\hat{k}\right)$ N C^{-1}. The electric flux through a surface area $30\hat{i}$ m^2 lying in YZ-plane (in SI unit) is:

(A) 90
(B) 150
(C) 180
(D) 60

Answer: (C) 180 · Key from source paper

Q88 JEE Main 2024 · 27 Jan · Shift 1 · MCQ

An electric charge 10^{-6} μC is placed at origin (0, 0) m of X – Y co-ordinate system. Two points P and Q are situated at $(\sqrt{3}, \sqrt{3})$ m and $(\sqrt{6}, 0)$ m respectively. The potential difference between the points P and Q will be :

(A) $\sqrt{3}$ V
(B) $\sqrt{6}$ V
(C) 0 V
(D) 3 V

Answer: (C) 0 V · Key from source paper

Q89 JEE Main 2024 · 27 Jan · Shift 1 · Numerical

A thin metallic wire having cross sectional area of 10^{-4} m^2 is used to make a ring of radius 30 cm. A positive charge of 2π C is uniformly distributed over the ring, while another positive charge of 30 pC is kept at the centre of the ring. The tension in the ring is _____ N; provided that the ring does not get deformed (neglect the influence of gravity).

(Given, $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ SI units)

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q90 JEE Main 2024 · 27 Jan · Shift 2 MCQ

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason(R)

Assertion (A) : Work done by electric field on moving a positive charge on an equipotential surface is always zero.

Reason (R) : Electric lines of forces are always perpendicular to equipotential surfaces.

In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(B) (A) is correct but (R) is not correct
(C) (A) is not correct but (R) is correct
(D) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Answer: (D) Both (A) and (R) are correct and (R) is the correct explanation of (A) · Key from source paper

Q91 JEE Main 2024 · 27 Jan · Shift 2 Numerical

The electric potential at the surface of an atomic nucleus ($Z = 50$) of radius 9×10^{-13} cm is $\alpha \times 10^6$ V.
What is the value of α?

(Charge of proton 1.6×10^{-19} C)

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q92 JEE Main 2024 · 27 Jan · Shift 2 Numerical

Two charges of -4 μC and +4 μC are placed at the points $A(1,\ 0,\ 4)$ m and $B(2,\ -1,\ 5)$ m located in an electric field $\vec{E} = 0.20\hat{i}$ V cm^{-1}. The magnitude of the torque acting on the dipole is $8\sqrt{\alpha} \times 10^{-5}$ N m, where $\alpha =$ _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q93 JEE Main 2023 · 15 Apr · Shift 1 MCQ

The electric field due to a short electric dipole at a large distance (r) from center of dipole on the equatorial plane varies with distance as :

(A) r
(B) $\frac{1}{r^2}$
(C) $\frac{1}{r^3}$
(D) $\frac{1}{r}$

Answer: (C) $\frac{1}{r^3}$ · Key from source paper

Q94 JEE Main 2023 · 13 Apr · Shift 1 MCQ

Two charges of each magnitude 0.01 C and separated by a distance of 0.4 mm constitute an electric dipole. If the dipole is placed in an uniform electric field $\vec{E}$ of 10 dyne · C^{-1} making 30° angle with $\vec{E}$, the magnitude of torque acting on dipole is:

(A) 4.0×10^{-10} N m
(B) 1.0×10^{-8} N m
(C) 1.5×10^{-9} N m
(D) 2.0×10^{-10} N m

Answer: (D) 2.0×10^{-10} N m · Key from source paper

Q95 JEE Main 2023 · 13 Apr · Shift 1 Numerical

A thin infinite sheet charge and an infinite line charge of respective charge densities $+\sigma$ and $+\lambda$ are placed parallel at 5 m distance from each other. Points P and Q are at $\frac{3}{\pi}$ m and $\frac{4}{\pi}$ m perpendicular distances from line charge towards sheet charge, respectively. E_p and E_q are the magnitudes of resultant electric field intensities at point P and Q respectively. If $\frac{E_P}{E_Q} = \frac{4}{a}$ for $2|\sigma| = |\lambda|$, then the value of a is _____.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q96 JEE Main 2023 · 13 Apr · Shift 2 MCQ

A 10 μC charge is divided into two parts and placed at 1 cm distance so that the repulsive force between them is maximum. The charges of the two parts are:

(A) 7μC, 3μC
(B) 8μC, 2μC
(C) 5μC, 5μC
(D) 9μC, 1μC

Answer: (C) 5μC, 5μC · Key from source paper

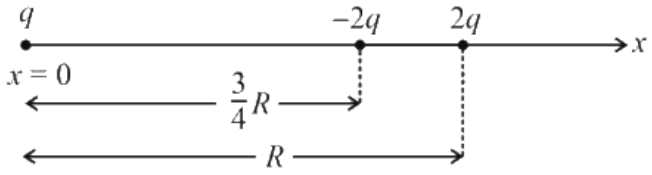
Q97 JEE Main 2023 · 13 Apr · Shift 2 Numerical

Three point charges q, $-2q$ and $2q$ are placed on x axis at a distance $x = 0$, $x = \frac{3}{4}R$ and $x = R$ respectively from origin as shown. If $q = 2 \times 10^{-6}$ C and $R = 2$ cm, the magnitude of net force

experienced by the charge $-2q$ is _____ N.

(see the figure above)

Q25. Three point charges q, $-2q$ and $2q$ are placed on x axis at a distance $x = 0, x = \frac{3}{4}R$ and $x = R$ respectively from origin as shown. If $q = 2 \times 10^{-6}$ C and $R = 2$ cm, the magnitude of net force experienced by the charge $-2q$ is _____ N.



Numerical value type: the answer is a number.

Answer: 5440. · Key from source paper

Q98 JEE Main 2023 · 12 Apr · Shift 1 Numerical

64 identical drops each charged upto potential of 10 mV are combined to form a bigger drop. The potential of the bigger drop will be _____ mV.

Numerical value type: the answer is a number.

Answer: 160. · Key from source paper

Q99 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion A : If an electric dipole of dipole moment 30×10^{-5} C m is enclosed by a closed surface, the net flux coming out of the surface will be zero.
Reason R : Electric dipole consists of two equal and opposite charges.
In the light of above, statements, choose the correct answer from the options given below.

(A) Both A and R are true and R is the correct explanation of A
(B) A is false but R is true
(C) A is true but R is false
(D) Both A and R are true and R is NOT the correct explanation of A

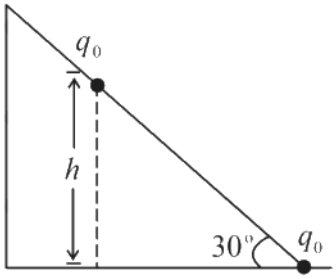
Answer: (A) Both A and R are true and R is the correct explanation of A · Key from source paper

Q100 JEE Main 2023 · 11 Apr · Shift 1 Numerical

As shown in the figure, a configuration of two equal point charges $q_0 = +2\mu C$ is placed on an inclined plane. Mass of each point charge is 20 g. Assume that there is no friction between charge and plane. For the system of two point charges to be in equilibrium (at rest) the height $h = x \times 10^{-3}$ m. The value of x is
Take $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2}, $g = 10$ m s^{-2}
(see the figure above)

Q26. As shown in the figure, a configuration of two equal point charges $q_0 = +2\mu C$ is placed on an inclined plane. Mass of each point charge is 20 g. Assume that there is no friction between charge and plane. For the system of two point charges to be in equilibrium (at rest) the height $h = x \times 10^{-3}$ m. The value of x is

Take $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2}, $g = 10$ m s^{-2}



Numerical value type: the answer is a number.

Answer: 300. · Key from source paper

Q101 JEE Main 2023 · 11 Apr · Shift 2 MCQ

A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the positive plate of the capacitor is:

(A) $\frac{CV}{\varepsilon_0}$

(B) Zero

(C) $\frac{2CV}{\varepsilon_0}$

(D) $\frac{CV}{2\varepsilon_0}$

Answer: (A) $\frac{CV}{\varepsilon_0}$ · Key from source paper

Q102 JEE Main 2023 · 10 Apr · Shift 1 Numerical

Three concentric spherical metallic shells X, Y and Z of radius a, b and c respectively $a < b < c$ have surface charge densities σ, $-\sigma$ and σ, respectively. The shells X and Z are at same potential. If the radii of X & Y are 2 cm and 3 cm, respectively. The radius of shell Z is _____ cm.

Numerical value type: the answer is a number.

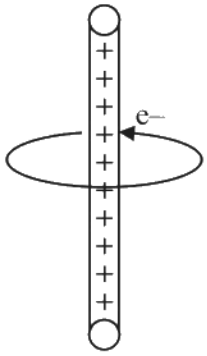
Answer: 5. · Key from source paper

Q103 JEE Main 2023 · 10 Apr · Shift 2 Numerical

An electron revolves around an infinite cylindrical wire having uniform linear charge density 2×10^{-8} C m^{-1} in circular path under the influence of attractive electrostatic field as shown in the figure. The velocity of electron with which it is revolving is _____ $\times 10^6$ m s^{-1}. Given mass of electron $= 9 \times 10^{-31}$ kg

(see the figure above)

Q25. An electron revolves around an infinite cylindrical wire having uniform linear charge density 2×10^{-8} C m^{-1} in circular path under the influence of attractive electrostatic field as shown in the figure. The velocity of electron with which it is revolving is _____ $\times 10^{6}$ m s^{-1}. Given mass of electron $= 9 \times 10^{-31}$ kg



Numerical value type: the answer is a number.

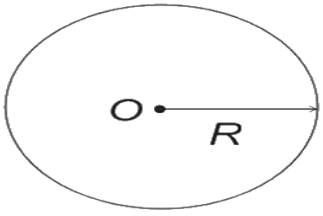
Answer: 8. · Key from source paper

Q104 JEE Main 2023 · 8 Apr · Shift 1 MCQ

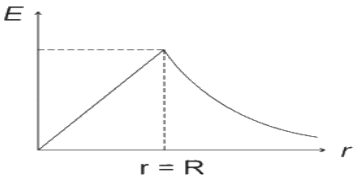
Graphical variation of electric field due to a uniformly charged insulating solid sphere of radius R, with distance r from the centre O is represented by:

(see the figure above)

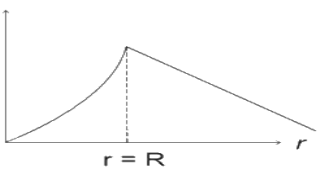
Q16. Graphical variation of electric field due to a uniformly charged insulating solid sphere of radius R, with distance r from the centre O is represented by:



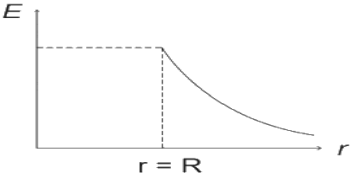
(1) Dig



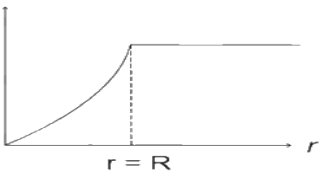
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q105 JEE Main 2023 · 8 Apr · Shift 1 · Numerical

An electric dipole of dipole moment is $6.0 \times 10^{-6}\ \mathrm{C\,m}$ placed in a uniform electric field of $1.5 \times 10^{3}\ \mathrm{N\,C^{-1}}$ in such a way that dipole moment is along electric field. The work done in rotating dipole by 180° in this field will be _____ mJ.

Numerical value type: the answer is a number.

Answer: 18. · Key from source paper

Q106 JEE Main 2023 · 8 Apr · Shift 2 · MCQ

Electric potential at a point P due to a point charge of $5 \times 10^{-9}\ \mathrm{C}$ is $50\ \mathrm{V}$. The distance of P from the point charge is:
(Assume, $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^{9}\ \mathrm{N\,m^2\,C^{-2}}$)

(A) $9\ \mathrm{cm}$
(B) $3\ \mathrm{cm}$
(C) $0.9\ \mathrm{cm}$
(D) $90\ \mathrm{cm}$

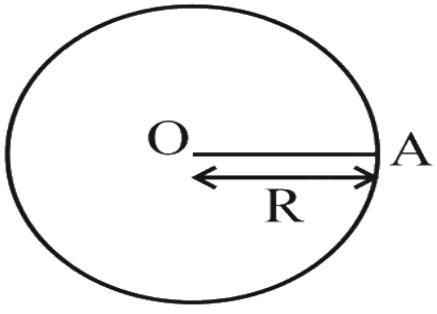
Answer: (D) $90\ \mathrm{cm}$ · Key from source paper

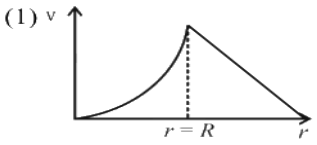
Q107 JEE Main 2023 · 6 Apr · Shift 1 · MCQ

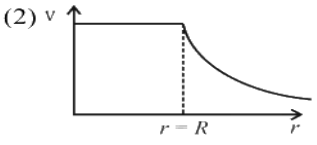
For a uniformly charged thin spherical shell, the electric potential V radially away from the centre O of shell can be graphically represented as

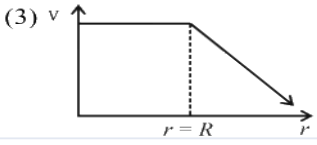
(see the figure above)

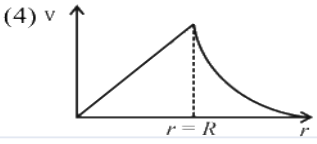
Q11. For a uniformly charged thin spherical shell, the electric potential V radially away from the centre O of shell can be graphically represented as











(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q108 JEE Main 2023 · 6 Apr · Shift 2 MCQ

A dipole comprises of two charged particles of identical magnitude q and opposite in nature. The mass m of the positive charged particle is half of the mass of the negative charged particle. The two charges are separated by a distance l . If the dipole is placed in a uniform electric field $\vec{E}$; in such a way that dipole axis makes a very small angle with the electric field, $\vec{E}$. The angular frequency of the oscillations of the dipole when released is given by:

(A) $\sqrt{\frac{3qE}{2ml}}$
(B) $\sqrt{\frac{8qE}{ml}}$
(C) $\sqrt{\frac{4qE}{ml}}$
(D) $\sqrt{\frac{8qE}{3ml}}$

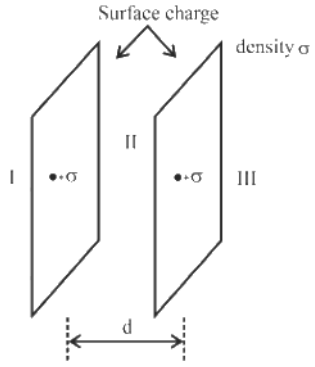
Answer: (A) $\sqrt{\frac{3qE}{2ml}}$ · Key from source paper

Q109 JEE Main 2023 · 1 Feb · Shift 1 MCQ

Let σ be the uniform surface charge density of two infinite thin plane sheets shown in figure. Then the electric fields in three different region E_I , E_{II} and E_{III}

(see the figure above)

Q11. Let σ be the uniform surface charge density of two infinite thin plane sheets shown in figure. Then the electric fields in three different region E_I , E_{II} and E_{III}



(1) $\vec{E}_I = \frac{2\sigma}{\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{2\sigma}{\epsilon_0}\hat{n}$
(2) $\vec{E}_I = 0, \vec{E}_{II} = \frac{\sigma}{\epsilon_0}\hat{n}, \vec{E}_{III} = 0$
(3) $\vec{E}_I = \frac{\sigma}{2\,\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{2\,\epsilon_0}\hat{n}$
(4) $\vec{E}_I = \frac{-\sigma}{\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{\epsilon_0}\hat{n}$

(A) $\vec{E}_I = \frac{2\sigma}{\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{2\sigma}{\epsilon_0}\hat{n}$

(B) $\vec{E}_I = 0, \vec{E}_{II} = \frac{\sigma}{\epsilon_0}\hat{n}, \vec{E}_{III} = 0$

(C) $\vec{E}_I = \frac{\sigma}{2\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{2\epsilon_0}\hat{n}$

(D) $\vec{E}_I = \frac{-\sigma}{\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{\epsilon_0}\hat{n}$

Answer: (D) $\vec{E}_I = \frac{-\sigma}{\epsilon_0}\hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{\epsilon_0}\hat{n}$ · Key from source paper

---

Q110 JEE Main 2023 · 1 Feb · Shift 1 Numerical

Two equal positive point charges are separated by a distance $2a$. The distance of a point from the centre of the line joining two charges on the equatorial line (perpendicular bisector) at which force experienced by a test charge q_0 becomes maximum is $\frac{a}{\sqrt{x}}$. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q111 JEE Main 2023 · 1 Feb · Shift 2 Numerical

A cubical volume is bounded by the surfaces x = 0, x = a, y = 0, y = a, z = 0, z = a. The electric field in the region is given by $\vec{E}$ = $E_0 x\hat{i}$. Where E_0 = 4 $\times$ 10^4 NC^{-1} m^{-1}. If a = 2 cm, the charge contained in the cubical volume is $Q \times 10^{-14}$ C. The value of Q is _____. (Take ϵ_0 = 9 $\times$ 10^{-12} C^2 $\mathrm{N}^{-1}\mathrm{m}^{-2}$)

Numerical value type: the answer is a number.

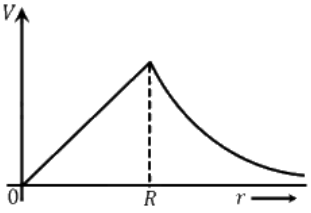
Answer: 288. · Key from source paper

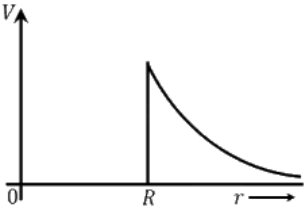
Q112 JEE Main 2023 · 31 Jan · Shift 1 MCQ

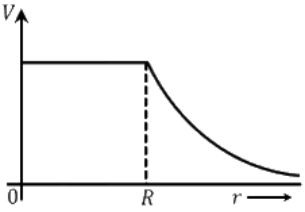
Which of the following correctly represents the variation of electric potential (V) of a charged spherical conductor of radius (R) with radial distance (r) from the centre?

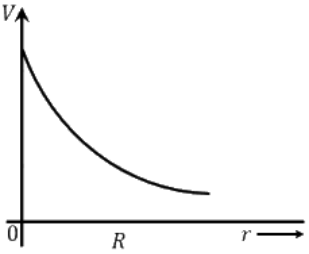
(see the figure above)

Q11. Which of the following correctly represents the variation of electric potential (V) of a charged spherical conductor of radius (R) with radial distance (r) from the centre?

(1) 

(2) 

(3) 

(4) 

(A) (graph 1, see figure)
(B) (graph 2, see figure)
(C) (graph 3, see figure)
(D) (graph 4, see figure)

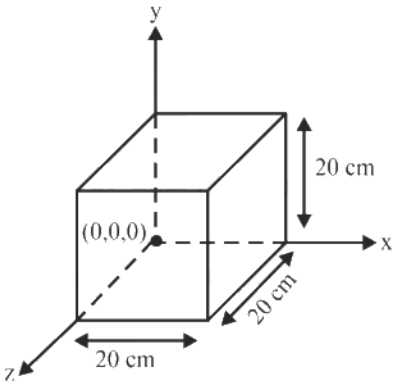
Answer: (C) (graph 3, see figure) · Key from source paper

Q113 JEE Main 2023 · 31 Jan · Shift 1 Numerical

Expression for an electric field is given by $\vec{E} = 4000\, x^2\, \hat{i}$ V m^{-1}. The electric flux through the cube of side 20 cm when placed in electric field (as shown in the figure) is _____ V cm.

(see the figure above)

Q26. Expression for an electric field is given by $\vec{E} = 4000\ \ x^2\ \ \hat{i}\ \ \text{V}\ \ \text{m}^{-1}$. The electric flux through the cube of side 20 cm when placed in electric field (as shown in the figure) is _____ V cm.



Numerical value type: the answer is a number.

Answer: 640. · Key from source paper

Q114 JEE Main 2023 · 31 Jan · Shift 2 MCQ

Considering a group of positive charges, which of the following statements is correct?

(A) Net potential of the system cannot be zero at a point but net electric field can be zero at that point

(B) Net potential of the system at a point can be zero but net electric field can't be zero at that point

(C) Both the net potential and the net field can be zero at a point

(D) Both the net potential and the net electric field cannot be zero at a point

Answer: (A) Net potential of the system cannot be zero at a point but net electric field can be zero at that point · Key from source paper

Q115 JEE Main 2023 · 30 Jan · Shift 1 MCQ

Two isolated metallic solid spheres of radii R and $2R$ are charged such that both have same charge density σ. The spheres are then connected by a thin conducting wire. If the new charge density of the bigger sphere is σ'. The ratio $\frac{\sigma'}{\sigma}$ is :

(A) $\frac{9}{4}$

(B) $\frac{4}{3}$

(C) $\frac{5}{3}$

(D) $\frac{5}{6}$

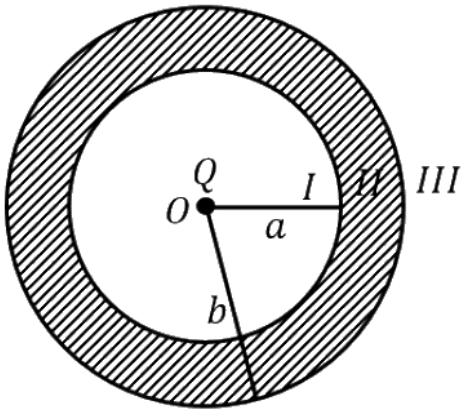
Answer: (D) $\frac{5}{6}$ · Key from source paper

Q116 JEE Main 2023 · 30 Jan · Shift 2 MCQ

As shown in the figure, a point charge Q is placed at the centre of conducting spherical shell of inner radius a and outer radius b. The electric field due to charge Q in three different regions I, II and III is given by : ($I : r < a$, $II : a < r < b$, $III : r > b$)

(see the figure above)

Q15. As shown in the figure, a point charge Q is placed at the centre of conducting spherical shell of inner radius a and outer radius b. The electric field due to charge Q in three different regions I, II and III is given by : ($I : r < a$, $II : a < r < b$, $III : r > b$)



(1) $E_I = 0,\ E_{II} = 0,\ E_{III} \neq 0$

(2) $E_I \neq 0,\ E_{II} = 0,\ E_{III} \neq 0$

(3) $E_I \neq 0,\ E_{II} = 0,\ E_{III} = 0$

(4) $E_I = 0,\ E_{II} = 0,\ E_{III} = 0$

(A) $E_I = 0,\ E_{II} = 0,\ E_{III} \neq 0$
(B) $E_I \neq 0,\ E_{II} = 0,\ E_{III} \neq 0$
(C) $E_I \neq 0,\ E_{II} = 0,\ E_{III} = 0$
(D) $E_I = 0,\ E_{II} = 0,\ E_{III} = 0$

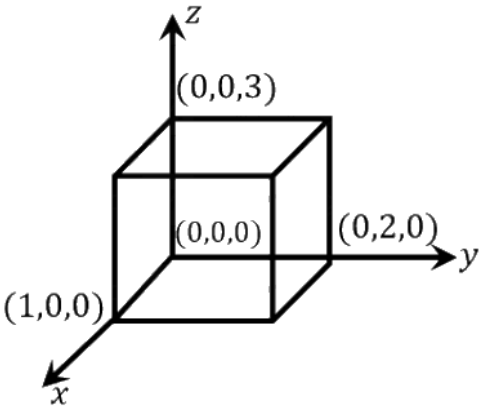
Answer: (B) $E_I \neq 0,\ E_{II} = 0,\ E_{III} \neq 0$ · Key from source paper

Q117 JEE Main 2023 · 30 Jan · Shift 2 Numerical

As shown in figure, a cuboid lies in a region with electric field $E = 2x^2\hat{i} - 4y\hat{j} + 6\hat{k}$ N C^{-1}. The magnitude of charge within the cuboid is $n\varepsilon_0$ C. The value of n is _____ (if dimension of cuboid is 1 $\times$ 2 $\times$ 3 m^3)

(see the figure above)

Q16. As shown in figure, a cuboid lies in a region with electric field $E = 2x^2\hat{i} - 4y\hat{j} + 6\hat{k}$ N C^{-1}. The magnitude of charge within the cuboid is $n\varepsilon_0$ C.
The value of n is _____ (if dimension of cuboid is $1 \times 2 \times 3$ m^3)



Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q118 JEE Main 2023 · 29 Jan · Shift 1 MCQ

In a cuboid of dimension $2L \times 2L \times L$, a charge q is placed at the centre of the surface S having area of $4L^2$. The flux through the opposite surface to S is given by

(A) $\frac{q}{12\epsilon_0}$
(B) $\frac{q}{3\epsilon_0}$
(C) $\frac{q}{2\epsilon_0}$
(D) $\frac{q}{6\epsilon_0}$

Answer: (D) $\frac{q}{6\epsilon_0}$ · Key from source paper

Q119 JEE Main 2023 · 29 Jan · Shift 1 Numerical

A point charge $q_1 = 4q_0$ is placed at origin. Another point charge $q_2 = -q_0$ is placed at $x = 12$ cm. Charge of proton is q_0. The proton is placed on x-axis so that the electrostatic force on it is zero. In

this situation, the position of the proton from the origin is _____ cm.

Numerical value type: the answer is a number.

Answer: 24. · Key from source paper

Q120 JEE Main 2023 · 29 Jan · Shift 2 MCQ

A point charge 2×10^{-2} C is moved from P to S in a uniform electric field of $30\ \mathrm{N\,C^{-1}}$ directed along positive x-axis. If coordinates of P and S are $(1, 2, 0)$ m and $(0, 0, 0)$ m respectively, the work done by electric field will be

(A) 1200 mJ
(B) 600 mJ
(C) -600 mJ
(D) -1200 mJ

Answer: (C) -600 mJ · Key from source paper

Q121 JEE Main 2023 · 29 Jan · Shift 2 Numerical

For a charged spherical ball, electrostatic potential inside the ball varies with r as $V = 2ar^2 + b$. Here, a and b are constant and r is the distance from the center. The volume charge density inside the ball is $-\lambda a\varepsilon$. The value of λ is _____.
ε = permittivity of medium.

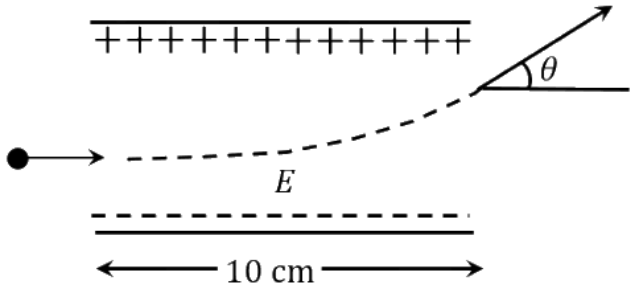
Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q122 JEE Main 2023 · 25 Jan · Shift 1 Numerical

A uniform electric field of $10\ \mathrm{N\,C^{-1}}$ is created between two parallel charged plates (as shown in figure). An electron enters the field symmetrically between the plates with a kinetic energy $0.5\ \mathrm{eV}$. The length of each plate is $10\ \mathrm{cm}$. The angle (θ) of deviation of the path of electron as it comes out of the field is _____ (in degree).
(see the figure above)

Q15. A uniform electric field of $10\ \mathrm{N\ C^{-1}}$ is created between two parallel charged plates (as shown in figure). An electron enters the field symmetrically between the plates with a kinetic energy 0.5 eV. The length of each plate is 10 cm. The angle (θ) of deviation of the path of electron as it comes out of the field is _____(in degree).



Numerical value type: the answer is a number.

Answer: 45. · Key from source paper

Q123 JEE Main 2023 · 25 Jan · Shift 2 MCQ

A point charge of 10 μC is placed at the origin. At what location on the X-axis should a point charge of 40 μC be placed so that the net electric field is zero at $x = 2$ cm on the X-axis ?

(A) $x = 6$ cm
(B) $x = 4$ cm
(C) $x = 8$ cm
(D) $x = -4$ cm

Answer: (A) $x = 6$ cm · Key from source paper

Q124 JEE Main 2023 · 24 Jan · Shift 1 MCQ

If two charges q_1 and q_2 are separated with distance d and placed in a medium of dielectric constant k . What will be the equivalent distance between charges in air for the same electrostatic force?

(A) $d\sqrt{k}$
(B) $k\sqrt{d}$
(C) $1.5\,d\sqrt{k}$
(D) $2d\sqrt{k}$

Answer: (A) $d\sqrt{k}$ · Key from source paper

Q125 JEE Main 2023 · 24 Jan · Shift 1 Numerical

A stream of a positively charged particles having $\frac{q}{m} = 2 \times 10^{11}\ \mathrm{C\,kg^{-1}}$ and velocity $\vec{v}_0 = 3 \times 10^{7}\hat{i}\ \mathrm{m\,s^{-1}}$ is deflected by an electric field $1.8\hat{j}\ \mathrm{kV\,m^{-1}}$. The electric field exists in a region of 10 cm along x direction. Due to the electric field, the deflection of the charge particles in the y direction is _____ mm.

Numerical value type: the answer is a number.

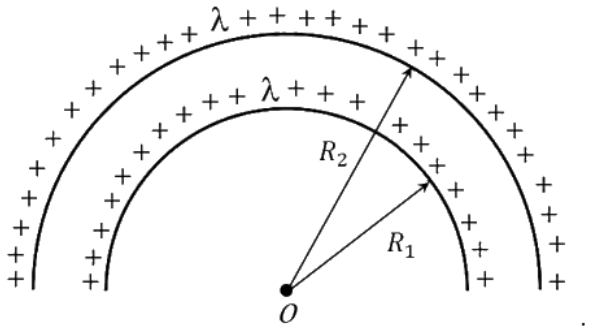
Answer: 2. · Key from source paper

Q126 JEE Main 2023 · 24 Jan · Shift 2 MCQ

The electric potential at the centre of two concentric half rings of radii R_1 and R_2, having same linear charge density λ is

(see the figure above)

Q15. The electric potential at the centre of two concentric half rings of radii R_1 and R_2, having same linear charge density λ is



(1) $\frac{2\lambda}{\epsilon_0}$ (2) $\frac{\lambda}{2\epsilon_0}$
(3) $\frac{\lambda}{4\epsilon_0}$ (4) $\frac{\lambda}{\epsilon_0}$

(A) $\frac{2\lambda}{\epsilon_0}$
(B) $\frac{\lambda}{2\epsilon_0}$
(C) $\frac{\lambda}{4\epsilon_0}$
(D) $\frac{\lambda}{\epsilon_0}$

Answer: (B) $\frac{\lambda}{2\epsilon_0}$ · Key from source paper

Q127 JEE Main 2022 · 29 Jul · Shift 1 MCQ

A spherically symmetric charge distribution is considered with charge density varying as

$$\rho(r) = \begin{cases} \rho_0\left(\frac{3}{4} - \frac{r}{R}\right) & \text{for } r \le R \\ \text{Zero} & \text{for } r > R \end{cases}$$

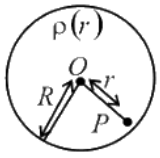
Where, $r(r < R)$ is the distance from the centre O (as shown in figure). The electric field at point P will be :

(see the figure above)

Q11. A spherically symmetric charge distribution is considered with charge density varying as

$$\rho(r) = \begin{cases} \rho_0\left(\frac{3}{4} - \frac{r}{R}\right) & \text{for } r \le R \\ \text{Zero} & \text{for } r > R \end{cases}$$

Where, $r(r < R)$ is the distance from the centre O (as shown in figure). The electric field at point P will be :



(1) $\frac{\rho_0 r}{4\varepsilon_0}\left(\frac{3}{4} - \frac{r}{R}\right)$
(2) $\frac{\rho_0 r}{3\varepsilon_0}\left(\frac{3}{4} - \frac{r}{R}\right)$
(3) $\frac{\rho_0 r}{4\varepsilon_0}\left(1 - \frac{r}{R}\right)$
(4) $\frac{\rho_0 r}{5\varepsilon_0}\left(1 - \frac{r}{R}\right)$

(A) $\frac{\rho_0 r}{4\epsilon_0}\left(\frac{3}{4} - \frac{r}{R}\right)$
(B) $\frac{\rho_0 r}{3\epsilon_0}\left(\frac{3}{4} - \frac{r}{R}\right)$
(C) $\frac{\rho_0 r}{4\epsilon_0}\left(1 - \frac{r}{R}\right)$
(D) $\frac{\rho_0 r}{5\epsilon_0}\left(1 - \frac{r}{R}\right)$

Answer: (C) $\frac{\rho_0 r}{4\epsilon_0}\left(1 - \frac{r}{R}\right)$ · Key from source paper

Q128 JEE Main 2022 · 29 Jul · Shift 1 MCQ

Given below are two statements.
Statement I : Electric potential is constant within and at the surface of each conductor.
Statement II : Electric field just outside a charged conductor is perpendicular to the surface of the conductor at every point.
In the light of the above statements, choose the most appropriate answer from the options give below.

(A) Both statement I and statement II are correct
(B) Both statement I and statement II are incorrect
(C) Statement I is correct but statement II is incorrect
(D) Statement I is incorrect but and statement II is correct

Answer: (A) Both statement I and statement II are correct · Key from source paper

Q129 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Two identical metallic spheres A and B when placed at certain distance in air repel each other with a force of F. Another identical uncharged sphere C is first placed in contact with A and then in contact with B and finally placed at midpoint between spheres A and B. The force experienced by sphere C will be :

(A) $\frac{3F}{2}$
(B) $\frac{3F}{4}$
(C) F
(D) $2F$

Answer: (B) $\frac{3F}{4}$ · Key from source paper

Q130 JEE Main 2022 · 28 Jul · Shift 1 Numerical

Two electric dipoles of dipole moments 1.2×10^{-30} cm and 2.4×10^{-30} cm are placed in two difference uniform electric fields of strengths 5×10^4 N C^{-1} and 15×10^4 N C^{-1} respectively. The ratio of maximum torque experienced by the electric dipoles will be $\frac{1}{x}$. The value of x is _____.

Numerical value type: the answer is a number.

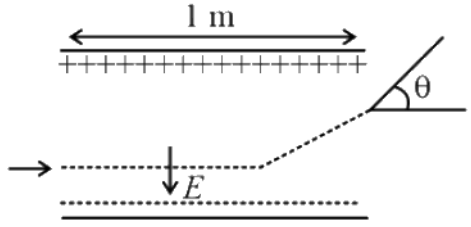
Answer: 6. · Key from source paper

Q131 JEE Main 2022 · 28 Jul · Shift 2 MCQ

A uniform electric field $E = \left(\frac{8m}{e}\right)$ V m^{-1} is created between two parallel plates of length 1 m as shown in figure, (where m = mass of electron and e = charge of electron). An electron enters the field symmetrically between the plates with a speed of 2 m s^{-1}. The angle of the deviation (θ) of the path of the electron as it comes out of the field will be _____.

(see the figure above)

Q9. A uniform electric field $E = \left(\frac{8m}{e}\right)$V m^{-1} is created between two parallel plates of length 1 m as shown in figure, (where m = mass of electron and e = charge of electron). An electron enters the field symmetrically between the plates with a speed of 2 m s^{-1}. The angle of the deviation (θ) of the path of the electron as it comes out of the field will be _____ .



(1) $\tan^{-1}(4)$ (2) $\tan^{-1}(2)$
(3) $\tan^{-1}\left(\frac{1}{3}\right)$ (4) $\tan^{-1}(3)$

(A) $\tan^{-1}(4)$
(B) $\tan^{-1}(2)$
(C) $\tan^{-1}\left(\frac{1}{3}\right)$
(D) $\tan^{-1}(3)$

Answer: (B) $\tan^{-1}(2)$ · Key from source paper

Q132 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Two identical positive charges Q each are fixed at a distance of $2a$ apart from each other. Another point charge q_0 with mass m is placed at midpoint between two fixed charges. For a small displacement along the line joining the fixed charges, the charge q_0 executes SHM. The time period of oscillation of charge q_0 will be

(A) $\sqrt{\frac{4\pi^3\varepsilon_0 ma^3}{q_0 Q}}$

(B) $\sqrt{\frac{q_0 Q}{4\pi^3\varepsilon_0 ma^3}}$

(C) $\sqrt{\frac{2\pi^2\varepsilon_0 ma^3}{q_0 Q}}$

(D) $\sqrt{\frac{8\pi^3\varepsilon_0 ma^3}{q_0 Q}}$

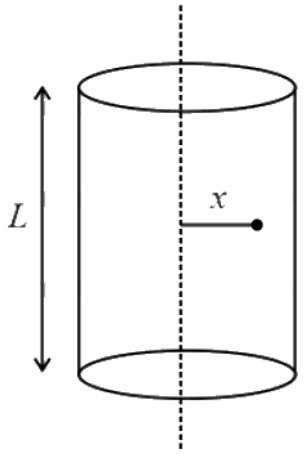
Answer: (A) $\sqrt{\frac{4\pi^3\varepsilon_0 ma^3}{q_0 Q}}$ · Key from source paper

Q133 JEE Main 2022 · 27 Jul · Shift 1 Numerical

A long cylindrical volume contains a uniformly distributed charge of density ρ C m^{-3}. The electric field inside the cylindrical volume at a distance $x = \frac{2\varepsilon_0}{\rho}$ m from its axis is _____ V m^{-1}.

(see the figure above)

Q26. A long cylindrical volume contains a uniformly distributed charge of density ρ C m^{-3}. The electric field inside the cylindrical volume at a distance $x = \frac{2\varepsilon_0}{\rho}$ m from its axis is _____ V m^{-1}.



Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q134 JEE Main 2022 · 27 Jul · Shift 2 MCQ

A charge of $4\mu\mathrm{C}$ is to be divided into two. The distance between the two divided charges is constant. The magnitude of the divided charges so that the force between them is maximum, will be:

(A) $1\mu C$ and $3\mu C$
(B) $2\mu C$ and $2\mu C$
(C) 0 and $4\mu C$
(D) $1.5\mu C$ and $2.5\mu C$

Answer: (B) $2\mu C$ and $2\mu C$ · Key from source paper

Q135 JEE Main 2022 · 26 Jul · Shift 2 MCQ

Two uniformly charged spherical conductors A and B of radii $5\ \text{mm}$ and $10\ \text{mm}$ are separated by a distance of $2\ \text{cm}$. If the spheres are connected by a conducting wire, then in equilibrium condition, the ratio of the magnitudes of the electric fields at the surface of the sphere A and B will be

(A) $1:2$
(B) $2:1$
(C) $1:1$
(D) $1:4$

Answer: (B) $2:1$ · Key from source paper

Q136 JEE Main 2022 · 26 Jul · Shift 2 Numerical

Three point charges of magnitude $5\ \mu$C, $0.16\ \mu$C and $0.3\ \mu$C are located at the vertices A, B, C of a right angled triangle whose sides are $AB = 3\ \text{cm}$, $BC = 3\sqrt{2}\ \text{cm}$ and $CA = 3\ \text{cm}$ and point A is the right angle corner. Charge at point A experiences _____ N of electrostatic force due to the other two charges.

Numerical value type: the answer is a number.

Answer: 17. · Key from source paper

Q137 JEE Main 2022 · 25 Jul · Shift 1 Numerical

The volume charge density of a sphere of radius 6 m is 2 $\mu\text{C cm}^{-3}$. The number of lines of force per unit surface area coming out from the surface of the sphere is _____ $\times 10^{10}\ \text{N C}^{-1}$.
[Given : Permittivity of vacuum $\epsilon_0 = 8.85 \times 10^{-12}\ \text{C}^2\ \text{N}^{-1}\text{-m}^{-2}$]

Numerical value type: the answer is a number.

Answer: 45. · Key from source paper

Q138 JEE Main 2022 · 29 Jun · Shift 1 MCQ

A positive charge particle of $100\ \text{mg}$ is thrown in opposite direction to a uniform electric field of strength $1 \times 10^5\ \text{N C}^{-1}$. If the charge on the particle is $40\ \mu\text{C}$ and the initial velocity is $200\ \text{m s}^{-1}$, how much distance it will travel before coming to the rest momentarily

(A) $0.5\ \mathrm{m}$
(B) $1\ \mathrm{m}$
(C) $5\ \mathrm{m}$
(D) $10\ \mathrm{m}$

Answer: (A) $0.5\ \mathrm{m}$ · Key from source paper

Q139 JEE Main 2022 · 29 Jun · Shift 2 MCQ

Two point charges Q each are placed at a distance d apart. A third point charge q is placed at a distance x from mid-point on the perpendicular bisector. The value of x at which charge q will experience the maximum Coulomb's force is:

(A) d
(B) $\frac{d}{2}$
(C) $\frac{d}{\sqrt{2}}$
(D) $\frac{d}{2\sqrt{2}}$

Answer: (D) $\frac{d}{2\sqrt{2}}$ · Key from source paper

Q140 JEE Main 2022 · 29 Jun · Shift 2 MCQ

If the electric potential at any point $(x,\ y,\ z)$ m in space is given by $V = 3x^2$ volt. The electric field at the point $(1,\ 0,\ 3)$ m will be :

(A) $3\ \mathrm{Vm}^{-1}$, directed along positive x-axis.
(B) $3\ \mathrm{Vm}^{-1}$, directed along negative x-axis.
(C) $6\ \mathrm{Vm}^{-1}$, directed along negative x-axis.
(D) $6\ \mathrm{Vm}^{-1}$, directed along positive x-axis.

Answer: (C) $6\ \mathrm{Vm}^{-1}$**, directed along negative** x**-axis.** · Key from source paper

---

Q141 JEE Main 2022 · 28 Jun · Shift 1 MCQ

Statement-I : A point charge is brought in an electric field. The value of electric field at a point near to the charge may increase if the charge is positive.
Statement-II : An electric dipole is placed in a uniform electric field. The net electric force on the dipole will not be zero.

(A) Both statement-I and statement-II are true.
(B) Both statement-I and statement-II are false.
(C) Statement-I is true but statement-II is false.
(D) Statement-I is false but statement-II is true.

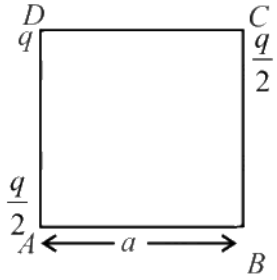
Answer: (C) Statement-I is true but statement-II is false. · Key from source paper

Q142 JEE Main 2022 · 28 Jun · Shift 1 MCQ

The three charges $\frac{q}{2}, q$ and $\frac{q}{2}$ are placed at the corners A, D and C of a square of side a as shown in figure. The magnitude of electric field (E) at the corner B of the square, is

(see the figure above)

Q11. The three charges $\frac{q}{2}, q$ and $\frac{q}{2}$ are placed at the corners A, D and C of a square of side a as shown in figure. The magnitude of electric field (E) at the corner B of the square, is



(1) $\frac{q}{4\pi\epsilon_0 a^2}\left(\frac{1}{\sqrt{2}}+\frac{1}{2}\right)$
(2) $\frac{q}{4\pi\epsilon_0 a^2}\left(1+\frac{1}{\sqrt{2}}\right)$
(3) $\frac{q}{4\pi\epsilon_0 a^2}\left(1-\frac{1}{\sqrt{2}}\right)$
(4) $\frac{q}{4\pi\epsilon_0 a^2}\left(\frac{1}{\sqrt{2}}-\frac{1}{2}\right)$

(A) $\frac{q}{4\pi\epsilon_0 a^2}\left(\frac{1}{\sqrt{2}}+\frac{1}{2}\right)$
(B) $\frac{q}{4\pi\epsilon_0 a^2}\left(1+\frac{1}{\sqrt{2}}\right)$
(C) $\frac{q}{4\pi\epsilon_0 a^2}\left(1-\frac{1}{\sqrt{2}}\right)$
(D) $\frac{q}{4\pi\epsilon_0 a^2}\left(\frac{1}{\sqrt{2}}-\frac{1}{2}\right)$

Answer: (A) $\frac{q}{4\pi\epsilon_0 a^2}\left(\frac{1}{\sqrt{2}}+\frac{1}{2}\right)$ · Key from source paper

Q143 JEE Main 2022 · 28 Jun · Shift 2 MCQ

Two point charges A and B of magnitude $+8\times10^{-6}\text{C}$ and $-8\times10^{-6}\text{C}$ respectively are placed at a distance d apart. The electric field at the middle point O between the charges is $6.4\times10^{4}\ \text{N C}^{-1}$. The distance 'd' between the point charges A and B is

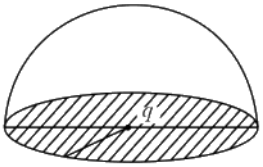
(A) $2\ \mathrm{m}$
(B) $3\ \mathrm{m}$
(C) $1\ \mathrm{m}$
(D) $4\ \mathrm{m}$

Answer: (B) $3\ \mathrm{m}$ · Key from source paper

Q144 JEE Main 2022 · 27 Jun · Shift 2 MCQ

If a charge q is placed at the centre of a closed hemispherical non-conducting surface, the total flux passing through the flat surface would be
(see the figure above)

Q13. If a charge q is placed at the centre of a closed hemispherical non-conducting surface, the total flux passing through the flat surface would be



(1) $\frac{q}{\varepsilon_0}$
(2) $\frac{q}{2\varepsilon_0}$
(3) $\frac{q}{4\varepsilon_0}$
(4) $\frac{q}{2\pi\varepsilon_0}$

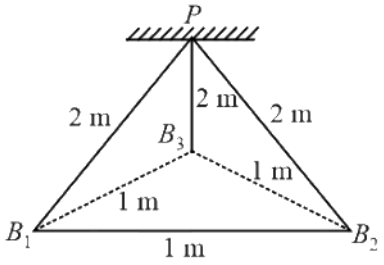
(A) $\frac{q}{\varepsilon_0}$
(B) $\frac{q}{2\varepsilon_0}$
(C) $\frac{q}{4\varepsilon_0}$
(D) $\frac{q}{2\pi\varepsilon_0}$

Answer: (B) $\frac{q}{2\varepsilon_0}$ · Key from source paper

Q145 JEE Main 2022 · 27 Jun · Shift 2 MCQ

Three identical charged balls each of charge $2C$ are suspended from a common point P by silk threads of $2\ \mathrm{m}$ each (as shown in figure). They form an equilateral triangle of side $1\ \mathrm{m}$.
The ratio of net force on a charged ball to the force between any two charged balls will be
(see the figure above)

Q14. Three identical charged balls each of charge $2C$ are suspended from a common point P by silk threads of 2 m each (as shown in figure). They form an equilateral triangle of side 1 m.
The ratio of net force on a charged ball to the force between any two charged balls will be



(1) $\sqrt{3}:1$
(2) $\sqrt{3}:2$
(3) $1:1$
(4) $1:4$

(A) $\sqrt{3}:1$
(B) $\sqrt{3}:2$
(C) $1:1$
(D) $1:4$

Answer: (A) $\sqrt{3}:1$ · Key from source paper

Q146 JEE Main 2022 · 26 Jun · Shift 2 MCQ

Sixty four conducting drops each of radius 0.02 m and each carrying a charge of 5μC are combined to form a bigger drop. The ratio of surface density of bigger drop to the smaller drop will be

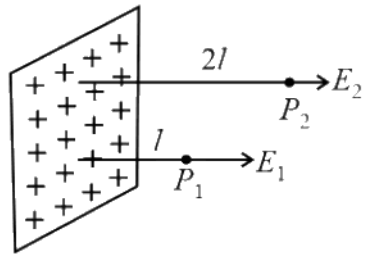
(A) $1:4$
(B) $4:1$
(C) $1:8$
(D) $8:1$

Answer: (B) $4:1$ · Key from source paper

Q147 JEE Main 2022 · 25 Jun · Shift 1 MCQ

In the figure, a very large plane sheet of positive charge is shown. P_1 and P_2 are two points at distance l and $2l$ from the charge distribution. If σ is the surface charge density, then the magnitude of electric fields E_1 and E_2 at P_1 and P_2 respectively are
(see the figure above)

Q8. In the figure, a very large plane sheet of positive charge is shown. P_1 and P_2 are two points at distance l and $2l$ from the charge distribution. If σ is the surface charge density, then the magnitude of electric fields E_1 and E_2 at P_1 and P_2 respectively are



(1) $E_1 = \frac{\sigma}{\varepsilon_o}, E_2 = \frac{\sigma}{2\varepsilon_o}$
(2) $E_1 = \frac{2\sigma}{\varepsilon_o}, E_2 = \frac{\sigma}{\varepsilon_o}$
(3) $E_1 = E_2 = \frac{\sigma}{2\varepsilon_o}$
(4) $E_1 = E_2 = \frac{\sigma}{\varepsilon_o}$

(A) $E_1 = \frac{\sigma}{\varepsilon_o}, E_2 = \frac{\sigma}{2\varepsilon_o}$
(B) $E_1 = \frac{2\sigma}{\varepsilon_o}, E_2 = \frac{\sigma}{\varepsilon_o}$
(C) $E_1 = E_2 = \frac{\sigma}{2\varepsilon_o}$
(D) $E_1 = E_2 = \frac{\sigma}{\varepsilon_o}$

Answer: (C) $E_1 = E_2 = \frac{\sigma}{2\varepsilon_o}$ · Key from source paper

Q148 JEE Main 2022 · 25 Jun · Shift 2 Numerical

27 identical drops are charged at 22 V each. They combine to form a bigger drop. The potential of the bigger drop will be _____ V.

Numerical value type: the answer is a number.

Answer: 198. · Key from source paper

Q149 JEE Main 2022 · 24 Jun · Shift 1 MCQ

A vertical electric field of magnitude 4.9×10^5 N C^{-1} just prevents a water droplet of a mass 0.1 g from falling. The value of charge on the droplet will be : (Given $g = 9.8$ m s^{-2})

(A) 1.6×10^{-9}C
(B) 2.0×10^{-9}C
(C) 3.2×10^{-9}C
(D) 0.5×10^{-9}C

Answer: (B) 2.0×10^{-9}C · Key from source paper

Q150 JEE Main 2022 · 24 Jun · Shift 2 MCQ

Two identical charged particles each having a mass 10 g and charge 2.0×10^{-7}C are placed on a horizontal table with a separation of L between them such that they stay in limited equilibrium. If the coefficient of friction between each particle and the table is 0.25, find the value of L. [Use g = 10 ms^{-2}]

(A) 12 cm
(B) 10 cm
(C) 8 cm
(D) 5 cm

Answer: (A) 12 cm · Key from source paper

Q151 JEE Main 2022 · 24 Jun · Shift 2 MCQ

A long cylindrical volume contains a uniformly distributed charge of density ρ. The radius of cylindrical volume is R. A charge particle (q) revolves around the cylinder in a circular path. The kinetic energy of the particle is :

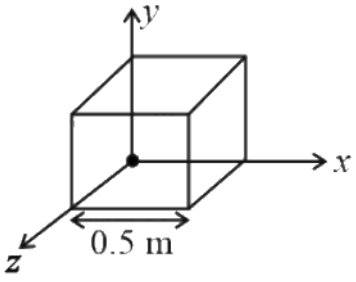
(A) $\frac{\rho q R^2}{4\varepsilon_0}$
(B) $\frac{\rho q R^2}{2\varepsilon_0}$
(C) $\frac{q\rho}{4\varepsilon_0 R^2}$
(D) $\frac{4\varepsilon_0 R^2}{q\rho}$

Answer: (A) $\frac{\rho q R^2}{4\varepsilon_0}$ · Key from source paper

Q152 JEE Main 2021 · 1 Sep · Shift 2 MCQ

A cube is placed inside an electric field, $\vec{E} = 150y^2\hat{j}$ The side of the cube is 0.5 m and is placed in the field as shown in the given figure. The charge inside the cube is:
(see the figure above)

Q11. A cube is placed inside an electric field, $\vec{E} = 150y^2\hat{j}$ The side of the cube is 0.5 m and is placed in the field as shown in the given figure. The charge inside the cube is:



(1) 8.3×10^{-11}C
(2) 3.8×10^{-11}C
(3) 3.8×10^{-12}C
(4) 8.3×10^{-12}C

(A) 8.3×10^{-11}C
(B) 3.8×10^{-11}C
(C) 3.8×10^{-12}C
(D) 8.3×10^{-12}C

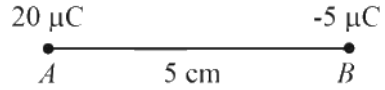
Answer: (A) 8.3×10^{-11}C · Key from source paper

Q153 JEE Main 2021 · 31 Aug · Shift 1 MCQ

Two particles A and B having charges $20\ \mu$C and $-5\ \mu$C respectively are held fixed with a separation of 5 cm. At what position a third charged particle should be placed so that it does not experience a net electric force ?

(see the figure above)

Q10. Two particles A and B having charges $20\ \mu$C and $-5\ \mu$C respectively are held fixed with a separation of 5 cm. At what position a third charged particle should be placed so that it does not experience a net electric force ?



(1) At 5 cm from $-5\ \mu$C on the right side
(2) At 5 cm from $20\ \mu$C on the left side of system
(3) At 1.25 cm from $-5\ \mu$C between two charges
(4) At midpoint between two charges

(A) At 5 cm from $-5\ \mu$C on the right side
(B) At 5 cm from $20\ \mu$C on the left side of system
(C) At 1.25 cm from $-5\ \mu$C between two charges
(D) At midpoint between two charges

Answer: (A) At 5 cm from $-5\ \mu$C on the right side · Key from source paper

Q154 JEE Main 2021 · 31 Aug · Shift 2 MCQ

Choose the incorrect statement:
(a) The electric lines of force entering into a Gaussian surface provide negative flux.
(b) A charge q is placed at the centre of a cube. The flux through all the faces will be the same.
(c) In a uniform electric field net flux through a closed Gaussian surface containing no net charge, is zero.
(d) When an electric field is parallel to a Gaussian surface, it provides a finite non-zero flux.
Choose the most appropriate answer from the options given below:

(A) (b) and (d) Only
(B) (c) and (d) Only
(C) (a) and (c) Only
(D) (d) Only

Answer: (D) (d) Only · Key from source paper

Q155 JEE Main 2021 · 27 Aug · Shift 1 MCQ

A uniformly charged disc of radius R having surface charge density σ is placed in the xy plane with its center at the origin. Find the electric field intensity along the z-axis at a distance Z from origin:

(A) $E = \frac{2\varepsilon_0}{\sigma}\left(\frac{1}{(Z^2+R^2)^{1/2}} + Z\right)$

(B) $E = \frac{\sigma}{2\varepsilon_0}\left(1 + \frac{Z}{(Z^2+R^2)^{1/2}}\right)$

(C) $E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{Z}{(Z^2+R^2)^{1/2}}\right)$

(D) $E = \frac{\sigma}{2\varepsilon_0}\left(\frac{1}{(Z^2+R^2)} + \frac{1}{Z^2}\right)$

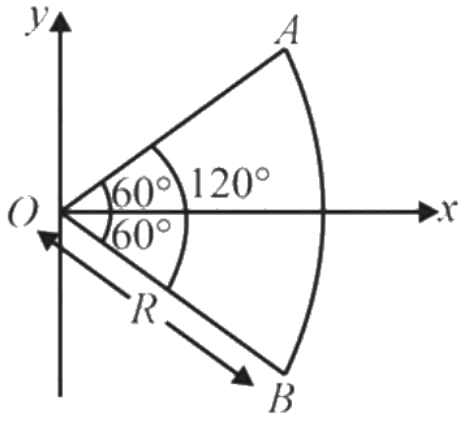
Answer: (C) $E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{Z}{(Z^2+R^2)^{1/2}}\right)$ · Key from source paper

Q156 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Figure shows a rod AB, which is bent in a 120° circular arc of radius R. A charge $(-Q)$ is uniformly distributed over rod AB. What is the electric filed $\vec{E}$ at the centre of curvature O ?

(see the figure above)

Q10. Figure shows a rod AB, which is bent in a 120° circular arc of radius R. A charge $(-Q)$ is uniformly distributed over rod AB. What is the electric filed $\vec{E}$ at the centre of curvature O ?



(1) $\frac{3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}\,\hat{i}$

(2) $\frac{3\sqrt{3Q}}{8\pi\varepsilon_0 R^2}\,\hat{i}$

(3) $\frac{-3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}\,\hat{i}$

(4) $\frac{3\sqrt{3Q}}{16\pi^2\varepsilon_0 R^2}\,\hat{i}$

(A) $\frac{3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}\,\hat{i}$

(B) $\frac{3\sqrt{3}Q}{8\pi\varepsilon_0 R^2}\,\hat{i}$

(C) $\frac{-3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}\,\hat{i}$

(D) $\frac{3\sqrt{3}Q}{16\pi^2\varepsilon_0 R^2}\,\hat{i}$

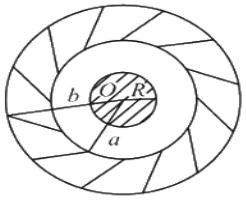
Answer: (A) $\frac{3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}\,\hat{i}$ · Key from source paper

Q157 JEE Main 2021 · 26 Aug · Shift 1 MCQ

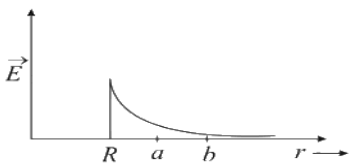
A solid metal sphere of radius R having charge q is enclosed inside the concentric spherical shell of inner radius a and outer radius b as shown in the figure. The approximate variation electric field $\vec{E}$, as a function of distance r, from centre O, is given by:

(see the figure above)

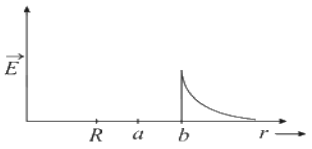
Q8. A solid metal sphere of radius R having charge q is enclosed inside the concentric spherical shell of inner radius a and outer radius b as shown in the figure. The approximate variation electric field $\vec{E}$, as a function of distance r, from centre O, is given by:



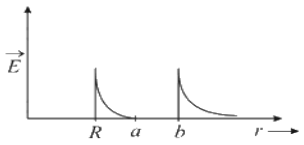
(1)



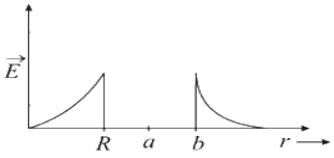
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (C) · Key from source paper

Q158 JEE Main 2021 · 26 Aug · Shift 2 MCQ

The two thin coaxial rings, each of radius a and having charges $+Q$ and $-Q$ respectively are separated by a distance of s. The potential difference between the centres of the two rings is :

(A) $\frac{Q}{2\pi\varepsilon_0}\left[\frac{1}{a}-\frac{1}{\sqrt{s^2+a^2}}\right]$

(B) $\frac{Q}{4\pi\varepsilon_0}\left[\frac{1}{a}-\frac{1}{\sqrt{s^2+a^2}}\right]$

(C) $\frac{Q}{4\pi\varepsilon_0}\left[\frac{1}{a}+\frac{1}{\sqrt{s^2+a^2}}\right]$

(D) $\frac{Q}{2\pi\varepsilon_0}\left[\frac{1}{a}+\frac{1}{\sqrt{s^2+a^2}}\right]$

Answer: (A) $\frac{Q}{2\pi\varepsilon_0}\left[\frac{1}{a}-\frac{1}{\sqrt{s^2+a^2}}\right]$ · Key from source paper

Q159 JEE Main 2021 · 27 Jul · Shift 1 MCQ

Two identical tennis balls each having mass m and charge q are suspended from a fixed point by threads of length l. What is the equilibrium separation when each thread makes a small angle θ with the vertical?

(A) $x = \left(\frac{q^2 l}{2\pi\varepsilon_0 mg}\right)^{\frac{1}{2}}$

(B) $x = \left(\frac{q^2 l}{2\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$

(C) $x = \left(\frac{q^2 l^2}{2\pi\varepsilon_0 m^2 g}\right)^{\frac{1}{3}}$

(D) $x = \left(\frac{q^2 l^2}{2\pi\varepsilon_0 m^2 g^2}\right)^{\frac{1}{3}}$

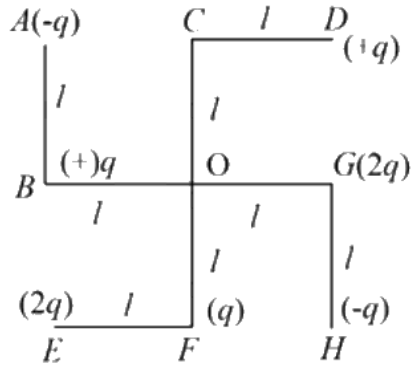
Answer: (B) $x = \left(\frac{q^2 l}{2\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$ · Key from source paper

Q160 JEE Main 2021 · 27 Jul · Shift 2 MCQ

What will be the magnitude of the electric field at point O as shown in the figure? Each side of the figure is l and perpendicular to the other?

(see the figure above)

Q13. What will be the magnitude of the electric field at point O as shown in the figure? Each side of the figure is l and perpendicular to the other?



(1) $\frac{1}{4\pi\varepsilon_0}\frac{q}{l^2}$

(2) $\frac{1}{4\pi\varepsilon_0}\frac{q}{(2l^2)}\left(2\sqrt{2}-1\right)$

(3) $\frac{q}{4\pi\varepsilon_0(2l)^2}$

(4) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{2l^2}\left(\sqrt{2}\right)$

(A) $\frac{1}{4\pi\varepsilon_0}\frac{q}{l^2}$

(B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{(2l^2)}\left(2\sqrt{2}-1\right)$

(C) $\frac{q}{4\pi\varepsilon_0(2l)^2}$

(D) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{2l^2}\left(\sqrt{2}\right)$

Answer: (B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{(2l^2)}\left(2\sqrt{2}-1\right)$ · Key from source paper

Q161 JEE Main 2021 · 25 Jul · Shift 1 Numerical

A particle of mass $1\ \text{mg}$ and charge q is lying at the mid-point of two stationary particles kept at a distance $2\ \text{m}$ when each is carrying same charge q. If the free charged particle is displaced from its equilibrium position through distance x $x << 1\ \text{m}$. The particle executes SHM. Its angular frequency of oscillation will be _____ $\times 10^5\ \text{rad s}^{-1}$ (if $q^2 = 10C^2$)

Numerical value type: the answer is a number.

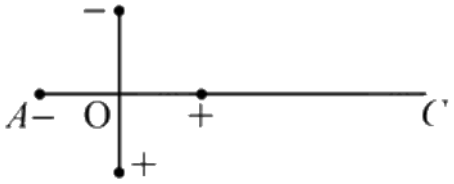
Answer: 6000. · Key from source paper

Q162 JEE Main 2021 · 25 Jul · Shift 2 MCQ

Two ideal electric dipoles A and B, having their dipole moment p_1 and p_2 respectively are placed on a plane with their centres at O as shown in the figure. At point C on the axis of dipole A, the resultant electric field is making an angle of 37° with the axis. The ratio of the dipole moment of A and B, $\frac{p_1}{p_2}$ is: (take $\sin 37^\circ = \frac{3}{5}$)

(see the figure above)

Q11. Two ideal electric dipoles A and B, having their dipole moment p_1 and p_2 respectively are placed on a plane with their centres at O as shown in the figure. At point C on the axis of dipole A, the resultant electric field is making an angle of 37° with the axis. The ratio of the dipole moment of A and B, $\frac{p_1}{p_2}$ is: $\left(\text{take } \sin 37^\circ = \frac{3}{5}\right)$



(1) $\frac{3}{8}$
(2) $\frac{3}{2}$
(3) $\frac{2}{3}$
(4) $\frac{4}{3}$

(A) $\frac{3}{8}$
(B) $\frac{3}{2}$
(C) $\frac{2}{3}$
(D) $\frac{4}{3}$

Answer: (C) $\frac{2}{3}$ · Key from source paper

Q163 JEE Main 2021 · 22 Jul · Shift 1 MCQ

An electric dipole is placed on x-axis in proximity to a line charge of linear charge density $3.0 \times 10^{-6}\ \text{C m}^{-1}$. Line charge is placed on z-axis and positive and negative charge of dipole is at a distance of $10\ \text{mm}$ and $12\ \text{mm}$ from the origin respectively. If total force of $4\ \text{N}$ is exerted on the dipole, find out the amount of positive or negative charge of the dipole.

(A) $815.1\ \text{nC}$
(B) $8.8\ \mu\text{C}$
(C) $0.485\ \text{mC}$
(D) $4.44\ \mu\text{C}$

Answer: (D) $4.44\ \mu\text{C}$ · Key from source paper

Q164 JEE Main 2021 · 22 Jul · Shift 1 Numerical

The total charge enclosed in an incremental volume of $2 \times 10^{-9}\ \mathrm{m}^3$ located at the origin is _____ nC, if electric flux density of its field is found as$D = e^{-x}\sin y\,\hat{i} - e^{-x}\cos y\,\hat{j} + 2z\hat{k}\ \mathrm{C\ m^{-2}}$

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q165 JEE Main 2021 · 20 Jul · Shift 1 MCQ

A certain charge Q is divided into two parts q and $(Q - q)$. How should the charges Q and q be divided so that q and $(Q - q)$ placed at a certain distance apart experience maximum electrostatic repulsion?

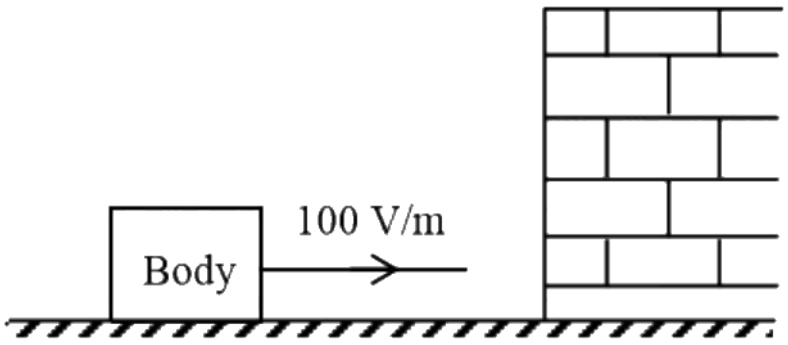
(A) $Q = \frac{q}{2}$
(B) $Q = 2q$
(C) $Q = 4q$
(D) $Q = 3q$

Answer: (B) $Q = 2q$ · Key from source paper

Q166 JEE Main 2021 · 20 Jul · Shift 1 Numerical

A body having specific charge $8\ \mu\mathrm{C\ g^{-1}}$ is resting on a frictionless plane at a distance $10\ \mathrm{cm}$ from the wall (as shown in the figure). It starts moving towards the wall when a uniform electric field of $100\ \mathrm{V\ m^{-1}}$ is applied horizontally towards the wall. If the collision of the body with the wall is perfectly elastic, then the time period of the motion will be _____ s.
(see the figure above)

Q22. A body having specific charge $8\ \mu\mathrm{C\ g^{-1}}$ is resting on a frictionless plane at a distance $10\ \mathrm{cm}$ from the wall (as shown in the figure). It starts moving towards the wall when a uniform electric field of $100\ \mathrm{V\ m^{-1}}$ is applied horizontally towards the wall. If the collision of the body with the wall is perfectly elastic, then the time period of the motion will be ____s.



Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q167 JEE Main 2021 · 18 Mar · Shift 1 MCQ

An oil drop of the radius $2\ \text{mm}$ with a density $3\ \text{g cm}^{-3}$ is held stationary under a constant electric field $3.55 \times 10^5\ \text{V m}^{-1}$ in the Millikan's oil drop experiment. What is the number of excess electrons that the oil drop will possess? (consider $g = 9.81\ \text{m s}^{-2}$).

(A) 48.8×10^{11}
(B) 1.73×10^{10}
(C) 17.3×10^{10}
(D) 1.73×10^{12}

Answer: (B) 1.73×10^{10} · Key from source paper

Q168 JEE Main 2021 · 18 Mar · Shift 2 Numerical

An infinite number of point charges, each carrying $1\ \mu\text{C}$ charge, are placed along the y-axis at $y = 1\ \text{m}, 2\ \text{m}, 4\ \text{m}, 8\ \text{m} \ldots$.
The total force on a $1\ \text{C}$ point charge, placed at the origin, is $x \times 10^3\ \text{N}$. The value of x, to the nearest integer, is _____ .
[Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\ \text{N m}^2\ \text{C}^{-2}$]

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q169 JEE Main 2021 · 17 Mar · Shift 2 Numerical

The electric field in a region is given by $\vec{E} = \frac{2}{5}E_0\hat{i} + \frac{3}{5}E_0\hat{j}$ with $E_0 = 4.0 \times 10^3\ \text{NC}^{-1}$. The flux of this field through a rectangular surface, area $0.4\ \text{m}^2$ parallel to the $Y - Z$ plane is _____ Nm^2C^{-1}.

Numerical value type: the answer is a number.

Answer: 640. · Key from source paper

Q170 JEE Main 2021 · 16 Mar · Shift 2 MCQ

Find out the surface charge density at the intersection of point $x = 3\ \text{m}$ plane and x-axis, in the region of uniform line charge of $8\ \text{nC m}^{-1}$ lying along the z-axis in free space.

(A) $0.424\ \text{nC m}^{-2}$
(B) $47.88\ \text{nC m}^{-2}$
(C) $0.07\ \text{nC m}^{-2}$
(D) $4.0\ \text{nC m}^{-2}$

Answer: (A) $0.424\ \text{nC m}^{-2}$ · Key from source paper

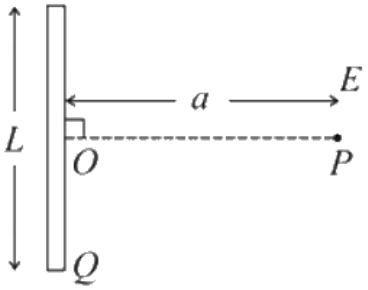
Q171 JEE Main 2021 · 26 Feb · Shift 1 MCQ

Find the electric field at point P (as shown in figure) on the perpendicular bisector of a uniformly charged thin wire of length L carrying a charge Q. The distance of the point P from the centre of the

rod is $a = \frac{\sqrt{3}}{2}L$

(see the figure above)

Q12. Find the electric field at point P (as shown in figure) on the perpendicular bisector of a uniformly charged thin wire of length L carrying a charge Q. The distance of the point P from the centre of the rod is $a = \frac{\sqrt{3}}{2}L$



(1) $\frac{Q}{3\pi\varepsilon_0 L^2}$

(2) $\frac{Q}{2\sqrt{3}\pi\varepsilon_0 L^2}$

(3) $\frac{\sqrt{3}Q}{4\pi\varepsilon_0 L^2}$

(4) $\frac{Q}{4\pi\varepsilon_0 L^2}$

(A) $\frac{Q}{3\pi\varepsilon_0 L^2}$

(B) $\frac{Q}{2\sqrt{3}\pi\varepsilon_0 L^2}$

(C) $\frac{\sqrt{3}Q}{4\pi\varepsilon_0 L^2}$

(D) $\frac{Q}{4\pi\varepsilon_0 L^2}$

Answer: (B) $\frac{Q}{2\sqrt{3}\pi\varepsilon_0 L^2}$ · Key from source paper

Q172 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Given below are two statements

Statement I : An electric dipole is placed at the centre of a hollow sphere. The flux of electric field through the sphere is zero, but the electric field is not zero anywhere in the sphere.

Statement II : If R is the radius of a solid metallic sphere and Q be the total charge on it. The electric field at any point on the spherical surface of radius $r(< R)$ is zero but the electric flux passing through this closed spherical surface of radius r is not

In the light of the above statements, choose the correct answer from the options given below:

(A) Both Statement I and Statement II are true

(B) Statement I is false but Statement II is true

(C) Statement I is true but Statement II is false

(D) Both Statement I and Statement II are false

Answer: (C) Statement I is true but Statement II is false · Key from source paper

Q173 JEE Main 2021 · 26 Feb · Shift 2 Numerical

27 similar drops of mercury are maintained at 10 V each. All these spherical drops combine into a single big drop. The potential energy of the bigger drop is _____ times that of a smaller drop.

Numerical value type: the answer is a number.

Answer: 243. · Key from source paper

Q174 JEE Main 2021 · 25 Feb · Shift 1 Numerical

The electric field in a region is given by $\vec{E} = \left(\frac{3}{5}E_0\hat{i} + \frac{4}{5}E_0\hat{j}\right)$ N C^{-1}. The ratio of flux of reported field through the rectangular surface of area 0.2 m^2 (parallel to $y-z$ plane) to that of the surface of area 0.3 m^2 (parallel to $x-z$ plane) is $a:b = a:2$, where $a =$? [Here $\hat{i}$, $\hat{j}$ and $\hat{k}$ are unit vectors along x, y and z -axes respectively]

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q175 JEE Main 2021 · 25 Feb · Shift 1 Numerical

512 identical drops of mercury are charged to a potential of 2 V each. The drops are joined to form a single drop. The potential of this drop is V in Volt.

Numerical value type: the answer is a number.

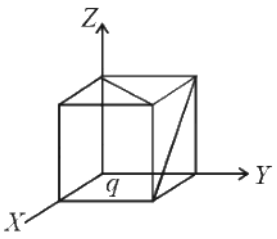
Answer: 128. · Key from source paper

Q176 JEE Main 2021 · 25 Feb · Shift 2 MCQ

A charge q is placed at one corner of a cube as shown in figure. The flux of electrostatic field $\vec{E}$ through the shaded area is:

(see the figure above)

Q9. A charge q is placed at one corner of a cube as shown in figure. The flux of electrostatic field $\vec{E}$ through the shaded area is:



(1) $\frac{q}{8\varepsilon_0}$ (2) $\frac{q}{24\varepsilon_0}$
(3) $\frac{q}{48\varepsilon_0}$ (4) $\frac{q}{4\varepsilon_0}$

(A) $\frac{q}{8\varepsilon_0}$
(B) $\frac{q}{24\varepsilon_0}$
(C) $\frac{q}{48\varepsilon_0}$
(D) $\frac{q}{4\varepsilon_0}$

Answer: (B) $\frac{q}{24\varepsilon_0}$ · Key from source paper

Q177 JEE Main 2021 · 25 Feb · Shift 2 MCQ

An electron with kinetic energy K_1 enters between parallel plates of a capacitor at an angle α with the plates. It leaves the plates at angle β with kinetic energy K_2. Then the ratio of kinetic energies $K_1 : K_2$ will be :

(A) $\frac{\sin^2\beta}{\cos^2\alpha}$
(B) $\frac{\cos\beta}{\sin\alpha}$
(C) $\frac{\cos\beta}{\cos\alpha}$
(D) $\frac{\cos^2\beta}{\cos^2\alpha}$

Answer: (D) $\frac{\cos^2\beta}{\cos^2\alpha}$ · Key from source paper

Q178 JEE Main 2021 · 25 Feb · Shift 2 Numerical

Two small spheres each of mass $10\ \text{mg}$ are suspended from a point by threads $0.5\ \text{m}$ long. They are equally charged and repel each other to a distance of $0.20\ \text{m}$. The charge on each of the sphere is $\frac{a}{21} \times 10^{-8}\ \text{C}$. The value of a will be _____. [Given $g = 10\ \text{m s}^{-2}$]

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q179 JEE Main 2021 · 25 Feb · Shift 2 Numerical

Two identical conducting spheres with negligible volume have $2.1\ \text{nC}$ and $-0.1\ \text{nC}$ charges, respectively. They are brought into contact and then separated by a distance of $0.5\ \text{m}$. The electrostatic force acting between the spheres is _____ $\times 10^{-9}$ N. [Given : $4\pi\varepsilon_0 = \frac{1}{9\times10^9}$ SI unit]

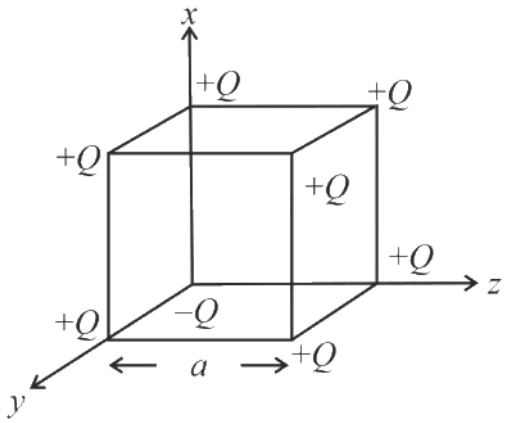
Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q180 JEE Main 2021 · 24 Feb · Shift 1 MCQ

A cube of side a has point charges $+Q$ located at each of its vertices except at the origin where the charge is $-Q$. The electric field at the centre of cube is:
(see the figure above)

Q12. A cube of side a has point charges +Q located at each of its vertices except at the origin where the charge is -Q. The electric field at the centre of cube is:



(1) $\frac{-Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(2) $\frac{Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(3) $\frac{-2Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(4) $\frac{2Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(A) $\frac{-Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(B) $\frac{Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(C) $\frac{-2Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

(D) $\frac{2Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$

Answer: (C) $\frac{-2Q}{3\sqrt{3}\pi\varepsilon_0 a^2}\hat{x}+\hat{y}+\hat{z}$ · Key from source paper

Q181 JEE Main 2021 · 24 Feb · Shift 2 MCQ

Two electrons each are fixed at a distance $2d$. A third charge proton placed at the midpoint is displaced slightly by a distance $x(x \ll d)$ perpendicular to the line joining the two fixed charges. Proton will execute simple harmonic motion having angular frequency:
(m = mass of charged particle)

(A) $\left(\frac{\pi\varepsilon_0 m d^3}{2q^2}\right)^{\frac{1}{2}}$

(B) $\left(\frac{2\pi\varepsilon_0 m d^3}{q^2}\right)^{\frac{1}{2}}$

(C) $\left(\frac{q^2}{2\pi\varepsilon_0 m d^3}\right)^{\frac{1}{2}}$

(D) $\left(\frac{2q^2}{\pi\varepsilon_0 m d^3}\right)^{\frac{1}{2}}$

Answer: (C) $\left(\frac{q^2}{2\pi\varepsilon_0 m d^3}\right)^{\frac{1}{2}}$ · Key from source paper

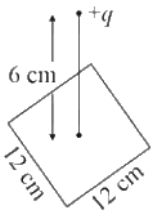
Q182 JEE Main 2021 · 24 Feb · Shift 2 Numerical

A point charge of $+12\ \mu\text{C}$ is at a distance $6\ \text{cm}$ vertically above the centre of a square of side $12\ \text{cm}$ as shown in figure. The magnitude of the electric flux through the square will be _____

$\times 10^3$ N m^2 C^{-1}.

(see the figure above)

Q26. A point charge of $+12\ \mu$C is at a distance 6 cm vertically above the centre of a square of side 12 cm as shown in figure. The magnitude of the electric flux through the square will be _____ $\times 10^3$ N m^2 C^{-1}.



Numerical value type: the answer is a number.

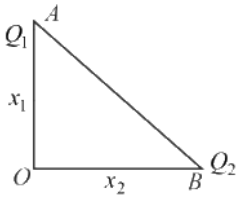
Answer: 226. · Key from source paper

Q183 JEE Main 2020 · 6 Sep · Shift 1 MCQ

Charges Q_1 and Q_2 are at points A and B of a right-angled triangle OAB. The resultant electric field at point O is perpendicular to the hypotenuse, then Q_1/Q_2 is proportional to:

(see the figure above)

Q10. Charges Q_1 and Q_2 are at points A and B of a right-angled triangle OAB. The resultant electric field at point O is perpendicular to the hypotenuse, then Q_1/Q_2 is proportional to:



(1) $\frac{x_1^3}{x_2^3}$ (2) $\frac{x_2}{x_1}$

(3) $\frac{x_1}{x_2}$ (4) $\frac{x_2^2}{x_1^2}$

(A) $\frac{x_1^3}{x_2^3}$

(B) $\frac{x_2}{x_1}$

(C) $\frac{x_1}{x_2}$

(D) $\frac{x_2^2}{x_1^2}$

Answer: (C) $\frac{x_1}{x_2}$ · Key from source paper

Q184 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Two identical electric point dipoles have dipole have dipole moments $\vec{p_1} = p\hat{i}$ and $\vec{p_2} = -p\hat{i}$ and are held on the x-axis at distance 'a' from each other. When released, they move along the x-axis with the direction of their dipole moments remaining unchanged. If the mass of each dipole is 'm', their speed when they are infinitely far apart is :

(A) $\frac{p}{a}\sqrt{\frac{1}{\pi\varepsilon_0 ma}}$

(B) $\frac{p}{a}\sqrt{\frac{1}{2\pi\varepsilon_0 ma}}$

(C) $\frac{p}{a}\sqrt{\frac{2}{\pi\varepsilon_0 ma}}$

(D) $\frac{p}{a}\sqrt{\frac{3}{2\pi\varepsilon_0 ma}}$

Answer: (B) $\frac{p}{a}\sqrt{\frac{1}{2\pi\varepsilon_0 ma}}$ · Key from source paper

Q185 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Consider the force F on a charge 'q' due to a uniformly charged spherical shell of radius R carrying charge Q distributed uniformly over it. Which one of the following statements is true for F, if 'q' is placed at distance r from the centre of the shell?

(A) $F = \frac{1}{4\pi\epsilon_0}\frac{Qq}{R^2}$ for $r < R$

(B) $\frac{1}{4\pi\epsilon_0}\frac{qQ}{R^2} > F > 0$ for $r < R$

(C) $F = \frac{1}{4\pi\epsilon_0}\frac{Qq}{r^2}$ for $r > R$

(D) $F = \frac{1}{4\pi\epsilon_0}\frac{Qq}{r^2}$ for all r

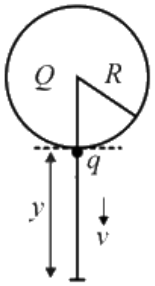
Answer: (C) $F = \frac{1}{4\pi\epsilon_0}\frac{Qq}{r^2}$ for $r > R$ · Key from source paper

Q186 JEE Main 2020 · 5 Sep · Shift 1 MCQ

A solid sphere of radius R carries a charge $Q + q$ distributed uniformly over its volume. A very small point like piece of it of mass m gets detached from the bottom of the sphere and falls down vertically under gravity. This piece carries charge q. If it acquires a speed v when it has fallen through a vertical height y (see figure), then (assume the remaining portion to be spherical)

(see the figure above)

Q12. A solid sphere of radius R carries a charge $Q + q$ distributed uniformly over its volume. A very small point like piece of it of mass m gets detached from the bottom of the sphere and falls down vertically under gravity. This piece carries charge q. If it acquires a speed ν when it has fallen through a vertical height y (see figure), then (assume the remaining portion to be spherical)



(1) $v^2 = y\left[\frac{qQ}{4\pi\epsilon_0 R^2 ym} + g\right]$

(2) $v^2 = y\left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g\right]$

(3) $v^2 = 2y\left[\frac{QqR}{4\pi\epsilon_0 (R+y)^3 m} + g\right]$

(4) $v^2 = 2y\left[\frac{qQ}{4\pi\varepsilon_0 R(R+y)m} + g\right]$

(A) $v^2 = y\left[\frac{qQ}{4\pi\epsilon_0 R^2 ym} + g\right]$

(B) $v^2 = y\left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g\right]$

(C) $v^2 = 2y\left[\frac{QqR}{4\pi\epsilon_0 (R+y)^3 m} + g\right]$

(D) $v^2 = 2y\left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g\right]$

Answer: (D) $v^2 = 2y\left[\frac{qQ}{4\pi\epsilon_0 R(R+y)m} + g\right]$ · Key from source paper

Q187 JEE Main 2020 · 5 Sep · Shift 2 MCQ

Ten charges are placed on the circumference of a circle of radius R with constant angular separation between successive charges. Alternate charges1, 3, 5, 7, 9 have charge $(+q)$ each, while 2, 4, 6, 8, 10 have charge $(-q)$ each. The potential V and the electric field E at the centre of the circle are respectively : (Take$V = 0$ at infinity)

(A) $V = \frac{10q}{4\pi\epsilon_0 R}; E = 0$

(B) $V = 0, E = \frac{10q}{4\pi\epsilon_0 R^2}$

(C) $V = 0; E = 0$

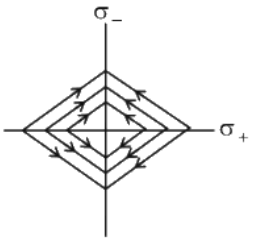
(D) $V = \frac{10q}{4\pi\epsilon_0 R}; E = \frac{10q}{4\pi\epsilon_0 R^2}$

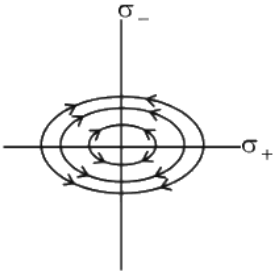
Answer: (C) $V = 0; E = 0$ · Key from source paper

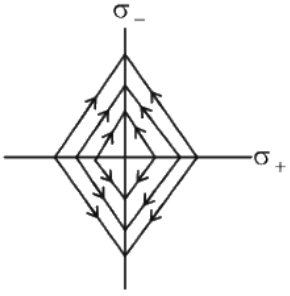
Q188 JEE Main 2020 · 4 Sep · Shift 1 MCQ

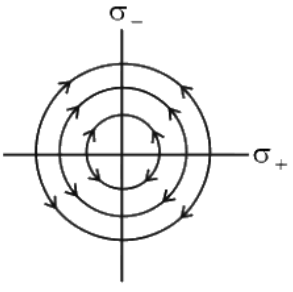
Two charged thin infinite plane sheets of uniform charge density σ_+ and σ_-, where $|\sigma_+| > |\sigma_-|$, intersect at the right angle. Which of the following best represents the electric field lines for the system:

Q10. Two charged thin infinite plane sheets of uniform charge density σ_+ and σ_-, where $|\sigma_+| > |\sigma_-|$, intersect at the right angle. Which of the following best represents the electric field lines for the system:

(1) 

(2) 

(3) 

(4) 

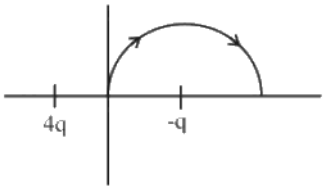
(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q189 JEE Main 2020 · 4 Sep · Shift 1 MCQ

A two point charges $4q$ and $-q$ are fixed on the x -axis at $x = \frac{-d}{2}$ and $x = \frac{d}{2}$, respectively. If the third point charge 'q ' is taken from the origin to $x = d$ along the semicircle as shown in the figure, the energy of the charge will:
(see the figure above)

Q11. A two point charges $4q$ and $-q$ are fixed on the x -axis at $x = \frac{-d}{2}$ and $x = \frac{d}{2}$, respectively. If the third point charge 'q ' is taken from the origin to $x = d$ along the semicircle as shown in the figure, the energy of the charge will:



(1) Increase by $\frac{3q^2}{4\pi\in_0 d}$
(2) Increase by $\frac{2q^2}{3\pi\in_0 d}$
(3) decrease by $\frac{q^2}{4\pi\in_0 d}$
(4) decrease by $\frac{4q^2}{3\pi\in_0 d}$

(A) Increase by $\frac{3q^2}{4\pi\epsilon_0 d}$
(B) Increase by $\frac{2q^2}{3\pi\epsilon_0 d}$
(C) decrease by $\frac{q^2}{4\pi\epsilon_0 d}$
(D) decrease by $\frac{4q^2}{3\pi\epsilon_0 d}$

Answer: (D) decrease by $\frac{4q^2}{3\pi\epsilon_0 d}$ · Key from source paper

Q190 JEE Main 2020 · 4 Sep · Shift 2 MCQ

A particle of charge q and mass m is subjected to an electric field $E = E_0\left(1 - ax^2\right)$ in the $x-$ direction, where a and E_0 are constants. Initially the particle was at rest at $x = 0$. Other than the initial position the kinetic energy of the particle becomes zero when the distance of the particle from the origin is :

(A) a
(B) $\sqrt{\frac{2}{a}}$
(C) $\sqrt{\frac{3}{a}}$
(D) $\sqrt{\frac{1}{a}}$

Answer: (C) $\sqrt{\frac{3}{a}}$ · Key from source paper

Q191 JEE Main 2020 · 3 Sep · Shift 1 MCQ

Two isolated conducting spheres S_1 and S_2 of radius $\frac{2}{3}R$ and $\frac{1}{3}R$ have $12\ \mu C$ and $-3\ \mu C$ charges, respectively, and are at a large distance from each other, They are now connected by a conducting wire. A long time after this is done the charges on S_1 and S_2 are respectively :

(A) $4.5\ \mu C$ of both
(B) $+4.5\ \mu C$ and $-4.5\ \mu C$
(C) $3\ \mu C$ and $6\ \mu C$
(D) $6\ \mu C$ and $3\ \mu C$

Answer: (D) $6\ \mu C$ and $3\ \mu C$ · Key from source paper

---

Q192 JEE Main 2020 · 3 Sep · Shift 2 MCQ

Hydrogen ion and singly ionized helium atom are accelerated, from rest, through the same potential difference. The ratio of final speeds of hydrogen and helium ions is close to:

(A) $1:2$
(B) $10:7$
(C) $2:1$
(D) $5:7$

Answer: (C) $2:1$ · Key from source paper

Q193 JEE Main 2020 · 3 Sep · Shift 2 MCQ

Concentric metallic hollow spheres of radii R and 4R hold charges Q_1 and Q_2 respectively. Given that surface charge densities of the concentric spheres are equal, the potential difference $V(R) - V(4R)$ is:

(A) $\frac{Q_2}{4\pi\varepsilon_0 R}$
(B) $\frac{3Q_2}{4\pi\varepsilon_0 R}$
(C) $\frac{3Q_1}{16\pi\varepsilon_0 R}$
(D) $\frac{3Q_1}{4\pi\varepsilon_0 R}$

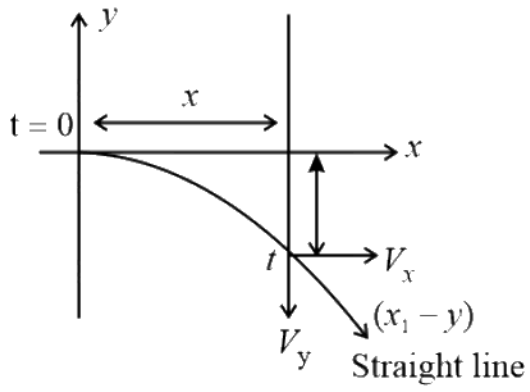
Answer: (C) $\frac{3Q_1}{16\pi\varepsilon_0 R}$ · Key from source paper

Q194 JEE Main 2020 · 2 Sep · Shift 1 MCQ

A charged particle (mass m and charge q) moves along X axis with velocity V_0. When it passes through the origin it enters a region having uniform electric field $\vec{E} = -E\hat{j}$ which extends upto $x = d$. Equation of path of electron in the region $x > d$ is:

(see the figure above)

Q14. A charged particle (mass m and charge q) moves along X axis with velocity V_0. When it passes through the origin it enters a region having uniform electric field $\vec{E} = -E\hat{j}$ which extends upto $x = d$. Equation of path of electron in the region $x > d$ is:



(1) $y = \frac{qEd}{mv_0^2}(x - d)$

(2) $y = \frac{qEd}{mv_0^2}\left(\frac{d}{2} - x\right)$

(3) $y = \frac{qEd}{mv_0^2}$

(4) $y = \frac{qEd^2}{mv_0^2}x$

(A) $y = \frac{qEd}{mv_0^2}(x - d)$

(B) $y = \frac{qEd}{mv_0^2}\left(\frac{d}{2} - x\right)$

(C) $y = \frac{qEd}{mv_0^2}$

(D) $y = \frac{qEd^2}{mv_0^2}x$

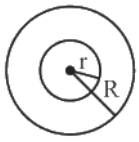
Answer: (B) $y = \frac{qEd}{mv_0^2}\left(\frac{d}{2} - x\right)$ · Key from source paper

Q195 JEE Main 2020 · 2 Sep · Shift 2 MCQ

A charge Q is distributed over two concentric conducting thin spherical shells radii r and R (R > r). If the surface charge densities on the two shells are equal, the electric potential at the common centre is :

(see the figure above)

Q9. A charge Q is distributed over two concentric conducting thin spherical shells radii r and R $(R > r)$. If the surface charge densities on the two shells are equal, the electric potential at the common centre is :



(1) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)}{2(R^2+r^2)}Q$

(2) $\frac{1}{4\pi\epsilon_0}\frac{(2R+r)}{(R^2+r^2)}Q$

(3) $\frac{1}{4\pi\epsilon_0}\frac{(R+2r)Q}{2(R^2+r^2)}$

(4) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)}{(R^2+r^2)}Q$

(A) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)}{2(R^2+r^2)}Q$

(B) $\frac{1}{4\pi\epsilon_0}\frac{(2R+r)}{(R^2+r^2)}Q$

(C) $\frac{1}{4\pi\epsilon_0}\frac{(R+2r)Q}{2(R^2+r^2)}$

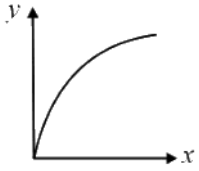
(D) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)}{(R^2+r^2)}Q$

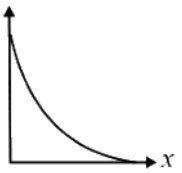
Answer: (D) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)}{(R^2+r^2)}Q$ · Key from source paper

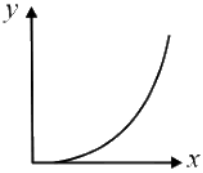
Q196 JEE Main 2020 · 2 Sep · Shift 2 MCQ

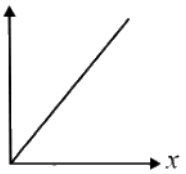
A small point mass carrying some positive charge on it, is released from the edge of a table. There is a uniform electric field in this region in the horizontal direction. Which of the following options then correctly describe the trajectory of the mass ? (Curves are drawn schematically and are not to scale)

Q14. A small point mass carrying some positive charge on it, is released from the edge of a table. There is a uniform electric field in this region in the horizontal direction. Which of the following options then correctly describe the trajectory of the mass ? (Curves are drawn schematically and are not to scale)

(1) 

(2) 

(3) 

(4) 

(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

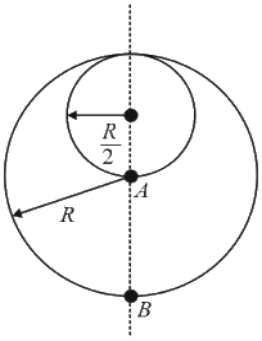
Answer: (D) · Key from source paper

Q197 JEE Main 2020 · 9 Jan · Shift 1 MCQ

Consider a sphere of radius R which carries a uniform charge density ρ. If a sphere of radius $\frac{R}{2}$ is carved out of it, as shown, the ratio $\frac{\left|\overrightarrow{E_A}\right|}{\left|\overrightarrow{E_B}\right|}$ of magnitude of electric field $\overrightarrow{E_A}$ and $\overrightarrow{E_B}$, respectively, at points A and B due to the remaining portion is:

(see the figure above)

Q10. Consider a sphere of radius R which carries a uniform charge density ρ. If a sphere of radius $\frac{R}{2}$ is carved out of it, as shown, the ratio $\frac{\left|\overrightarrow{E_A}\right|}{\left|\overrightarrow{E_B}\right|}$ of magnitude of electric field $\overrightarrow{E_A}$ and $\overrightarrow{E_B}$, respectively, at points A and B due to the remaining portion is:



(1) $\frac{21}{34}$
(2) $\frac{18}{34}$
(3) $\frac{17}{54}$
(4) $\frac{18}{54}$

(A) $\frac{21}{34}$
(B) $\frac{18}{34}$
(C) $\frac{17}{54}$
(D) $\frac{18}{54}$

Answer: (B) $\frac{18}{34}$ · Key from source paper

Q198 JEE Main 2020 · 9 Jan · Shift 1 MCQ

An electric dipole of moment $\overrightarrow{\mathrm{p}} = \left(-\hat{i} - 3\hat{j} + 2\hat{k}\right) \times 10^{-29}\ \mathrm{C\ m}$ at the origin $(0, 0, 0)$. The electric field due to this dipole at $\overrightarrow{\mathrm{r}} = +\hat{i} + 3\hat{j} + 5\hat{k}$ (note that $\overrightarrow{r} \bullet \overrightarrow{p} = 0$) is parallel to:

(A) $\left(+\hat{i} - 3\hat{j} - 2\hat{k}\right)$
(B) $\left(-\hat{i} + 3\hat{j} - 2\hat{k}\right)$
(C) $\left(+\hat{i} + 3\hat{j} - 2\hat{k}\right)$
(D) $\left(-\hat{i} - 3\hat{j} + 2\hat{k}\right)$

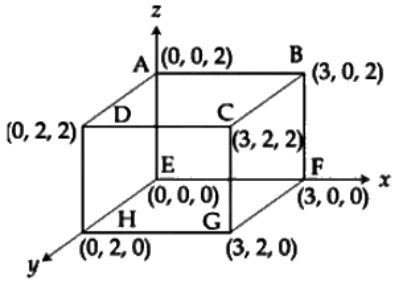
Answer: (C) $\left(+\hat{i} + 3\hat{j} - 2\hat{k}\right)$ · Key from source paper

Q199 JEE Main 2020 · 9 Jan · Shift 2 Numerical

An electric field $\vec{E} = 4x\hat{i} - (y^2+1)\hat{j}\ N/C$ passes through the box shown in figure. The flux of the electric field through surfaces $ABCD$ and $BCGF$ are marked as ϕ_I and ϕ_{II} respectively. The difference between $(\phi_I - \phi_{II})$ is (in $\mathrm{Nm^2/C}$) _____.

(see the figure above)

Q22. An electric field $\vec{E} = 4x\hat{i} - (y^2+1)\hat{j}N/C$ passes through the box shown in figure. The flux of the electric field through surfaces $ABCD$ and $BCGF$ are marked as ϕ_{I} and ϕ_{II} respectively. The difference between $(\phi_I - \phi_{II})$ is (in $\mathrm{Nm^2/C}$) _____.



Numerical value type: the answer is a number.

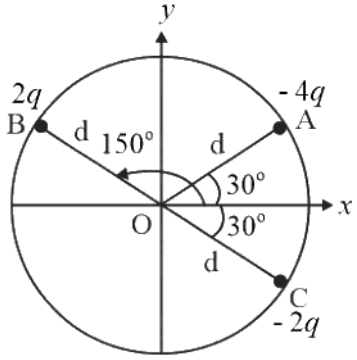
Accepted answers: 48 or -48. · Key from source paper

Q200 JEE Main 2020 · 8 Jan · Shift 1 MCQ

Three charged particles A , B and C with charges $-4q$, $2q$ and $-2q$ are present on the circumference of a circle of radius d. The charged particles A, C and centre O of the circle formed an equilateral triangle as shown in the figure. The electric field at the point O is

(see the figure above)

Q10. Three charged particles A , B and C with charges $-4q, 2q$ and $-2q$ are present on the circumference of a circle of radius d. The charged particles A, C and centre O of the circle formed an equilateral triangle as shown in the figure. The electric field at the point O is



(1) $\frac{\sqrt{3}q}{\pi\varepsilon_0 d^2}$

(2) $\frac{2\sqrt{3}q}{\pi\varepsilon_0 d^2}$

(3) $\frac{\sqrt{3}q}{4\pi\varepsilon_0 d^2}$

(4) $\frac{3\sqrt{3}q}{4\pi\varepsilon_0 d^2}$

(A) $\frac{\sqrt{3}q}{\pi\varepsilon_0 d^2}$
(B) $\frac{2\sqrt{3}q}{\pi\varepsilon_0 d^2}$
(C) $\frac{\sqrt{3}q}{4\pi\varepsilon_0 d^2}$
(D) $\frac{3\sqrt{3}q}{4\pi\varepsilon_0 d^2}$

Answer: (A) $\frac{\sqrt{3}q}{\pi\varepsilon_0 d^2}$ · Key from source paper

Q201 JEE Main 2020 · 8 Jan · Shift 1 MCQ

In finding the electric field using Gauss law the formula $\left|\vec{E}\right| = \frac{q_{\text{enc}}}{\varepsilon_0 |A|}$ is applicable. In the formula ε_0 is permittivity of free space, A is the area of Gaussian surface and q_{enc} is charge enclosed by the Gaussian surface. This equation can be used in which of the following situation?

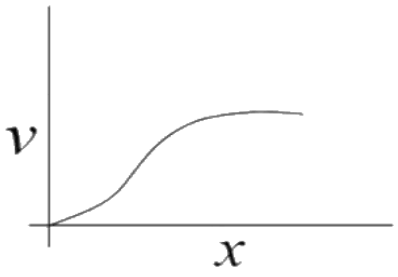
(A) Only when the Gaussian surface is an equipotential surface
(B) Only when the Gaussian surface is an equipotential surface and $\left|\vec{E}\right|$ is constant on the surface.
(C) Only when $\left|\vec{E}\right|$ = constant on the surface.
(D) For any choice of Gaussian surface.

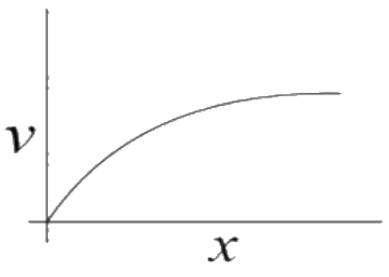
Answer: (B) Only when the Gaussian surface is an equipotential surface and $\left|\vec{E}\right|$ is constant on the surface. · Key from source paper

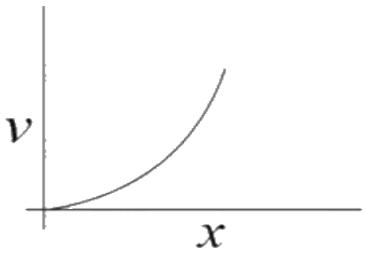
Q202 JEE Main 2020 · 8 Jan · Shift 2 MCQ

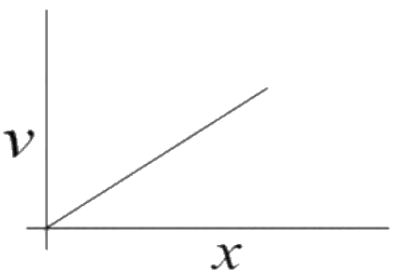
A particle of mass m and charge q is released from rest in a uniform electric field. If there is no other force on the particle, the dependence of its speed v on the distance x travelled by it is correctly given by (graphs are schematic and not drawn to scale)

Q2. A particle of mass m and charge q is released from rest in a uniform electric field. If there is no other force on the particle, the dependence of its speed v on the distance x travelled by it is correctly given by (graphs are schematic and not drawn to scale)

(1)


(2)


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q203 JEE Main 2020 · 8 Jan · Shift 2 MCQ

Consider two charged metallic spheres S_1 and S_2 of radii R_1 and R_2, respectively. The electric fields E_1 (on S_1) and E_2 (on S_2) on their surfaces are such that $\frac{E_1}{E_2} = \frac{R_1}{R_2}$. Then the ratio V_1 (on S_1)/V_2 (on S_2) of the electrostatic potentials on each sphere is:

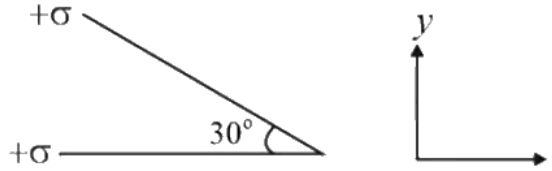
(A) $\frac{R_1}{R_2}$
(B) $\left(\frac{R_1}{R_2}\right)^2$
(C) $\left(\frac{R_2}{R_1}\right)$
(D) $\left(\frac{R_1}{R_2}\right)^3$

Answer: (B) $\left(\frac{R_1}{R_2}\right)^2$ · Key from source paper

Q204 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Two infinite planes each with uniform surface charge density $+\sigma$ are kept in such a way that the angle between them is 30°. The electric field in the region shown between them is given by:
(see the figure above)

Q9. Two infinite planes each with uniform surface charge density $+\sigma$ are kept in such a way that the angle between them is 30° . The electric field in the region shown between them is given by:



(1) $\frac{\sigma}{2\in_0}\left[\left(1+\sqrt{3}\right)\hat{y}-\frac{\hat{x}}{2}\right]$
(2) $\frac{\sigma}{\in_0}\left[\left(1+\frac{\sqrt{3}}{2}\right)\hat{y}+\frac{\hat{x}}{2}\right]$
(3) $\frac{\sigma}{2\in_0}\left[\left(1+\sqrt{3}\right)\hat{y}+\frac{\hat{x}}{2}\right]$
(4) $\frac{\sigma}{2\in_0}\left[\left(1-\frac{\sqrt{3}}{2}\right)\hat{y}-\frac{\hat{x}}{2}\right]$

(A) $\frac{\sigma}{2\epsilon_0}\left[\left(1+\sqrt{3}\right)\hat{y}-\frac{\hat{x}}{2}\right]$
(B) $\frac{\sigma}{\epsilon_0}\left[\left(1+\frac{\sqrt{3}}{2}\right)\hat{y}+\frac{\hat{x}}{2}\right]$
(C) $\frac{\sigma}{2\epsilon_0}\left[\left(1+\sqrt{3}\right)\hat{y}+\frac{\hat{x}}{2}\right]$
(D) $\frac{\sigma}{2\epsilon_0}\left[\left(1-\frac{\sqrt{3}}{2}\right)\hat{y}-\frac{\hat{x}}{2}\right]$

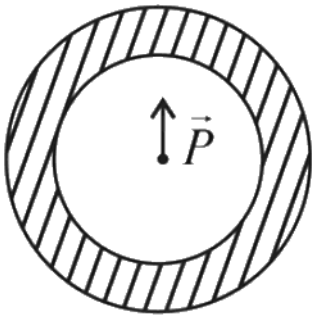
Answer: (D) $\frac{\sigma}{2\epsilon_0}\left[\left(1-\frac{\sqrt{3}}{2}\right)\hat{y}-\frac{\hat{x}}{2}\right]$ · Key from source paper

Q205 JEE Main 2019 · 12 Apr · Shift 1 MCQ

Shown in the figure is a shell made of a conductor. It has inner radius a and outer radius b, and carries charge Q . At its centre a dipole $\vec{p}$ is placed as shown then:

(see the figure above)

Q14. Shown in the figure is a shell made of a conductor. It has inner radius a and outer radius b, and carries charge Q . At its centre a dipole $\vec{p}$ is placed as shown then:



(1) Surface charge density on the inner surface of the shell is zero everywhere.

(2) Electric field outside the shell is the same as that of a point charge at the centre of the shell.

(3) Surface charge density on the inner surface is uniform and equal to $\frac{\left(\frac{Q}{2}\right)}{4\pi a^2}$.

(4) Surface charge density on the outer surface depends on $\vec{p}$.

(A) Surface charge density on the inner surface of the shell is zero everywhere.

(B) Electric field outside the shell is the same as that of a point charge at the centre of the shell.

(C) Surface charge density on the inner surface is uniform and equal to $\frac{\left(\frac{Q}{2}\right)}{4\pi a^2}$.

(D) Surface charge density on the outer surface depends on $\vec{p}$.

Answer: (B) Electric field outside the shell is the same as that of a point charge at the centre of the shell.
· Key from source paper

Q206 JEE Main 2019 · 12 Apr · Shift 1 MCQ

A Point dipole $\vec{\mathrm{p}} = -\mathrm{p}_0\hat{x}$ is kept at the origin. The potential and electric field due to this dipole on the $y-$ axis at a distance d are, respectively: (Taken V = 0 at infinity)

(A) $\frac{|\vec{p}|}{4\pi\epsilon_0 d^2}, \frac{-\vec{p}}{4\pi\epsilon_0 d^3}$

(B) $0, \frac{|\vec{p}|}{4\pi\epsilon_0 d^3}$

(C) $\frac{|\vec{p}|}{4\pi\epsilon_0 d^3}, \frac{\vec{p}}{4\pi\epsilon_0 d^3}$

(D) $0, \frac{-\vec{p}}{4\pi\epsilon_0 d^3}$

Answer: (D) $0, \frac{-\vec{p}}{4\pi\epsilon_0 d^3}$ · Key from source paper

Q207 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Let a total charge 2Q be distributed in a sphere of radius R, with the charge density given by $\rho(\mathrm{r}) = \mathrm{kr}$, where r is the distance from the centre. Two charges A and B , of $-\mathrm{Q}$ each, are placed on

diametrically opposite points, at equal distance, a, from the centre. If A and B do not experience any force, then:

(A) $\mathrm{a} = \frac{3\mathrm{R}}{2^{\frac{1}{4}}}$

(B) $\mathrm{a} = \frac{\mathrm{R}}{\sqrt{3}}$

(C) $\mathrm{a} = 2^{\frac{-1}{4}}\mathrm{R}$

(D) $\mathrm{a} = 8^{\frac{-1}{4}}\mathrm{R}$

Answer: (D) $\mathrm{a} = 8^{\frac{-1}{4}}\mathrm{R}$ · Key from source paper

Q208 JEE Main 2019 · 10 Apr · Shift 1 MCQ

A uniformly charged ring of radius $3a$ and total charge q is placed in x-y plane centred at origin. A point charge q is moving towards the ring along the $z-$ axis and has speed v at $z = 4a$. The minimum value of v such that it crosses the origin is:

(A) $\sqrt{\frac{2}{m}}\left(\frac{1}{15}\frac{q^2}{4\pi\epsilon_0 a}\right)^{1/2}$

(B) $\sqrt{\frac{2}{m}}\left(\frac{4}{15}\frac{q^2}{4\pi\epsilon_0 a}\right)^{1/2}$

(C) $\sqrt{\frac{2}{m}}\left(\frac{1}{5}\frac{q^2}{4\pi\epsilon_0 a}\right)^{1/2}$

(D) $\sqrt{\frac{2}{m}}\left(\frac{2}{15}\frac{q^2}{4\pi\epsilon_0 a}\right)^{1/2}$

Answer: (D) $\sqrt{\frac{2}{m}}\left(\frac{2}{15}\frac{q^2}{4\pi\epsilon_0 a}\right)^{1/2}$ · Key from source paper

Q209 JEE Main 2019 · 10 Apr · Shift 2 MCQ

In free space, a particle A of charge $1\ \mu\mathrm{C}$ is held fixed at point P. Another particle B of the same charge and mass $4\ \mathrm{mg}$ is kept at a distance of $1\ \mathrm{mm}$ from P. If B is released, then its velocity at a distance of $9\ \mathrm{mm}$ from P is:
[Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\ \mathrm{N\,m^2\,C^{-2}}$]

(A) $1.0\ \mathrm{m\ s^{-1}}$

(B) $1.5 \times 10^2\ \mathrm{m\ s^{-1}}$

(C) $2.0 \times 10^3\ \mathrm{m\ s^{-1}}$

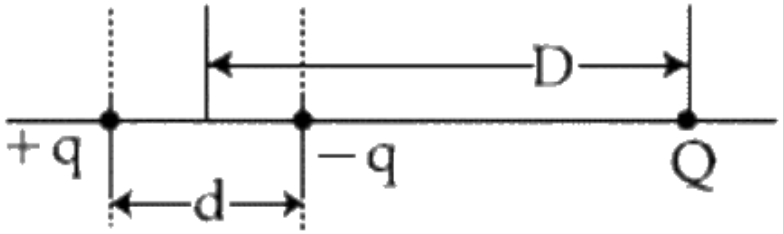
(D) $3.0 \times 10^4\ \mathrm{m\ s^{-1}}$

Answer: (C) $2.0 \times 10^3\ \mathrm{m\ s^{-1}}$ · Key from source paper

Q210 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A system of three charges are placed as shown in the figure:
(see the figure above)
If D >> d, the potential energy of the system is best given by:

Q16. A system of three charges are placed as shown in the figure:



If D >> d, the potential energy of the system is best given by:

(1) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}-\frac{q\,Q\,d}{D^2}\right]$

(2) $\frac{1}{4\pi\epsilon_0}\left[+\frac{q^2}{d}+\frac{q\,Q\,d}{D^2}\right]$

(3) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}-\frac{q\,Q\,d}{2D^2}\right]$

(4) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}+\frac{2q\,Q\,d}{D^2}\right]$

(A) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}-\frac{qQd}{D^2}\right]$

(B) $\frac{1}{4\pi\epsilon_0}\left[+\frac{q^2}{d}+\frac{qQd}{D^2}\right]$

(C) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}-\frac{qQd}{2D^2}\right]$

(D) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}+\frac{2qQd}{D^2}\right]$

Answer: (A) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d}-\frac{qQd}{D^2}\right]$ · Key from source paper

Q211 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Four point charges $-q$, $+q$, $+q$ and $-q$ are placed on y-axis at y = $-2d$, y = $-d$, y = $+d$ and y = $+2d$, respectively. The magnitude of the electric field E at a point on the x-axis at x = D, with D $\gg$ d, will behave as:

(A) $E \propto \frac{1}{D^4}$

(B) $E \propto \frac{1}{D}$

(C) $E \propto \frac{1}{D^3}$

(D) $E \propto \frac{1}{D^2}$

Answer: (A) $E \propto \frac{1}{D^4}$ · Key from source paper

Q212 JEE Main 2019 · 8 Apr · Shift 1 MCQ

The bob of a simple pendulum has mass 2 g and a charge of 5.0 μC. It is at rest in a uniform horizontal electric field of intensity 2000 V / m At equilibrium, the angle that the pendulum makes with the vertical is: take $g = 10\ \mathrm{m/s^2}$

(A) $\tan^{-1} 0.2$
(B) $\tan^{-1} 2.0$
(C) $\tan^{-1} 0.5$
(D) $\tan^{-1} 5.0$

Answer: (C) $\tan^{-1} 0.5$ · Key from source paper

Q213 JEE Main 2019 · 8 Apr · Shift 1 MCQ

A solid conducting sphere, having a charge Q, is surrounded by an uncharged conducting hollow spherical shell. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be V. If the shell is now given a charge of $-4Q$, the new potential difference between the same two surfaces is:

(A) $-2V$
(B) $2\,V$
(C) V
(D) $4\,V$

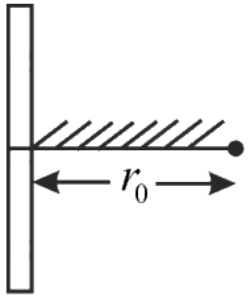
Answer: (C) V · Key from source paper

Q214 JEE Main 2019 · 8 Apr · Shift 2 MCQ

A positive point charge is released from rest at a distance r_0 from a positive line charge with uniform charge density. The speed (v) of the point charge, as a function of instantaneous distance r from line charge, is proportional to

(see the figure above)

Q14. A positive point charge is released from rest at a distance r_0 from a positive line charge with uniform charge density. The speed (v) of the point charge, as a function of instantaneous distance r from line charge, is proportional to



(1) $v \propto \frac{r}{r_0}$
(2) $v \propto \sqrt{\ln\frac{r}{r_0}}$
(3) $v \propto \ln\frac{r}{r_0}$
(4) $v \propto e^{\frac{+r}{r_0}}$

(A) $v \propto \frac{r}{r_0}$

(B) $v \propto \sqrt{\ln \frac{r}{r_0}}$

(C) $v \propto \ln \frac{r}{r_0}$

(D) $v \propto e^{\frac{+r}{r_0}}$

Answer: (B) $v \propto \sqrt{\ln \frac{r}{r_0}}$ · Key from source paper

Q215 JEE Main 2019 · 8 Apr · Shift 2 MCQ

An electric dipole is formed by two equal and opposite charges q with separation d . The charges have same mass m. It is kept in a uniform electric field E. If it is slightly rotated from its equilibrium orientation, then its angular frequency ω is:

(A) $2\sqrt{\frac{qE}{md}}$

(B) $\sqrt{\frac{2qE}{md}}$

(C) $\sqrt{\frac{qE}{2md}}$

(D) $\sqrt{\frac{qE}{md}}$

Answer: (B) $\sqrt{\frac{2qE}{md}}$ · Key from source paper

Q216 JEE Main 2019 · 8 Apr · Shift 2 MCQ

The electric field in a region is given by $\vec{E}$ = Ax + B $\hat{i}$, where E is in NC^{-1} and x is in metres. The values of constants are A = 20 SI unit and B = 10 SI unit. If the potential at x = 1 is V_1 and that at x = - 5 is V_2, then V_1 - V_2 is

(A) 320 V

(B) -520 V

(C) 180 V

(D) -48 V

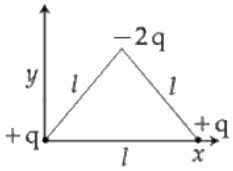
Answer: (C) 180 V · Key from source paper

Q217 JEE Main 2019 · 12 Jan · Shift 1 MCQ

Determine the electric dipole moment of the system of three charges, placed on the vertices of an equilateral triangle, as shown in the figure:

(see the figure above)

Q13. Determine the electric dipole moment of the system of three charges, placed on the vertices of an equilateral triangle, as shown in the figure:



(1) $\sqrt{3}\,ql\,\frac{\hat{j}-\hat{i}}{\sqrt{2}}$

(2) $-\sqrt{3}\,ql\,\hat{j}$

(3) $2\,ql\;\hat{j}$

(4) $(ql)\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

(A) $\sqrt{3}\,ql\,\frac{\hat{j}-\hat{i}}{\sqrt{2}}$

(B) $-\sqrt{3}\,ql\,\hat{j}$

(C) $2\,ql\,\hat{j}$

(D) $(ql)\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

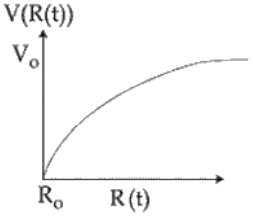
Answer: (B) $-\sqrt{3}\,ql\,\hat{j}$ · Key from source paper

Q218 JEE Main 2019 · 12 Jan · Shift 1 MCQ

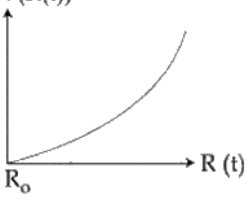
There is a uniform spherically symmetric surface charge density at a distance R_0 from the origin. The charge distribution is initially at rest and starts expanding because of mutual repulsion. The figure that represents best the speed $V(R(t))$ of the distribution as a function of its instantaneous radius $R(t)$ is:

Q14. There is a uniform spherically symmetric surface charge density at a distance R_0 from the origin. The charge distribution is initially at rest and starts expanding because of mutual repulsion. The figure that represents best the speed $V(R(t))$ of the distribution as a function of its instantaneous radius $R(t)$ is:

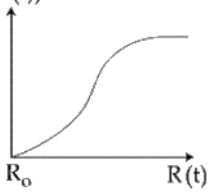
(1) V(R(t))



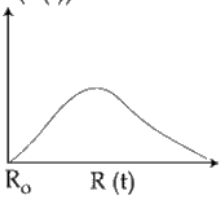
(2) V(R(t))



(3) V(R(t))



(4) V(R(t))



(A) *see figure*

(B) *see figure*

(C) *see figure*

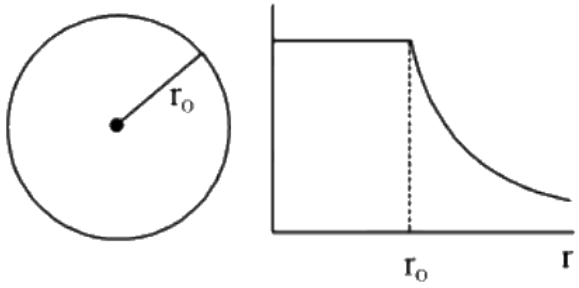
(D) *see figure*

Answer: (A) · Key from source paper

Q219 JEE Main 2019 · 11 Jan · Shift 1 MCQ

The given graph shows variation (with distancer from centre) of:
(see the figure above)

Q14. The given graph shows variation (with distancer from centre) of:



(1) Electric field of a uniformly charged sphere
(2) Potential of a uniformly charged spherical shell
(3) Potential of a uniformly charged sphere
(4) Electric field of a uniformly charged spherical shell

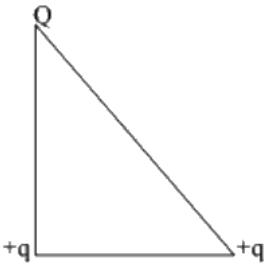
(A) Electric field of a uniformly charged sphere
(B) Potential of a uniformly charged spherical shell
(C) Potential of a uniformly charged sphere
(D) Electric field of a uniformly charged spherical shell

Answer: (B) Potential of a uniformly charged spherical shell · Key from source paper

Q220 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Three charges Q, $+y$ and $+q$ are placed at the vertices of a right-angle isosceles triangle as shown below. The net electrostatic energy of the configuration is zero, if the value of Q is
(see the figure above)

Q15. Three charges Q, $+y$ and $+q$ are placed at the vertices of a right-angle isosceles triangle as shown below. The net electrostatic energy of the configuration is zero, if the value of Q is



(1) $+q$
(2) $\frac{-\sqrt{2}q}{\sqrt{2}+1}$
(3) $\frac{-q}{1+\sqrt{2}}$
(4) $-2q$

(A) $+q$
(B) $\frac{-\sqrt{2}q}{\sqrt{2}+1}$
(C) $\frac{-q}{1+\sqrt{2}}$
(D) $-2q$

Answer: (B) $\frac{-\sqrt{2}q}{\sqrt{2}+1}$ · Key from source paper

Q221 JEE Main 2019 · 11 Jan · Shift 2 MCQ

An electric field of 1000 V/m is applied to an electric dipole at angle of 45°. The value of electric dipole moment is 10^{-29}C · m. What is the potential energy of the electric dipole?

(A) -20×10^{-18} J
(B) -7×10^{-27} J
(C) -10×10^{-29} J
(D) -9×10^{-20} J

Answer: (B) -7×10^{-27} J · Key from source paper

Q222 JEE Main 2019 · 11 Jan · Shift 2 MCQ

A particle of mass m and charge q is in an electric and magnetic field given by
$\vec{E} = 2\hat{i} + 3\hat{j};\ \vec{B} = 4\hat{j} + 6\hat{k}$
The charged particle is shifted from the origin to the point P($x = 1; y = 1$) along a straight path. The magnitude of the total work done is :

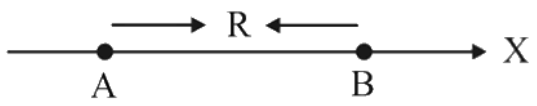
(A) (0.35)q
(B) 5q
(C) (2.5) q
(D) (0.15)q

Answer: (B) 5q · Key from source paper

Q223 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Two electric dipoles, A, B with respective dipole moments $\vec{d}_A = -4qa\hat{i}$ and $\vec{d}_B = -2qa\hat{i}$ are placed on the x - axis with a separation R, as shown in the figure
(see the figure above)
The distance from A from which both of them produce the same potential is:

Q14. Two electric dipoles, A, B with respective dipole moments $\overrightarrow{d_A} = -4qa\hat{i}$ and $\overrightarrow{d_B} = -2qa\hat{i}$ are placed on the x -axis with a separation R, as shown in the figure



The distance from A at which both of them produce the same potential is:

(1) $\frac{R}{\sqrt{2}-1}$
(2) $\frac{\sqrt{2}R}{\sqrt{2}-1}$
(3) $\frac{\sqrt{2}\,R}{\sqrt{2}+1}$
(4) $\frac{R}{\sqrt{2}+1}$

(A) $\frac{R}{\sqrt{2}-1}$
(B) $\frac{\sqrt{2}R}{\sqrt{2}-1}$
(C) $\frac{\sqrt{2}\,R}{\sqrt{2}+1}$
(D) $\frac{R}{\sqrt{2}+1}$

Answer: (B) $\frac{\sqrt{2}R}{\sqrt{2}-1}$ · Key from source paper

Q224 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A charge Q is distributed over three concentric spherical shells of radii a, b, c $(a < b < c)$ such that their surface charge densities are equal to one another.
The total potential at a point at distance r from their common centre, where $r < a$, would be:

(A) $\frac{Q}{4\pi\epsilon_0(a+b+c)}$
(B) $\frac{Q\,(a^2+b^2+c^2)}{4\pi\epsilon_0(a^3+b^3+c^3)}$
(C) $\frac{Q}{12\pi\epsilon_0}\,\frac{ab+bc+ca}{abc}$
(D) $\frac{Q(a+b+c)}{4\pi\epsilon_0(a^2+b^2+c^2)}$

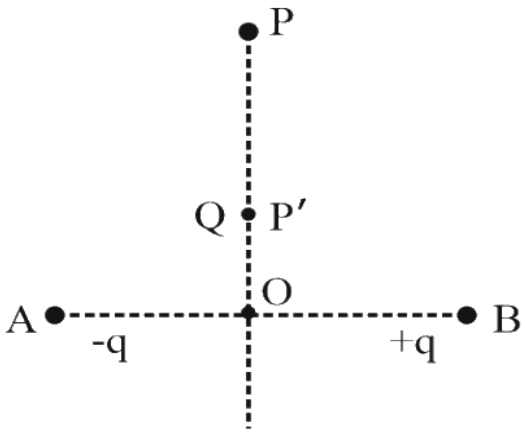
Answer: (D) $\frac{Q(a+b+c)}{4\pi\epsilon_0(a^2+b^2+c^2)}$ · Key from source paper

Q225 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Charges $-q$ and $+q$, located at A and B, respectively, constitute an electric dipole. Distance $AB = 2a$, O is the mid point of the dipole and OP is perpendicular to AB. A charge Q is placed at P where $OP = y$ and $y \gg 2a$. The charge Q experiences an electrostatic force F. If Q is now moved along the equatorial line to P' such that $OP' = \left(\frac{y}{3}\right)$ the force on Q will be close to $\left(\frac{y}{3} \gg 2a\right)$

(see the figure above)

Q16. Charges $-q$ and $+q$, located at A and B, respectively, constitute an electric dipole. Distance $AB = 2a$, O is the mid point of the dipole and OP is perpendicular to AB. A charge Q is placed at P where $OP = y$ and $y \gg 2a$. The charge Q experiences an electrostatic force F. If Q is now moved along the equatorial line to P' such that $OP' = \left(\frac{y}{3}\right)$ the force on Q will be close to $\left(\frac{y}{3} \ll 2a\right)$



(1) $27F$.
(2) $\frac{F}{3}$.
(3) $3F$.
(4) $9F$.

(A) $27F$.
(B) $\frac{F}{3}$.
(C) $3F$.
(D) $9F$.

Answer: (A) $27F$. · Key from source paper

Q226 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Four equal point charges Q each are placed in the xy plane at $(0,\ 2), (4,\ 2), (4,\ -2)$ and $(0,\ -2)$. The work required to put a fifth charge Q at the origin of the coordinate system will be:

(A) $\frac{Q^2}{4\pi\epsilon_0}$
(B) $\frac{Q^2}{2\sqrt{2}\pi\epsilon_0}$
(C) $\frac{Q^2}{4\pi\epsilon_0}\left(1+\frac{1}{\sqrt{5}}\right)$
(D) $\frac{Q^2}{4\pi\epsilon_0}\left(1+\frac{1}{\sqrt{3}}\right)$

Answer: (C) $\frac{Q^2}{4\pi\epsilon_0}\left(1+\frac{1}{\sqrt{5}}\right)$ · Key from source paper

Q227 JEE Main 2019 · 9 Jan · Shift 1 MCQ

Three charges $+Q$, q, $+Q$ are placed respectively, at distance, $0, d/2$ and d from the origin, on the x-axis. If the net force experienced by $+Q$, placed at $x = 0$, is zero, then value of q is:

(A) $+Q / 2$
(B) $+Q / 4$
(C) $-Q / 4$
(D) $-Q / 2$

Answer: (C) $-Q / 4$ · Key from source paper

Q228 JEE Main 2019 · 9 Jan · Shift 1 MCQ

For a uniformly charged ring of radius R, the electric field on its axis has the largest magnitude at a distance h from its centre. Then value of h is:

(A) $\frac{R}{\sqrt{2}}$
(B) $\frac{R}{\sqrt{5}}$
(C) $R\sqrt{2}$
(D) R

Answer: (A) $\frac{R}{\sqrt{2}}$ · Key from source paper

Q229 JEE Main 2019 · 9 Jan · Shift 2 MCQ

Charge is distributed within a sphere of radius R with a volume charge density $\rho(r)=\frac{A}{r^2}e^{-\frac{2r}{a}}$, where A and a are constants. If Q is the total charge of this charge distribution, the radius R is:

(A) $\frac{a}{2}\log\left(\frac{1}{1-\frac{Q}{2\pi aA}}\right)$
(B) $a\log\left(\frac{1}{1-\frac{Q}{2\pi aA}}\right)$
(C) $a\log\left(1-\frac{Q}{2\pi aA}\right)$
(D) $\frac{a}{2}\log\left(1-\frac{Q}{2\pi aA}\right)$

Answer: (A) $\frac{a}{2}\log\left(\frac{1}{1-\frac{Q}{2\pi aA}}\right)$ · Key from source paper

Q230 JEE Main 2019 · 9 Jan · Shift 2 MCQ

Two point charges $q_1\left(\sqrt{10}\ \mu\mathrm{C}\right)$ and $q_2(-25\ \mu\mathrm{C})$ are placed on the x -axis at $x=1\ \mathrm{m}$ and $x=4\ \mathrm{m}$ respectively. The electric field (in $\mathrm{V/m}$) at a point $y=3\ \mathrm{m}$ on y-axis is,
$\left[\text{Take } \frac{1}{4\pi\epsilon_0}=9\times10^9\ \mathrm{N\,m^2C^{-2}}\right]$

(A) $\left(-81\hat{i}+81\hat{j}\right)\times 10^2$

(B) $\left(81\hat{i}-81\hat{j}\right)\times 10^2$

(C) $\left(-63\hat{i}+27\hat{j}\right)\times 10^2$

(D) $\left(63\hat{i}-27\hat{j}\right)\times 10^2$

Answer: (D) $\left(63\hat{i}-27\hat{j}\right)\times 10^2$ · Key from source paper

Q231 JEE Main 2018 · 16 Apr · Online MCQ

Two identical conducting spheres A and B carry an equal charges. They are separated by a distance much larger than their diameters, and the force between them is F. A third identical conducting sphere, C, is uncharged. Sphere C is first touched to A, then to B, and then removed. As a result, the force between A and B would be equal to:

(A) $\frac{3F}{4}$

(B) $\frac{F}{2}$

(C) $\frac{3F}{8}$

(D) F

Answer: (C) $\frac{3F}{8}$ · Key from source paper

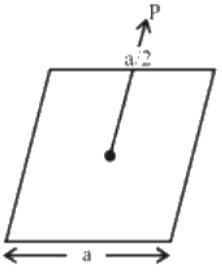
Q232 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A charge Q is placed at a distance $a/2$ above the centre of the square surface of edge a as shown in the figure.

(see the figure above)

The electric flux through the square surface is:

Q14. A charge Q is placed at a distance a/2 above the centre of the square surface of edge a as shown in the figure.



The electric flux through the square surface is:

(1) $\frac{Q}{3\varepsilon_0}$ (2) $\frac{Q}{6\varepsilon_0}$

(3) $\frac{Q}{2\varepsilon_0}$ (4) $\frac{Q}{\varepsilon_0}$

(A) $\frac{Q}{3\varepsilon_0}$
(B) $\frac{Q}{6\varepsilon_0}$
(C) $\frac{Q}{2\varepsilon_0}$
(D) $\frac{Q}{\varepsilon_0}$

Answer: (B) $\frac{Q}{6\varepsilon_0}$ · Key from source paper

Q233 JEE Main 2018 · 15 Apr · Shift 2 MCQ

[12] A solid ball of radius R has a charge density ρ given by $\rho = \rho_0\left(1 - \frac{r}{R}\right)$ for $0 \le r \le R$. The electric field outside the ball is:

(A) $\frac{\rho_0 R^3}{\varepsilon_0 r^2}$
(B) $\frac{4\rho_0 R^3}{3\varepsilon_0 r^2}$
(C) $\frac{3\rho_0 R^3}{4\varepsilon_0 r^2}$
(D) $\frac{\rho_0 R^3}{12\varepsilon_0 r^2}$

Answer: (D) $\frac{\rho_0 R^3}{12\varepsilon_0 r^2}$ · Key from source paper

Q234 JEE Main 2018 · 8 Apr · Offline MCQ

Three concentric metal shells A, B and C of respective radii a, b and c $(a < b < c)$ have surface charge densities $+\sigma$, $-\sigma$ and $+\sigma$ respectively. The potential of shell B is:

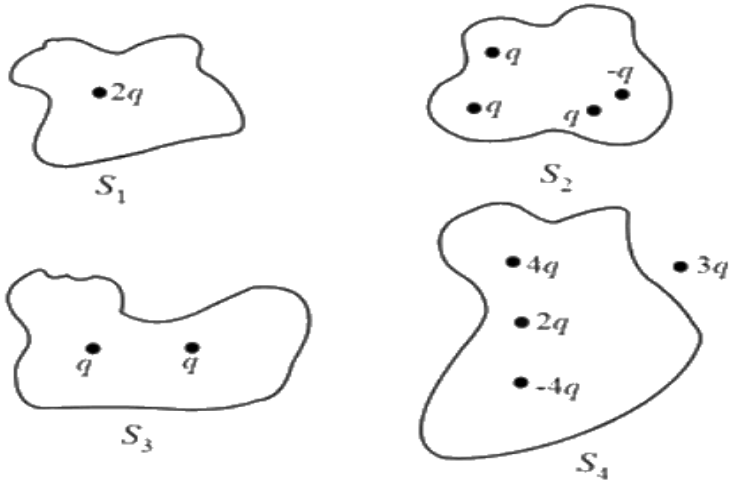
(A) $\frac{\sigma}{\varepsilon_0}\left[\frac{b^2 - c^2}{c} + a\right]$
(B) $\frac{\sigma}{\varepsilon_0}\left[\frac{a^2 - b^2}{a} + c\right]$
(C) $\frac{\sigma}{\varepsilon_0}\left[\frac{a^2 - b^2}{b} + c\right]$
(D) $\frac{\sigma}{\varepsilon_0}\left[\frac{b^2 - c^2}{b} + a\right]$

Answer: (C) $\frac{\sigma}{\varepsilon_0}\left[\frac{a^2 - b^2}{b} + c\right]$ · Key from source paper

Q235 JEE Main 2017 · 9 Apr · Online MCQ

Four closed surfaces and corresponding charge distributions are shown below.
(see the figure above)
Let the respective electric fluxes through the surfaces be ϕ_1, ϕ_2, ϕ_3 and ϕ_4. Then:

Q15. Four closed surfaces and corresponding charge distributions are shown below.



Let the respective electric fluxes through the surfaces be ϕ_1, ϕ_2, ϕ_3 and ϕ_4. Then:

(1) $\phi_1 > \phi_2 > \phi_3 > \phi_4$ (2) $\phi_1 < \phi_2 = \phi_3 > \phi_4$

(3) $\phi_1 > \phi_3;\ \phi_2 < \phi_4$ (4) $\phi_1 = \phi_2 = \phi_3 = \phi_4$

(A) $\phi_1 > \phi_2 > \phi_3 > \phi_4$

(B) $\phi_1 < \phi_2 = \phi_3 > \phi_4$

(C) $\phi_1 > \phi_3;\ \phi_2 < \phi_4$

(D) $\phi_1 = \phi_2 = \phi_3 = \phi_4$

Answer: (D) $\phi_1 = \phi_2 = \phi_3 = \phi_4$ · Key from source paper

Q236 JEE Main 2017 · 8 Apr · Online MCQ

There is a uniform electrostatic field in a region. The potential at various points on a small sphere centred at P, in the region, is found to vary between the limits 589.0 V to 589.8 V. What is the potential at a point on the sphere whose radius vector makes an angle of 60° with the direction of the field?

(A) 589.4 V

(B) 589.5 V

(C) 589.2 V

(D) 589.6 V

Answer: (C) 589.2 V · Checked by our team

Q237 JEE Main 2017 · 8 Apr · Online MCQ

The energy stored in the electric field produced by a metal sphere is 4.5 J. If the sphere contains 4 μC charge, its radius will be: $\left[\text{Take : } \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2}\right]$

(A) 32 mm
(B) 16 mm
(C) 28 mm
(D) 20 mm

Answer: (B) 16 mm · Key from source paper

Q238 JEE Main 2017 · 2 Apr · Offline MCQ

An electric dipole has fixed dipole moment $\vec{p}$, which makes angle θ with respect to x - axis. When subjected to an electric field $\vec{E}_1 = E\hat{i}$, it experiences a torque $\vec{T}_1 = \tau\hat{k}$. When subjected to another electric field $\vec{E}_2 = \sqrt{3}\,E_1\hat{j}$ it experiences a torque $\vec{T}_2 = -\vec{T}_1$. The angle θ is:

(A) 90°
(B) 30°
(C) 45°
(D) 60°

Answer: (D) 60° · Key from source paper

Q239 JEE Main 2016 · 10 Apr · Online MCQ

Within a spherical charge distribution of charge density $\rho(r)$, N equipotential surfaces of potential $V_0,\ V_0+\Delta V,\ V_0+2\Delta V, \ldots V_0+N\Delta V\ (\Delta V>0)$, are drawn and have increasing radii $r_0,\ r_1,\ r_2, \ldots r_N$, respectively. If the difference in the radii of the surfaces is constant for all values of V_0 and ΔV then :

(A) $\rho(r) = \text{constant}$
(B) $\rho(r) \propto \frac{1}{r^2}$
(C) $\rho(r) \propto \frac{1}{r}$
(D) $\rho(r) \propto r$

Answer: (C) $\rho(r) \propto \frac{1}{r}$ · Key from source paper

Q240 JEE Main 2016 · 9 Apr · Online MCQ

The potential (in volts) of a charge distribution is given by
$V(z) = 30 - 5z^2$ for $|z| \le 1$ m
$V(z) = 35 - 10\,|z|$ for $|z| \ge 1$ m .
$V(z)$ does not depend on x and y. If this potential is generated by a constant charge per unit volume ρ_0 (in units of ϵ_0) which is spread over a certain region, then choose the correct statement.

(A) $\rho_0 = 20\ \epsilon_0$ in the entire region

(B) $\rho_0 = 10\ \epsilon_0$ for $|z| \leq 1$ m and $\rho_0 = 0$ else where

(C) $\rho_0 = 20\ \epsilon_0$ for $|z| \leq 1$ m and $\rho_0 = 0$ else where

(D) $\rho_0 = 40\ \epsilon_0$ in the entire region

Answer: (B) $\rho_0 = 10\ \epsilon_0$ **for** $|z| \leq 1$ **m and** $\rho_0 = 0$ **else where** · Key from source paper

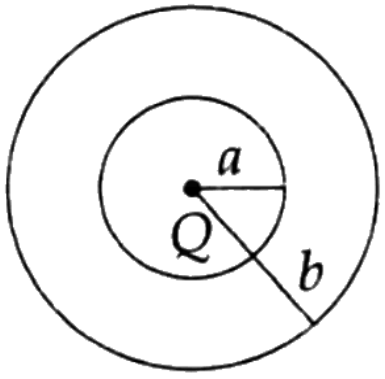
Q241

JEE Main 2016 · 3 Apr · Offline · MCQ

The region between two concentric spheres of radii 'a' and 'b', respectively (see figure), has volume charge density $\rho = \frac{A}{r}$, where A is a constant and r is the distance from the centre. At the centre of the spheres is a point charge Q. The value of A such that the electric field in the region between the spheres will be constant, is:

(see the figure above)

Q13. The region between two concentric spheres of radii 'a' and 'b', respectively (see figure), has volume charge density $\rho = \frac{A}{r}$, where A is a constant and r is the distance from the centre. At the centre of the spheres is a point charge Q. The value of A such that the electric field in the region between the spheres will be constant, is:



(1) $\frac{2Q}{\pi(a^2-b^2)}$

(2) $\frac{2Q}{\pi a^2}$

(3) $\frac{Q}{2\pi a^2}$

(4) $\frac{Q}{2\pi(b^2-a^2)}$

(A) $\frac{2Q}{\pi(a^2-b^2)}$

(B) $\frac{2Q}{\pi a^2}$

(C) $\frac{Q}{2\pi a^2}$

(D) $\frac{Q}{2\pi(b^2-a^2)}$

Answer: (C) $\frac{Q}{2\pi a^2}$ · Key from source paper

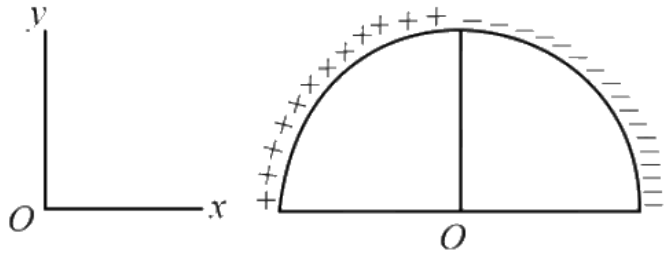
Q242

JEE Main 2015 · 11 Apr · Online · MCQ

A wire of length $L = 20$ cm is bent into a semi-circular arc and the two equal halves of the arc are uniformly charged with charges $+Q$ and $-Q$ as shown in the figure. The magnitude of the charge on each half is $|Q| = 10^3\varepsilon_0$, where ε_0 is the permittivity of free the space. The net electric field at the centre O is

(see the figure above)

Q15. A wire of length $L = 20$ cm is bent into a semi-circular arc and the two equal halves of the arc are uniformly charged with charges $+Q$ and $-Q$ as shown in the figure. The magnitude of the charge on each half is $|Q| = 10^3\varepsilon_0$, where ε_0 is the permittivity of free the space. The net electric field at the centre O is



(1) $(25 \times 10^3)\hat{\mathrm{i}}$ N C^{-1}
(2) $(50 \times 10^3)\hat{\mathrm{i}}$ N C^{-1}
(3) $(25 \times 10^3)\hat{\mathrm{j}}$ N C^{-1}
(4) $(50 \times 10^3)\hat{\mathrm{j}}$ N C^{-1}

(A) $(25 \times 10^3)\hat{i}$ N C^{-1}
(B) $(50 \times 10^3)\hat{i}$ N C^{-1}
(C) $(25 \times 10^3)\hat{j}$ N C^{-1}
(D) $(50 \times 10^3)\hat{j}$ N C^{-1}

Answer: (A) $(25 \times 10^3)\hat{i}$ N C^{-1} · Key from source paper

Q243 JEE Main 2015 · 11 Apr · Online MCQ

An electric field $\vec{E} = \left(25\,\hat{i} + 30\,\hat{j}\right)$ N C^{-1} exists in a region of space. If the potential at the origin is taken to be zero then the potential at $x = 2$ m, $y = 2$ m is:

(A) -110 J C^{-1}
(B) -140 J C^{-1}
(C) -130 J C^{-1}
(D) -120 J C^{-1}

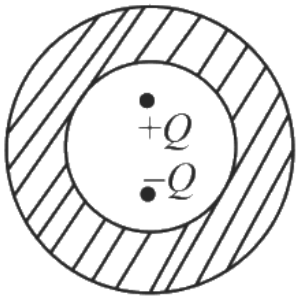
Answer: (A) -110 J C^{-1} · Key from source paper

Q244 JEE Main 2015 · 10 Apr · Online MCQ

Shown in the figure are two point charges $+Q$ and $-Q$ inside the cavity of a spherical shell. The charges are kept near the surface of the cavity on opposite sides of the centre of the shell. If σ_1 is the surface charge on the inner surface and Q_1 net charge on it and σ_2 the surface charge on the outer surface and Q_2 net charge on it then:

(see the figure above)

Q15. Shown in the figure are two point charges $+Q$ and $-Q$ inside the cavity of a spherical shell. The charges are kept near the surface of the cavity on opposite sides of the centre of the shell. If σ_1 is the surface charge on the inner surface and Q_1 net charge on it and σ_2 the surface charge on the outer surface and Q_2 net charge on it then:



(1) $\sigma_1 = 0,\ Q_1 = 0\ , \sigma_2 = 0,\ Q_2 = 0$
(2) $\sigma_1 \neq 0,\ Q_1 = 0\ , \sigma_2 \neq 0,\ Q_2 = 0$
(3) $\sigma_1 \neq 0, Q_1 \neq 0\ , \sigma_2 \neq 0,\ Q_2 \neq 0$
(4) $\sigma_1 \neq 0,\ Q_1 = 0\ , \sigma_2 = 0,\ Q_2 = 0$

(A) $\sigma_1 = 0, Q_1 = 0, \sigma_2 = 0, Q_2 = 0$
(B) $\sigma_1 \neq 0, Q_1 = 0, \sigma_2 \neq 0, Q_2 = 0$
(C) $\sigma_1 \neq 0, Q_1 \neq 0, \sigma_2 \neq 0, Q_2 \neq 0$
(D) $\sigma_1 \neq 0, Q_1 = 0, \sigma_2 = 0, Q_2 = 0$

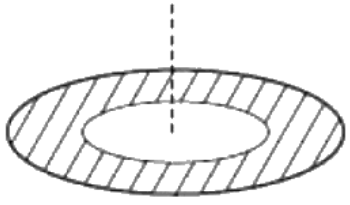
Answer: (D) $\sigma_1 \neq 0, Q_1 = 0, \sigma_2 = 0, Q_2 = 0$ · Key from source paper

Q245 JEE Main 2015 · 10 Apr · Online MCQ

A thin disc of radius $b = 2a$ has a concentric hole of radius a in it (see figure). It carries uniform surface charge σ on it. If the electric field on its axis at a height h($h << a$) from its centre is given as Ch then the value of C is

(see the figure above)

Q16. A thin disc of radius $b = 2a$ has a concentric hole of radius a in it (see figure). It carries uniform surface charge σ on it. If the electric field on its axis at a height h(h << a) from its centre is given as Ch then the value of C is



(1) $\frac{\sigma}{4\,a\epsilon_0}$
(2) $\frac{\sigma}{a\epsilon_0}$
(3) $\frac{\sigma}{5a\epsilon_0}$
(4) $\frac{\sigma}{2a\epsilon_0}$

(A) $\frac{\sigma}{4a\epsilon_0}$
(B) $\frac{\sigma}{a\epsilon_0}$
(C) $\frac{\sigma}{5a\epsilon_0}$
(D) $\frac{\sigma}{2a\epsilon_0}$

Answer: (A) $\frac{\sigma}{4a\epsilon_0}$ · Key from source paper

Q246 JEE Main 2015 · 4 Apr · Offline MCQ

A uniformly charged solid sphere of radius R has potential V_0 (measured with respect to ∞) on its surface. For this sphere the equipotential surfaces with potential $\frac{3V_0}{2}$, $\frac{5V_0}{4}$, $\frac{3V_0}{4}$ and $\frac{V_0}{4}$ have radius R_1, R_2, R_3 and R_4 respectively. Then

(A) $2R > R_4$

(B) $R_1 = 0$ and $R_2 > (R_4 - R_3)$

(C) $R_1 \neq 0$ and $(R_2 - R_1) > (R_4 - R_3)$

(D) $R_1 = 0$ and $R_2 < (R_4 - R_3)$

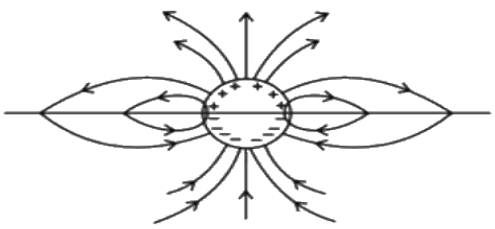
Answer: (D) $R_1 = 0$ and $R_2 < (R_4 - R_3)$ · Key from source paper

Q247 JEE Main 2015 · 4 Apr · Offline MCQ

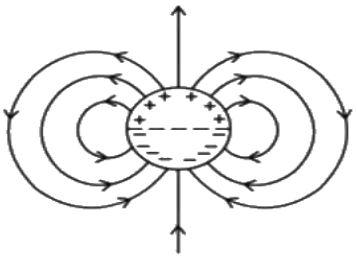
A long cylindrical shell carries positive surface charge σ in the upper half and negative surface charge $-\sigma$ in the lower half. The electric field lines around the cylinder will look like figure given in:
(figures are schematic and not drawn to scale)

Q16. A long cylindrical shell carries positive surface charge σ in the upper half and negative surface charge $-\sigma$ in the lower half. The electric field lines around the cylinder will look like figure given in:
(figures are schematic and not drawn to scale)

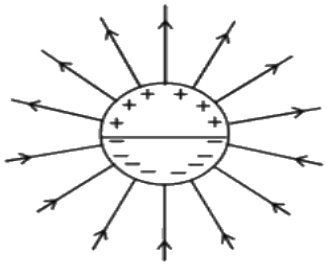
(1)



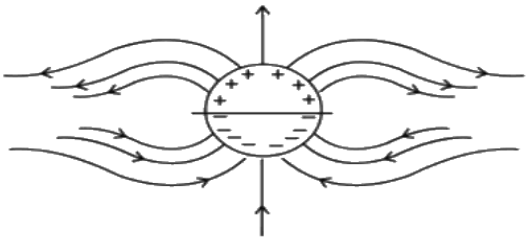
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (B) · Key from source paper

Q248 JEE Main 2014 · 19 Apr · Online MCQ

The electric field in a region of space is given by, $\overrightarrow{E} = E_0\hat{i} + 2E_0\hat{j}$ where $E_0 = 100\ \mathrm{N\,C^{-1}}$. The flux of this field through a circular surface of radius $0.02\ \mathrm{m}$ parallel to the Y-Z plane is nearly

(A) $0.02\ \mathrm{N\,m^2\,C^{-1}}$
(B) $0.005\ \mathrm{N\,m^2\,C^{-1}}$
(C) $0.125\ \mathrm{N\,m^2\,C^{-1}}$
(D) $3.14\ \mathrm{N\,m^2\,C^{-1}}$

Answer: (C) $0.125\ \mathrm{N\,m^2\,C^{-1}}$ · Key from source paper

Q249 JEE Main 2014 · 12 Apr · Online MCQ

A spherically symmetric charge distribution is characterised by a charge density having the following variations: $\rho(r) = \rho_o\left(1 - \frac{r}{R}\right)$ for $r < R$ $\rho(\mathrm{r}) = 0$ for $r \geq \mathrm{R}$ Where r is the distance from the centre of the charge distribution ρ_o is a constant. The electric field at an internal point $(r < R)$ is:

(A) $\frac{\rho_o}{4\varepsilon_o}\left(\frac{\mathrm{r}}{3} - \frac{\mathrm{r}^2}{4\mathrm{R}}\right)$
(B) $\frac{\rho_0}{\varepsilon_0}\left(\frac{r}{3} - \frac{r^2}{4R}\right)$
(C) $\frac{\rho_o}{3\varepsilon_o}\left(\frac{\mathrm{r}}{3} - \frac{\mathrm{r}^2}{4\mathrm{R}}\right)$
(D) $\frac{\rho_o}{12\varepsilon_o}\left(\frac{\mathrm{r}}{3} - \frac{\mathrm{r}^2}{4\mathrm{R}}\right)$

Answer: (B) $\frac{\rho_0}{\varepsilon_0}\left(\frac{r}{3} - \frac{r^2}{4R}\right)$ · Key from source paper

Q250 JEE Main 2014 · 11 Apr · Online MCQ

A cone of base radius R and height h is located in a uniform electric field $\vec{\mathrm{E}}$ parallel to its base. The electric flux entering the cone is:

(A) $\frac{1}{2}\mathrm{EhR}$
(B) EhR
(C) $2\mathrm{EhR}$
(D) $4\mathrm{EhR}$

Answer: (B) EhR · Key from source paper

Q251 JEE Main 2014 · 9 Apr · Online MCQ

The magnitude of the average electric field normally present in the atmosphere just above the surface of the Earth is about 150 N/C, directed inward towards the center of the Earth. This gives the total net surface charge carried by the Earth to be : [Given : $\epsilon_0 = 8.85 \times 10^{-12}\ \mathrm{C^2/N\text{-}m^2}$, $\mathrm{R_E} = 6.37 \times 10^6\mathrm{m}$]

(A) $-680\ \mathrm{kC}$
(B) $+670\ \mathrm{kC}$
(C) $+680\ \mathrm{kC}$
(D) $-670\ \mathrm{kC}$

Answer: (A) $-680\ \mathrm{kC}$ · Key from source paper

Q252 JEE Main 2014 · 6 Apr · Offline MCQ

Assume that an electric field $\vec{E} = 30x^2\hat{i}$ exists in space. Then the potential difference $\mathrm{V_A} - \mathrm{V_O}$, where $\mathrm{V_O}$ is the potential at the origin and $\mathrm{V_A}$ the potential at x = 2 m is :

(A) 120 J C^{-1}
(B) -120 J C^{-1}
(C) -80 J C^{-1}
(D) 80 J C^{-1}

Answer: (C) -80 J C^{-1} · Key from source paper

Q253 JEE Main 2013 · 25 Apr · Online MCQ

This question has Statement-1 and Statement-2. Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: No work is required to be done to move a test charge between any two points on an equipotential surface. Statement 2 : Electric lines of force at the equipotential surfaces are mutually perpendicular to each other.

(A) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.
(B) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.
(C) Statement 1 is true, Statement 2 is false.
(D) Statement 1 is false, Statement 2 is true.

Answer: (C) Statement 1 is true, Statement 2 is false. · Key from source paper

---

Q254 JEE Main 2013 · 25 Apr · Online MCQ

The surface charge density of a thin charged disc of radius R is σ. The value of the electric field at the centre of the disc is $\frac{\sigma}{2\epsilon_0}$. With respect to the field at the centre, the electric field along the axis at a distance R from the centre of the disc:

(A) reduces by 70.7%
(B) reduces by 29.3%
(C) reduces by 9.7%
(D) reduces by 14.6%

Answer: (A) reduces by 70.7% · Key from source paper

Q255 JEE Main 2013 · 23 Apr · Online MCQ

Consider a finite insulated, uncharged conductor placed near a finite positively charged conductor. The uncharged body must have a potential :

(A) less than the charged conductor and more than at infinity.
(B) more than the charged conductor and less than at infinity.
(C) more than the charged conductor and more than at infinity.
(D) less than the charged conductor and less than at infinity.

Answer: (A) less than the charged conductor and more than at infinity. · Key from source paper

Q256 JEE Main 2013 · 23 Apr · Online MCQ

A liquid drop having 6 excess electrons is kept stationary under a uniform electric field of 25.5 $\mathrm{kVm^{-1}}$. The density of liquid is $1.26 \times 10^3\ \mathrm{kg\,m^{-3}}$. The radius of the drop is (neglect buoyancy).

(A) 4.3×10^{-7} m
(B) 7.8×10^{-7} m
(C) 0.078×10^{-7} m
(D) 3.4×10^{-7} m

Answer: (B) 7.8×10^{-7} **m** · Key from source paper

Q257 JEE Main 2013 · 22 Apr · Online MCQ

A point charge of magnitude $+1\mu\mathrm{C}$ is fixed at $(0, 0, 0)$. An isolated uncharged spherical conductor, is fixed with its center at $(4\ \mathrm{cm}, 0, 0)$. The potential and the induced electric field at the centre of the sphere is :

(A) $1.8 \times 10^5\ \mathrm{V}$ and $-5.625 \times 10^6\ \mathrm{V/m}$
(B) $0\ \mathrm{V}$ and $0\ \mathrm{V/m}$
(C) $2.25 \times 10^5\ \mathrm{V}$ and $-5.625 \times 10^6\ \mathrm{V/m}$
(D) $2.25 \times 10^5\ \mathrm{V}$ and $0\ \mathrm{V/m}$

Answer: (C) $2.25 \times 10^5\ \mathrm{V}$ **and** $-5.625 \times 10^6\ \mathrm{V/m}$ · Key from source paper

Q258 JEE Main 2013 · 22 Apr · Online MCQ

Two small equal point charges of magnitude q are suspended from a common point on the ceiling by insulating mass less strings of equal lengths. They come to equilibrium with each string making angle θ from the vertical. If the mass of each charge is m, then the electrostatic potential at the centre of line joining them will be $\left(\frac{1}{4\pi\,\epsilon_0} = k\right)$.

EdLoop JEE

(A) $2\sqrt{kmg\tan\theta}$
(B) $\sqrt{kmg\tan\theta}$
(C) $4\sqrt{kmg\tan\theta}$
(D) $4\sqrt{kmg/\ \tan\theta}$

Answer: (C) $4\sqrt{kmg\tan\theta}$ · Key from source paper

Q259 JEE Main 2013 · 9 Apr · Online MCQ

Two balls of same mass and carrying equal charge are hung from a fixed support of length l. At electrostatic equilibrium, assuming that angles made by each thread is small, the separation, x between the balls is proportional to :

(A) l
(B) l^2
(C) $l^{2/3}$
(D) $l^{1/3}$

Answer: (D) $l^{1/3}$ · Key from source paper

Q260 JEE Main 2013 · 9 Apr · Online MCQ

A uniform electric field $\vec{E}$ exists between the plates of a charged condenser. A charged particle enters the space between the plates and perpendicular to $\vec{E}$. The path of the particle between the plates is a:

(A) straight line
(B) hyperbola
(C) parabola
(D) circle

Answer: (C) parabola · Key from source paper

Q261 JEE Main 2013 · 7 Apr · Offline MCQ

Two charges, each equal to q, are kept at x = $-$a and x = a on the x-axis. A particle of mass m and charge $q_0 = -\frac{q}{2}$ is placed at the origin. If charge q_0 is given a small displacement (y << a) along the y-axis, the net force acting on the particle is proportional to :

(A) $\frac{1}{y}$
(B) $-\frac{1}{y}$
(C) -y
(D) y

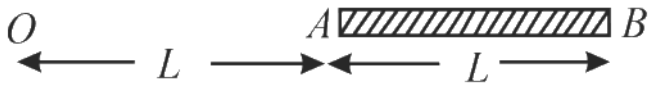
Answer: (C) -y · Key from source paper

Q262 JEE Main 2013 · 7 Apr · Offline MCQ

A charge Q is uniformly distributed over a long rod AB of length L as shown in the figure. The electric potential at the point O lying at a distance L from the end A is :

(see the figure above)

Q13. A charge Q is uniformly distributed over a long rod AB of length L as shown in the figure. The electric potential at the point O lying at a distance L from the end A is :



(1) $\frac{Q}{4\pi\epsilon_0 L\, ln\, 2}$
(2) $\frac{Q\, ln\, 2}{4\pi\epsilon_0 L}$
(3) $\frac{Q}{8\pi\epsilon_0 L}$
(4) $\frac{3Q}{4\pi\epsilon_0 L}$

(A) $\frac{Q}{4\pi\epsilon_0 L\ \ln 2}$
(B) $\frac{Q\ \ln 2}{4\pi\epsilon_0 L}$
(C) $\frac{Q}{8\pi\epsilon_0 L}$
(D) $\frac{3Q}{4\pi\epsilon_0 L}$

Answer: (B) $\frac{Q\ \ln 2}{4\pi\epsilon_0 L}$ · Key from source paper

Q263 AIEEE 2012 · 26 May · Online MCQ

Three positive charges of equal value q are placed at vertices of an equilateral triangle. The resulting lines of force should be sketched as in

Q15. Three positive charges of equal value q are placed at vertices of an equilateral triangle. The resulting lines of force should be sketched as in

(1)


(2)


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q264 AIEEE 2012 · 19 May · Online MCQ

A charge of total amount Q is distributed over two concentric hollow spheres of radii r and $R(R > r)$ such that the surface charge densities on the two spheres are equal. The electric potential at the common centre is

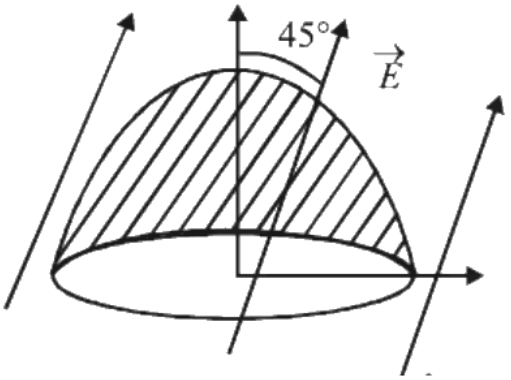
(A) $\frac{1}{4\pi\epsilon_0}\frac{(R-r)Q}{(R^2+r^2)}$
(B) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)Q}{2(R^2+r^2)}$
(C) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)Q}{(R^2+r^2)}$
(D) $\frac{1}{4\pi\epsilon_0}\frac{(R-r)Q}{2(R^2+r^2)}$

Answer: (C) $\frac{1}{4\pi\epsilon_0}\frac{(R+r)Q}{(R^2+r^2)}$ · Key from source paper

Q265 AIEEE 2012 · 19 May · Online MCQ

The flat base of a hemisphere of radius a with no charge inside it lies in a horizontal plane. A uniform electric field $\vec{E}$ is applied at an angle $\frac{\pi}{4}$ with the vertical direction. The electric flux through the curved surface of the *(see the figure above)* hemisphere is

Q16. The flat base of a hemisphere of radius a with no charge inside it lies in a horizontal plane. A uniform electric field $\vec{E}$ is applied at an angle $\frac{\pi}{4}$ with the vertical direction. The electric flux through the curved surface of the



hemisphere is

(1) $\pi a^2 E$
(2) $\frac{\pi a^2 E}{\sqrt{2}}$
(3) $\frac{\pi a^2 E}{2\sqrt{2}}$
(4) $\frac{(\pi+2\pi\phi^2 E}{\left(2\sqrt{2^2}\right)}$

(A) $\pi a^2 E$

(B) $\frac{\pi a^2 E}{\sqrt{2}}$

(C) $\frac{\pi a^2 E}{2\sqrt{2}}$

(D) $\frac{(\pi+2\pi\phi^2 E}{\left(2\sqrt{2^2}\right)}$

Answer: (B) $\frac{\pi a^2 E}{\sqrt{2}}$ · Key from source paper

Q266 AIEEE 2012 · 7 May · Online MCQ

The electric potential $V(x)$ in a region around the origin is given by $V(x) = 4x^2$ volts. The electric charge enclosed in a cube of 1 m side with its centre at the origin is (in coulomb)

(A) $8\varepsilon_0$

(B) $-4\varepsilon_0$

(C) 0

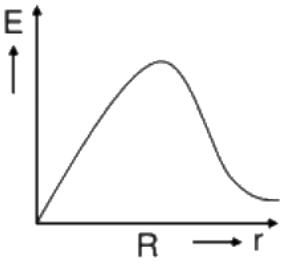
(D) $-8\varepsilon_0$

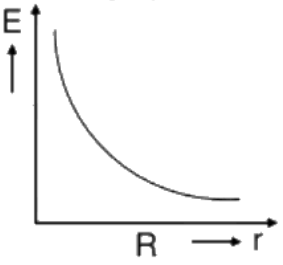
Answer: (D) $-8\varepsilon_0$ · Checked by our team

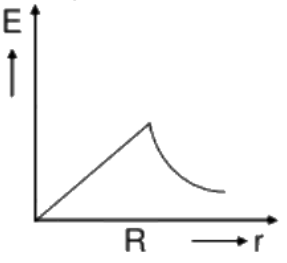
Q267 AIEEE 2012 · Offline MCQ

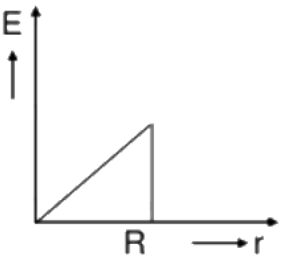
In a uniformly charged sphere of total charge Q and radius R, the electric field E is plotted as a function of distance from the centre. The graph which would correspond to the above will be

Q14. In a uniformly charged sphere of total charge Q and radius R, the electric field E is plotted as a function of distance from the centre. The graph which would correspond to the above will be

(1) 

(2) 

(3) 

(4) 

(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (C) · Key from source paper

Q268 AIEEE 2012 · Offline MCQ

This question has statement 1 and statement 2 . Of the four choices given after the statements, choose the one that best describes the two statements. An insulating solid sphere of radius R has a uniformly positive charge density ρ. As a result of this uniform charge distribution there is a finite value of electric potential at the centre of the sphere, at the surface of the sphere and also at a point out side the sphere. The electric potential at infinity is zero. Statement 1: When a charge q is taken from the centre to the surface of the sphere, its potential energy changes by $\frac{qp}{3\varepsilon_0}$ Statement 2: The electric field at a distance $r(r<R)$ from the centre of the sphere is $\frac{\rho r}{3\varepsilon_0}$

(A) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for statement 1.
(B) Statement 1 is true, Statement 2 is false
(C) Statement 1 is false, Statement 2 is true
(D) Statement 1 is true, Statement 2 is the correct explanation for statement 1

Answer: (C) Statement 1 is false, Statement 2 is true · Key from source paper

Q269 AIEEE 2011 MCQ

Two identical charged spheres suspended from a common point by two massless strings of length l are initially a distance d ($d \ll l$) apart because of their mutual repulsion. The charge begins to leak from both the spheres at a constant rate. As a result the charges approach each other with a velocity v. Then as a function of distance x between them,

(A) $v \propto x^{-1}$
(B) $v \propto x^{1/2}$
(C) $v \propto x$
(D) $v \propto x^{-1/2}$

Answer: (D) $v \propto x^{-1/2}$ · Key from source paper

Q270 AIEEE 2011 MCQ

The electrostatic potential inside a charged spherical ball is given by $\phi = ar^2 + b$ where r is the distance from the centre; a, b are constants. Then the charge density inside ball is

(A) $-6a\varepsilon_0 r$
(B) $-24\pi a\varepsilon_0 r$
(C) $-6a\varepsilon_0$
(D) $-24\pi a\varepsilon_0 r$

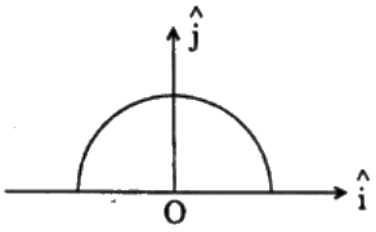
Answer: (C) $-6a\varepsilon_0$ · Key from source paper

Q271 AIEEE 2010 MCQ

A thin semi-circular ring of radius r has a positive charge q distributed uniformly over it. The net field E at the centre O is

(see the figure above)

Q14. A thin semi-circular ring of radius r has a positive charge q distributed uniformly over it. The net field E at the centre O is



(1) $\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$ (2) $-\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

(3) $-\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$ (4) $\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$

(A) $\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

(B) $-\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

(C) $-\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$

(D) $\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$

Answer: (C) $-\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$ · Key from source paper

Q272 AIEEE 2010 MCQ

Let there be a spherically symmetric charge distribution with charge density varying as $\rho(r) = \rho_0\left(\frac{5}{4} - \frac{r}{R}\right)$ upto $r = R$, and $\rho(r) = 0$ for $r > R$, where r is the distance from the origin. The electric field at a distance $r(r < R)$ from the origin is given by

(A) $\frac{4\pi\rho_0 r}{3\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$

(B) $\frac{\rho_0 r}{4\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$

(C) $\frac{4\rho_0 r}{3\varepsilon_0}\left(\frac{5}{4} - \frac{r}{R}\right)$

(D) $\frac{\rho_0 r}{3\varepsilon_0}\left(\frac{5}{4} - \frac{r}{R}\right)$

Answer: (B) $\frac{\rho_0 r}{4\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$ · Key from source paper

Q273 AIEEE 2010 MCQ

Two identical charged spheres are suspended by strings of equal lengths. The strings make an angle of 30° with each other. When suspended in a liquid of density $0.8\ \mathrm{g\ cm^{-3}}$, the angle remains the same. If density of the material of the sphere is $1.6\ \mathrm{g\ cm^{-3}}$, the dielectric constant of the liquid is

(A) 4
(B) 3
(C) 2
(D) 1

Answer: (C) 2 · Key from source paper

Q274 AIEEE 2009 MCQ

This question contains Statement-1 and Statement-2. Of the four choices given after the statements, choose the one that best describes the two statements. Statement - 1: For a charged particle moving from point P to point Q, the net work done by an electrostatic field on the particle is independent of the path connecting point P to point Q. Statement-2: The net work done by a conservative force on an object moving along a closed loop is zero

(A) Statement-1 is true, Statement-2 is false
(B) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation of Statement-1.
(C) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation of Statement-1.
(D) Statement-1 is false, Statement-2 is true

Answer: (B) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation of Statement-1. · Key from source paper

Q275 AIEEE 2009 MCQ

Let $P(r)=\frac{Q}{\pi R^4}r$ be the charge density distribution for a solid sphere of radius R and total charge Q. for a point ' p ' inside the sphere at distance r_1 from the centre of the sphere, the magnitude of electric field is

(A) 0
(B) $\frac{Q}{4\pi\varepsilon_0 r_1^2}$
(C) $\frac{Qr_1^2}{4\pi\varepsilon_0 R^4}$
(D) $\frac{Q_1^2}{3\pi\varepsilon_0 R^4}$

Answer: (C) $\frac{Qr_1^2}{4\pi\varepsilon_0 R^4}$ · Key from source paper

Q276 AIEEE 2009 MCQ

Two points P and Q are maintained at the potentials of 10 V and -4 V respectively. The work done in moving 100 electrons from P to Q is

(A) -19×10^{-17} J

(B) 9.60×10^{-17} J

(C) -2.24×10^{-16} J

(D) 2.24×10^{-16} J

Answer: (D) 2.24×10^{-16} J · Key from source paper

Q277 AIEEE 2009 MCQ

A charge Q is placed at each of the opposite corners of a square. A charge q is placed at each of the other two corners. If the net electrical force on Q is zero, then the Q/q equals

(A) $-2\sqrt{2}$

(B) -1

(C) 1

(D) $-\frac{1}{\sqrt{2}}$

Answer: (A) $-2\sqrt{2}$ · Key from source paper

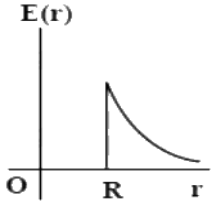
Q278 AIEEE 2008 MCQ

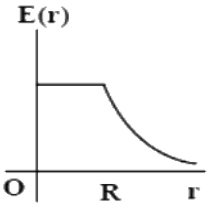
A thin spherical shell of radius R has charge Q spread uniformly over its surface. Which of the following graphs most closely represents the electric field $E(r)$ produced by the shell in the range $0 \leq r < \infty$, where r is the distance from the centre of the shell?

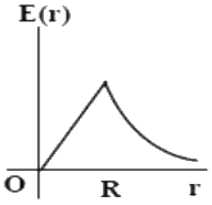
Q17. A thin spherical shell of radius R has charge Q spread uniformly over its surface. Which of the following graphs most closely represents the electric field $E(r)$ produced by the shell in the range $0 \leq r < \infty$, where r is the distance from the centre of the shell?

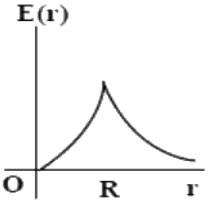
Sol. (1)

$$E(r) = \begin{cases} 0 \text{ if } r < R \\ \dfrac{Q}{4\pi\varepsilon_0 r^2} \text{ if } r \geq R \end{cases}$$

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q279 AIEEE 2007 MCQ

An electric charge $10^{-3}\mu C$ is placed at the origin $(0,0)$ of $X-Y$ co-ordinate system. Two points A and B are situated at $(\sqrt{2},\sqrt{2})$ and $(2,0)$ respectively. The potential difference between the points A and B will be

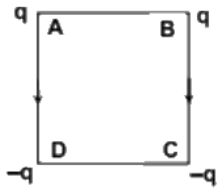
(A) 9 volt
(B) zero
(C) 2 volt
(D) 4.5 volt

Answer: (B) zero · Key from source paper

Q280 AIEEE 2007 MCQ

see figure

Q21. Charges are placed on the vertices of a square as shown. Let E be the electric field and V the potential at the centre. If the charges on A and B are interchanged with those on D and C respectively, then



(1) $\vec{E}$ remains unchanged, V changes
(2) Both $\vec{E}$ and V change
(3) $\vec{E}$ and V remains unchanged
(4) $\vec{E}$ changes, V remains unchanged

(A) $\vec{E}$ remains unchanged, V changes
(B) Both $\vec{E}$ and V change
(C) $\vec{E}$ and V remains unchanged
(D) $\vec{E}$ changes, V remains unchanged

Answer: (D) $\vec{E}$ changes, V remains unchanged · Key from source paper

Q281 AIEEE 2007 MCQ

The potential at a point x (measured in μm) due to some charges situated on the x-axis is given by $V(x)=20/(x^2-4)$ Volts. The electric field E at $x=4$ μm is given by

(A) 5/3 Volt/ μm and in the $-ve\ x$ direction
(B) 5/3 Volt/ μm and in the $+ve\ x$ direction.
(C) 10/9 Volt/μm and in the $-ve\ x$ direction
(D) 10/9 Volt/μm and in the $+ve\ x$ direction.

Answer: (D) 10/9 Volt/μm and in the $+ve\ x$ direction. · Key from source paper

Q282 AIEEE 2007 MCQ

If $\mathrm{g_E}$ and $\mathrm{g_m}$ are the accelerations due to gravity on the surfaces of the earth and the moon respectively and if Millikan's oil drop experiment could be performed on the two surfaces, one will find the ratio $\frac{\text{electronic charge on the moon}}{\text{electronic charge on the earth}}$ to be

(A) 1
(B) 0
(C) $\mathrm{g_E/g_m}$
(D) $\mathrm{g_m/g_E}$

Answer: (A) 1 · Key from source paper

Q283 AIEEE 2006 MCQ

A electric dipole is placed at an angle of 30° to a non-uniform electric field. The dipole will experience

(A) a torque only
(B) a translational force only in the direction of the field
(C) a translational force only in a direction normal to the direction of the field
(D) a torque as well as a translational force

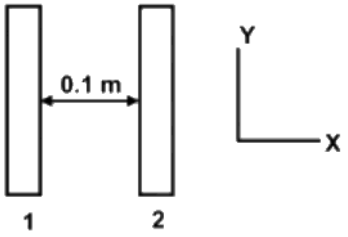
Answer: (D) a torque as well as a translational force · Key from source paper

Q284 AIEEE 2006 MCQ

Two insulating plates are both uniformly charged in such a way that the potential difference between them is $V_2 - V_1 = 20$ V. (i.e. plate 2 is at a higher potential). The plates are separated by $d = 0.1$ m and can be treated as infinitely large. An electron is released from rest on the inner surface of plate 1 . What is its speed when it hits plate 2? $(e = 1.6 \times 10^{-19}\ \mathrm{C}, \mathrm{m_e} = 9.11 \times 10^{-31}\ \mathrm{kg})$

(see the figure above)

Q25. Two insulating plates are both uniformly charged in such a way that the potential difference between them is $V_2 - V_1 = 20$ V. (i.e. plate 2 is at a higher potential). The plates are separated by $d = 0.1$ m and can be treated as infinitely large. An electron is released from rest on the inner surface of plate 1 . What is its speed when it hits plate 2? $\left(e = 1.6 \times 10^{-19} C, m_e = 9.11 \times 10^{-31} \text{ kg}\right)$



(1) 32×10^{-19} m/s
(2) 2.65×10^{6} m/s
(3) 7.02×10^{12} m/s
(4) 1.87×10^{6} m/s

(A) 32×10^{-19} m/s
(B) 2.65×10^{6} m/s
(C) 7.02×10^{12} m/s
(D) 1.87×10^{6} m/s

Answer: (B) 2.65×10^{6} **m/s** · Key from source paper

Q285 AIEEE 2006 MCQ

Two spherical conductors A and B of radii 1 mm and 2 mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire then in equilibrium condition, the ratio of the magnitude of the electric fields at the surface of spheres A and B is

(A) $1:4$
(B) $4:1$
(C) $1:2$
(D) $2:1$

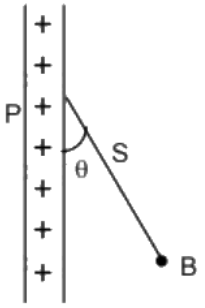
Answer: (D) $2:1$ · Key from source paper

Q286 AIEEE 2005 MCQ

A charged ball B hangs from a silk thread S which makes an angle θ with a large charged conducting sheet P, as show in the figure. The surface charge density σ of the sheet is proportional to

(see the figure above)

Q40. A charged ball B hangs from a silk thread S which makes an angle θ with a large charged conducting sheet P,



as show in the figure. The surface charge density σ of the sheet is proportional to

(1) $\cos\theta$ (2) $\cot\theta$

(3) $\sin\theta$ (4) $\tan\theta$

(A) $\cos\theta$

(B) $\cot\theta$

(C) $\sin\theta$

(D) $\tan\theta$

Answer: (D) $\tan\theta$ · Key from source paper

Q287 AIEEE 2005 MCQ

Two point charges $+8q$ and $-2q$ are located at $x = 0$ and $x = L$ respectively. The location of a point on the x axis at which the net electric field due to these two point charges is zero is

(A) $2\,\mathrm{L}$

(B) $L/4$

(C) $8\,\mathrm{L}$

(D) $4\,\mathrm{L}$

Answer: (A) $2\,\mathrm{L}$ · Key from source paper

Q288 AIEEE 2005 MCQ

Two thin wires rings each having a radius R are placed at a distance d apart with their axes coinciding. The charges on the two rings are $+q$ and $-q$. The potential difference between the centres of the two rings is

(A) $\mathrm{QR}/4\pi\varepsilon_0\,\mathrm{d}^2$

(B) $\frac{Q}{2\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

(C) zero

(D) $\frac{Q}{4\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

Answer: (B) $\frac{Q}{2\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$ · Key from source paper

Q289 AIEEE 2004 MCQ

Two spherical conductor B and C having equal radii and carrying equal charges in them repel each other with a force F when kept apart at some distance. A third spherical conductor having same radius as that of B but uncharged brought in contact with B, then brought in contact with C and finally removed away from both. The new force of repulsion, between B and C is

(A) F/4
(B) $3F/4$
(C) F/8
(D) 3 F/8.

Answer: (D) 3 F/8. · Key from source paper

Q290 AIEEE 2004 MCQ

A charged particle q is shot towards another charged particle Q which is fixed, with a speed v it approaches Q upto a closest distance r and then returns. If q were given a speed $2v$, the closest distances of approach would be

(A) r
(B) $2r$
(C) r/2
(D) r/4

Answer: (D) r/4 · Key from source paper

Q291 AIEEE 2004 MCQ

Four charges equal to $-Q$ are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium the value of q is

(A) $-\frac{Q}{4}(1+2\sqrt{2})$
(B) $\frac{Q}{4}(1+2\sqrt{2})$
(C) $-\frac{Q}{2}(1+2\sqrt{2})$
(D) $\frac{Q}{2}(1+2\sqrt{2})$

Answer: (B) $\frac{Q}{4}(1+2\sqrt{2})$ · Key from source paper

Q292 AIEEE 2004 MCQ

A charged oil drop is suspended in a uniform field of 3×10^4 V/m so that it neither falls nor rises. The charge on the drop will be (take the mass of the charge = 9.9×10^{-15} kg and g = 10 m/s^2)

(A) $3.3 \times 10^{-18}\mathrm{C}$
(B) $3.2 \times 10^{-18}\mathrm{C}$
(C) $1.6 \times 10^{-18}\mathrm{C}$
(D) $4.8 \times 10^{-18}\mathrm{C}$

Answer: (A) $3.3 \times 10^{-18}\mathrm{C}$ · Key from source paper

Q293 AIEEE 2003 MCQ

If the electric flux entering and leaving an enclosed surface respectively is ϕ_1 and ϕ_2, the electric charge inside the surface will be

(A) $(\phi_2 - \phi_1)\varepsilon_0$
(B) $(\phi_1 + \phi_2)/\varepsilon_0$
(C) $(\phi_2 - \phi_1)/\varepsilon_0$
(D) $(\phi_1 + \phi_2)\varepsilon_0$

Answer: (A) $(\phi_2 - \phi_1)\varepsilon_0$ · Key from source paper

Q294 AIEEE 2003 MCQ

A thin spherical conducting shell of radius R has a charge q. Another charge Q is placed at the centre of the shell. The electrostatic potential at a point P a distance $\frac{R}{2}$ from the centre of the shell is

(A) $\frac{2Q}{4\pi\varepsilon_0 R}$
(B) $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{2q}{4\pi\varepsilon_0 R}$
(C) $\frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$
(D) $\frac{(q+Q)2}{4\pi\varepsilon_0 R}$

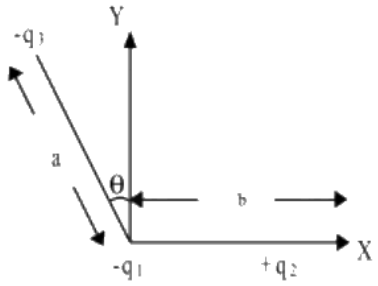
Answer: (C) $\frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$ · Key from source paper

Q295 AIEEE 2003 MCQ

Three charges $-q_1$, $+q_2$ and $-q_3$ are placed as shown in the figure. The x-component of the force on $-q_1$ is proportional to

(see the figure above)

Q42. Three charges $-q_1, +q_2$ and $-q_3$ are placed as shown in the figure. The x-component of the force on $-q_1$ is



proportional to

(1) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\cos\theta$

(2) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\sin\theta$

(3) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\cos\theta$

(4) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\sin\theta$

(A) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\cos\theta$

(B) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\sin\theta$

(C) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\cos\theta$

(D) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\sin\theta$

Answer: (B) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\sin\theta$ · Key from source paper

Q296 AIEEE 2002 MCQ

On moving a charge of 20 coulombs by 2 cm, 2 J of work is done, then the potential difference between the points is

(A) 0.1 V

(B) 8 V

(C) 2 V

(D) 0.5 V

Answer: (A) 0.1 V · Key from source paper

Q297 AIEEE 2002 MCQ

If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium then the value of q is

(A) $Q/2$

(B) $-Q/2$

(C) $Q/4$

(D) $-Q/4$

Answer: (D) $-Q/4$ · Key from source paper