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Coulomb's Law · JEE Main 2022 · Shift-II — View Solution on Crucible ↗

1. A charge of $4\,\mu\text{C}$ 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) $1\,\mu\text{C}$ and $3\,\mu\text{C}$

(B) $2\,\mu\text{C}$ and $2\,\mu\text{C}$

(C) 0 and $4\,\mu\text{C}$

(D) $1.5\,\mu\text{C}$ and $2.5\,\mu\text{C}$

Capacitance · JEE Main 2023 · Shift-II — View Solution on Crucible ↗

2. 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) $\frac{CV}{2\varepsilon_0}$

Coulomb's Law in a Medium · JEE Main 2024 · Shift-II — View Solution on Crucible ↗

3. 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) $25F$

Series and Parallel Combinations of Capacitor · JEE Main 2021 · Shift-I — View Solution on Crucible ↗

4. Two equal capacitors are first connected in series and then in parallel. The ratio of the equivalent capacities in the two cases will be:

(A) $1:2$

(B) $1:4$

(C) $4:1$

(D) $2:1$

Charge and its properties · JEE Main 2022 · Shift-II — View Solution on Crucible ↗

5. Sixty four conducting drops each of radius $0.02\,\text{m}$ and each carrying a charge of $5\,\mu\text{C}$ 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) $8:1$

Energy stored in capacitor · JEE Main 2022 · Shift-II View Solution on Crucible ↗

6. If the charge on a capacitor is increased by $2\,\mathrm{C}$, the energy stored in it increases by 44%. The original charge on the capacitor is (in C):

(A) 10
(B) 20
(C) 30
(D) 40

Point where Force is zero · JEE Main 2025 · Shift-I View Solution on Crucible ↗

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

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

Energy density of electric field · JEE Main 2025 · Shift-I View Solution on Crucible ↗

8. Consider a parallel plate capacitor of area A (of each plate) and separation d between the plates. If E is the electric field and ε_0 is the permittivity of free space between the plates, then potential energy stored in the capacitor is:

(A) $\varepsilon_0 E^2 Ad$
(B) $\frac{1}{2}\varepsilon_0 E^2 Ad$
(C) $\frac{1}{4}\varepsilon_0 E^2 Ad$
(D) $\frac{3}{4}\varepsilon_0 E^2 Ad$

Electric Potential due to a Dipole · JEE Main 2024 · Shift-I View Solution on Crucible ↗

9. 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) $\frac{1}{r}$

Capacitance · JEE Main 2022 · Shift-II View Solution on Crucible ↗

10. Two identical thin metal plates have charges q_1 and q_2 respectively such that $q_1 > q_2$. The plates were brought close to each other to form a parallel plate capacitor of capacitance C. The potential difference between them is:

(A) $\frac{(q_1+q_2)}{C}$
(B) $\frac{(q_1-q_2)}{C}$
(C) $\frac{(q_1-q_2)}{2C}$
(D) $\frac{2(q_1-q_2)}{C}$

Charge Sharing Between Connected Conductors · JEE Main 2024 · Shift-I View Solution on Crucible ↗

11. 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) $\frac{a}{b}$
(B) $\sqrt{ab}$
(C) $\frac{b}{a}$
(D) ab

Energy stored in capacitor · JEE Main 2022 · Shift-I View Solution on Crucible ↗

12. A parallel plate capacitor filled with a medium of dielectric constant 10, is connected across a battery and is charged. The dielectric slab is replaced by another slab of dielectric constant 15. Then the energy of capacitor will:

(A) increase by 50%
(B) decrease by 15%
(C) increase by 25%
(D) increase by 33%

Applications of gauss theorem · JEE Main 2024 · Shift-I View Solution on Crucible ↗

13. 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) $\frac{\sigma}{\epsilon_0 R}$
(B) $\frac{\sigma}{\epsilon_0}$
(C) $\frac{\sigma}{4\epsilon_0}$
(D) $\frac{\sigma}{2\epsilon_0}$

Series and Parallel Combinations of Capacitor · JEE Main 2022 · Shift-I View Solution on Crucible ↗

14. The total charge on the system of capacitance $C_1 = 1\,\mu F,\ C_2 = 2\,\mu F,\ C_3 = 4\,\mu F$ and $C_4 = 3\,\mu F$ connected in parallel is (assume a battery of $20\,\mathrm{V}$ is connected to the combination):

(A) $200\,\mu C$
(B) $200\,\mathrm{C}$
(C) $10\,\mu C$
(D) $10\,\mathrm{C}$

Point where Force is zero · JEE Main 2024 · Shift-I View Solution on Crucible ↗

15. 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) $r(1+\sqrt{3})$

Capacitance · JEE Main 2019 · Shift-II View Solution on Crucible ↗

16. A parallel plate capacitor has $1\,\mu F$ capacitance. One of its two plates is given $+2\,\mu C$ charge and the other plate, $+4\,\mu C$ charge. The potential difference developed across the capacitor is:

(A) $1\,\text{V}$
(B) $2\,\text{V}$
(C) $3\,\text{V}$
(D) $5\,\text{V}$

Coulomb's Law · JEE Main 2023 · Shift-II View Solution on Crucible ↗

17. A $10\,\mu C$ 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) $7\,\mu C,\ 3\,\mu C$
(B) $8\,\mu C,\ 2\,\mu C$
(C) $5\,\mu C,\ 5\,\mu C$
(D) $9\,\mu C,\ 1\,\mu C$

Induced charge on dielectric · JEE Main 2021 · Shift-II View Solution on Crucible ↗

18. If q_f is the free charge on the capacitor plates and q_b is the bound charge on the dielectric slab of dielectric constant k placed between the capacitor plates, then bound charge q_b can be expressed as:

(A) $q_b = q_f\left(1 - \frac{1}{\sqrt{k}}\right)$
(B) $q_b = q_f\left(1 - \frac{1}{k}\right)$
(C) $q_b = q_f\left(1 + \frac{1}{\sqrt{k}}\right)$
(D) $q_b = q_f\left(1 + \frac{1}{k}\right)$

Applications of gauss theorem · JEE Main 2024 · Shift-II View Solution on Crucible ↗

19. 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 the 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) $T = \frac{1}{2\pi}\sqrt{\frac{2k\lambda q}{m}}$

Energy stored in capacitor · JEE Main 2024 · Shift-I View Solution on Crucible ↗

20. A capacitor of capacitance $100\,\mu F$ is charged to a potential of $12\,\text{V}$ and connected to a $6.4\,\text{mH}$ inductor to produce oscillations. The maximum current in the circuit would be:

(A) $3.2\,\text{A}$
(B) $1.5\,\text{A}$
(C) $2.0\,\text{A}$
(D) $1.2\,\text{A}$

Gauss theorem · JEE Main 2024 · Shift-II View Solution on Crucible ↗

21. 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) $\frac{q}{4\epsilon_0}$

Force on plates of capacitor · JEE Main 2019 · Shift-I View Solution on Crucible ↗

22. A capacitor with capacitance $5\,\mu F$ is charged to $5\,\mu C$. If the plates are pulled apart to reduce the capacitance to $2\,\mu F$, how much work is done?

(A) $6.25 \times 10^{-6}\,\text{J}$
(B) $2.55 \times 10^{-6}\,\text{J}$
(C) $2.16 \times 10^{-6}\,\text{J}$
(D) $3.75 \times 10^{-6}\,\text{J}$

Electric flux · JEE Main 2024 · Shift-II View Solution on Crucible ↗

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

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

Types of Capacitors · JEE Main 2022 · Shift-II View Solution on Crucible ↗

24. Capacitance of an isolated conducting sphere of radius R_1 becomes n times when it is enclosed by a concentric conducting sphere of radius R_2 connected to earth. The ratio of their radii $\frac{R_2}{R_1}$ is:

(A) $\frac{n}{n-1}$
(B) $\frac{2n}{2n+1}$
(C) $\frac{n+1}{n}$
(D) $\frac{2n+1}{n}$

Applications of gauss theorem · JEE Main 2022 · Shift-II View Solution on Crucible ↗

25. 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) $\frac{4\varepsilon_0 R^2}{q\rho}$

Energy density of electric field · JEE Main 2025 · Shift-II View Solution on Crucible ↗

26. A parallel plate capacitor of capacitance $1\,\mu F$ is charged to a potential difference of $20\,\mathrm{V}$. The distance between plates is $1\,\mu\mathrm{m}$. The energy density between plates of capacitor is:

(A) $2\times10^{-4}\,\mathrm{J/m^3}$ **(B)** $1.8\times10^{5}\,\mathrm{J/m^3}$

(C) $1.8\times10^{3}\,\mathrm{J/m^3}$ **(D)** $2\times10^{2}\,\mathrm{J/m^3}$

Torque and work done due to rotation of Dipole · JEE Main 2025 · Shift-I View Solution on Crucible ↗

27. 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)** $2\pi\sqrt{\frac{ml}{2qE_0}}$

Single dielectric slab in capacitor · JEE Main PYQ View Solution on Crucible ↗

28. In a parallel-plate capacitor, the region between the plates is filled by a dielectric slab. The capacitor is connected to a cell and the slab is taken out.

(A) Some charge is drawn from the cell. **(B)** Some charge is returned to the cell.

(C) The potential difference across the capacitor is reduced. **(D)** No work is done by an external agent in taking the slab out.

Equipotential Surfaces · JEE Main 2025 · Shift-I View Solution on Crucible ↗

29. 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) $xyz=\text{constant}$ **(B)** $xy+yz+zx=\text{constant}$

(C) $(x^2+y^2)(y^2+z^2)(z^2+x^2)=\text{constant}$ **(D)** $(x+y)(y+z)(z+x)=\text{constant}$

Discharging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

30. The charge on a capacitor decreases η times in time t, when it discharges through a circuit with a time constant τ.

(A) $t=\eta\tau$ **(B)** $t=\tau\ln\eta$

(C) $t=\tau(\ln\eta-1)$ **(D)** $t=\tau\ln\left(1-\frac{1}{\eta}\right)$

Potential Energy for system of charges · JEE Main 2026 · Shift-I View Solution on Crucible ↗

31. 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. ($\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ in SI units)

(A) 45×10^{-6}
(B) 0
(C) 30×10^{-6}
(D) 15×10^{-6}

Capacitance · JEE Main PYQ View Solution on Crucible ↗

32. If we treat the earth as a conducting sphere of radius 6400 km, its capacitance would be of the order of

(A) $1\ \mu\text{F}$
(B) $1\ \text{mF}$
(C) $1\ \text{F}$
(D) $10^3\ \text{F}$

Relation between electric field and potential · JEE Main 2026 · Shift-I View Solution on Crucible ↗

33. Electric field in a region is given by $\vec{E} = Ax\hat{i} + By\hat{j}$, where $A = 10\ \text{V/m}^2$ and $B = 5\ \text{V/m}^2$. 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

Charging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

34. A capacitor is connected to a cell of emf $\mathcal{E}$ and some internal resistance. The potential difference across the

(A) cell is $\mathcal{E}$
(B) cell is $< \mathcal{E}$
(C) capacitor is $< \mathcal{E}$
(D) capacitor is $> \mathcal{E}$

Electric potential due to point charge · JEE Main 2026 · Shift-II View Solution on Crucible ↗

35. 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) $1 : 3^{1/3}$
(B) $1 : 2^{2/3}$
(C) $3^{2/3} : 1$
(D) $1 : 3^{2/3}$

Discharging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

36. In the previous question, after how many time constants will the potential difference across the capacitor fall to 10% of its initial value?

(A) 2
(B) 2.303
(C) $\frac{1}{0.693}$
(D) $\frac{1}{0.37}$

Properties of Electric Dipole · JEE Main 2026 · Shift-I View Solution on Crucible ↗

37. 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___

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

Discharging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

38. In the previous question, if the switch is opened after the capacitor has been charged, it will discharge with a time constant

(A) RC
(B) $2RC$
(C) $\frac{1}{2}RC$
(D) $RC\ln 2$

Electric potential due to point charge · JEE Main 2026 · Shift-II View Solution on Crucible ↗

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

(A) Potential difference
(B) Resistance
(C) Absolute potential at a point
(D) Displacement current

Energy density of electric field · JEE Main PYQ View Solution on Crucible ↗

40. Let u_a and u_d represent the energy density (energy per unit volume) in air and in a dielectric respectively, for the same field in both. Let K = dielectric constant. Then,

(A) $u_a = u_d$
(B) $u_a = Ku_d$
(C) $u_d = Ku_a$
(D) $u_a = (K-1)u_d$

Gauss theorem · JEE Main 2026 · Shift-II View Solution on Crucible ↗

41. Two point charges $8\mu C$ and $-2\mu C$ 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

Charging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

42. In the previous question, after how many time constants will the charge on the capacitor be 10% less than its final charge?

(A) 2
(B) 2.303
(C) $\frac{1}{0.693}$
(D) $\frac{1}{0.37}$

Relation between electric field and potential · JEE Main 2026 · Shift-II View Solution on Crucible ↗

43. 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) $(-20\hat{i} + 30\hat{j})$
(B) $(20\hat{i} - 30\hat{j})$
(C) $(20\hat{i} + 45\hat{j})$
(D) $(-4\hat{i} + 6\hat{j})$

Discharging of Capacitors · JEE Main PYQ View Solution on Crucible ↗

44. Two identical capacitors A and B are charged to the same potential and then made to discharge through resistances R_A and R_B respectively, with $R_A > R_B$.

(A) A will require greater time than B to discharge completely.
(B) More heat will be produced in A than in B.
(C) More heat will be produced in B than in A.
(D) All the above options are incorrect.

Electric potential due to point charge · JEE Main 2023 · Shift-II View Solution on Crucible ↗

45. 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: $\left(\text{Assume, } \frac{1}{4\pi\epsilon_0} = 9 \times 10^9\,\mathrm{N\,m^2\,C^{-2}}\right)$

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

Capacitance · JEE Main PYQ View Solution on Crucible ↗

46. A capacitor of capacitance C is charged to a potential difference V from a cell and then disconnected from it. A charge $+Q$ is now given to its positive plate. The potential difference across the capacitor is now

(A) V
(B) $V + \frac{Q}{C}$
(C) $V + \frac{Q}{2C}$
(D) $V - \frac{Q}{C}$, if $V < CV$

Types of Equilibrium for a system of charges · JEE Main 2019 · Shift-I View Solution on Crucible ↗

47. 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) $+\frac{Q}{2}$
(B) $+\frac{Q}{4}$
(C) $-\frac{Q}{4}$
(D) $-\frac{Q}{2}$

Energy stored in capacitor · JEE Main PYQ View Solution on Crucible ↗

48. A capacitor of capacitance C has charge Q. It is connected to an identical capacitor through a resistance. The heat produced in the resistance is

(A) $\frac{Q^2}{2C}$
(B) $\frac{Q^2}{4C}$
(C) $\frac{Q^2}{8C}$
(D) dependent on the value of the resistance

Charged Particle in electric field · JEE Main 2022 · Shift-I View Solution on Crucible ↗

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

(A) $1.6 \times 10^{-9}\ \mathrm{C}$
(B) $2.0 \times 10^{-9}\ \mathrm{C}$
(C) $3.2 \times 10^{-9}\ \mathrm{C}$
(D) $0.5 \times 10^{-9}\ \mathrm{C}$

Capacitance · JEE Main PYQ View Solution on Crucible ↗

50. When two uncharged metal balls of radius 0.09 mm each collide, one electron is transferred between them. The potential difference between them would be

(A) $16\ \mu\mathrm{V}$
(B) $16\ \mathrm{pV}$
(C) $32\ \mu\mathrm{V}$
(D) $32\ \mathrm{pV}$

Answer Key (Q1 to Q50)

Click any question number below to open its exact step-by-step solution on The Crucible ↗

1: (B)	2: (A)	3: (B)	4: (B)	5: (B)	6: (A)	7: (B)	8: (B)	9: (B)	10: (C)
11: (A)	12: (A)	13: (B)	14: (A)	15: (C)	16: (A)	17: (C)	18: (B)	19: (B)	20: (B)
21: (A)	22: (D)	23: (C)	24: (A)	25: (A)	26: (C)	27: (D)	28: (B)	29: (C)	30: (B)
31: (C)	32: (B)	33: (C)	34: (A)	35: (D)	36: (B)	37: (C)	38: (B)	39: (C)	40: (C)
41: (C)	42: (B)	43: (A)	44: (D)	45: (D)	46: (C)	47: (C)	48: (B)	49: (B)	50: (C)

Sample Solution — Question 4 (Correct Option: B)

Open Full Solution on Crucible ↗

Q4. Two equal capacitors are first connected in series and then in parallel. The ratio of the equivalent capacities in the two cases will be:

Ten seconds. Two equal capacitors C:

• *Series:**

$C_s = \frac{C \cdot C}{C+C} = \frac{C}{2}$

• *Parallel:**

$C_p = C + C = 2C$

• *Ratio:**

$\frac{C_s}{C_p} = \frac{C/2}{2C} = \frac{1}{4}$

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