

PHYSICS · JEE MAIN

Electrostatics II — Potential & Capacitance

Chapter-wise previous year questions, with answer key

69

PYQS

2020–2025

PAPERS

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TOPICS

Energy Stored in Capacitor

Dielectrics

Capacitors

Electric Potential and Potential Energy

Combination of Capacitors

Equipotential Surfaces

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Energy Stored in Capacitor · 14 PYQs

Q1 JEE Main 2025 · 28 Jan · Shift 2

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

- (A) $1.8 \times 10^3\ \text{J/m}^3$
- (B) $2 \times 10^2\ \text{J/m}^3$
- (C) $2 \times 10^{-4}\ \text{J/m}^3$
- (D) $1.8 \times 10^5\ \text{J/m}^3$

Step-by-step solution ► [prepwiser.in/questions/3Vi9ARlxVU](https://www.prepwiser.in/questions/3Vi9ARlxVU)

Q2 JEE Main 2025 · 24 Jan · Shift 1

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) $\epsilon_0 E^2 A d$
- (B) $\frac{3}{4} \epsilon_0 E^2 A d$
- (C) $\frac{1}{4} \epsilon_0 E^2 A d$
- (D) $\frac{1}{2} \epsilon_0 E^2 A d$

Step-by-step solution ► [prepwiser.in/questions/N55u_vCY8b](https://www.prepwiser.in/questions/N55u_vCY8b)

Q3 JEE Main 2024 · 4 Apr · Shift 2

A parallel plate capacitor of capacitance 12.5pF is charged by a battery connected between its plates to potential difference of 12.0V . The battery is now disconnected and a dielectric slab ($\epsilon_r = 6$) is inserted between the plates. The change in its potential energy after inserting the dielectric slab is _____ $\times 10^{-12}\text{J}$.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/iHben6H1FQ](https://www.prepwiser.in/questions/iHben6H1FQ)

Q4 JEE Main 2024 · 1 Feb · Shift 1

Two identical capacitors have same capacitance C . One of them is charged to the potential V and other to the potential $2V$. The negative ends of both are connected together. When the positive ends are also joined together, the decrease in energy of the combined system is :

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

Step-by-step solution ► [prepwiser.in/questions/TCStjvPO2F](https://www.prepwiser.in/questions/TCStjvPO2F)

Q5 JEE Main 2024 · 30 Jan · Shift 1

A capacitor of capacitance C and potential V has energy E . It is connected to another capacitor of capacitance $2C$ and potential $2V$. Then the loss of energy is $\frac{x}{3} E$, where x is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/Uf9sXU21JX](https://www.prepwiser.in/questions/Uf9sXU21JX)

Q6 JEE Main 2023 · 11 Apr · Shift 1

A parallel plate capacitor of capacitance $2F$ is charged to a potential V , The energy stored in the capacitor is E_1 . The capacitor is now connected to another uncharged identical capacitor in parallel combination. The energy stored in the combination is E_2 . The ratio E_2/E_1 is :

- (A) 1 : 2 (B) 2 : 3
(C) 2 : 1 (D) 1 : 4

[Step-by-step solution ► prepwiser.in/questions/jRfVlJDqX_](https://www.prepwiser.in/questions/jRfVlJDqX_)

Q7 JEE Main 2023 · 8 Apr · Shift 2

A $600pF$ capacitor is charged by $200V$ supply. It is then disconnected from the supply and is connected to another uncharged $600pF$ capacitor. Electrostatic energy lost in the process is _____ μJ

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/9kgZ6ecsE7](https://www.prepwiser.in/questions/9kgZ6ecsE7)

Q8 JEE Main 2023 · 30 Jan · Shift 1

A capacitor of capacitance $900\mu F$ is charged by a $100V$ battery. The capacitor is disconnected from the battery and connected to another uncharged identical capacitor such that one plate of uncharged capacitor connected to positive plate and another plate of uncharged capacitor connected to negative plate of the charged capacitor. The loss of energy in this process is measured as $x \times 10^{-2}J$. The value of x is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4jy3JpYhgN](https://www.prepwiser.in/questions/4jy3JpYhgN)

Q9 JEE Main 2022 · 29 Jun · Shift 2

A capacitor is discharging through a resistor R . Consider in time t_1 , the energy stored in the capacitor reduces to half of its initial value and in time t_2 , the charge stored reduces to one eighth of its initial value. The ratio t_1/t_2 will be

- (A) $1/2$ (B) $1/3$
(C) $1/4$ (D) $1/6$

[Step-by-step solution ► prepwiser.in/questions/vp5pM7FU5q](https://www.prepwiser.in/questions/vp5pM7FU5q)

Q10 JEE Main 2022 · 27 Jun · Shift 1

A capacitor of capacitance $50 pF$ is charged by $100 V$ source. It is then connected to another uncharged identical capacitor. Electrostatic energy loss in the process is _____ nJ .

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/BIdAw5G1wX](https://www.prepwiser.in/questions/BIdAw5G1wX)

Q11 JEE Main 2022 · 24 Jun · Shift 2

If the charge on a capacitor is increased by $2 C$, 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

[Step-by-step solution ► prepwiser.in/questions/s6mC2NHVd5](https://www.prepwiser.in/questions/s6mC2NHVd5)

Q12 JEE Main 2020 · 5 Sep · Shift 1

Two capacitors of capacitances C and $2C$ are charged to potential differences V and $2V$, respectively. These are then connected in parallel in such a manner that the positive terminal of one is connected to the negative terminal of the other. The final energy of this configuration is :

- (A) Zero (B) $\frac{3}{2}CV^2$
 (C) $\frac{9}{2}CV^2$ (D) $\frac{25}{6}CV^2$

Step-by-step solution ► [prepwiser.in/questions/vFA-LOY7yv](https://www.prepwiser.in/questions/vFA-LOY7yv)

Q13 JEE Main 2020 · 4 Sep · Shift 2

A capacitor C is fully charged with voltage V_0 . After disconnecting the voltage source, it is connected in parallel with another uncharged capacitor of capacitance $\frac{C}{2}$. The energy loss in the process after the charge is distributed between the two capacitors is :

- (A) $\frac{1}{2}CV_0^2$ (B) $\frac{1}{4}CV_0^2$
 (C) $\frac{1}{3}CV_0^2$ (D) $\frac{1}{6}CV_0^2$

Step-by-step solution ► [prepwiser.in/questions/IkH25fD1vV](https://www.prepwiser.in/questions/IkH25fD1vV)

Q14 JEE Main 2020 · 2 Sep · Shift 1

A $5\ \mu\text{F}$ capacitor is charged fully by a $220\ \text{V}$ supply. It is then disconnected from the supply and is connected in series to another uncharged $2.5\ \mu\text{F}$ capacitor. If the energy change during the charge redistribution is $\frac{X}{100}\text{J}$ then value of X to the nearest integer is ____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/Eg03kY0Lim](https://www.prepwiser.in/questions/Eg03kY0Lim)

Dielectrics · 15 PYQs

Q15 JEE Main 2025 · 7 Apr · Shift 2

A parallel plate capacitor has charge $5 \times 10^{-6}\text{C}$. A dielectric slab is inserted between the plates and almost fills the space between the plates. If the induced charge on one face of the slab is $4 \times 10^{-6}\text{C}$ then the dielectric constant of the slab is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/tTAebnNCWh](https://www.prepwiser.in/questions/tTAebnNCWh)

Q16 JEE Main 2025 · 2 Apr · Shift 2

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

Assertion (A) : Net dipole moment of a polar linear isotropic dielectric substance is not zero even in the absence of an external electric field.

Reason (R) : In absence of an external electric field, the different permanent dipoles of a polar dielectric substance are oriented in random directions.

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

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

Step-by-step solution ► [prepwiser.in/questions/eMyWoofjFg](https://www.prepwiser.in/questions/eMyWoofjFg)

Q17 JEE Main 2025 · 22 Jan · Shift 1

A parallel-plate capacitor of capacitance $40\mu\text{F}$ is connected to a 100 V power supply. Now the intermediate space between the plates is filled with a dielectric material of dielectric constant $K = 2$. Due to the introduction of dielectric material, the extra charge and the change in the electrostatic energy in the capacitor, respectively, are

- (A) 8 mC and 2.0 J (B) 4 mC and 0.2 J
(C) 2 mC and 0.2 J (D) 2 mC and 0.4 J

Step-by-step solution ► [prepwisar.in/questions/eeWyMx--cV](https://www.prepwisar.in/questions/eeWyMx--cV)

Q18 JEE Main 2024 · 31 Jan · Shift 1

A parallel plate capacitor with plate separation 5 mm is charged up by a battery. It is found that on introducing a dielectric sheet of thickness 2 mm , while keeping the battery connections intact, the capacitor draws 25% more charge from the battery than before. The dielectric constant of the sheet is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/M90yKmeHxO](https://www.prepwisar.in/questions/M90yKmeHxO)

Q19 JEE Main 2023 · 25 Jan · Shift 2

A capacitor has capacitance $5\mu\text{F}$ when its parallel plates are separated by air medium of thickness d . A slab of material of dielectric constant 1.5 having area equal to that of plates but thickness $\frac{d}{2}$ is inserted between the plates. Capacitance of the capacitor in the presence of slab will be _____ μF .

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/8M5JR5gcai](https://www.prepwisar.in/questions/8M5JR5gcai)

Q20 JEE Main 2023 · 24 Jan · Shift 2

A parallel plate capacitor with air between the plate has a capacitance of 15 pF . The separation between the plate becomes twice and the space between them is filled with a medium of dielectric constant 3.5 . Then the capacitance becomes $\frac{x}{4}\text{ pF}$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/_Fg8hDow2e](https://www.prepwisar.in/questions/_Fg8hDow2e)

Q21 JEE Main 2022 · 28 Jul · Shift 2

A slab of dielectric constant K has the same cross-sectional area as the plates of a parallel plate capacitor and thickness $\frac{3}{4}d$, where d is the separation of the plates. The capacitance of the capacitor when the slab is inserted between the plates will be :

(Given C_0 = capacitance of capacitor with air as medium between plates.)

- (A) $\frac{4KC_0}{3+K}$ (B) $\frac{3KC_0}{3+K}$
(C) $\frac{3+K}{4KC_0}$ (D) $\frac{K}{4+K}$

Step-by-step solution ► [prepwisar.in/questions/ZoihbysKku](https://www.prepwisar.in/questions/ZoihbysKku)

Q22 JEE Main 2022 · 28 Jul · Shift 1

Two capacitors, each having capacitance $40\ \mu\text{F}$ are connected in series. The space between one of the capacitors is filled with dielectric material of dielectric constant K such that the equivalence capacitance of the system became $24\ \mu\text{F}$. The value of K will be :

- (A) 1.5 (B) 2.5
(C) 1.2 (D) 3

[Step-by-step solution ► prepwiser.in/questions/mu0MD7BfEe](https://www.prepwiser.in/questions/mu0MD7BfEe)

Q23 JEE Main 2022 · 27 Jul · Shift 2

A parallel plate capacitor with width 4cm , length 8cm and separation between the plates of 4mm is connected to a battery of 20V . A dielectric slab of dielectric constant 5 having length 1cm , width 4cm and thickness 4mm is inserted between the plates of parallel plate capacitor. The electrostatic energy of this system will be _____ $\epsilon_0\text{ J}$. (Where ϵ_0 is the permittivity of free space)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/gG_T93d9qS](https://www.prepwiser.in/questions/gG_T93d9qS)

Q24 JEE Main 2022 · 29 Jun · Shift 1

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%

[Step-by-step solution ► prepwiser.in/questions/ik_XWNTy4v](https://www.prepwiser.in/questions/ik_XWNTy4v)

Q25 JEE Main 2022 · 26 Jun · Shift 1

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

Assertion (A) : Non-polar materials do not have any permanent dipole moment.

Reason (R) : When a non-polar material is placed in an electric field, the centre of the positive charge distribution of its individual atom or molecule coincides with the centre of the negative charge distribution.

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

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

[Step-by-step solution ► prepwiser.in/questions/6GLs8l5W-o](https://www.prepwiser.in/questions/6GLs8l5W-o)

Q26 JEE Main 2022 · 24 Jun · Shift 1

A parallel plate capacitor is formed by two plates each of area $30\pi \text{ cm}^2$ separated by 1 mm. A material of dielectric strength $3.6 \times 10^7 \text{ Vm}^{-1}$ is filled between the plates. If the maximum charge that can be stored on the capacitor without causing any dielectric breakdown is $7 \times 10^{-6} \text{ C}$, the value of dielectric constant of the material is :

[Use $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$]

- (A) 1.66 (B) 1.75
(C) 2.25 (D) 2.33

[Step-by-step solution ► prepwiser.in/questions/TNxO5m8Cyj](https://www.prepwiser.in/questions/TNxO5m8Cyj)

Q27 JEE Main 2021 · 31 Aug · Shift 2

A parallel plate capacitor of capacitance $200 \mu\text{F}$ is connected to a battery of 200 V. A dielectric slab of dielectric constant 2 is now inserted into the space between plates of capacitor while the battery remain connected. The change in the electrostatic energy in the capacitor will be _____J.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/HKRX-M4pag](https://www.prepwiser.in/questions/HKRX-M4pag)

Q28 JEE Main 2021 · 26 Aug · Shift 1

The material filled between the plates of a parallel plate capacitor has resistivity $200 \Omega\text{m}$. The value of capacitance of the capacitor is 2 pF. If a potential difference of 40 V is applied across the plates of the capacitor, then the value of leakage current flowing out of the capacitor is : (given the value of relative permittivity of material is 50)

- (A) $9.0 \mu\text{A}$ (B) 9.0 mA
(C) 0.9 mA (D) $0.9 \mu\text{A}$

[Step-by-step solution ► prepwiser.in/questions/JH8TeSgJGQ](https://www.prepwiser.in/questions/JH8TeSgJGQ)

Q29 JEE Main 2021 · 17 Mar · Shift 1

A parallel plate capacitor whose capacitance C is 14 pF is charged by a battery to a potential difference $V = 12 \text{ V}$ between its plates. The charging battery is now disconnected and a porcelain plate with $k = 7$ is inserted between the plates, then the plate would oscillate back and forth between the plates with a constant mechanical energy of _____ pJ. (Assume no friction)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/SPJoL-eoUz](https://www.prepwiser.in/questions/SPJoL-eoUz)

Capacitors · 11 PYQs

Q30 JEE Main 2025 · 29 Jan · Shift 2

A parallel plate capacitor consisting of two circular plates of radius 10 cm is being charged by a constant current of 0.15 A . If the rate of change of potential difference between the plates is $7 \times 10^8 \text{ V/s}$ then the integer value of the distance between the parallel plates is

(Take, $\epsilon_0 = 9 \times 10^{-12} \frac{\text{F}}{\text{m}}$, $\pi = \frac{22}{7}$) _____ μm .

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/0rUTDwjni7](https://www.prepwiser.in/questions/0rUTDwjni7)

Q31 JEE Main 2025 · 24 Jan · Shift 1

A parallel plate capacitor was made with two rectangular plates, each with a length of $l = 3\text{cm}$ and breadth of $b = 1\text{cm}$. The distance between the plates is $3\mu\text{m}$. Out of the following, which are the ways to increase the capacitance by a factor of 10 ?

A. $l = 30\text{cm}$, $b = 1\text{cm}$, $d = 1\mu\text{m}$

B. $l = 3\text{cm}$, $b = 1\text{cm}$, $d = 30\mu\text{m}$

C. $l = 6\text{cm}$, $b = 5\text{cm}$, $d = 3\mu\text{m}$

D. $l = 1\text{cm}$, $b = 1\text{cm}$, $d = 10\mu\text{m}$

E. $l = 5\text{cm}$, $b = 2\text{cm}$, $d = 1\mu\text{m}$

Choose the correct answer from the options given below:

(A) C only

(B) A only

(C) B and D only

(D) C and E only

[Step-by-step solution ► prepwisser.in/questions/XQRA5dC-Co](https://www.prepwisser.in/questions/XQRA5dC-Co)

Q32 JEE Main 2023 · 10 Apr · Shift 2

The distance between two plates of a capacitor is d and its capacitance is C_1 , when air is the medium between the plates. If a metal sheet of thickness $\frac{2d}{3}$ and of the same area as plate is introduced between the plates, the capacitance of the capacitor becomes C_2 . The ratio $\frac{C_2}{C_1}$ is

(A) 1 : 1

(B) 3 : 1

(C) 2 : 1

(D) 4 : 1

[Step-by-step solution ► prepwisser.in/questions/yvvsEdrDkt](https://www.prepwisser.in/questions/yvvsEdrDkt)

Q33 JEE Main 2023 · 1 Feb · Shift 2

Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.

Assertion A : Two metallic spheres are charged to the same potential. One of them is hollow and another is solid, and both have the same radii. Solid sphere will have lower charge than the hollow one.

Reason R : Capacitance of metallic spheres depend on the radii of spheres

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

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

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

(C) A is false but R is true

(D) A is true but R is false

[Step-by-step solution ► prepwisser.in/questions/D1ZIWJUqXI](https://www.prepwisser.in/questions/D1ZIWJUqXI)

Q34 JEE Main 2023 · 31 Jan · Shift 2

Two parallel plate capacitors C_1 and C_2 each having capacitance of $10\mu\text{F}$ are individually charged by a 100 V D.C. source. Capacitor C_1 is kept connected to the source and a dielectric slab is inserted between its plates. Capacitor C_2 is disconnected from the source and then a dielectric slab is inserted in it. Afterwards the capacitor C_1 is also disconnected from the source and the two capacitors are finally connected in parallel combination. The common potential of the combination will be _____ V.

(Assuming Dielectric constant = 10)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/sn8c2kZwFH](https://www.prepwisser.in/questions/sn8c2kZwFH)

Q35 JEE Main 2022 · 25 Jul · Shift 2

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 $\left(\frac{R_2}{R_1}\right)$ is :

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

[Step-by-step solution ► prepwisser.in/questions/FwlpKGFJaF](https://www.prepwisser.in/questions/FwlpKGFJaF)

Q36 JEE Main 2022 · 25 Jul · Shift 1

A condenser of $2\ \mu\text{F}$ capacitance is charged steadily from 0 to 5 C. Which of the following graph represents correctly the variation of potential difference (V) across it's plates with respect to the charge (Q) on the condenser?

- (A)
(B)
(C)
(D)

[Step-by-step solution ► prepwisser.in/questions/zVBejiHeNw](https://www.prepwisser.in/questions/zVBejiHeNw)

Q37 JEE Main 2022 · 27 Jun · Shift 1

A force of 10 N acts on a charged particle placed between two plates of a charged capacitor. If one plate of capacitor is removed, then the force acting on that particle will be.

- (A) 5 N (B) 10 N
(C) 20 N (D) Zero

[Step-by-step solution ► prepwisser.in/questions/7rbYc3Bm7p](https://www.prepwisser.in/questions/7rbYc3Bm7p)

Q38 JEE Main 2022 · 25 Jun · Shift 2

Two metallic plates form a parallel plate capacitor. The distance between the plates is 'd'. A metal sheet of thickness $\frac{d}{2}$ and of area equal to area of each plate is introduced between the plates. What will be the ratio of the new capacitance to the original capacitance of the capacitor?

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

[Step-by-step solution ► prepwisser.in/questions/b4GNRRLdXi](https://www.prepwisser.in/questions/b4GNRRLdXi)

Q39 JEE Main 2021 · 1 Sep · Shift 2

A capacitor is connected to a 20 V battery through a resistance of $10\ \Omega$. It is found that the potential difference across the capacitor rises to 2 V in $1\ \mu\text{s}$. The capacitance of the capacitor is _____ μF . Given $\ln\left(\frac{10}{9}\right) = 0.105$

- (A) 9.52 (B) 0.95
(C) 0.105 (D) 1.85

[Step-by-step solution ► prepwisser.in/questions/WFU1B03JFE](https://www.prepwisser.in/questions/WFU1B03JFE)

Q40 JEE Main 2020 · 2 Sep · Shift 2

A $10\ \mu\text{F}$ capacitor is fully charged to a potential difference of 50 V. After removing the source voltage it is connected to an uncharged capacitor in parallel. Now the potential difference across them becomes 20 V. The capacitance of the second capacitor is :

- (A) $20\ \mu\text{F}$ (B) $15\ \mu\text{F}$
(C) $10\ \mu\text{F}$ (D) $30\ \mu\text{F}$

[Step-by-step solution ► prepwiser.in/questions/c4ADRvo30h](https://www.prepwiser.in/questions/c4ADRvo30h)

Electric Potential and Potential Energy · 23 PYQs

Q41 JEE Main 2025 · 8 Apr · Shift 2

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

[Step-by-step solution ► prepwiser.in/questions/f49z0iijgk](https://www.prepwiser.in/questions/f49z0iijgk)

Q42 JEE Main 2025 · 8 Apr · Shift 2

Two metal spheres of radius **R** and **3R** 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) $\frac{1}{3}$
(B) $\frac{1}{9}$
(C) 9
(D) 3

[Step-by-step solution ► prepwiser.in/questions/li4qkKPbpY](https://www.prepwiser.in/questions/li4qkKPbpY)

Q43 JEE Main 2025 · 3 Apr · Shift 1

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

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

[Step-by-step solution ► prepwiser.in/questions/cSu6_WZD1Z](https://www.prepwiser.in/questions/cSu6_WZD1Z)

Q44 JEE Main 2025 · 28 Jan · Shift 2

An electric dipole of dipole moment $6 \times 10^{-6} \text{Cm}$ is placed in uniform electric field of magnitude 10^6V/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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/qtRv_ucDUM](https://www.prepwiser.in/questions/qtRv_ucDUM)

Q45 JEE Main 2025 · 23 Jan · Shift 2

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

(A) -2.0 J (B) -1.5 J

(C) -1.2 J (D) -1.8 J

[Step-by-step solution ► prepwiser.in/questions/Es64oFs7jf](https://www.prepwiser.in/questions/Es64oFs7jf)

Q46 JEE Main 2025 · 23 Jan · Shift 2

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

(A) 18.4 mJ (B) 12.4 mJ

(C) 16.4 mJ (D) 14.4 mJ

[Step-by-step solution ► prepwiser.in/questions/7GADitbhM8](https://www.prepwiser.in/questions/7GADitbhM8)

Q47 JEE Main 2024 · 9 Apr · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/nwfpSCAHCH](https://www.prepwiser.in/questions/nwfpSCAHCH)

Q48 JEE Main 2024 · 8 Apr · Shift 1

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) ab (B) $\frac{b}{a}$

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

[Step-by-step solution ► prepwiser.in/questions/BaWH79E7Kd](https://www.prepwiser.in/questions/BaWH79E7Kd)

Q49 JEE Main 2024 · 30 Jan · Shift 1

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

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

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

[Step-by-step solution ► prepwiser.in/questions/o06BSfgzon](https://www.prepwiser.in/questions/o06BSfgzon)

Q50 JEE Main 2024 · 27 Jan · Shift 1

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

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

[Step-by-step solution ► prepwiser.in/questions/PKgSng3vil](https://www.prepwiser.in/questions/PKgSng3vil)

Q51 JEE Main 2024 · 27 Jan · Shift 2

The electric potential at the surface of an atomic nucleus ($z = 50$) of radius $9 \times 10^{-13}\text{cm}$ is _____ $\times 10^6\text{V}$.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/uHFMXQku3V](https://www.prepwiser.in/questions/uHFMXQku3V)

Q52 JEE Main 2023 · 12 Apr · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/gwBBDq_90h](https://www.prepwiser.in/questions/gwBBDq_90h)

Q53 JEE Main 2023 · 8 Apr · Shift 1

An electric dipole of dipole moment is $6.0 \times 10^{-6}\text{Cm}$ placed in a uniform electric field of $1.5 \times 10^3\text{NC}^{-1}$ 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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/NC-xepe_NG](https://www.prepwiser.in/questions/NC-xepe_NG)

Q54 JEE Main 2023 · 8 Apr · Shift 2

Electric potential at a point 'P' due to a point charge of $5 \times 10^{-9}\text{C}$ is 50V . The distance of 'P' from the point charge is:

(Assume,

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{Nm}^2\text{C}^{-2}$$

)

- (A) 0.9 cm (B) 90 cm
(C) 3 cm (D) 9 cm

[Step-by-step solution ► prepwiser.in/questions/IUseM28G6E](https://www.prepwiser.in/questions/IUseM28G6E)

Q55 JEE Main 2023 · 30 Jan · Shift 1

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) $\frac{5}{3}$ (B) $\frac{5}{6}$
(C) $\frac{9}{4}$ (D) $\frac{4}{3}$

Step-by-step solution ► [prepwisser.in/questions/JEgFrQsTk0](https://www.prepwisser.in/questions/JEgFrQsTk0)

Q56 JEE Main 2022 · 30 Jun · Shift 1

Eight similar drops of mercury are maintained at 12 V each. All these spherical drops combine into a single big drop. The potential energy of bigger drop will be _____ E. Where E is the potential energy of a single smaller drop.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/RBUFEHUog2](https://www.prepwisser.in/questions/RBUFEHUog2)

Q57 JEE Main 2022 · 29 Jun · Shift 2

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

Step-by-step solution ► [prepwisser.in/questions/UmW6rSq5fC](https://www.prepwisser.in/questions/UmW6rSq5fC)

Q58 JEE Main 2022 · 25 Jun · Shift 2

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

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/awB2mvvTiv](https://www.prepwisser.in/questions/awB2mvvTiv)

Q59 JEE Main 2021 · 26 Feb · Shift 2

27 similar drops of mercury are maintained at 10V 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 answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/7M5dZmjZSR](https://www.prepwisser.in/questions/7M5dZmjZSR)

Q60 JEE Main 2021 · 25 Feb · Shift 1

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

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/CcgCDsEYwi](https://www.prepwisser.in/questions/CcgCDsEYwi)

Q61 JEE Main 2020 · 4 Sep · Shift 2

A particle of charge q and mass m is subjected to an electric field

$E = E_0(1 - ax^2)$ 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) $\sqrt{\frac{1}{a}}$

Step-by-step solution ► [prepwisser.in/questions/bxOeAQqAMu](https://www.prepwisser.in/questions/bxOeAQqAMu)

Q62 JEE Main 2020 · 3 Sep · Shift 2

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

Step-by-step solution ► [prepwisser.in/questions/ssgg6Vees-z](https://www.prepwisser.in/questions/ssgg6Vees-z)

Q63 JEE Main 2020 · 8 Jan · Shift 2

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 $E_1/E_2 = R_1/R_2$. Then the ratio V_1 (on S_1) / V_2 (on S_2) of the electrostatic potentials on each sphere is :

- (A) $(R_1/R_2)^2$
(B) (R_2/R_1)
(C) $(R_1/R_2)^3$
(D) R_1/R_2

Step-by-step solution ► [prepwisser.in/questions/eVMbiYmPRE](https://www.prepwisser.in/questions/eVMbiYmPRE)

Combination of Capacitors · 5 PYQs

Q64 JEE Main 2024 · 5 Apr · Shift 1

Three capacitors of capacitances $25\mu\text{F}$, $30\mu\text{F}$ and $45\mu\text{F}$ are connected in parallel to a supply of 100V. Energy stored in the above combination is E . When these capacitors are connected in series to the same supply, the stored energy is $\frac{9}{x}E$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/9Haj9EggUd](https://www.prepwisser.in/questions/9Haj9EggUd)

Q65 JEE Main 2022 · 26 Jul · Shift 1

The total charge on the system of capacitors $C_1 = 1\mu\text{F}$, $C_2 = 2\mu\text{F}$, $C_3 = 4\mu\text{F}$ and $C_4 = 3\mu\text{F}$ connected in parallel is :

(Assume a battery of 20V is connected to the combination)

- (A) $200\mu\text{C}$ (B) 200 C
(C) $10\mu\text{C}$ (D) 10 C

Step-by-step solution ► [prepwisser.in/questions/NyDohVLT0W](https://www.prepwisser.in/questions/NyDohVLT0W)

Q66 JEE Main 2021 · 26 Feb · Shift 1

Consider the combination of 2 capacitors C_1 and C_2 with $C_2 > C_1$, when connected in parallel, the equivalent capacitance is $\frac{15}{4}$ times the equivalent capacitance of the same connected in series. Calculate the ratio of capacitors, $\frac{C_2}{C_1}$.

(A) $\frac{15}{11}$

(B) No Solutions

(C) $\frac{29}{15}$

(D) $\frac{15}{4}$

[Step-by-step solution ► prepwiser.in/questions/DSNKjmM-q1](https://www.prepwiser.in/questions/DSNKjmM-q1)

Q67 JEE Main 2021 · 24 Feb · Shift 1

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) 4 : 1

(B) 1 : 2

(C) 2 : 1

(D) 1 : 4

[Step-by-step solution ► prepwiser.in/questions/OBkQqL0EGQ](https://www.prepwiser.in/questions/OBkQqL0EGQ)

Q68 JEE Main 2020 · 8 Jan · Shift 1

Effective capacitance of parallel combination of two capacitors C_1 and C_2 is $10 \mu\text{F}$. When these capacitors are individually connected to a voltage source of 1V , the energy stored in the capacitor C_2 is 4 times that of C_1 . If these capacitors are connected in series, their effective capacitance will be :

(A) $4.2 \mu\text{F}$

(B) $8.4 \mu\text{F}$

(C) $1.6 \mu\text{F}$

(D) $3.2 \mu\text{F}$

[Step-by-step solution ► prepwiser.in/questions/3qN3AYSPPg](https://www.prepwiser.in/questions/3qN3AYSPPg)

Equipotential Surfaces · 1 PYQs

Q69 JEE Main 2024 · 27 Jan · Shift 2

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 and (R) is the correct explanation of (A)

(B) (A) is correct but (R) is not correct

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

(D) (A) is not correct but (R) is correct

[Step-by-step solution ► prepwiser.in/questions/B-vEcbPXQD](https://www.prepwiser.in/questions/B-vEcbPXQD)

Answer key — Electrostatics II — Potential & Capacitance

Numbers match the question numbers above. For full working, open the solution link under each question.

1	A	2	D	3	750	4	A	5	2	6	A	7	6	8	225
9	D	10	125	11	A	12	B	13	D	14	4	15	5	16	C
17	B	18	2	19	6	20	105	21	A	22	A	23	240	24	A
25	C	26	D	27	4	28	C	29	864	30	1320	31	D	32	B
33	C	34	55	35	A	36	A	37	A	38	A	39	B	40	B
41	B	42	D	43	B	44	12	45	D	46	D	47	36	48	C
49	C	50	C	51	8	52	160	53	18	54	B	55	B	56	32
57	D	58	198	59	243	60	128	61	C	62	A	63	A	64	86
65	A	66	B	67	D	68	C	69	A						

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