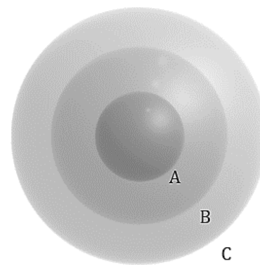
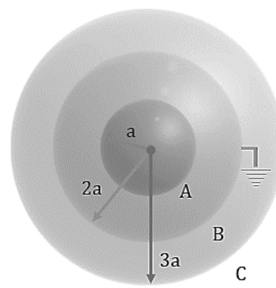
Q.1 Charges **Q**, **2Q** and **−Q** are given to three concentric conducting spherical shell **A**, **B** and **C** respectively as shown in figure. The ratio of charges on the inner and outer surfaces of shell **C** will be

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



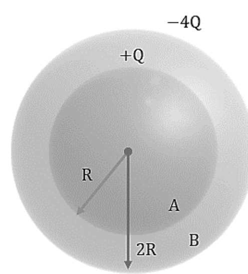
Q.2 Figure shows a system of three concentric metal shells **A**, **B** and **C** with radii **a**, **2a** and **3a** respectively. Shell **B** is earthed and shell **C** is given a charge **Q**. Now, if shell **C** is connected to shell **A**, then the final charge on the shell **B** is equal to

(A) $\frac{-4Q}{13}$ (B) $\frac{-8Q}{11}$ (C) $\frac{-5Q}{3}$ (D) $\frac{-3Q}{7}$



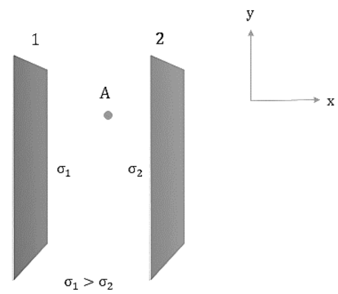
Q.3 Two concentric thin conducting spherical shells having radius **R** and **2R** are shown in figure. A charge **+Q** is given to shell **A** and **−4Q** is given to shell **B**. Now shell **A** and **B** are connected by a thin conducting wire, then the final charge on the sphere **B** will be:

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



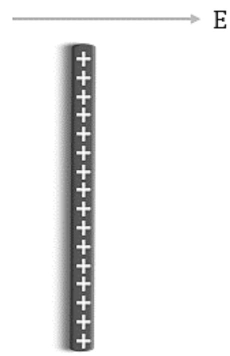
Q.4 Two large conducting sheets are kept parallel to each other as shown in the figure. In equilibrium, the charge density on facing surfaces is $\boldsymbol{\sigma_1}$ and $\boldsymbol{\sigma_2}$. What is the net value of electric field at **A** ?

(A) $\frac{\sigma_1}{\epsilon_0}\hat{i}$ (B) $-\frac{\sigma_2}{\epsilon_0}\hat{i}$ (C) $\frac{\sigma_1+\sigma_2}{2\epsilon_0}\hat{i}$ (D) $\frac{\sigma_1-\sigma_2}{2\epsilon_0}\hat{i}$

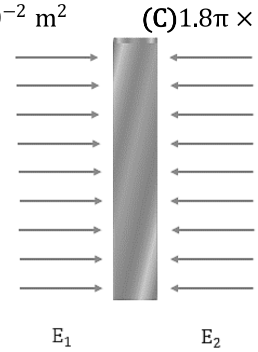


Q.5 An uncharged conducting large plate is placed as shown in the figure below. Now a uniform electric field **E** towards right is applied. Find the induced charge density on the right surface of the plate.

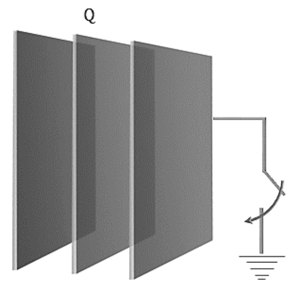
(A)$-\varepsilon_0 E$ **(B)**$\varepsilon_0 E$ **(C)**$-2\varepsilon_0 E$ **(D)**$2\varepsilon_0 E$



Q.6 A large charged conducting sheet is placed in a uniform electric field, perpendicularly to the electric field lines. After placing the sheet into the field, the electric field on the left side of the sheet is $\mathbf{E1 = 5 \times 105\ V/m}$ and on the right it is $3.6\pi \times 10^{-2}\ m^2$
$\mathbf{E2 = 3 \times 105\ V/m}$. The sheet experiences a net electric force of$\mathbf{0.08\ N}$. Find the area of one face of the sheet.
(Assume the external field to remain constant after introducing the large sheet)
$\left[\mathbf{k = \frac{1}{4\pi\varepsilon_0} = 9 \times 10^9\ Nm^2C^{-2}}\right]$ **v**
(A)$3.6\pi \times 10^{-2}\ m^2$ **(B)**$0.9\pi \times 10^{-2}\ m^2$ **(C)**$1.8\pi \times 10^{-2}\ m^2$ **(D)**None

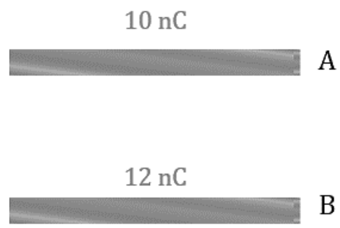


Q.7 Three identical large plates are placed parallel to each other at a very small separation as shown in the figure. The central plate is given a charge**Q**. What amount of charge will flow to earth when the key is closed. (The other two plates are initially neutral)
(A)$-$ Q **(B)**$+2$Q **(C)**$+$Q **(D)**-2Q



Q.8 Two conducting plates **A** and **B** are placed parallel to each other. **A** And **B** are given charges **10 nC** and **12 nC** respectively. Find the distribution of charge on the inner surface of plate**A**.

(A)-1nC **(B)**-2nC **(C)**-2nC **(D)**-3Nc



Q.9 Determine the current flowing (in **A**) through an element at time $\mathbf{t = 2\ sec}$, if the charge flow is given by $\mathbf{q} = (\mathbf{2t^2 + 3})$ C.

(A)1 **(B)**2 **(C)**4 **(D)**8

Q.10 The current through a wire depends on time as$\mathbf{I} = (\mathbf{2 + 3t})$ **A**. Calculate the charge crossed through a cross-section of the wire in **10 s**.

(A)170 C **(B)**70 C **(C)**150 C **(D)**20 C

Q.11 A conducting sphere **A** of radius **a**, with charge**Q**, is placed concentrically inside a conducting shell **B** of radius**b**. **B** is earthed and **C** is the common center of **A** and **B**. Study the following statements.

I. The potential at a distance **r** from**C**, where

$\mathbf{a \le r \le b}$, is $\frac{\mathbf{1}}{\mathbf{4\pi\epsilon_0}}\left(\frac{\mathbf{Q}}{\mathbf{r}}\right)$

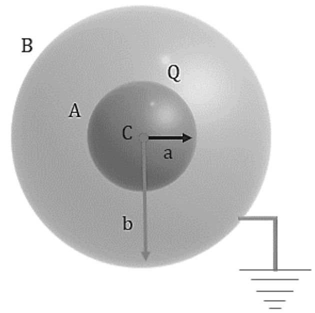
II. The potential difference between **A** and **B** is

$$\frac{\mathbf{Q}}{\mathbf{4\pi\epsilon_0}}\left(\frac{\mathbf{1}}{\mathbf{a}} - \frac{\mathbf{1}}{\mathbf{b}}\right)$$

III.The potential at a distance **r** from**C**, where

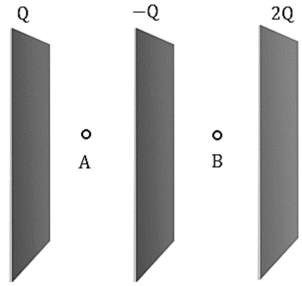
$\mathbf{a \le r \le b}$, is $\frac{\mathbf{Q}}{\mathbf{4\pi\epsilon_0}}\left(\frac{\mathbf{1}}{\mathbf{r}} - \frac{\mathbf{1}}{\mathbf{b}}\right)$

(A) Only (I) and (II) **(B)**Only (II) and (III) **(C)**Only (I) and (III) **(D)**All



Q.12 Three large identical conducting parallel plates carrying charge $+\mathbf{Q}$, $-\mathbf{Q}$ and $+\mathbf{2Q}$ respectively, are placed as shown in the figure. If $\mathbf{E_A}$, $\mathbf{E_B}$ and $\mathbf{E_C}$ refer to the magnitudes of the electric fields at points **A**, **B** and **C** respectively, then

(A) $E_A > E_B > E_C$ **(B)** $E_A = 0$ and $E_c > E_B$ **(C)** $E_A = 0$ and $E_B > E_C$ **(D)** $E_A = 0$ and $E_B = E_C$



ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(B)	(C)	(D)	(B)	(A)	(C)	(A)	(D)	(A)
Q.	11	12								
Sol.	(B)	(B)								