1.

If a conductor has a potential $V \neq 0$ and there are no charges anywhere else outside, then

(a) there must be charges on the surface or inside itself

(b) there cannot be any charge in the body of the conductor

(c) there must be charges only on the surface

(d) there must be charges inside the surface

(1) (a, c)

(2) (a, d)

(3) (a, b)

(4) (c, d)

2.

Charges $+q$ and $-q$ are placed at points A and B, respectively; which are at a distance $2L$ apart, C is the midpoint between A and B. The work done in moving a charge +Q along the semicircle CRD is :

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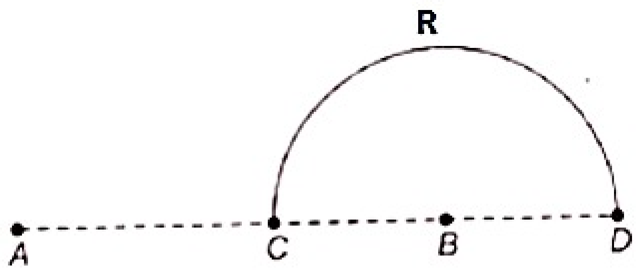


1. $\frac{qQ}{4\pi\varepsilon_0 \mathrm{L}}$

2. $\frac{qQ}{2\pi\varepsilon_0 \mathrm{L}}$

3. $\frac{qQ}{6\pi\varepsilon_0 \mathrm{L}}$

4. $-\frac{qQ}{6\pi\varepsilon_0 \mathrm{L}}$

3.

What is the potential energy of two equal positive point charges of 1 μC each held 1 m apart in air ?

(1) $9 \times 10^{-3} J$

(2) $9 \times 10^{-3} eV$

(3) $2eV/m$

(4) Zero

4.

A ball of mass 1g and charge 10^{-7} C moves from a point A whose potential is 500 V to a point B whose potential is zero. If the speed of the ball at A is 0.51 m/s, its speed at point B will be

1. $0.6\ \mathrm{m/s}$

2. $6\ \mathrm{m/s}$

3. $2\ \mathrm{m/s}$

4. $4\ \mathrm{m/s}$

5.

An elementary particle of mass m and charge e is projected with velocity v at a much more massive particle of charge Ze, where Z>0. What is the closest possible approach of the incident particle ?

(1) $\frac{Ze^2}{2\pi\varepsilon_0 mv^2}$

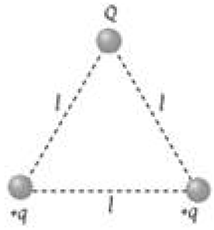
(2) $\frac{Ze}{4\pi\varepsilon_0 mv^2}$

(3) $\frac{Ze^2}{8\pi\varepsilon_0 mv^2}$

(4) $\frac{Ze}{8\pi\varepsilon_0 mv^2}$

6.

Three charges Q, $(+q)$ and $(+q)$ are placed at the vertices of an equilateral triangle of side l as shown in the figure. If the net electrostatic energy of the system is zero, then Q is equal to



(1) $\left(-\frac{q}{2}\right)$

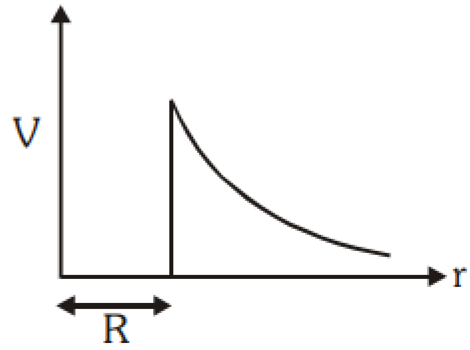
(2) $(-q)$

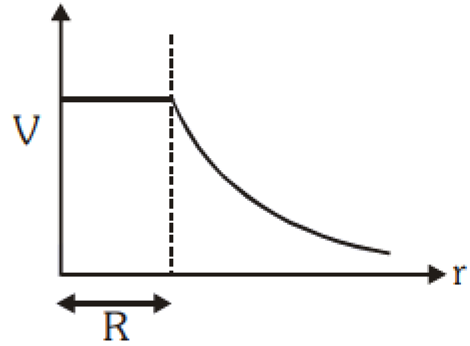
(3) $(+q)$

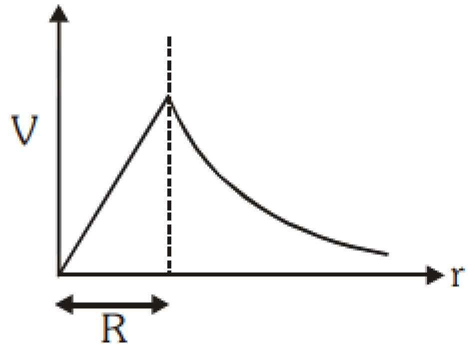
(4) Zero

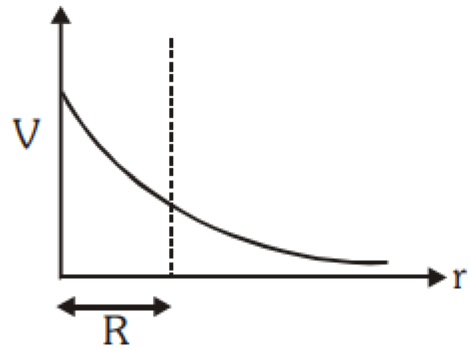
7.

The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph:

1. 

2. 

3. 

4. 

8.

Two metal spheres, one of radius R and the other of radius 2R respectively have the same surface charge density σ. They are brought in contact and separated. What will be the new surface charge densities on them?

1. $\sigma_1 = \frac{5}{6}\sigma$, $\sigma_2 = \frac{5}{6}\sigma$

2. $\sigma_1 = \frac{5}{2}\sigma$, $\sigma_2 = \frac{5}{6}\sigma$

3. $\sigma_1 = \frac{5}{2}\sigma$, $\sigma_2 = \frac{5}{3}\sigma$

4. $\sigma_1 = \frac{5}{3}\sigma$, $\sigma_2 = \frac{5}{6}\sigma$

9.

Ten electrons are equally spaced and fixed around a circle of radius *R*. Relative to *V* = 0 at infinity, the electrostatic potential *V* and the electric field *E* at the centre *C* are

(1) $V \neq 0$ and $\overrightarrow{E} \neq 0$

(2) $V \neq 0$ and $\overrightarrow{E} = 0$

(3) $V = 0$ and $\overrightarrow{E} = 0$

(4) $V = 0$ and $\overrightarrow{E} \neq 0$

10.

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 which is at a distance $\frac{R}{2}$ from the centre of the shell is

(1) $\frac{(q+Q)}{4\pi\varepsilon_0}\frac{2}{R}$

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

(3) $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{2q}{4\pi\varepsilon_0 R}$

(4) $\frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$

11.

Two spheres of radius *a* and *b* respectively are charged and joined by a wire. The ratio of the electric field at the surface of the spheres is

(1) a/b

(2) b/a

(3) a^2/b^2

(4) b^2/a^2

12.

In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is:

(1) 0.5 N/C

(2) 1 N/C

(3) 5 N/C

(4) zero

13.

The electric potential at a point in space due to charge Q is Q $\times$ 10^{12}V. The value of an electric field at that point will be

1. $\frac{Q}{9} \times 10^{12}\frac{N}{C}$

2. $\frac{Q}{9} \times 10^{15}\frac{N}{C}$

3. $\frac{Q}{9} \times 10^{9}\frac{N}{C}$

4. $Q \times 10^{15}\frac{N}{C}$

14.

A hollow charged metal spherical shell has radius R. If the potential difference between its surface and a point at a distance 3R from the center is V, then the value of electric field intensity at a point at distance 4R from the center is

1. $\frac{3V}{19R}$

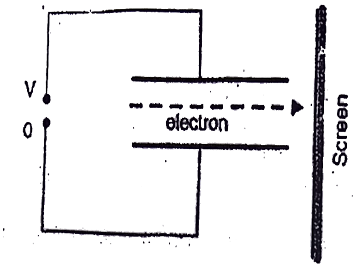
2. $\frac{V}{6R}$

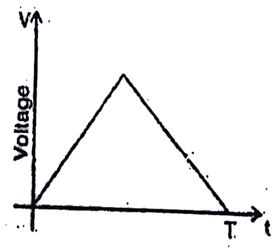
3. $\frac{3V}{32R}$

4. $\frac{3V}{16R}$

15.

An electron beam passes between two parallel plate electrodes as shown in the diagram. The bottom plate is kept at zero potential, while a slowly varying positive voltage is applied to the upper plate, as shown in the graph. After passing between the plates the beam hits a screen and makes spot. Ignoring gravity , the spot is:

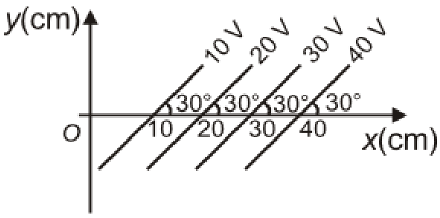




1. deflected up
2. deflected down
3. deflected up then down
4. deflected down then up

16.

The figure shows some of the equipotential surfaces. Magnitude and direction of the electric field is given by



1. 200 V/m, making an angle 120^0 with the x-axis
2. 100 V/m, pointing towards the negative x-axis
3. 200 V/m, making an angle -60^0 with the x-axis
4. 100 V/m, making an angle 30^0 with the x-axis

17.

In a certain charge distribution, all points having zero potential can be joined by a circle S. Points inside S have positive potential, and points outside S have a negative potential. A positive charge, which is free to move, is placed inside S .

(1) It will remain in equilibrium

(2) It can move inside S, but it cannot cross S

(3) It must cross S at some time

(4) It may move, but will ultimately return to its starting point

18.

On rotating a point charge having a charge q around a charge Q in a circle of radius r, the work done will be

(1) $q \times 2\pi r$

(2) $\frac{q \times 2\pi Q}{r}$

(3) Zero

(4) $\frac{Q}{2\varepsilon_0 r}$

19.

A cube of a metal is given a positive charge Q. For the above system, which of the following statements is true ?

(1) Electric potential at the surface of the cube is zero

(2) Electric potential within the cube is zero

(3) Electric field is normal to the surface of the cube

(4) Electric field varies within the cube

20.

An electric dipole of moment $\overrightarrow{p}$ is lying along a uniform electric field $\overrightarrow{E}$. The work done in rotating the dipole by 90 ° is :

1. $\sqrt{2}pE$
2. $\frac{2E}{2}$
3. 2pE
4. pE

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