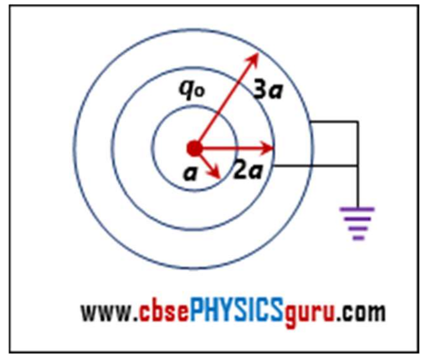
ELECTRIC POTENTIAL AND POTENTIAL DIFFERENCE

1. An infinite number of positive charges each numerically equal to q are placed along x-axis at x = 1, x = 2, x = 4, x = 8 - - - and so on. Then the electric potential at x = 0 due this charge set-up will be (in CGS):
(a) $2q/3$ **(b)** $2q$ (c) $2q/5$ (d) $4q/3$
2. A charge Q is distributed over two concentric hollow spheres of radii r and R (>r) such that the surface densities are equal. The potential at the common centre is:
(a) $\frac{Q(R+r)}{4\pi\varepsilon_0(R^2+r^2)}$ (b) $\frac{Q(R^2+r^2)}{4\pi\varepsilon_0(R+r)}$ (c) $\frac{QR}{4\pi\varepsilon_0(R^2+r^2)}$ (d) Zero
3. N small drops of same size are charged to V volt each. If they coalesce to form a single large drop, then its potential will be:
(a) $V\,N^{-1/3}$ (b) VN (c) $VN^{1/3}$ **(d)** $VN^{2/3}$
4. 27 identical drops of mercury are charged simultaneously to the same potential of 20 volt. Assuming the drops to be spherical, if all the charged drops are made to combine to form one large drop, then its potential will be:
(a) 120 V (b) 160 V **(c)** 180 V (d) 540 V
5. A cube of side L has a charge Q at each of its vertices. The potential due to this charge array at the centre of the cube is:
(a) $\frac{4Q}{\sqrt{3}\,\pi\varepsilon_0 L}$ (b) $\frac{4Q}{\pi\varepsilon_0 L}$ (c) $\frac{8Q}{\sqrt{3}\,\pi\varepsilon_0 L}$ (d) Zero
6. A solid sphere of radius R is charged uniformly. At what distance from its surface is the electrostatic potential is half the potential at its centre?
(a) R/2 **(b)** R/3 (c) R/4 (d) 3R
7. A hollow metal sphere of radius 5 cm is charged such the potential on its surface is 10 V. The potential ac centre of the sphere is:
(a) 0 V **(b)** 10 V (c) same as at a point 5 cm away from the, surface (d) same as at a point 20 cm away from the surface
8. Two thin wire rings each having a radius R are placed at a distance L 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) Zero (b) $\frac{QR}{4\pi\varepsilon_0 L^2}$ (c) $\frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{R}-\frac{1}{\sqrt{R^2+L^2}}\right)$ **(d)** $\frac{Q}{2\pi\varepsilon_0}\left(\frac{1}{R}-\frac{1}{\sqrt{R^2+L^2}}\right)$
9. Two conducting, concentric, hollow spheres X and Y of radii r and R respectively, with X inside Y. Their common potential is V. X is now given some charge such that its potential becomes zero. The potential of Y will now be:
(a) $V\left(\frac{R-r}{r}\right)$ **(b)** $V\left(\frac{R-r}{R}\right)$ (c) $V\left(\frac{R-r}{R+r}\right)$ (d) Zero
10. Two identical thin rings, each of radius R are placed coaxially at a distance R apart. Let charges Q_1 and Q_2 be placed uniformly on the two rings. The work done in moving a charge Q from the centre of one ring to that of the other is:
(a) $\frac{Q(\sqrt{2}-1)}{4\pi\varepsilon_0 R\sqrt{2}}(Q_1-Q_2)$ (b) $\frac{Q(\sqrt{2}+1)}{4\pi\varepsilon_0 R\sqrt{2}}(Q_1-Q_2)$ (c) $\frac{Q(\sqrt{2}-1)}{4\pi\varepsilon_0 R}(Q_1-Q_2)$ (d) Zero
11. Two identical thin rings, each of radius 10 cm carrying charges 10 C and 5 C are coaxially placed at a distance 10 cm apart. The work done in moving a charge q from the centre of the first ring to that of the second is:

(a) $\frac{q(\sqrt{2}+1)}{8\pi\varepsilon_0\sqrt{2}}$ (b) $\frac{q(\sqrt{2}-1)}{4\pi\varepsilon_0\sqrt{2}}$ (c) $\frac{50q(\sqrt{2}+1)}{4\pi\varepsilon_0\sqrt{2}}$ **(d)** $\frac{50q(\sqrt{2}-1)}{4\pi\varepsilon_0\sqrt{2}}$

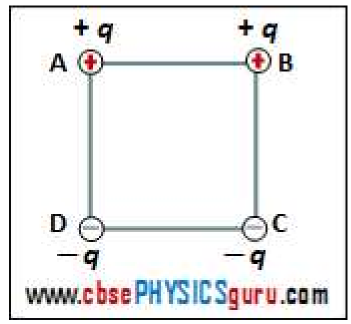
12. Two point charges Q and -Q are kept at (0, 0, a/2) and (0, 0, -a/2) respectively. The work done by the electric field when another positive point charge is moved from (-a, 0, 0) to (0, a, 0) is:
(a) Positive (b) Negative **(c)** Zero (d) Depends on the path connecting the initial and final positions

13. Three concentric conducting spherical shells are arranged as shown in figure. The middle and outermost shells are earthed. The Innermost sphere is given a charge q_o. The charges on the middle and the outermost sphere are respectively:
(a) q_o and -q_o (b) q_o and zero (c) zero and -q_o **(d)** -q_o and zero.



14. Two point charges +5 µC and –2 µC are kept at a distance of 1 m in free space. The distance between the two zero potential points on the line joining the charges is:
(a) 4/5 m **(b)** 20/21 m (c) 21/22 m (d) 3/7 m

15. 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 D are interchanged, then:
(a) E = 0, V = 0 (b) E ≠ 0, V = 0 (c) E = 0, V ≠ 0 (d) E ≠ 0, V ≠ 0



16. A charge +q is placed at the origin 0 of X-Y co-ordinates. The work done in taking a charge Q from A (a, 0) to B (0, b) is:
(a) $\frac{Qq}{4\pi\varepsilon_0}\left(\frac{b}{a^2}-\frac{1}{b}\right)$ (b) $\frac{Qq}{4\pi\varepsilon_0}\left(\frac{a}{b^2}-\frac{1}{b}\right)$ **(c)** $\frac{Qq}{4\pi\varepsilon_0}\left(\frac{a-b}{ab}\right)$ (d) $\frac{Qq}{4\pi\varepsilon_0}\left(\frac{b-a}{ab}\right)$