

Electric Potential Assignment 1

Paragraph Type of Question

(A) Electric potential at any point x, y, z in the space is given $V = 4x^2 - 3x$

Question 1

Find the electric field at any point (x, y, z)

- a. $(8x - 3)\mathbf{i}$
- b. $-(8x - 3)\mathbf{i}$
- c. $-8x\mathbf{i}$
- d. $8x\mathbf{i}$

Question 2

Equipotential surface in the region are

- a. planes parallel to X-Y plane
- b. planes parallel to Y-Z plane
- c. planes parallel to X-Z plane
- d. none of the above

Question 3

Find the force experienced by a charge particle q at point $(1, 1, 1)$

- a. $-11q\mathbf{i}$
- b. $11q\mathbf{i}$
- c. $11q\mathbf{i} + \mathbf{j}$
- d. $11q\mathbf{i} - \mathbf{j}$

Question 4

Find the value of $\int_{0,0,0}^{1,1,1} \mathbf{E} \cdot d\mathbf{L}$

- a. -1 volt
- b. 0 volt
- c. -2 volt
- d. 1 volt

(B) A spherical shell of radius R carries a uniform surface charge q . Take the reference point at ∞

Question 5

Find the electric field at $r > R$. Here \mathbf{r} is the unit vector across radial direction

- a. $\left(\frac{1}{4\pi\epsilon_0}\right)\left(\frac{q}{r^2}\right)\mathbf{r}$
- b. $\left(\frac{1}{4\pi\epsilon_0}\right)\left(\frac{qR}{r^2}\right)\mathbf{r}$

c. $(\frac{1}{4\pi\epsilon_0})(\frac{q}{r^2 - R^2}) r$

d. $(\frac{1}{4\pi\epsilon_0})(\frac{q}{r^2 + R^2}) r$

Question 6

Find the electric field at $r < R$

- a. $(1/4\pi\epsilon_0)(q/R^2)$
- b. $(1/4\pi\epsilon_0)(q/r^2)$
- c. zero
- d. $(1/4\pi\epsilon_0)(q/r^2 + R^2)$

Question 7

Find the potential at $r > R$

- a. $(1/4\pi\epsilon_0)(q/r)$
- b. $(1/4\pi\epsilon_0)(q/r + R)$
- c. $(1/4\pi\epsilon_0)(q/r - R)$
- d. none of the above

Question 8

Find the potential at $r < R$

- a. $(1/4\pi\epsilon_0)(q/r)$
- b. $(1/4\pi\epsilon_0)(q/R)$
- c. $(1/4\pi\epsilon_0)(q/R - r)$
- d. none of the above

Ans. B

Question 9

If I placed an second uniformly charge shell (Q) at radius $R' > R$, will the value of potential change at $r < R$

- a. increases
- b. decreases
- c. constant
- d. none of the above

Question 10

What will the electric field at $r < R$

- a. $(1/4\pi\epsilon_0)(q/r^2)$
- b. $(1/4\pi\epsilon_0)(q/R^2)$
- c. zero
- d. $(1/4\pi\epsilon_0)(q/r + R)$

Single Answer type question

Question 11

A point charge q is located at $(2, 3, 3)$ in xyz coordinate. Find the potential differences between A and B

$$A = (2, 3, 3)$$

$$B = (-2, 3, 3)$$

- a. $q/4\pi\epsilon_0$
- b. $1/16\pi\epsilon_0$
- c. $3q/16\pi\epsilon_0$
- d. none of the above

Question 12

Two equally charges are placed on the x -axis at $(-a, 0)$ and $(a, 0)$. Charge is q and mass is m . They are released from rest. Find their velocities when they are $4a$ apart

- a. $q\sqrt{1/\pi\epsilon_0 m}$
- b. $(q/4)\sqrt{1/\pi\epsilon_0 m}$
- c. $q/\pi\epsilon_0 m$
- d. $q/4\pi\epsilon_0 m$

Question 13

A point charge $q_1 = +2\mu\text{C}$ is placed at the origin of coordinates. A second charge $q_2 = -3\mu\text{C}$ is placed on the y -axis at $y = 100\text{cm}$. At what point on the y -axis, potential is zero

- a. $y = -200\text{cm}$
- b. $y = 40\text{cm}$
- c. $y = 200\text{cm}$
- d. none of the above

Answers:

- 1. (b)
- 2. (b)
- 3. (a)
- 4. (a)
- 5. (a)
- 6. (c)
- 7. (a)
- 8. (b)
- 9. (a)
- 10. (c)
- 11. (c)
- 12. (b)
- 13. (b),(a)