ASSIGNMENT-2 ANSWER KEY

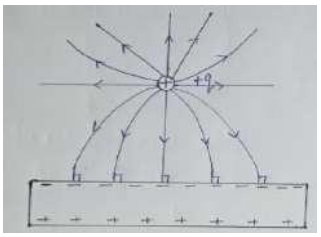
(1 MARK QUESTION)

Q1. Refer from NCERT textbook

Q2. Refer from NCERT textbook

Q3. d Q4. a Q5. c Q6. a Q7. a Q8. d

Q9.



Q10. 1. q_1 *and* q_2 are opposite to each other 2. $q_1 > q_2$

Q11. Since field lines start from Q_1 and end at Q_2 therefore Q_1 is positive and Q_2 is negative

MCQ Types Question

Q12. (d) Explanation : Total field, $\vec{E} = \vec{E}_1 + \vec{E}_2$

$= \rho/3\varepsilon_0 \vec{OA} + \rho/3\varepsilon_0 \vec{AP}$

$= \rho/3\varepsilon_0 (\vec{OA} + \vec{AP})$

$E = \rho/3\varepsilon_0 \vec{OP} = \rho/3\varepsilon_0 a$

Q13. (d) 1:1

Assertion/Reasoning

Q14. (b) Q15. (d) Q16. (c)

Q17. (d) Both statements are false.

Explanation: A –ve charge moves in opposite direction of electric field and force also acts in opposite direction of electric field.

Q18. (a) Both A and R are true and R is the correct explanation of A.

Case Study Base Type Question

Q19. (d) Q20. (a) Q21. (c) Q22. (c) Q23. (a) Q24. b) $2q/\epsilon o$ Q25. a) 1 C

Q26. c) Zero Q27. c) Same in both cases Q28. Scalar, Nm^2C^{-1}. Q29. Charges. Q30. A

Q31. C Q32. A Q33. B Q34. A Q35. B Q36. D Q37. A

Answer for Two-mark questions

Q38. The total charge of an isolated system remains constant.

Ex: i) NaCl $\rightleftharpoons$ Na+ + Cl—

As the total charge is zero before & after the ionisation, so charge is conserved.

ii) When a glass rod is rubbed with a silk cloth it develops a positive charge. But at the same time silk cloth develop an equal negative charge. Thus, the net charge is zero as it was before rubbing.

Q39. According to special theory of relativity, the mass of body increases with its speed in accordance with the relation :

$m = m_0 / \sqrt{(1 - v^2/c^2)}$

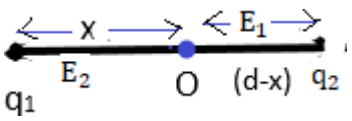
As v is less than c therefore m is greater than m_0.

In contrast to mass, the charge on a body remains constant and does not change as the speed of the body changes.

Q40. As $r_{21} = - r_{12}$, therefore $F_{21} = - F_{12}$

This means that the two charges exert equal and opposite forces on each other. So Coulombian forces obey Newton's third law of motion.

Q41. Therefore, E1=E2



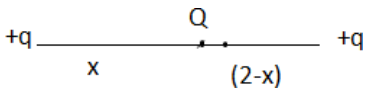
$kq_1 / (x)^2 = kq_2 / (d - x)^2$

$1/4\pi\varepsilon_0 (4x^2) = 1/4\pi\varepsilon_0 (1/(2 - X)^2)$

$x/2 = 2-x$

therefore, $3x=4$ & $x=4/3$

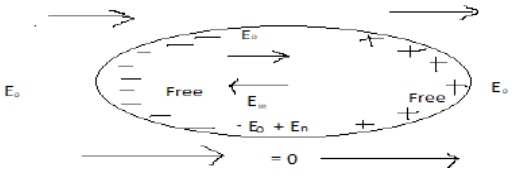
Q42.



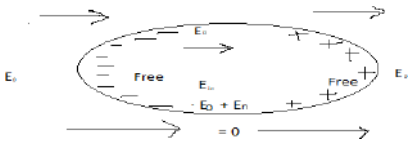
$$\frac{1}{4\pi \in_0}\frac{qQ}{x^2} = \frac{1}{4\pi \in_0}\cdot\frac{qQ}{(2-x)^2}$$

Total force on Q =0 & X=2-x Or 2x =2 or X=1m

Therefore, -Q charge is placed at a midpoint between the two charges of +q each.

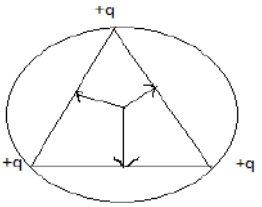


Q43. In conductor, net electric field is zero.



In case of dielectric: Induced electric filed inside is less than external electric field.

Q44. (i) Never intersect (ii) They are perpendicular on surface.



Q45. Resultant force (F=0) $\vec{E}$ at centre = 0

Three equal force make angle 120^0

Q46. Here, $\vec{dS} = 5i$, $\vec{E} = 4\hat{\imath} + 8\hat{\jmath} + 14\hat{k}$

Electric flux, $\Phi = \vec{E}.\vec{dS} = (4\hat{\imath} + 8\hat{\jmath} + 14\hat{k}).\ 25\hat{\imath}$ or $\Phi = 100$ units.

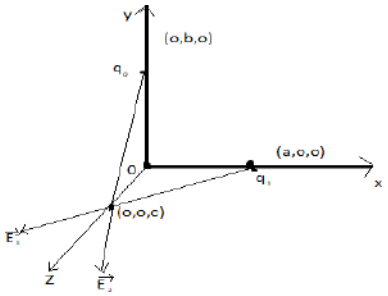
Q47. Here, E= 9 x 104 N C-1, r= 0.02 m, λ=?

As $E = \lambda/2\pi\epsilon or = 2\lambda/4\pi\epsilon or$ $\therefore \lambda = E\ (4\pi\epsilon or)/2 = 9 \times 104 \times \frac{1}{9*10^9} \times \frac{0.02}{2} = 10^{-7}$ C/m

Answer to Three-mark questions

Q48.- Refer from NCERT textbook

Q49. Net electric filed at the points (o,o,c) due to the charge q_1 & q_2 is



$\vec{E}\ net = \vec{E}_1 + \vec{E}_2 = 1/4\pi E_0\ [q_1/r_1^3 \vec{r}_1 + q_2/r_2^3 \vec{r}_2)$

But $r_1 = \vec{r} = -a\hat{\imath} + c\hat{k}$

$\Rightarrow r_1 = (a^2 + c^2)^{1/2}$

$\vec{r}_2 = -b\hat{\jmath} + c\hat{k}$

$\Rightarrow r_2 = (b^2 + c^2)^{1/2}$

$\vec{E}\ net = 1/4\pi E_0\ [q(-a\hat{\imath} + c\hat{k})/(a^2 + c^2)^{3/2} + q_2\ (-b\hat{\jmath} + c\hat{k})/\ (b^2 + c^2)^{3/2}$

Q50. $K = E_0/E_0 = E_0/E_{0/10} = 10$

Q51. 1) From Gauss's theorem electric flux through S_1 is $\Phi_1 = Q/\epsilon_o$

electric flux through S_2 is $\Phi_2 = Q + 2Q/\epsilon_o = 3Q/\epsilon_o$

$\therefore \Phi_1/\ \Phi_2 = 1/3$

2) When a medium of dielectric constant K is introduced in the space inside S_1, then

$\Phi_1' = \oint_s \vec{E}.\vec{dS} = \oint_s \frac{\vec{E}}{K}.\vec{dS} = Q/\ K\epsilon_o$

3) On introducing dielectric medium inside S_2, electric flux through S_1 will not change.

Q52. +Q is the charge which is kept at the centre of the spherical cavity. –Q is the charge

that is induced in the inner surface and +Q on the outer surface.

Answer for Five-mark questions

Q53. a) Equal charge of opposite nature induces in the surface of the conductor nearer to the source charge.Electric lines of forces should fall normally on the conducting plate.