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India's Number 1 Education App

PHYSICS

BOOKS - MODERN PUBLICATION

GAUSS' THEOREM

EXAMPLE

1. If the electric field is given by $6\hat{i} + 3\hat{j} + 4\hat{k}$, calculate the electric flux through a surface of area 20 units lying in YZ-plane.

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2. A spherical gaussian surface encloses a charge of $8.85 \times 10^{-8} C$ Calculate the electric flux passing through the surface.

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3. A spherical gaussian surface encloses a charge of $8.85 \times 10^{-8} C$ If the radius of the gaussian surface is doubled, hwo would the flux change?

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4. A rectangular surface of sides 10cm and 15 cm is placed inside a uniform electric field of 25 V m^{-1}, suh that normal to the surface makes an angle of 60° with the direction of electric field. Find the flux of the electric field through the rectangular surface.

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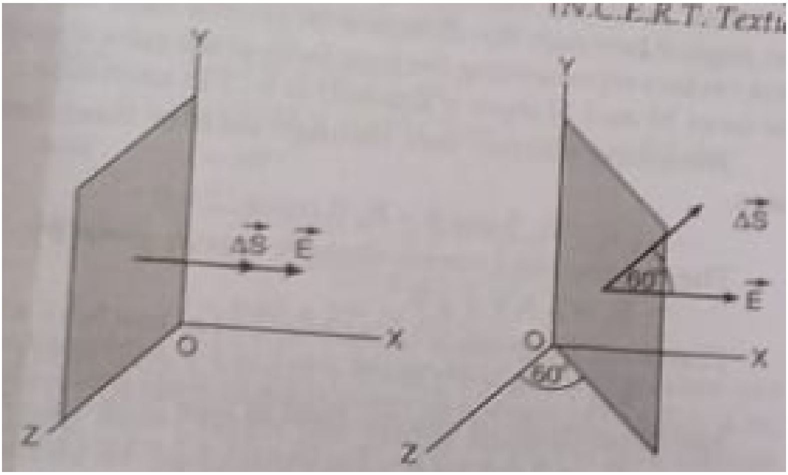
5. Consider a uniform electric field $\overrightarrow{E} = 3 \times 10^3 \hat{i} NC^{-1}$ What is the flux through the same square, if the normal to its plane makes a 60°

angle with the X-axis?



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6. Calculate the number of electric lines of force originating from a charge of 1 C. Given $\varepsilon_0 = 8.854 \times 10^{-12} C^2 N^{-1} m^{-2}$

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7. Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is $8.0 \times 10^3 Nm^2 / C$. What is the net charge inside the box?

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8. Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is $8.0 \times 10^3 Nm^2 / C$. If the net outward flux through the surface of the box were zero, could you conclude that there were no charges inside the box? Why or Why not?

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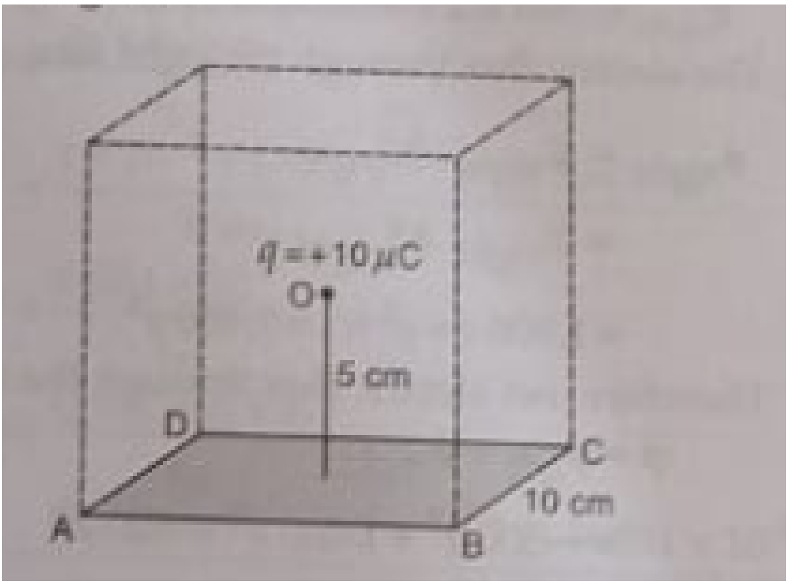
9. A point charge $+10\mu C$ is at a distance 5 cm directly above the centre of a square of side 10 cm as shown in the figure



What is

the magnitude of the surface flux through the square?

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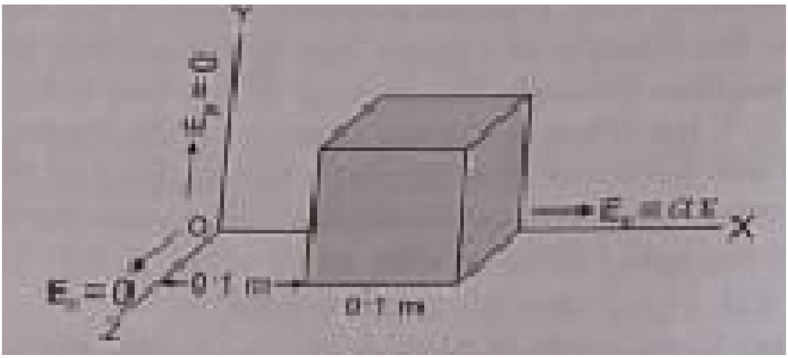
10. The electric field components due to a charge inside the cube of side 0.1 m are as shown in the figure.



$E_X = ax$, where a = 500

$NC^{-1}m^{-1}E_y = 0$ and $E_z = 0$ Calcualte the electric flux through the cube

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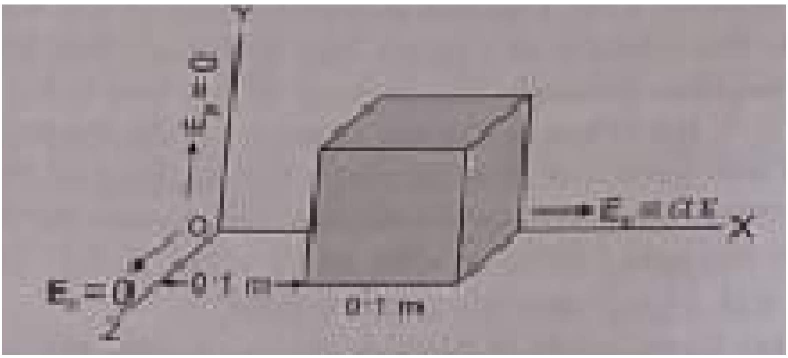
11. The electric field components due to a charge inside the cube of side 0.1 m are as shown in the figure.



$E_X = ax,$ where a = 500

$NC^{-1}m^{-1}E = 0$ and $E_2 = 0$ Calcualte the charge inside the cube.

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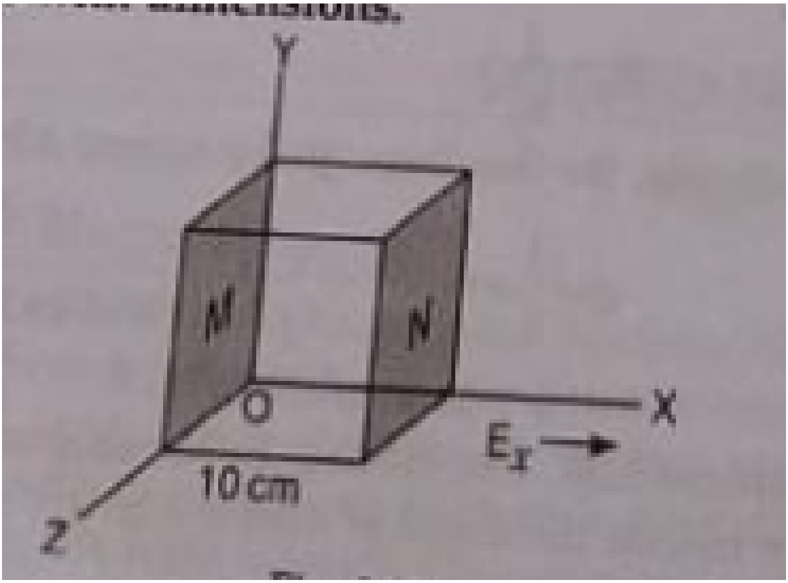
12. In figure



the electric field is directed along positive X-direction and given by $E_x = 5Ax + 2B$ where E is in NC^{-1}

and x is in metre. A and B are constants with dimensions. Takign $A = 10Nc^{-1}m^{-1}$ and $B = 5NC^{-1}$ calculate the electric flux through the cube. and net charge enclosed within the cube.

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13. An infinite line charge produces a field of $9 \times 10^4 NC^{-1}$ at a distance of 4 cm. Calcualte the linear charge density.

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14. A large plane sheet of charge having surface charge density 5.0×10^{-16} C m^-2 lies in the XY-plane . Find the electric flux through a circular area of radius 0.1 m , if the normal to the circular area makes an angle of 60° with the Z-axis. Given that $\varepsilon_0 = 8.85 \times 10^{-12} C^2 N^{-m} \hat{} -2$

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15. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude $17.0 \times 10^{-22} C / m^2$. What is E: in the outer region of the first plate?

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16. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude $17.0 \times 10^{-22} C / m^2$. What is E: between the plates?

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17. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude $17.0 \times 10^{-22} C / m^2$. What is E: between the plates?

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18. The electric field in a region is radially outward and varies with distance r as $E = 250 r V m^{-2}$ Calculate the charge contained in a sphere of radius 0.2 m centred at the origin.

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19. The flux of the elements field, through the closed surface S, is found to be four times that through the closed spherical surface S'. Find the magnitude of the charge Q.

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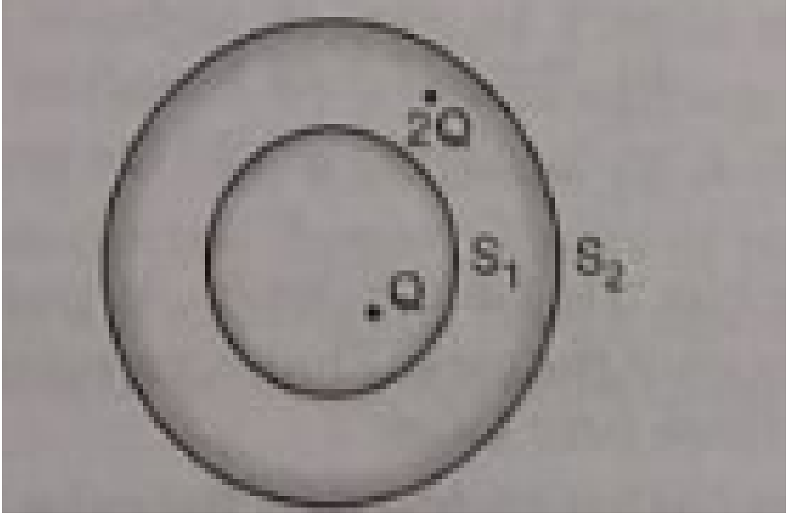
20. S_1 and S_2 are two parallel concentric spheres enclosing charges Q and 2Q respectively as shown in the figure.



what is the ratio of the electric flux through S_1 and S_2?

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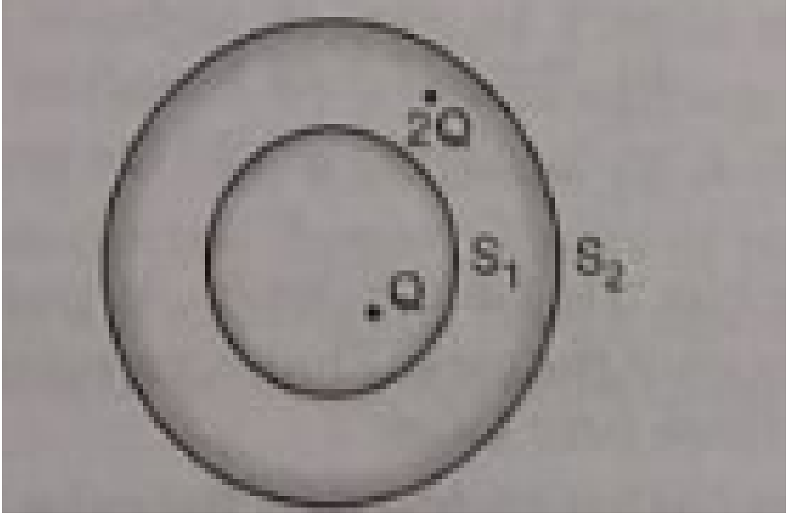
21. S_1 and S_2 are two parallel concentric spheres enclosing charges Q and 2Q respectively as shown in the figure.



How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in plae at air?

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22. It has been experimentally observed that the electric field in a large region of earth's atmosphere is directed vertically down. At an altitude of 300 m, the electric field $60Vm^{-1}$. At an altitude of 200 m, the field is $100Vm^{-1}$, the field is $100Vm^{-1}$. Calculate the net amount of charge contained in the cube of 100 m edge, located between 200 and 300 m altitude.

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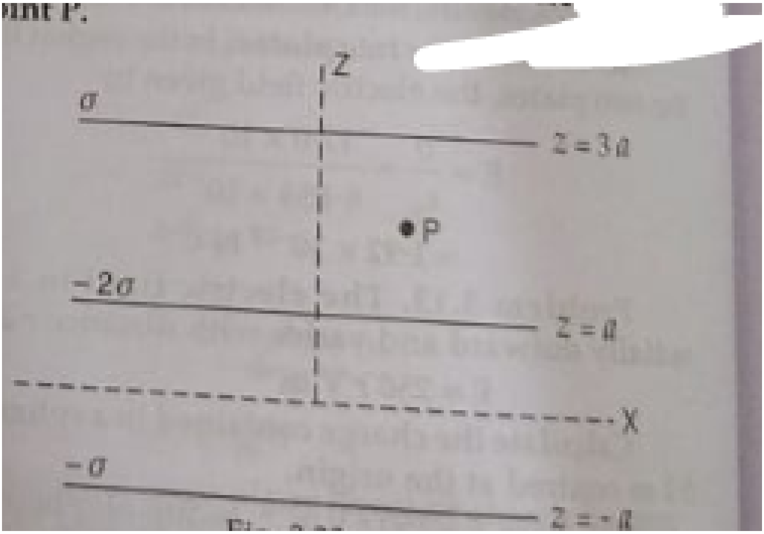
23. Three infinitely long charge sheets are placed as shown in the figure



Find the electric field at the point P.

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24. A conducting sphere of radius 10 cm has an unknown charge. If the electric field 20 cm from the centre of the sphere is $1.5 \times 10^3 N/C$ and points radially inward, what is the net charge on the sphere?

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25. Define electric flux.

Watch Video Solution

26. Is electric flux a scalar or a vector? Give the SI untis of electric flux.

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27. An area S is held inside an electric field E, such that normal to the area S subtends angle θ with the direction of electric field. What is the electric flux linked with the surface area?

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28. Write an expression for the flux $\Delta\phi$, of the electric field $\overrightarrow{E}$ through an area of element $\overrightarrow{\Delta}S$

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29. Define Gauss's theorem in electrostatics.

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30. A charge q is placed at the centre of a cube of side l. What is the electric flux passing through two opposite faces of the cube?

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31. A box enlcoses an electrical diple consisting of charge $5\mu C$ and $-5\mu C$ and of length 10 cm.

What is the total electric flux through the box?

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32. An electric dipole of dipole moment $20 \times 10^{-6} cm$ is enclosed by a closed surface. What is the net flux coming out of the surface?

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33. Two charges of magntiudes - 2Q and + Q are located at points (a,0) and (4a,0) respectively. What is the electric flux due to these charges through a sphere of radius 3 a with the centre at the origin?

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34. What is the use of Gaussian surface in electrostatics ?

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35. Does the strength of electric field due to an infinity long line charge depend upon the distance of the obervation point from the line charge?

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36. Does the strength of electric field due to an infinite plane sheet of charge depend upon the distance of the osbervation point from the sheet of charge?

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37. What is the difference between a sheet of charge and a plane conductor having charge?

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38. How does electric field at a point change with distance r from an infinitely long charged wire?

Watch Video Solution

39. How does electric field at a point change with distance r from an infinite thin sheet of charge?

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40. What is the strength of the electric field inside a charged spherical shell?

Watch Video Solution

41. Define electric flux.

Watch Video Solution

42. What is the importance of Gauss'theorem in electrostatics ?

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43. Supose a gaussian surface does not include any net charge. Does it necessarily mean that E is equal to zero for all points on the surface?

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44. A point charge causes an electric flux of $-1.0 \times 10^3 Nm^2/C$ to pass through a spherical Gaussian surface of 10.0 cm radius centred on the charge - If the radius of the Gaussian surface were doubled, how much flux would pass through the surface?

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45. A point charge causes an electric flux of $-1.0 \times 10^3 Nm^2 / C$ to pass through a spherical Gaussian surface of 10.0 cm radius centred on the charge - What is the value of the point charge?

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46. An electric flux of $-5 \times 10^3 Nm^2C^{-1}$ passes through a spherical gaussian surface of radius 20 cm due to the charge placed at its centre. Calculate the charge enclosed by the gaussian surface.

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47. An electric flux of $-5 \times 10^3 Nm^2C^{-1}$ passes through a spherical gaussian surface of radius 20 cm due to the charge placed at its centre. If the radius of the gaussian surface is doubled, how much flux would pass through the surface?

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48. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu C / m^2$ - Find the charge on the sphere.

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49. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu C/m^2$ - What is the total electric flux leaving the surface of the sphere?

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50. Two infinite parallel planes have uniform charge densities $\pm\sigma$. What is the electric field in the region between the planes

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51. Two infinite parallel planes have uniform charge densities $\pm\sigma$. What is the electric field outisde the plates? In what way does the infinite extension of the planes simplify your derivation?

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52. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?

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53. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?

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54. A spherical conduting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. Write the expression for the electric field at a point $x > r_2$ from the centre of the spherical shell.

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55. A and B are two conducting spheres of the same radii. A being solid and B hollow. Both are charged to the same potential. What will be the relation between the charges on the two spheres?

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56. Explain the term electrostatic shelding.

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57. What is the principle of electrostatic shielding?

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58. The safest way to save yourself from lightening is to be inside a car. Comment?

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59. A sensitive instrument is to be shielded from the strong electrostatic fields in its environment. Suggest a possible way.

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60. How can the whole charge of a conductor be transferred to another isolated conductor?

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61. One mole of α-particles are trapped inside a closed box. Find the number of electric field lines emanating from the α-particles.

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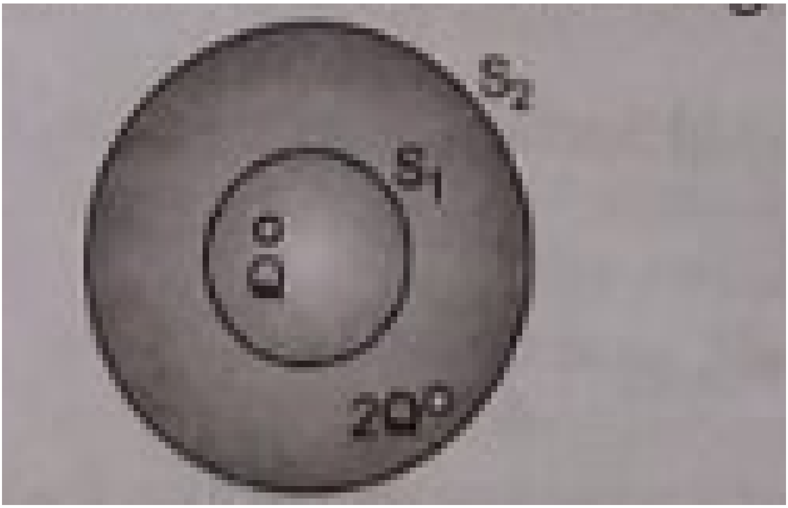
62. Two concentric spherical shells S_1 and S_2 enclose charge Q and 2Q as shown in the figure



If air is

inside the tow shells, what is the ratio of electric flux through S_1 and S_2?

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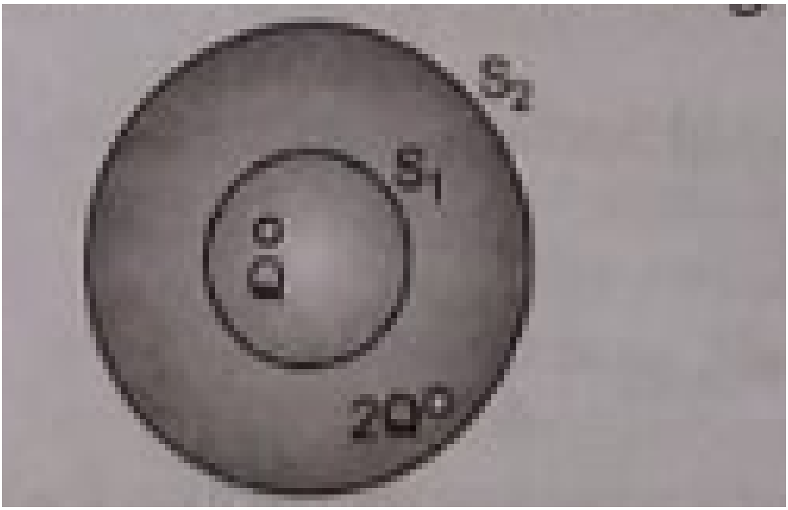
63. Two concentric spherical shells S_1 and S_2 enclose charge Q and 2Q as shown in the figure



How will the electric flux through the shells S_1 change, if a medium of dielectric constant 10 replaces air in the shell S_1?

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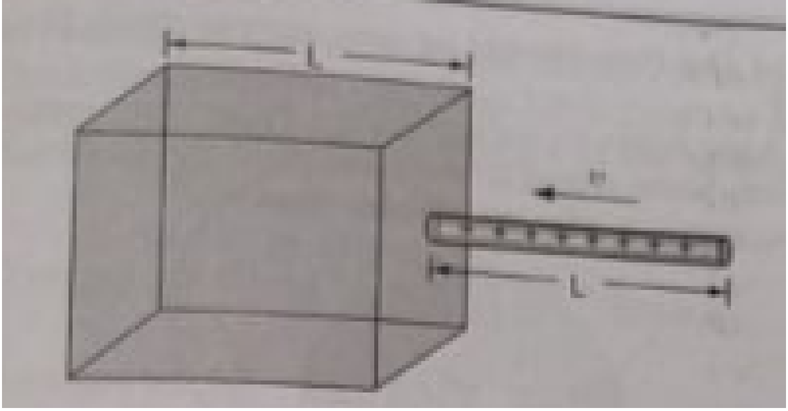
64. A thin straight rod of length l, has uniform linear charge density λ. Moving at a constant speed v, the rod enters a cube of sides having length L through its left fae and leaves through the right face as shown in the figure



Find the maximum electric flux through the cube.

Watch Video Solution

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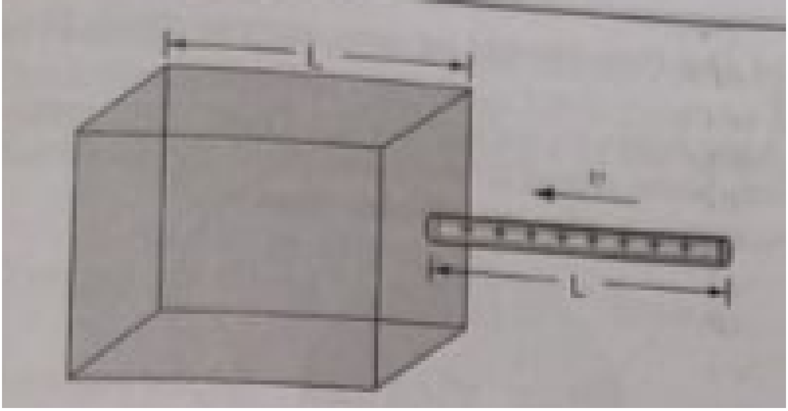

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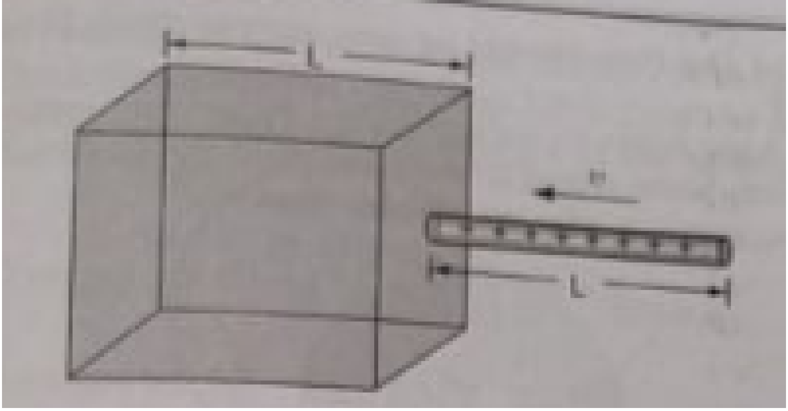
Watch Video Solution

66. A thin straight rod of length l, has uniform linear charge density λ. Moving at a constant speed v, the rod enters a cube of sides having length L through its left fae and leaves through the right face as shown in the figure



Find the maximum electric flux through the cube.

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67. A right circular cylinder of length L (in m) and of radius R (in m) has its center at the origin and its length along the X-axis. A uniform electric field $\overrightarrow{E} = E_x \hat{I} NC^{-1} f$ or $x > 0$ and $\overrightarrow{E} = -E_x \hat{i} NC^{-1}$

for x < 0 exists over the cylinder. Find net outward electric flux

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68. A right circular cylinder of length L (in m) and of radius R (in m) has its center at the origin and its length along the X-axis. A uniform electric field $\overrightarrow{E} = E_x \hat{I} NC^{-1} f$ or $x > 0$ and $\overrightarrow{E} = -E_x \hat{\imath} NC^{-1}$ for x < 0 exists over the cylinder. Find the net charge enclosed by the cylinder.

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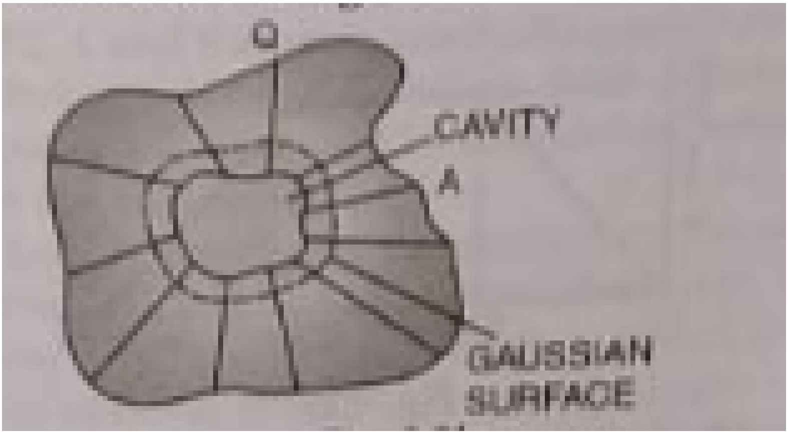
69. A conductor A with cavity as shown in the figure



a charge Q. Show that the entire charge must appear on the outer surface of the conductor.

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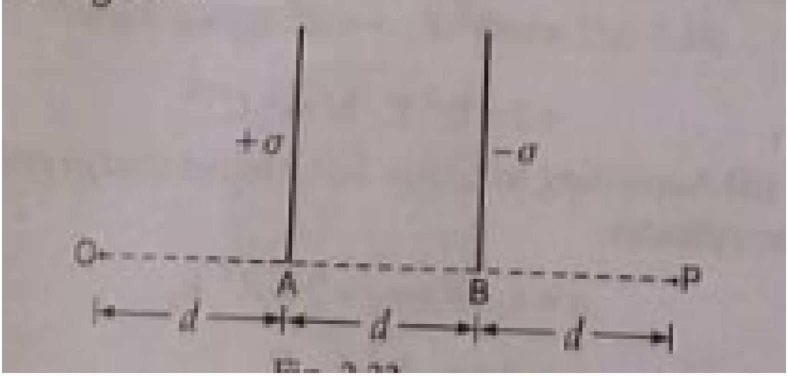
70. Two large flat parallel sheets A and B having uniform surface charge densities σ and $-\sigma$ are held as shown in the figure



graphically, represent the variation of electric field due to the two sheets as one move from the point O to P.

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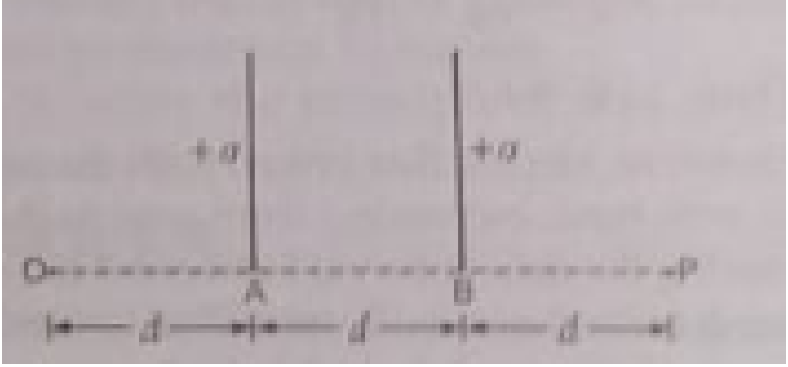
71. Two large flat parallel sheets A and B having a uniform charge density $+\sigma are$ held as shown in the figure.



Graphically, represent the variation of electric field due to the two sheets as one moves from the point O to P.

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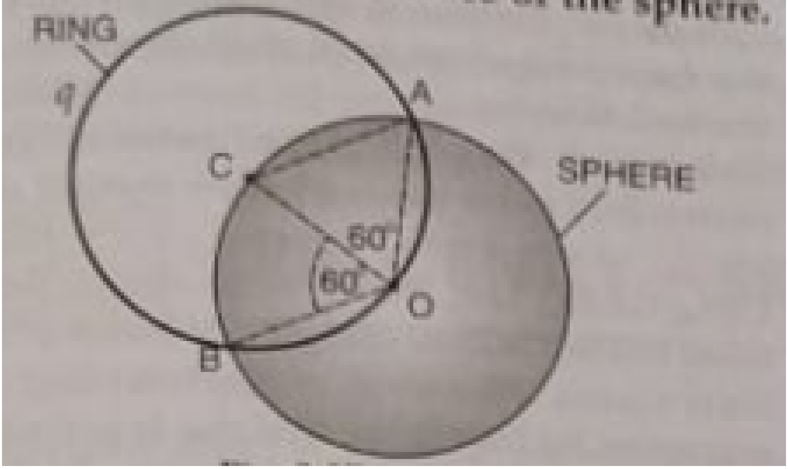
72. A charge q is distributed unifromly on x ring of radius r. A sphere of equal radius r is centred at the circumference of the ring



. Find the flux of the electric field through the surface of the sphere.

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EXERCISE

1. What is electriG flux ? Explain how the electric flux through a surface is related to electric field

intensity, when the surface is heldinside the electric field.

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2. State and prove Gauss's theorem in electrostatics.

Watch Video Solution

3. State and prove Gauss's theorem in electrostatics.

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4. State Gauss's theorem.How Coulomb's law can be derived from it ?

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5. State and explain Coulomb's law of force in electrostatics. What are its limitations? Define one coulomb of charge using this law.

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6. State Gauss' theorem in electrostatics. Hence obtain expression for the force between two point charges.

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7. How does electric field at a point change with distance r from an infinitely long charged wire?

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8. Find an expression for the electric field at a point due to a line charge by using Gauss' theorem in electrostatics.

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9. Use Gauss' law to derive the expression for the electric field due to straight uniformally charged infinite line of charge density λcm^{-1}.

Watch Video Solution

10. How does electric field at a point change with distance r from an infinitely long charged wire?

Watch Video Solution

11. State Gauss' theorem and using this theorem, derive an expression for the electric field intensity at a point due to an infinitely long wire having a uniform distribution of charge.

Watch Video Solution

12. Use Gauss' law to derive the expression for the electric field due to straight uniformally charged infinite line of charge density λcm^{-1}.

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13. What is electric flux? Write its SI units. Using Gauss. Theorem, derive an expression for electric theorem, derive an expression for electric field at a point due to uniformaly charged infinite plane sheet.

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14. Derive an expression for electric field intensity at a distance r from a point charge q.

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15. Find the Electric field due to two infinite plane parallel sheet of charge.

Watch Video Solution

16. How does electric field at a point change with distance r from an infinite thin sheet of charge?

Watch Video Solution

17. Find the Electric field due to two infinite plane parallel sheet of charge.

Watch Video Solution

18. Use Gauss' law to derive the expression for the electric field due to straight uniformally charged infinite line of charge density λcm^{-1}.

Watch Video Solution

19. State Gauss' theorem in electrostatics. Derive an expression for the electric field intensity at any point of to an infinite plane sheet of charge.

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20. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point inside

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21. Show that the electric field at the surface of a charged conductor is given bu$\vec{E} = \frac{\sigma}{\varepsilon_0}\hat{n}$, where σ is the surface charge density and $\hat{n}$ is a unit vector normal to the surface in the outward direction.

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22. How does electric field at a point change with distance r from an infinite thin sheet of charge?

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23. How is the field directed if the sheet is positively charged

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24. How is the field directed, if sheet is negativity charged.

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25. Find the Electric field due to two infinite plane parallel sheet of charge.

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26. What is the strength of the electric field inside a charged spherical shell?

Watch Video Solution

27. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point on the surface of the spherical shell.

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28. Why electric intensity at any point inside a charged conductor is zero?

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29. Using Gauss's theorem, show mathematically that for any point outside the shell, the field due to a uniformly chargead thin spherical shell is the same as if the entire charge is concentrated at the centre. Why do you expect the electric field inside the shell to be zero according to this theorem?

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30. Inside a charged spherical shell, the electric field is zero.

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31. What is the strength of the electric field inside a charged spherical shell?

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32. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity

due to uniformly charged thin spherical shell at a point inside

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33. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point outside

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34. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point on the surface of the spherical shell.

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35. Define the term electric flux. State its units.

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36. A sphere S_1 of radius r_1 encloses a charge Q. If there is another concentric sphere S_2 of the radius $r_2 (r_2 > r_1)$ and there be no additional charges between S_1 and S_2 find the ratio of electric flux through S_1 and S_2

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37. State and prove Gauss' theorem in electrostatics. Deduce Coulomb's law from Gauss' theorem.

Watch Video Solution

38. State and prove Gauss' theorem in electrostatics. Deduce Coulomb's law from Gauss' theorem.

Watch Video Solution

39. Using Gauss's law, determine the electric field intensity due to a long thin wire of uniform charge density.

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40. State Gauss' theorem and using this theorem, derive an expression for the electric field intensity at a point due to an infinitely long wire having a uniform distribution of charge.

Watch Video Solution

41. State and prove Gauss' theorem and by using it deduce an expression for the electric field at a point due to a line charge.

Watch Video Solution

42. State Gauss' law in electrostatics. Using this law, derive an expression for the electric field due to an infinitely long straight charged wire at a point distant r from it. Plot a graph showing the variation of electric field with r.

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43. State Gauss' theorem in electrostatics. Derive an expression for the electric field intensity at any point of to an infinite plane sheet of charge.

Watch Video Solution

44. State Gauss' theorem in electrostatics. Using it, derive an expression for the electric charged thin spherical shell at a point inside

Watch Video Solution

45. State Gauss' law and using this law , derive an expression for the electric field intensity due to a uniformly charged thin spherical shell at a point outside the shell.

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46. Derive expression for the electric field due to a uniformly charged spherical shell at a point inside

Watch Video Solution

47. Derive expression for the electric field due to a uniformly charged spherical shell at a point outside the shell.

Watch Video Solution

48. State Gauss' law and using this law , derive an expression for the electric field intensity due to a

uniformly charged thin spherical shell at a point inside

Watch Video Solution

49. State Gauss' law and using this law , derive an expression for the electric field intensity due to a uniformly charged thin spherical shell at a point outside the shell.

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50. Plot a graph shoing variation of electric field as a function of r> R and r < R (being the distance from the centre of the shell)

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51. Using Gauss' law, derive expression for the electric field intensity at any point outside a uniformly charged shell Draw the field lines when the charge density of the shell is positive

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52. Using Gauss' law, derive expression for the electric field intensity at any point outside a uniformly charged shell Draw the field lines when the charge density of the shell is negative.

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53. A spherical conduting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. Write the expression for the electric field at a point $x > r_2$ from the centre of the spherical shell.

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54. Draw the electric field lines due to a uniformly charged thin spherical shell when charge on the shell is negative?

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55. Draw the electric field lines due to a uniformly charged thin spherical shell when charge on the shell is positive?

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56. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point inside

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57. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point outside

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58. State Gauss's theorem with the help of diagram, derive an expression for the electric field intensity due to uniformly charged thin spherical shell at a point on the surface of the spherical shell.

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59. Find electric field due to solid sphere of charge at a point

outside.

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60. Find electric field due to solid sphere of charge at a point on the surface.

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61. Find electric field due to solid sphere of charge at a point inside.

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62. Consider an over all neutral sphere of radius R. This sphere has a point charge +Q at its centre and this positive charge is surrounded by a uniform density ρ of negative charge upto a radius R. Use Gauss' law to obtain expressions for the electric field of this at a point distant r form its centre. where $r < R$. show that these two expressions give identical results for the elctric field at $r = R$.

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63. Consider an over all neutral sphere of radius R. This sphere has a point charge +Q at its centre and

this positive charge is surrounded by a uniform density ρ of negative charge upto a radius R. Use Gauss' law to obtain expressions for the electric field of this at a point distant r form tis centre. where r > R. show that these two expressions give identical results for the elctric field at r = R

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64. A rectangular frame of wire of $25cm \times 15cm$ is placed in a uniform electric field of strength $2 \times 10^4 \frac{N}{C}$, such that the plane of the coil is

normal to field. Find the electric flux linked with the rectangular frame.

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65. A rectangular frame of wire of 25 cm x 15 cm is placed in a uniform electric field of strength 2 x 10^4N/C, such that the plane of the coil is normal to field. Find the electric flux linked with the rectangular frame. Calcuate the electric flux linked with the frame, when it is converted into a square

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66. A rectangular frame of wire of 25 cm x 15 cm is placed in a uniform electric field of strength 2 x 10^4N/C, such that the plane of the coil is normal to field. Find the electric flux linked with the rectangular frame Calcuate the electric flux linked with the frame, when it is converted into a circular frame.

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67. In which case is the electric flux maximum?

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68. A plane surface having area of $0.5m^2$ is placed inside a uniform electric field of strength $5 \times 10^3 NC^{-1}$. Calculate its flux makes an angle of 30° with the direction of electric field.

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69. A plane surface having area of $0.5m^2$ is placed inside a uniform electric field of strength $5 \times 10^3 NC^{-1}$. Calculate its fluxplane makes an angle of 60° with the direction of electric field.

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70. A plane surface having area of $0.5m^2$ is placed inside a uniform electric field of strength $5 \times 10^3 NC^{-1}$. Calculate its flux, plane makes an angle of 90° with the direction of electric field.

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71. There is uniform electric field of $3 \times 10^3 \hat{i} Nc^{-1}$ what is the net flux of the uniform electric field through a cube of ide 20 cm oriented so that its faces are parallel to the co-ordinate planes?

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72. A uniformly charged conducting sphere of 2.5 m in diameter has a surface charge density of $100\mu\frac{C}{m^2}$. Calculate the charge on the sphere.

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73. A uniformly charged conducting sphere of 2.5 m in diameter has a surface charge density of $100\mu\frac{C}{m^2}$. Calculate the total electric flux passing through the sphere.

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74. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu C / m^2$ - Find the charge on the sphere.

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75. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu C / m^2$ - What is the total electric flux leaving the surface of the sphere?

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76. A uniformly charged conducting sphere of 2.8 m in diameter has a surface charge density of $100\mu C m^{-2}$. Find the charge on the sphere.

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77. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu C/m^2$ - What is the total electric flux leaving the surface of the sphere?

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78. Consider a uniform electric field $E = 3 \times 10^3 \hat{\imath} N/C$. - What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane?

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79. Given a uniform electric field $\vec{E} = 5 \times 10^{-3} \hat{i} NC^{-1}$ What would be the flux through the same square, if the plane makes a 30° angle with the X-axis?

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80. A point charge of 10^-7` colulomb is situated at the centre of a cube of 1 m side. Calculate the electric flux through its surface.

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81. A point charge of $5\mu C$ is situated at the centre of a sphere of radius 0.2 m. Calculate the electric flux through its surface. Given $\varepsilon_0 = 8.854 \times 10^{-12} C^2 N^{-1} m^{-2}$

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82. Find the electric flux through each force of a hollow cube of side 10cm, if a charge of $8.854\mu C$ is placed at its centre.

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83. A point charge of $12\mu C$ is located at the centre of a cube of side 1 m. Calculate the electric flux through each face of the cube.

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84. If the number of electric lines of force emerging out of a closed surface are 10^3, calculate the charge enclosed by the surface.

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85. An electric flux of $-6 \times 10^3 Nm^2C^{-1}$ passes through a spherical gaussian surface of radius 10 cm due to a point charge placed at the centre. What is the charge enclosed by the gaussian surface.

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86. An electric flux of $-5 \times 10^3 Nm^2C^{-1}$ passes through a spherical gaussian surface of radius 20 cm due to the charge placed at its centre. If the radius of the gaussian surface is doubled, how much flux would pass through the surface?

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87. A charged particle having a charge of $-3\mu C$ is placed close to a sheet of charge having a surface charge density $5 \times 10^{-6} Cm^{-2}$. Find the force of attraction between the particle and the sheet of charge.

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88. A particle of mass 9×10^{-5} g is kept over a large horizontal sheet of charge having surface charge density $5x10^{-5}Cm^{-2}$ What charge should be given to this particle so that if released, it does not fall down?

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89. Assume that earth has a charge of surface density 1 electron per $metre^3$. Calculate the earth's

electric field

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90. Assume that earth has a charge of surface density 1 electron per $metre^2$. Calculate the earth's electric potential just outside the earth's surface.

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91. The radius of gold nucleus (Z=79) is about 7.0×10^{-15} m. Assuming that the positive charge is distributed uniformly througout the nuclear

volume, find the strength of the electric field at the surface of the nucelus

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92. The radius of gold nucleus (Z=79) is about 7.0×10^{-15} m. Assuming that the positive charge is distributed uniformly througout the nuclear volume, find the strength of the electric field at the middle point of the radius.

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93. A 1 mg ball carrying a charge of 2×10^{-8} C hangs from a thread. When a large conducting plate of charge is brought near the ball, the thread makes an angle of 30° with the plate. What is the surface charge density of the plate?

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94. If a small sphere of mass m and charge q hangs from a silk thread at angle θ with a charged coducting plate, show that the equilibrium of the sphere, the surface charge density for the plate is

$$\varepsilon_0 = \frac{mg}{q} \tan \theta$$

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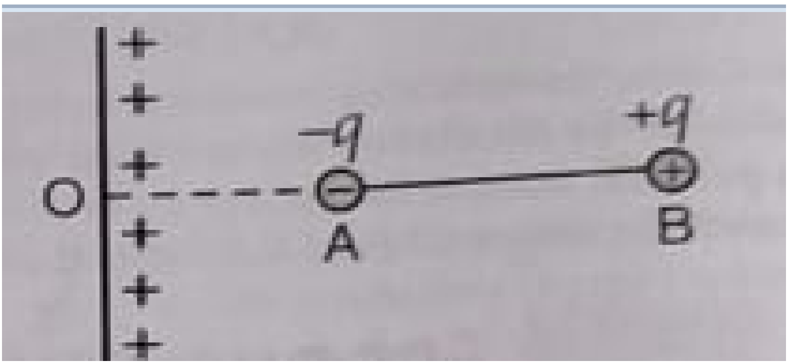
95. An electric dipole AB consists of charge ± 5 separated by a distance of $2 \times 10^{-3} m$ The dipole is placed near a long line charge having linear charge density $4.5 \times 10^{-4} Cm^{-1}$, such that the negative charge is at a distance OA = 2.5 cm from the line charge. Find the force acting on the dipole.



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