PHYSICS

BOOKS - MODERN PUBLICATION

TEXUAL QUESTIONS

Example

1. What is the Coulomb.s force between two small charged spheres having charges

2.0×10^{-7} C and 3.0×10^{-7} Coulomb placed 30 cm in air.

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2. The electrostatic force on a small sphere of charge $0.4\mu C$ due to another small sphere of charge $-0.8\mu C$ in air is 0.2 N.

What is the distance between the two spheres?

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3. The electrostatic force on a small sphere of charge $0.4\mu C$ due to another small sphere of charge $-0.8\mu C$ in air is 0.2 N.

What is the force on the second spheres due to the first?

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4. Check that the ratio $k\frac{e^2}{G}m_e m_p$ is dimensionless. Look up a table of physical constants and determine the value of this ratio. What does the ratio signify.

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5. Explain the meaning of the statement 'electric charge of a body is quantised.'

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6. Why Can one ignore quantisation of electric charge when dealing with macroscopic i.e., large scale charges?

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7. When a glass rod is rubbed with a silk cloth, charges appear on both. A similar phenomenon is observed with many other pairs of bodies. Explain how this observation is consitent with the law of conservation of charge.

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8. Four point charges $q_A = 2\mu C$, $q_B = -5\mu C$. $q_c = 2\mu C$, and $q_D = -5\mu C$

are located at the corners of a square ABCD of side 10 cm. What is the force on a charge of $1\mu C$ placed at the centre of the square?

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9. An electrostatic field line is a continuous curve. That is, a field line cannot have sudden breaks. Why not?

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10. Explain why the two field lines never cross each other at any point?

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11. Two point charges $q_A = 3\mu C$ and $q_B = -3\mu C$ are located 20 cm apart in vacuum. What is the electric field at the midpoint O of the line AB joining the two charges?

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12. Two point charges $q_A = 3\mu C$ and $q_B = -3\mu C$ are located 20 cm apart in vacuum. If a negative test charge of magnitude $1.5 \times 10^{-9} C$ is placed at this point, what is the force experienced by the test charge?

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13. A system has two charges $q_A = 2.5 \times 10^{-7}$ C and $q_B = -2.5 \times 10^{-7} C$ located at points

A: (0, 0, -15 cm) and B: (0,0, +15 cm), respectively. What are the total charge and electric dipole moment of the system?

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14. An electric dipole with dipole moment 4×10 ^−9 C m is aligned at 30^∘ with the direction of a uniform electric field of magnitude 5×10 ^4 N/C. Calculate the magnitude of the torque acting on the dipole.

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15. A polythene piece rubbed with wool is found to have a negative charge of $3 \times 10^{-7} C$. Estimate the number of electrons transferred (from which to which?)

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16. A polythene piece rubbed with wool is found to have a negative charge of $3 \times 10^{-7} C$. Is there a transfer of mass from wool to polythene?

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17. Two insulated charged copper spheres A and B have their centres separated by a distance of 50 cm. What is the mutual force of electrostatic repulsion if the charge on each is $6.5 \times 10^{-7} C$? The radii of A and B are negligible compared to the distance of separation.

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18. What is the Coulomb.s force between two small charged spheres having charges 2.0×10^{-7} C and 3.0×10^{-7} Coulomb placed 30 cm in air.

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19. The sphere A and B have identical sizes. A third sphere of the same size but uncharged is brought in contact with the first, then brought in contact with the second and finally removed

from both. What is the new force of repulsion between A and B?

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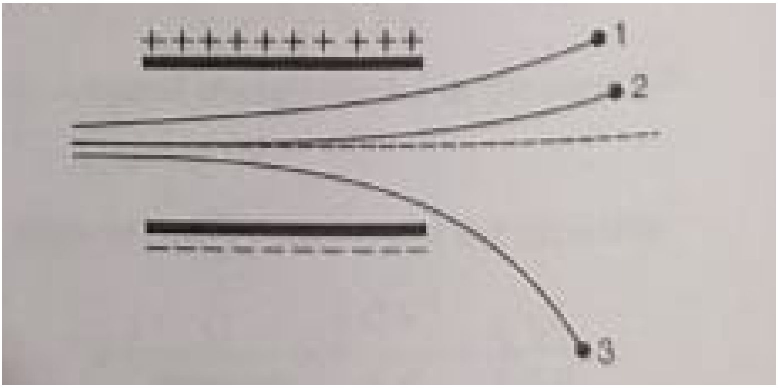
20. Shows the tracks of three charged particles crossing a uniform electrostatic field with same velocities along horizontal. Give the signs of the three charges. Which particle has the highest charge to mass ratio?



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21. Consider a uniform electric field $E = 3 \times 10^3 \hat{i} N / C$. - 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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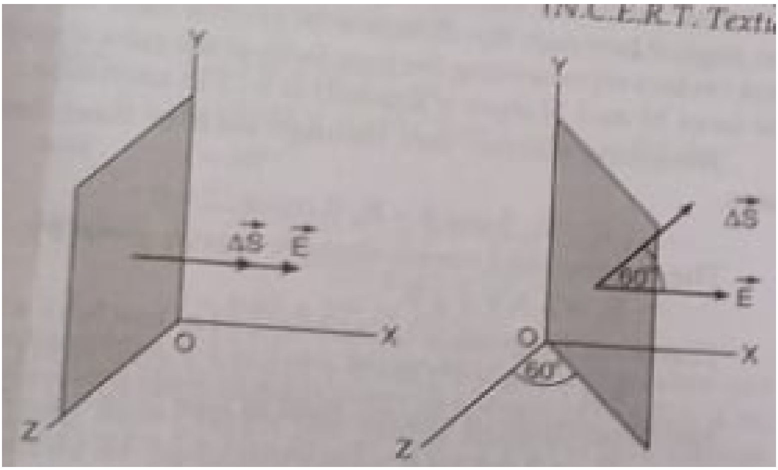
22. Consider a uniform electric field $\overrightarrow{E} = 3 \times 10^3 \hat{i} NC^{-1}$ What is the flux through the same square, if the normal to its plane makes a 60° angle with the X-axis?



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23. What is the net flux of the uniform electric field through a cube of side 20 cm oriented so that its faces are parallel to the coordinate planes?

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24. 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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25. 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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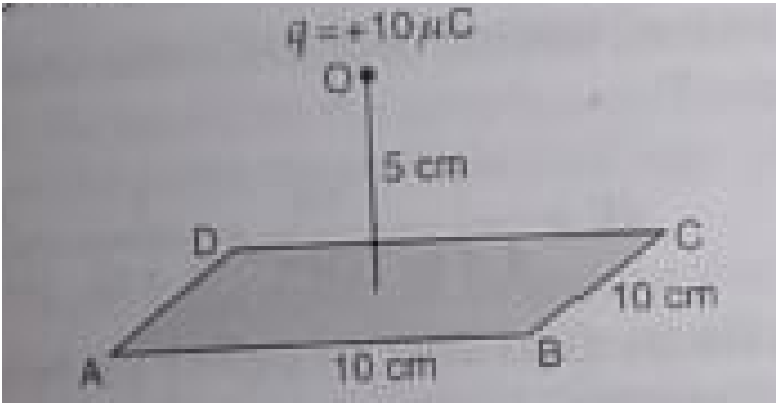
26. A point charge $+10\mu C$ is at a distance 5 cm directly above the centre of a square of side 10 cm as show in the figure.



What is the magnitude of the electric flux through the square?

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27. A point charge of $2.0\mu C$ is at the centre of a cubic Gaussian surface 9.0 cm on edge. What is the net electric flux through the surface?

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28. 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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29. 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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30. 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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31. 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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32. 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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33. 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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34. 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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35. 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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37. An oil drop of 12 excess electrons is held stationary under a constant electric field of $2.55 \times 10^4 NC^{-}$ 1 in Millikan's oil drop experiment. The density of the oil is

$1.26 g cm^{-3}$. Estimate the radius of the drop. $(g = 9.81 m s^{-2}, e = 1.60 \times 10^{-19} C)$.

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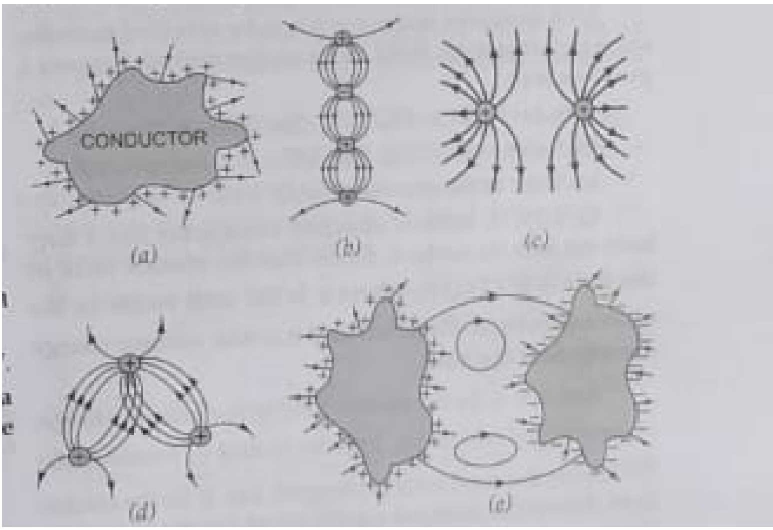
38. Which of the following curves shown in the figure cannot possibl represent electrostatic field lines?



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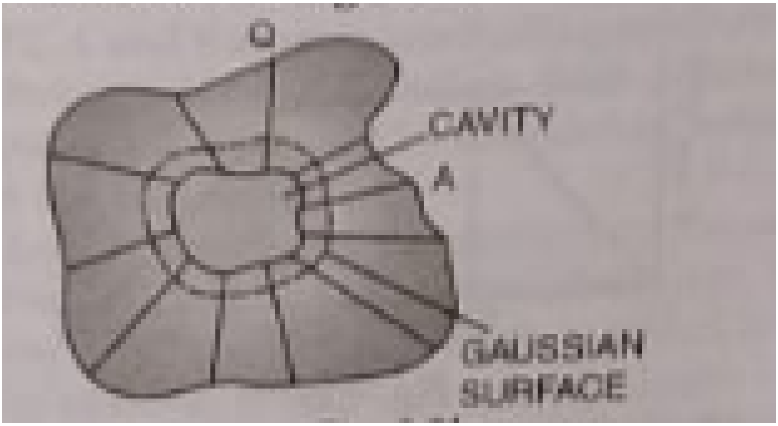
39. A conductor A with cavity as shown in the figure



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

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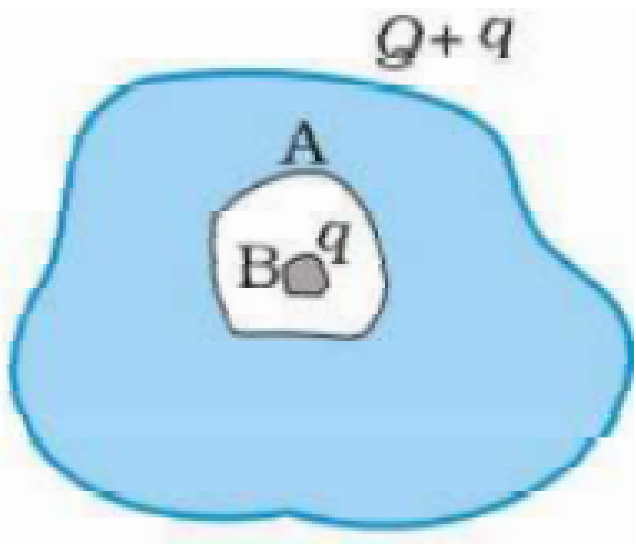
40. A conductor A with a cavity as shown in Fig. is given a charge Q.. Another conductor B with charge q is inserted into the cavity keeping B insulated from A. Show that the total charge on the outside surface of A is Q + q .



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

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42. A hollow charged conductor has a tiny hole cut into its surface. Show that the electric field in the hole is $(\sigma / 2\varepsilon_0)\ \widehat{n}$, where $\widehat{n}$ is the unit vector in the outward normal direction, and σ is the surface charge density near the hole.

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43. Obtain the formula for the electric field due to a long thin wire of uniform linear charge density λ without using Gauss's law.

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44. It is now believed that protons and neutrons (which constitute nuclei of ordinary matter) are themselves built out of more elementary units called quarks. A proton and a neutron consist of three quarks each. Two types of quarks, the so called 'up' quark (denoted by u) of charge + $(2/3)$ e, and the 'down' quark (denoted by d) of charge $(-1/3)$ e, together with electrons build up ordinary matter. (Quarks of other types have also been found which give rise to different unusual varieties of matter.) Suggest a possible quark composition of a proton and neutron.

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45. Consider an arbitrary electrostatic field configuration. A small test charge is placed at a null point (i.e., where E = 0) of the configuration. Show that the equilibrium of the test charge is necessarily unstable.

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46. Consider an arbitrary electrostatic field configuration. A small test charge is placed at a null point (i.e., where $E = 0$) of the configuration. Show that the equilibrium of the test charge is necessarily unstable. Verify this result for the simple configuration of two charges of the same magnitude and sign placed a certain distance apart.

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47. A particle of mass m and charge (-q) enters the region between the two charged plates initially moving along x-axis with speed v_x. The length of plate is L and an uniform electric field E is maintained between the plates. Show that the vertical deflection of the particle at the far edge of the plate is $qEL^2 / (2mv_x^2)$.

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48. Suppose that the particle is an electron projected with velocity $v_x = 2.0 \times 10^6 ms^{-1}$. If E between the plates separated by 0.5 cm is $9.1 \times 10^2 N/C$, where will the electron strike the upper plate? `(|e| =1.6 xx 10^-19 C, m_e=9.1 xx 10^-31 kg.)

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49. Two charges $5 \times 10^{-8} C$ and $-3 \times 10^{-8} C$ are located 16 cm apart. At what point(s) on

the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero.

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50. A regular hexagon of side 10 cm has a charge $5\mu C$ at each of its vertices. Calculate the potential at the centre of the hexagon.

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51. Two charges $2\mu C$ and $-2\mu C$ are placed at points A and B 6 cm apart. Identify an equipotential surface of the system.

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52. Two charges $2\mu C$ and $-2\mu C$ are placed at points A and B 6 cm apart. What is the direction of the electric field at every point on this surface?

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53. A spherical conductor of radius 12 cm has a charge of $1.6 \times 10^{-7} C$ distributed uniformly on its surface. What is the electric field inside the sphere?

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54. A spherical conductor of radius 12 cm has a charge of $1.6 \times 10^{-7} C$ distributed uniformly on its surface. What is the electric field just outside the sphere?

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55. A spherical conductor of radius 12 cm has a charge of $1.6 \times 10^{-7} C$ distributed uniformly on its surface. What is the electric field at a point 18 cm from the centre of the sphere?

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56. A parallel plate capacitor with air between the plates has a capacitance of 8 pF

$(1pF = 10^{-12}F)$. What will be the capacitance if the distance between the plates is reduced by half, and the space between them is filled with a substance of dielectric constant 6?

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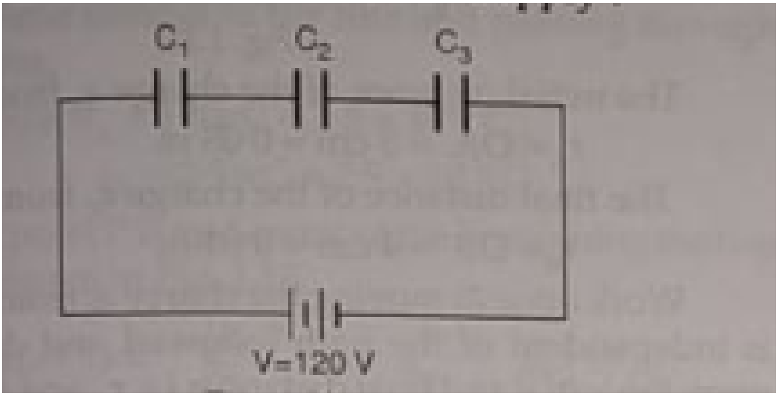
57. Three capacitors each of capacitance 9 pF are connected in series as shown in the figure. What is the total capacitance of the combination.



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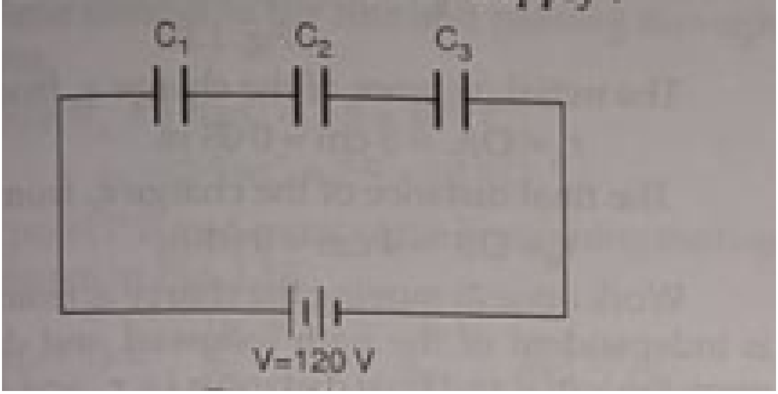
58. Three capacitors each of capacitance 9 pF are connected in series as shown in the figure.



What is the potential difference across each capacitor, if the combination is connected to a 120 volt supply?

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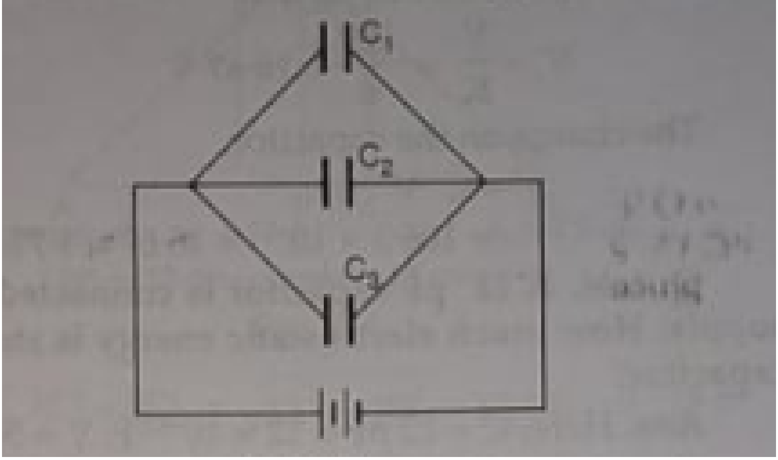
59. Three capacitors of capacitances 2pF, 3pF and 4pF are connected in parrallel as shown in the figure.



What is the total capacitance of the combination?

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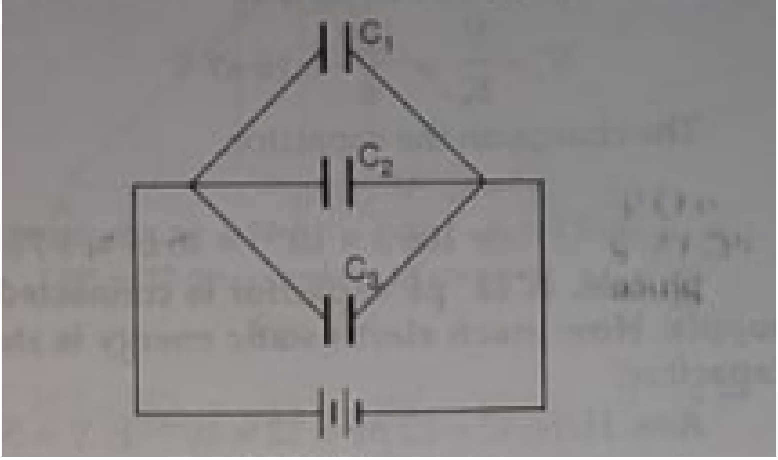
60. Three capacitors of capacitances 2pF, 3pF and 4pF are connected in parrallel as shown in the figure.



Determine the charge on each capacitor, if the combination is connected to a 100 V supply.

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61. In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3} m^2$ and the distance between the plates is 3 mm. Calculate the capacitance of the capacitor. If this capacitor is connected to a 100 V supply, what is the charge on each plate of the capacitor?

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62. A parallel plate capacitor a air between its plates having plate area of 6*10^-3 m^2 and separation between them 3 mm is connected to a 100 V battery. Explain what would happen when a 3 mm thick mica sheet (of dielectric constant = 6) were inserted between the plates, while the voltage supply remained connected.

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63. A parallel plate capacitor a air between its plates having plate area of 6*10^-3 m^2 and separation between them 3 mm is connected to a 100 V battery. Explain what would happen when a 3 mm thick mica sheet (of dielectric constant = 6) were inserted between the plates, after the supply was disconnected.

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64. A 12pF capacitor is connected to a 50V battery. How much electrostatic energy is stored in the capacitor?

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65. A 600pF capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged 600 pF capacitor. How much electrostatic energy is lost in the process?

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66. A charge of 8 mC is located at the origin. Calculate the work done in taking a small charge of $-2 \times 10^{-9} C$ from a point P (0, 0, 3 cm) to a point Q (0, 4 cm, 0), via a point R (0, 6 cm, 9 cm).

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67. A cube of side b has a charge q at each of its vertices. Determine the potential and electric field due to this charge array at the centre of the cube.

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68. Two tiny spheres carrying charges $1.5\mu C$ and $2.5\mu C$ are located 30 cm apart. Find the potential and electrical field at the mid-point of the line joining the two charges.

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69. Two tiny spheres canying charges $1.5\mu C$ and $2.5\mu C$ are located 30 cm apart. Find the potential and electric field: at a point 10 cm from this midpoint in a plane normal to the line and passing through the mid-point.

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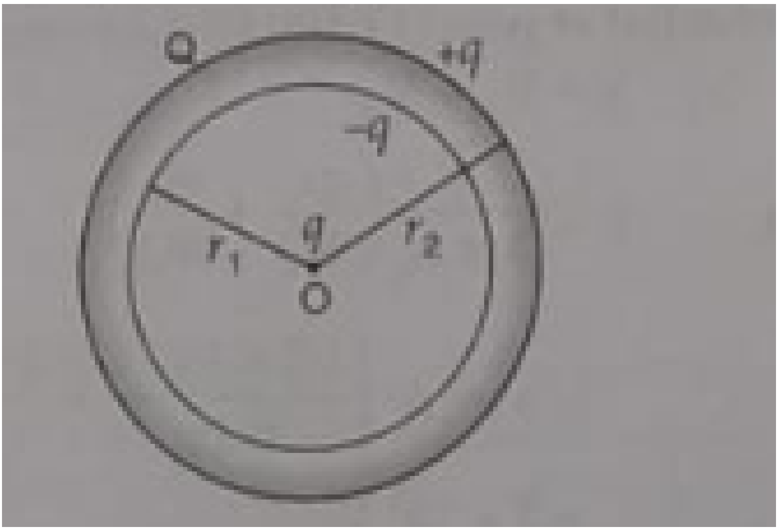
70. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q as shown in the figure.



A charge

q is placed at the centre of the shell. What is the surface charge density of the inner and outer sufaces of the shell?

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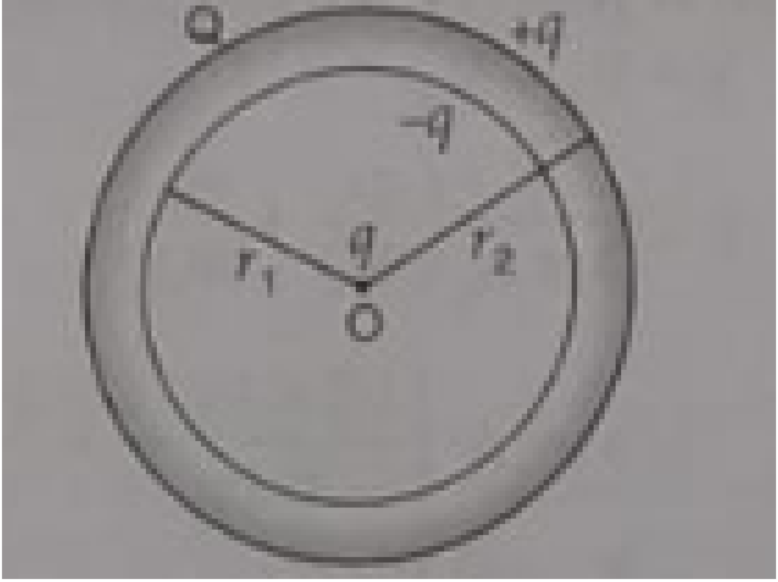
71. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q as shown in the figure.



Is the electric field isnide a cavity (with no charge) zero, even if the shell is not spherical, but has any irregular shape? Explain.

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72. Show that the normal component of electrostatic field has a discontinuity from one side of a charged surface to another given by $(E_2 - E_1)\widehat{n} = \frac{\sigma}{\varepsilon_0}$ where $\widehat{n}$ is a unit vector normal to the surface at a point and is the surface charge density at that point. (The direction of$\widehat{n}$ is from side 1 to side 2.) Hence show that just outside a conductor, the electric field is$\sigma\widehat{n}/\varepsilon_0$

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73. Show that the normal component of electrostatic field has a discontinuity from one side of a charged surface to another given by $(E_2 - E_1)\widehat{n} = \frac{\sigma}{\varepsilon_0}$ where n is a unit vector normal to the surface at a point and is the surface charge density at that point. (The direction of $\widehat{n}$ is from side 1 to side 2.) Hence show that just outside a conductor, the electric field is $\sigma\widehat{n}/\varepsilon_0$. Show that the tangential component of electrostatic field is continuous from one side of a charged surface to another.

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74. A long charged cylinder of linear charged density λ is surrounded by a hollow co-axial conducting cylinder. What is the electric field in the space between the two cylinders?

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75. In a hydrogen atom, the electron and proton are bound at a distance of about 0.53 A. (a) Estimate the potential energy of the system in eV, taking the zero of the potential energy at infinite separation of the electron from proton. (b) What is the minimum work required to free the electron, given that its kinetic energy in the orbit is half the magnitude of potential energy obtained in (a)?

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76. In a hydrogen atom, the electron and proton are bound at a distance of about 0.53

A. (a) Estimate the potential energy of the system in eV, taking the zero of the potential energy at infinite separation of the electron from proton. (b) What is the minimum work required to free the electron, given that its kinetic energy in the orbit is half the magnitude of potential energy obtained in (a)?

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77. In a hydrogen atom, the electron and proton are bound at a distance of about 0.53 A: (a) Estimate the potential energy of the system in eV, if the zero of potential energy is taken at $1.06\overset{\circ}{A}$ separation of the electron from proton? (b) What is the minimum work required to free the electron, given that its kinetic energy in the orbit is half the magnitude of potential energy obtained in (a)?

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78. If one of the two electrons of a H_2 molecule is removed, we get a hydrogen molecular ion H_2^+. In the ground state of an H_2^+, the two protons are separated by roughly $1.5\overset{\circ}{A}$. and the electron is roughly 1 A from each proton. Determine the potential energy of the system. Specify your choice of the zero of potential energy.

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79. Two charged conducting spheres of radii a and b are connected to each other by a wire. What is the ratio of electric fields at the surfaces of the two spheres? Use the result obtained to explain why charge density on the sharp and pointed ends of a conductor is higher than on its flatter portions.

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80. Two charges $-q$ and $+q$ are located point (0, 0, -a) and (0, 0, a) respectively:

What is the electrostatic potential at the points (0,0,z) and (x,y,0) ?

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81. Two charges -q and +q are located at points (0, 0, -a) and (0, 0, a), respectively. How much work is done in moving a small test charge from the point (5,0,0) to (-7,0,0) along the x-axis? Does the answer change if the path of the test charge between the same points is not along the x-axis?

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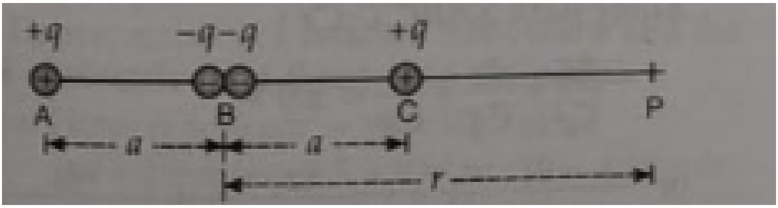
82. In figure



Shows a charge array known as an electric quadrupole. For a point P on the axis of the quadrupole, obtain the dependence of potential on distance r for r/a >> 1.

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83. An electrical technician requires a capacitance of $2\mu F$ in a circuit across a potential difference of 1 kV. A large number of $1\mu F$ capacitors are available to him each of which can withstand a potential difference of not more than 400 V. Suggest a possible arrangement that requires the minimum number of capacitors.

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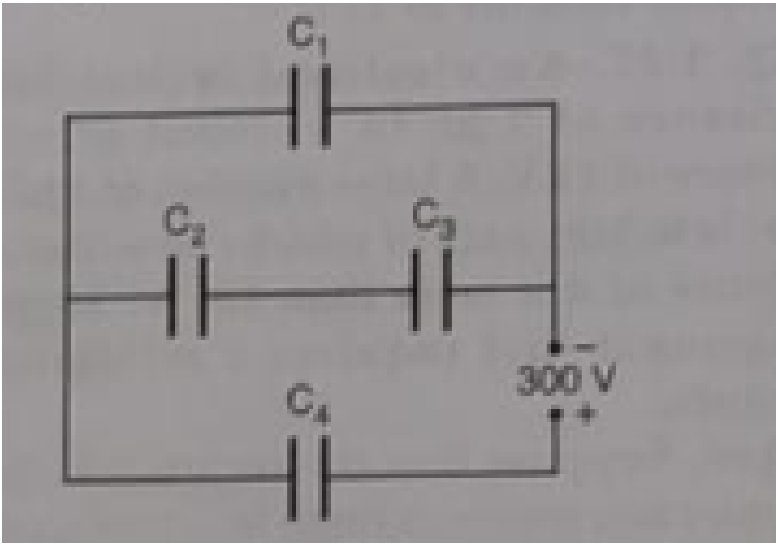
84. Obtain the equivalent capacitance of the following netweork shown in the figure



For a

300 V supply, determine the charge and voltage across each capacitor. Given that $C_1 = C_4 = 100pF$ and $C_2 = C_3 = 200pF$.

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85. The plates of a parallel plate capacitor have an area of $90cm^2$ each and are separated by 2.5 mm. The capacitor is charged by connecting it to a 400 V supply. How much electrostatic energy is stored by the capacitor?

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86. The plates of a parallel plate capacitor have an area of $90cm^2$ each and are separated by 2.5 mm. The capacitor is charged by connecting it to a 400 V supply. (a) How much electrostatic energy is stored by the capacitor? (b) View this energy as stored in the electrostatic field between the plates, and obtain the energy per unit volume u. Hence arrive at a relation between u and the magnitude of electric field E between the plates.

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87. A $4\mu F$ capacitor is charged by a 200 V supply. It is then disconnected from the supply, and is connected to another uncharged $2\mu F$ capacitor. How much electrostatic energy of the first capacitor is lost in the form of heat and electromagnetic radiation?

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88. Show that the force on each plate of a parallel plate capacitor has a magnitude equal to (1/2) QE, where Q is the charge on the capacitor, and E is the magnitude of electric field between the plates. Explain the origin of the factor 1/2.

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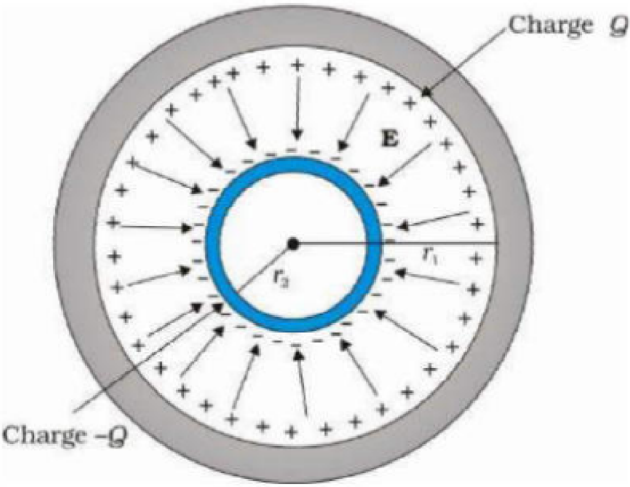
89. A spherical capacitor consists of two concentric spherical conductors, held in position by suitable insulating supports (Fig. 2.36). Show that the capacitance of a spherical capacitor is given by $C = \dfrac{4\pi\varepsilon_0 r_1 r_2}{(r_1) - (r_2)}$ where r_1 and r_2 are the radii of outer and inner spheres, respectively.:



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90. A spherical capacitor has an inner sphere of radius 12 cm and an outer sphere of radius 13 cm. The outer sphere is earthed and the inner sphere is given a charge of $2.5\mu C$. The space between the concentric spheres is filled with a liquid of dielectric constant 32. Determine the capacitance of the capacitor.

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91. A spherical capacitor has an inner sphere of radius 12 cm and an outer sphere of radius 13 cm. The outer sphere is earthed and the inner sphere is given a charge of $2.5\mu C$. The space between the concentric spheres is filled with a liquid of dielectric constant 32. What is the potential of the inner sphere?

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92. A spherical capacitor has an inner sphere of radius 12 cm and an outer sphere of radius 13 cm. The outer sphere is earthed and the inner sphere is given a charge of $2.5\mu C$. The space between the concentric spheres is filled with a liquid of dielectric constant 32. Compare the capacitance of this capacitor with that of an isolated sphere of radius 12 cm.

Explain why the latter is much smaller.

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93. Answer carefully: Two large conducting spheres carrying charges Q_1 and Q_2 are brought close to each other. Is the magnitude of electrostatic force between them exactly given by $\left((Q_1Q_2) / \left(4\pi\varepsilon_0 r^2\right)\right)$, where r is the distance between their centres?

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94. Answer carefully: If Coulomb's law involved $1/r^3$ dependence (instead of $1/r^2$), would Gauss's law be still true ?

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95. Answer carefully: A small test charge is released at rest at a point in an electrostatic field configuration. Will it travel along the field line passing through that point?

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96. What is the work done by the field of a necleus in a complete circular orbit of the electron? What if the orbit is elliptical?

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97. Answer carefully: We know that electric field is discontinuous across the surface of a charged conductor. Is electric potential also discontinuous there?

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98. Answer carefully: What meaning would you give to the capacitance of a single conductor?

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99. Answer carefully: Guess a possible reason why water has a much greater dielectric constant (= 80) than say, mica (= 6).

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100. A cylindrical capacitor has two co-axial cylinders of length 15 cm and radii 1.5 cm and 1.4 cm. The outer cylinder is earthed and the inner cylinder is given a charge of $3.5\mu C$. Determine the capacitance of the system and the potential of the inner cylinder. Neglect end effects (i.e., bending of field lines at the ends).

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101. A parallel plate capacitor is to be designed with a voltage rating 1 kV, using a material of dielectric constant 3 and dielectric strength about $10^7 Vm^{-1}$. (Dielectric strength is the maximum electric field a material can tolerate without breakdown, i.e., without starting to conduct electricity through partial ionisation.) For safety, we should like the field never to exceed, say 10% of the dielectric strength. What minimum area of the plates is required to have a capacitance of 50 pF?

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102. Describe schematically the equipotential surfaces corresponding to- a constant electric field in the z-direction.

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103. Describe schematically the equipotential surfaces corresponding to - a field that uniformly increases in magnitude but remains in a constant (say, z) direction.

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104. Describe schematically the equipotential surfaces corresponding to - a single positive charge at the origin.

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105. Describe schematically the equipotential surfaces corresponding to - a uniform grid consisting of long equally spaced parallel charged wires in a plane.

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106. In a Van de Graaff type generator a spherical metal shell is to be a $15 \times 10^6 V$ electrode. The dielectric strength of the gas surrounding the electrode is $5 \times 10^7 V m^{-1}$. What is the minimum radius of the spherical shell required? (You will learn from this exercise why one cannot build an electrostatic generator using a very small shell which requires a small charge to acquire a high potential.)

Watch Video Solution

107. A small sphere of radius r_1 and charge q_1 is enclosed by a spherical shell of radius r_2 and charge q_2. Show that if q_1 is positive, charge will necessarily flow from the sphere to the shell (when the two are connected by a wire) no matter what the charge q_2 on the shell is.

Watch Video Solution

108. Answer the following: The top of the atmosphere is at about 400 kV with respect to the surface of the earth, corresponding to an electric field that decreases with altitude. Near the surface of the earth, the field is about $100Vm^{-1}$. Why then do we not get an electric shock as we step out of our house into the open? (Assume the house to be a steel cage so there is no field inside!)

Watch Video Solution

109. Answer the following: A man fixes outside his house one evening a two metre high insulating slab carrying on its top a large aluminium sheet of area $1m^2$. Will he get an electric shock if he touches the metal sheet next morning?

Watch Video Solution

110. Answer the following: The discharging current in the atmosphere due to the small conductivity of air is known to be 1800 A on an average over the globe. Why then does the atmosphere not discharge itself completely in due course and become electrically neutral? In other words, what keeps the atmosphere charged?

Watch Video Solution

111. Answer the following: What are the forms of energy into which the electrical energy of the atmosphere is dissipated during a lightning?

Watch Video Solution

112. An arbitraty surface enclose a dipole. What is the electric flux through this surface?

Watch Video Solution

113. 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.

Watch Video Solution

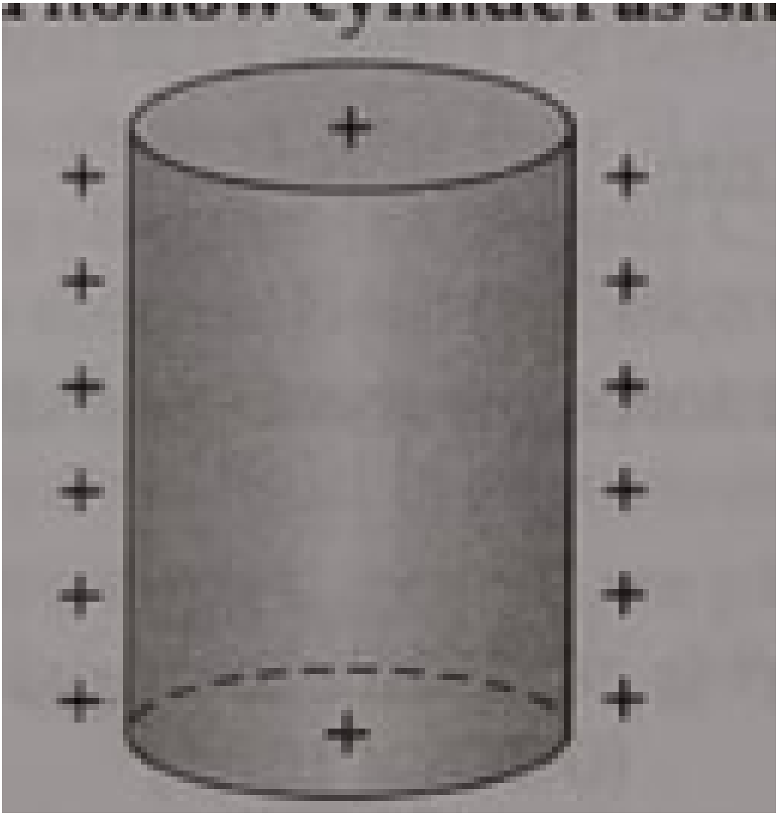
114. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?

Watch Video Solution

115. The dimensions of an atom are of the order of an angstrom. Thus there must be large electric fields between the protons and electrons. Why, then is the electrostatic field inside a conductor zero?

Watch Video Solution

116. Sketch the electric field lines for a uniformly charged hollow cylinder as shown in the figure.

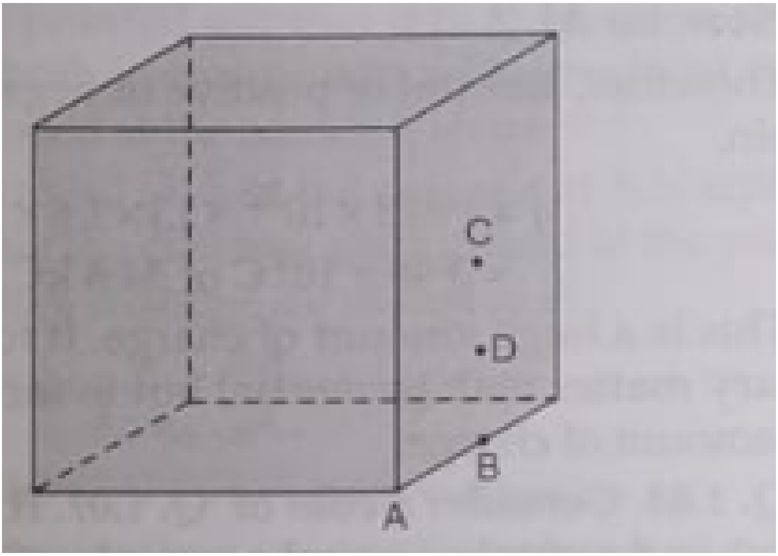


Watch Video Solution

117. If the total charge enclosed by a surface is zero, does it imply that the electric field everywhere on the surface is zero? Conversely, if the electric field everywhere on a surface is zero, does it imply that net charge inside is zero.

Watch Video Solution

118. Shows a cube with side of length a.

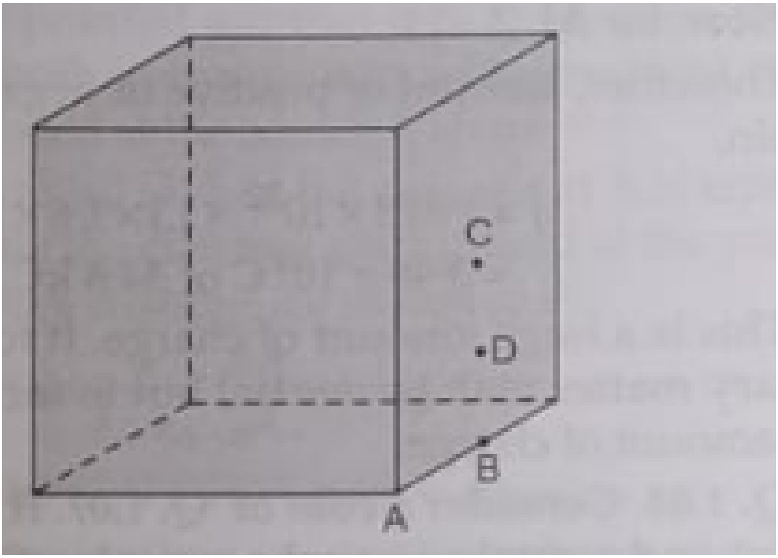


What will the total flux through the faces of the cube, if a charge q is placed at

A, a corner of the cube?

Watch Video Solution

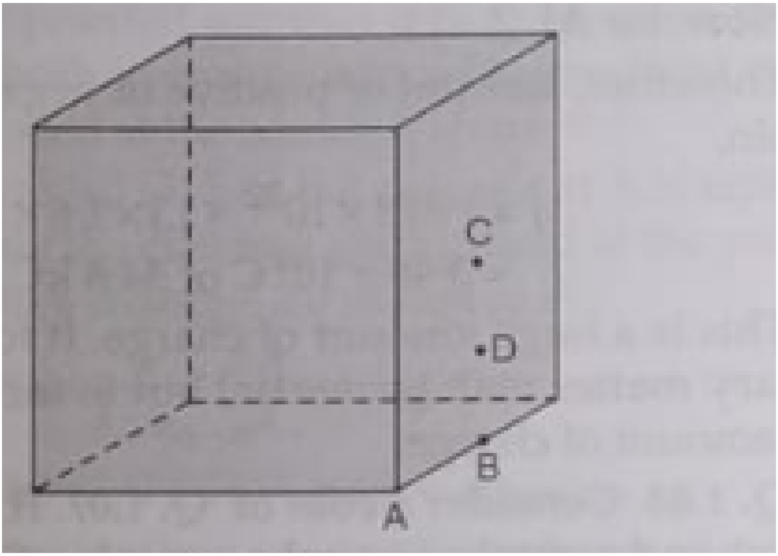
119. Shows a cube with side of length a.



What will the total flux through the faces of the cube, if a charge q is placed at B, mid-point of an edge of the cube?

Watch Video Solution

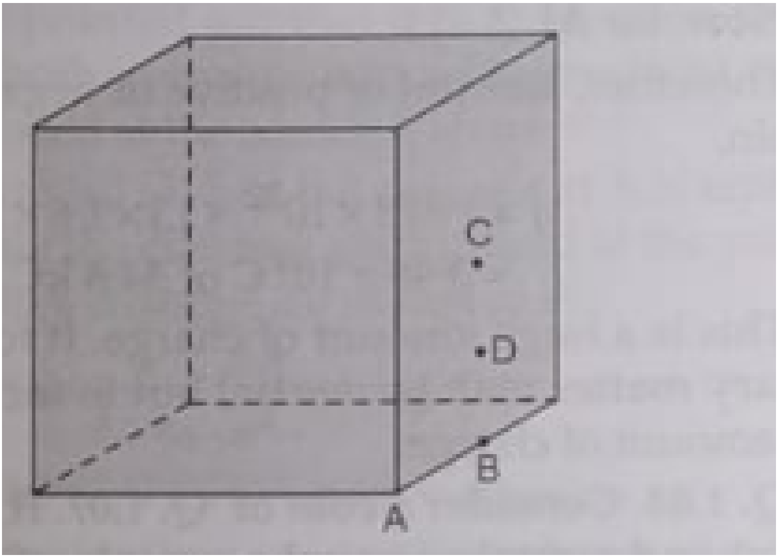
120. Shows a cube with side of length a.



What will the total flux through the faces of the cube, if a charge q is placed at C, centre of the face of the cube?

Watch Video Solution

121. Shows a cube with side of length a. What will the total flux through the faces of the cube, if a charge q is placed at D, mid-point of B and C?



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122. A paisa coin is made up of Al-Mg alloy and weights 0.75g. It has a square shape and its diagonal measures 17 mm. it is electrically neutral and contains equal amounts of positive and negative charges.

Treating the paisa coins made up of only Al, find the magnitude of equal number of positively and negatively charages. what conclusion do you draw from this magnitude?

Watch Video Solution

123. Consider a coin, It is electrically neutral and contains equal amounts of positive and negative charge of magnitude $34.8kC$. Suppose that these equal charages were concentrated two point charges separated by 100 m(-length of a long building),find the force on each such point charge in this case. What do you conclude from these results?

Watch Video Solution

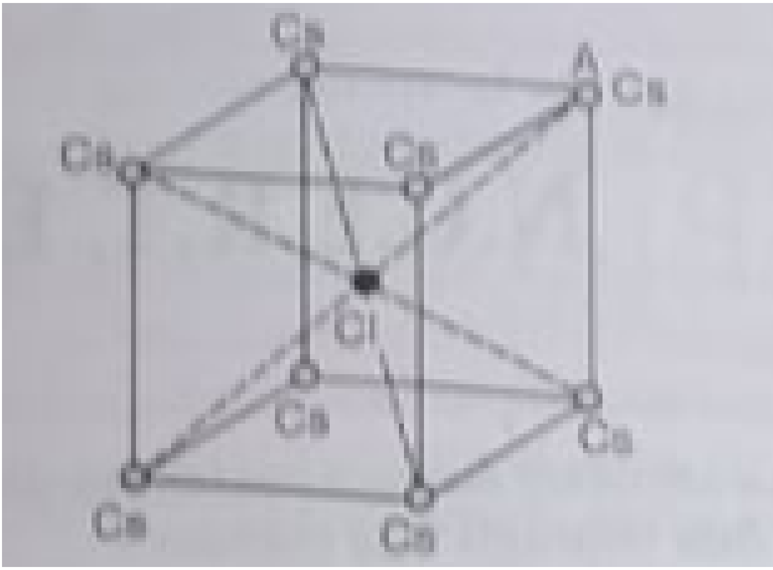
124. Consider a coin, It is electrically neutral and contains equal amounts of positive and negative charge of magnitude $34.8kC$. Suppose that these equal charages were concentrated two point charges separated by 100 m(-length of a long building),find the force on each such point charge in this case. What do you conclude from these results?

Watch Video Solution

125. Consider a coin, It is electrically neutral and contains equal amounts of positive and negative charge of magnitude $34.8kC$. Suppose that these equal charages were concentrated two point charges separated by 100 m(-length of a long building),find the force on each such point charge in this case. What do you conclude from these results?

Watch Video Solution

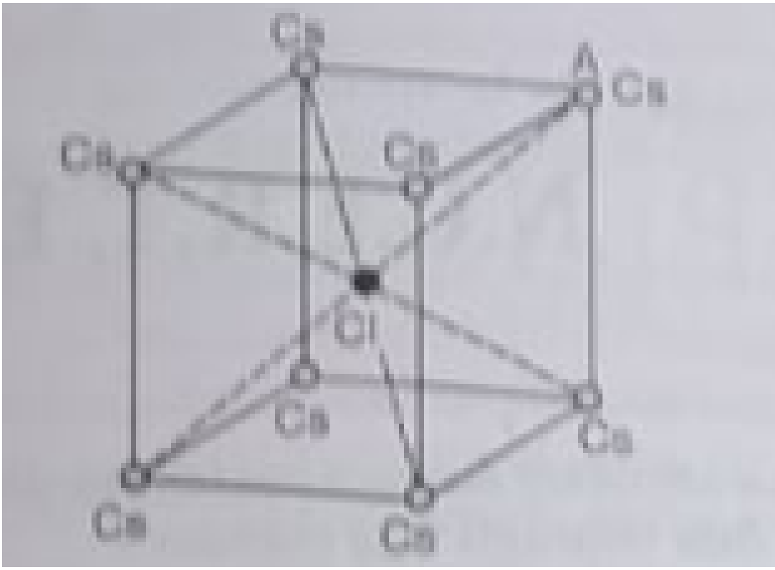
126. Represents a crystal a crystal unit of cesium chloride (CsCl).



The Cs atoms are situated at the corners of a cube of side 0.4 nm, whereas a Cl atom is situated at the centre of the cube. The Cs atoms are deficient in one electron, while the Cl atom carries an excess electron. What is the net electric field on the Cl atom due to eight Cs atoms?

Watch Video Solution

127. Represents a crystal a crystal unit of cesium chloride (CsCl).



The Cs

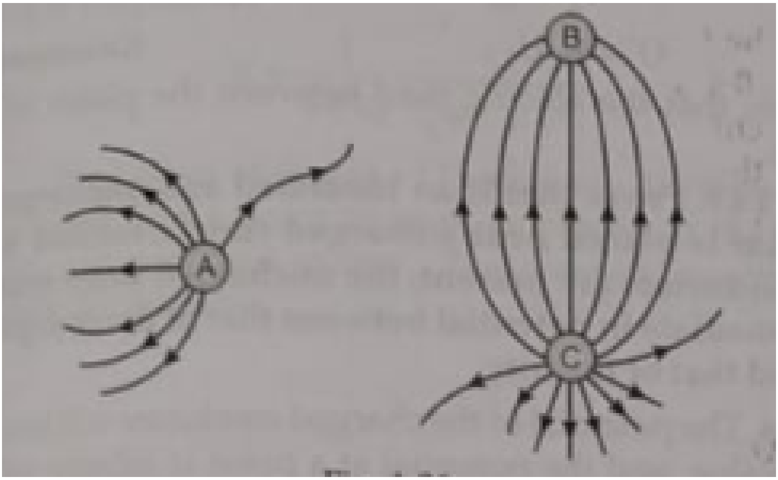
atoms are situated at the corners of a cube of side 0.4 nm, whereas a Cl atom is situated at the centre of the cube. The Cs atoms are deficient in one electron, while the Cl atom carries an excess electron. Suppose that the Cs atom at the corner A is missing. What is the net force now on the Cl atom due to the seven remaining Cs atoms?

Watch Video Solution

128. Two charges q and -3q are placed fixed on X-axis separated by distance 'd'. Where should a thrd charge 2q be placed such that it will not experience any force?

Watch Video Solution

129. In figure Which charges are positive?



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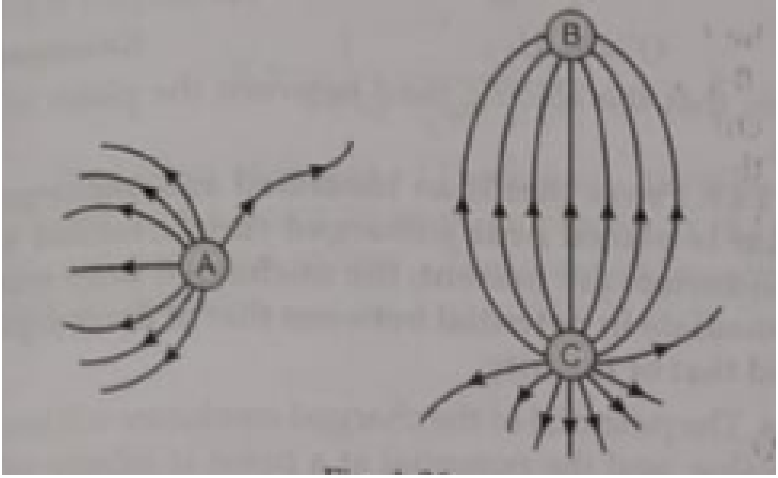
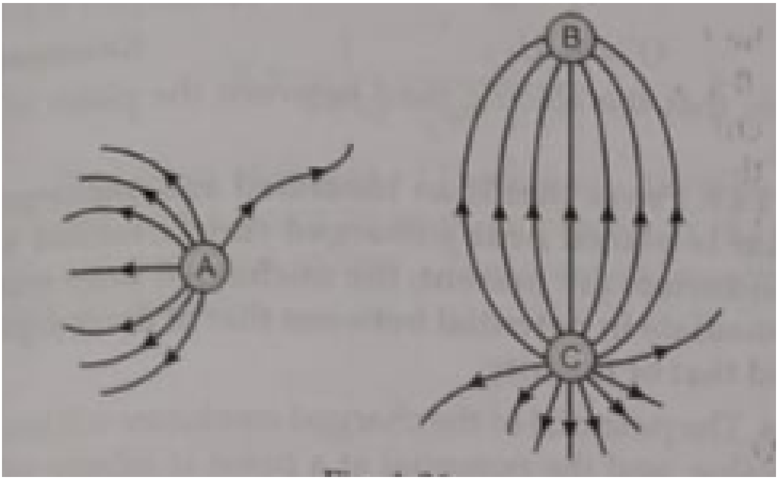
130. In figure Which charge has the largest magnitude? Why?



Watch Video Solution

131. In figure In which region or regions of the figure could the electric field be zero nearA, nearB, near C or nowhere. Justify your answer.



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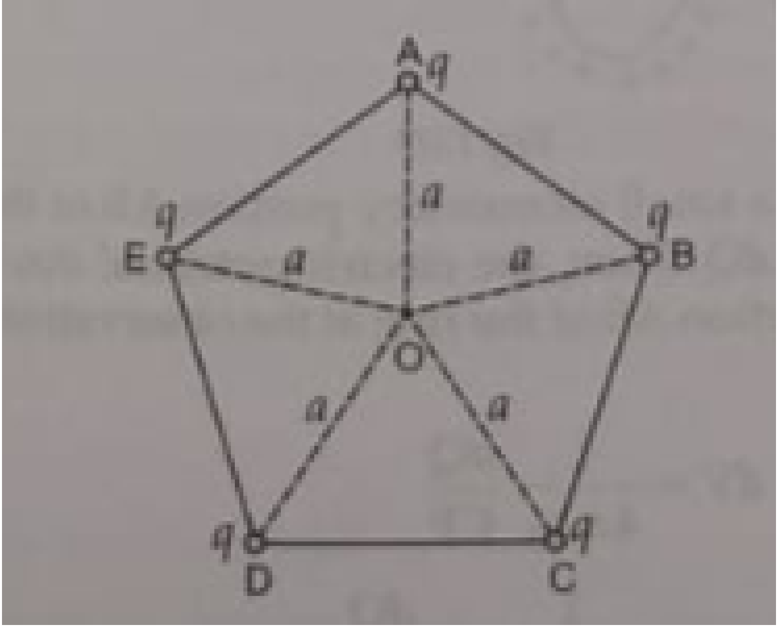
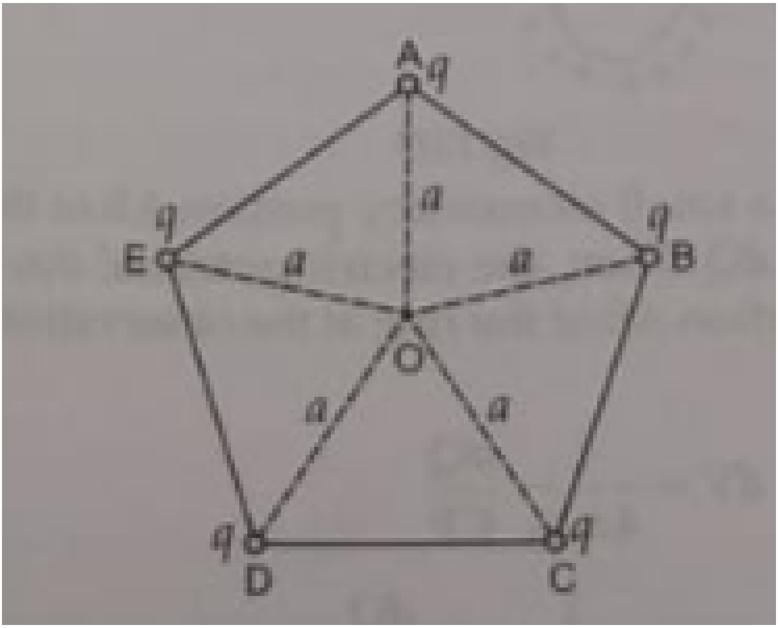
132. Five charges, q each, are placed at the corners of a regular pentagon of side a as shown in the figure.



What will be the electric field at O, the centre of the pentagon? What will be the electric field at O, fi the charge from one of the corners (Say A) is removed? What will be the electric field at O, if the charge q at A is repalced by - q?

Watch Video Solution

133. Five charges, q each, are placed at the corners of a regular pentagon of side a as shown in the figure.



How would your answer to be affected, if pentagon is replaced by n-sided regular polygon with charge q at each of its corners?

134. Consider two conducting spheres of radii of R_1 and R_2 with $R_1 > R_2$. If the two are at the same potential the larger sphere has more charge than the smaller spheres. State whether the charge density of the smaller sphere is more or less than that of the larger one.

135. Do free electrons travel to region of higher potential or lower potential?

Watch Video Solution

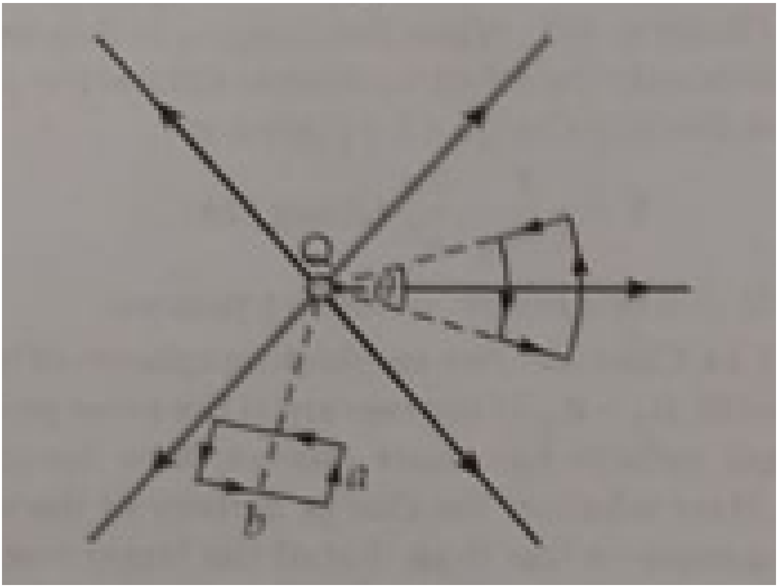
136. Can there be potential difference between two adjacent conductors which carry the same positive charge?

Watch Video Solution

137. Can the potential function have a maximum or minimum in free space?

Watch Video Solution

138. A test charge q is made to move in the electric field of a point charge Q along two different closed paths. Fig. First path has sections along and perpendicular loop of the same area as the first loop. How does the work done compare in the two cases?



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139. A capacitor has some dielectric between its plates, and the capacitor is connected to a DC source. The battery is now disconnected and then the dielectric is removed. State whether the capacitance, the energy stored in it, electric field, charged stored and the voltage will increase, decrease or remains constant.

Watch Video Solution

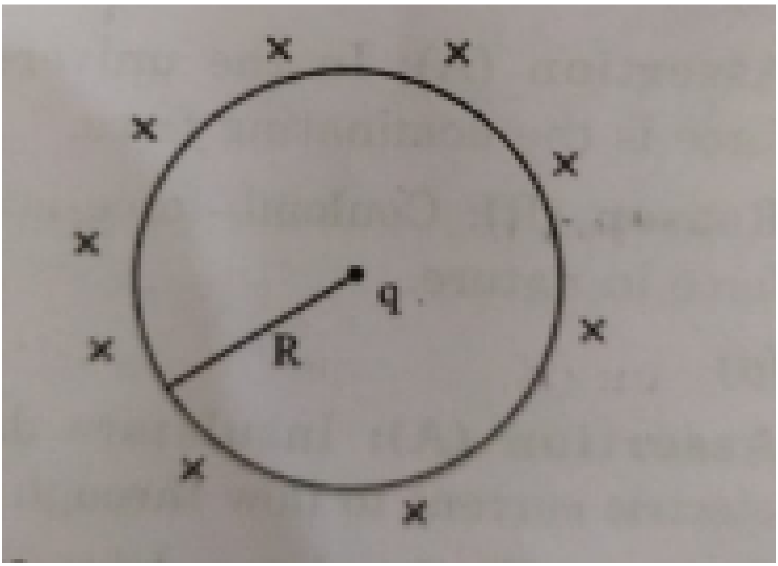
140. Prove that, if an insulated, unchanged conductor is placed near a charged conductor, and no other conductors are present, the uncharged body must be intermediate in potential between that of the charged body and that of infinity.

Watch Video Solution

141. Electric field is the electrostatic force per unit charge acting on a vanishingly small test charge placed at that point. It is a vector quantity and the electric field inside a charged conductor is zero. Electric flux ϕ is the total number of electric lines of force passing through a surface in a direction normal to the surface when the surface is placed inside the electric field.

$$\phi = \oint \vec{E} \cdot \vec{ds} = \frac{q}{\varepsilon_0}$$

A positive charge Q is uniformly distributed along the circular ring of radius R. A small test charge q is placed at the centre of te ring as shown.



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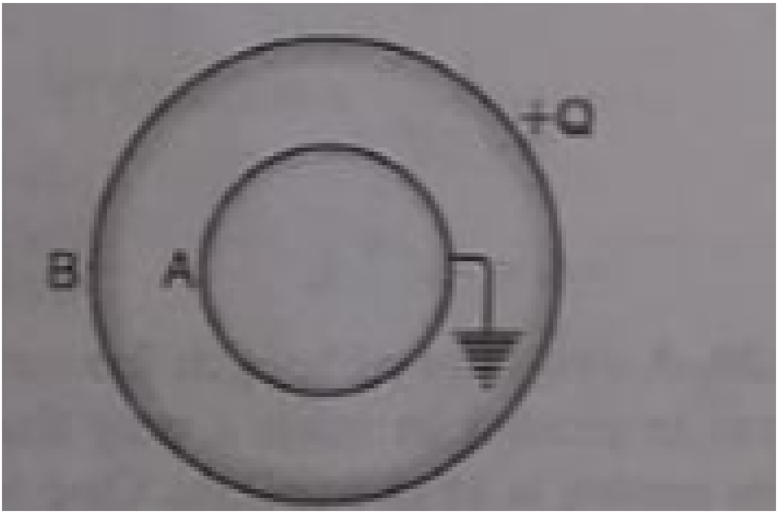
142. A positive charge Q is uniformly distributed along a circular ring of radius R. A small test charge q is placed at the centre of the ring.

Watch Video Solution

143. Two identical conducting spheres M and N has charge q_M and q_N respectively. A third identical neutral spehre P is brought in contact with M and then separated. Now, sphere P is brought in contact with N and then separated. Find out final charge on the spehre P.

Watch Video Solution

144. Two concentric hollow spheres are arranged as shown in the figure. If a charge +Q is given to the outer sphere, find charge induced on the inner sphere.



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145. Electric field and a dipole are in same direction. When the dipole is deflected through a small angle, does it exhibit S.H.M?

Watch Video Solution

146. An electric dipole of dipole moment $\overrightarrow{p}$ is lying along a uniform electric field $\overrightarrow{E}$. What is the work done in rotating the dipole through 90°?

Watch Video Solution

147. An electric dipole has the magnitude of its chawrge q and its dipole moment is p. It is placed in a uniform electric field. If the dipole moment is along the direction of the field, what is the force on its and its potential energy?

Watch Video Solution

148. Electric field inside a sphere varies with distance as A r. Find the total charge enclosed within the sphere, if A = 3,000 Vm^{-2} and R = 30 cm, where R is radius of the sphere.

Watch Video Solution

149. The electric field at a distance $3R/2$ from the centre of a charge conducting spherical shell of radius R is E. The electric field at a distance $R/2$ from the centre of the sphere is

A. zero

B. E

C. $E/2$

D. $E/3$

Answer:

Watch Video Solution

150. A ring of radius R is uniformly charged by + Q charge. Find potential at an axial point, which is situated at distance r from the centre and hence deduce electric field.

Watch Video Solution

151. A charge Q is given to a conducting cone. Is charge density on the cone it all the points is same?

Watch Video Solution

152. A charge Q is given to a conducting cone. Is electric potential at all the points on the surface of the cone same?

Watch Video Solution

153. Dielectric strength of air is $3 \times 10^6 Vm^{-1}$. If electric potential on a sphere can be $9 \times 10^6 V$, then find the minimum radius of the sphere.

Watch Video Solution

154. Is the electrostatic potential necessarily zero at a point where the electric field strength is zero? Give an example to illustrate your answer.

Watch Video Solution

155. Two parallel metal plates having charge +Q and -Q face each other at a certain distance between them. If the plates are now dipped in kerosene oil tank, the uniform electric field between the plates will

A. increase

B. decreases

C. remain same

D. becomes zero.

Answer:

Watch Video Solution

156. A capacitor of plate area A and separation between plates d is half filled with dielectric of dielectric constant K. What is equivalent capacitance?

Watch Video Solution

Exercise

1. A charge q is placed at the centre of line joining two equal charges Q. Show that the system of three charges will be in equilibrium

if q = -Q/4

A. Q/2

B. $-Q/2$

C. Q/4

D. $-Q/4$

Answer:

Watch Video Solution

2. Two opposite corners of a square carry Q charges each and the other two opposite corners of the square carry q charge each. If the resutlant force on Q is zero, how are Q and q related?

A. -1

B. 1

C. $-2\sqrt{2}$

D. $-1/\sqrt{2}$

Answer:

Watch Video Solution

3. A copper ball of density $8.6 gcm^{-3}$ cm in diameter is immersed in oil of density $0.8 gcm^{-3}$. If the ball remains suspended in oil in a uniform electric field of intensity $36,000 NC^{-1}$ acting in upward direction, what is the charge on the ball?

A. $3.3 \times 10^{-18} C$

B. $3.2 \times 10^{-18} C$

C. $1.6 \times 10^{-18} C$

D. $4.8 \times 10^{-18} C$

Answer:

Watch Video Solution

4. Two point charges of $+16 \mu C$ and $-9 \mu C$ are placed 8 cm apart in air. Determine the position of the point at which the resultant electric field is zero.

A. 2 L

B. L/4

C. 8 L

D. 4 L

Answer:

Watch Video Solution

5. A spherical conductor of radius 12 cm has a charge of $1.6 \times 10^{-7} C$ distributed uniformly on its surface. What is the electric field inside the sphere?

A. $-\frac{q}{2\pi^2 e\pi slona^2}\hat{j}$

B. $\frac{q}{2\pi^2 e\pi slona^2}\hat{j}$

C. $-\frac{q}{4\pi^2 e\pi slona^2}\hat{j}$

D. $\frac{q}{4\pi^2 e\pi slona^2}\hat{j}$

Answer:

Watch Video Solution

6. An electric dipoole, when placed at an angle 30° with a uniform electric field of $10^4 NC^{-1}$, expereinces a torque of 9×10^{-26}N m.

Calculate the dipole moment and electrostatic potential energy in this position.

A. a torque as well as translational force

B. a torque only

C. a translational force only in the direction of the field.

D. a translational force only in a direction normal to the direction of the field.

Answer:

Watch Video Solution

7. A charged ball B hangs from a silk thread S, which makes an angle θ with a large charged conducting sheet P as shown in Fig. Show that the surface charge density of the sheet is proportional to $\tan\theta$.

A. cos θ

B. $\cot\theta$

C. $\sin\theta$

D. $\tan\theta$

Answer:

Watch Video Solution

8. A charged particle q is placed at the centre O of the cube (ABCDEFGH) of length L. Another same charge q is placed at a distance L from O. Then, the electric flux through ABCD is

A. $q / 4\pi\varepsilon_0 L$

B. zero

C. $q / 2\pi\varepsilon_0 L$

D. $q/3\pi\varepsilon_0 L$

Answer:

Watch Video Solution

9. Two charged conducting spheres A and B having radii a and b connected to each other by a copper wire. Find the ratio of the electric fields at the surfaces of the two spheres.

A. $2:1$

B. $1:4$

C. $4:1$

D. $1:2$

Answer:

Watch Video Solution

10. On moving a charge of 20 C by 2 cm, 2 J of work is done. Then, the potential difference between the points is

A. 0.1 V

B. 8 V

C. 2 V

D. 0.5 V

Answer:

Watch Video Solution

11. The potential at a point at distance x from some charge placed on X-axis is given by

$V(x) = \frac{20}{x^2 - 4}$ (in volt) The electric field at a distane x = $4\mu m$ is given by

A. $5/3V\mu m^{-1}$ (in the negative X-direction)

B. $5/3V\mu m^{-1}$ (in the postive X-direction)

C. $10/9V\mu m^{-1}$ (in the postive X-direction)

D. $10/9V\mu m^{-1}$ (in the negative X-direction)

Answer:

Watch Video Solution

12. Capacitance (in F) of a spherical conductor of radius 1 m is

A. 1.1×10^{-10}

B. 10^{-6}

C. 9×10^{-9}

D. 10^{-3}

Answer:

Watch Video Solution

13. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitence of the capacitor.

A. decrease

B. remains unchanged

C. become infinite

D. increase

Answer:

Watch Video Solution

14. A parallel plate capacitor is made by stacking n equally spaced plates connected alternatively. If the capacitance between any two adjacent plates is 'C' then the resultant capacitance is

A. (n-1)C

B. (n+1)C

C. C

D. nC

Answer:

Watch Video Solution

15. If n capacitors are connected in parallel to a V volt source, then total energy of the system is:

A. CV

B. $\frac{1}{2}nCV^2$

C. CV^2

D. $\frac{1}{2}(n)CV^2$

Answer:

Watch Video Solution

16. A battery is used to charge a parallel plate capacitor till the potential differece between the plates becomes equal to the electromotive force of the battery. The ratio of the energy stored in the capacitor and the work done by the battery will be

A. 44200

B. 44198

C. 1

D. 2

Answer:

Watch Video Solution

17. A parallel plate capacitor with air between the plates has capacitance of 9pF. The separation between its plates is 'd'. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant$k_1 = 3$ and thickness d/3 while the other one has dielectric constant$k_2 = 6$and thickness $\frac{2d}{3}$. Capacitance of the capacitor is now

A. 1.8 pF

B. 20.25 pF

C. 40.5 pF

D. 45 pF

Answer:

Watch Video Solution

18. A fully charged capacitor has a capacitance 'C'. It is discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat capacity 's' and mass 'm'. If the temperature of the block is raised by ΔT, the potential difference 'V' across the capacitance is

A. $\left(\frac{\sqrt{2mC\Delta T}}{s}\right)$

B. $\frac{mC\Delta T}{s}$

C. $\frac{ms\Delta T}{C}$

D. $\sqrt{\frac{2ms\Delta T}{C}}$

Answer:

Watch Video Solution

19. The unit of permittivity of free space (E_0) is :

A. $CN^{-1}m^{-1}$

B. Nm^2C^{-2}

C. $C^2N^{-1}M^{-2}$

D. $C^2N^{-2}m^{-2}$

Answer:

Watch Video Solution

20. When air is replaced by a dielectric medium of dielectric constant K, the maximum force of attraction between two charges separated by a distance

A. decrease K times

B. remains unchanged

C. increase K times

D. decrease k^2 times

Answer:

Watch Video Solution

21. A charge q is placed at the centre of the line joining two exactly equal positive charges Q. the system of three charges will be in equilibrium, if q is equal to:

A. $-Q/4$

B. $+Q$

C. $-Q$

D. Q/2

Answer:

Watch Video Solution

22. Point charges + 4q, -q and +4 q are kept on the X-axis at points x = 0, x = a and x = 2 a respectively

A. Only - q is in stable equilibrium

B. None of the charges is in equilibrium

C. All the charges are in unstable equilibrium

D. All the charges are in stable equilibrium.

Answer:

Watch Video Solution

23. There is an electric field E in x-direction. If the work done on moving a charge of 0.2C through a distance of 2m along a line making a angle 60° with x-axis is 4 J, then what is the value of E?

A. $\sqrt{3} N C^{-1}$

B. $4 N C^{-1}$

C. $5 N C^{-1}$

D. $20 N C^{-1}$

Answer:

Watch Video Solution

24. A point Q lies on the perpendicular bisector of an electrical dipole of dipole moment p, If the distance of Q from the dipole is r (much larger than the size of the dipole), then electric field at Q is proportional to

A. p^{-1} and r^{-2}

B. p and r^{-2}

C. p^{2} and r^{-3}

D. p and r^{-3}

Answer:

Watch Video Solution

25. Dedce the expression for the torque acting ona dipole of dipole moment $\overrightarrow{p}$ in the presence of a uniform electric field $\overrightarrow{E}$

A. $\overrightarrow{p} \times \overrightarrow{E}$

B. $\overrightarrow{p} . \overrightarrow{E}$

C. $\overrightarrow{p} \times \left(\overrightarrow{E} \times \overrightarrow{p}\right)$

D. $\overrightarrow{E} \, . \, \overrightarrow{p} \, / \, p^2$

Answer:

Watch Video Solution

26. A semi-cricular arc of radius a is charged unformly and the charge per unit length is λ. The electric field at the centre is

A. $\dfrac{\lambda}{4\pi^2\varepsilon_0 a}$

B. $\dfrac{\lambda}{2\pi\varepsilon_0 a^2}$

C. $\dfrac{\lambda}{2\pi\varepsilon_a}$

D. $\dfrac{\lambda^2}{2\pi\varepsilon_0 a}$

Answer:

Watch Video Solution

27. A point charge +q is placed at the mid point of a cube of side b. The electric flux emerging from the cube is:

A. zero

B. $\frac{q}{\varepsilon_0}$

C. $\frac{6ql^2}{}$epsilon_0`

D. $\frac{q}{6l^2\varepsilon_0}$

Answer:

Watch Video Solution

28. A charge Q isenclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will

A. increase four times

B. be reduced to half

C. remains the same

D. be doubled

Answer:

Watch Video Solution

29. A capacitor of capacitance C is charged to a potential V and is placed inside a closed surface. The electric flux through the closed surface is

A. CV / ε_0

B. $2CV / \varepsilon_0$

C. $CV / 2\varepsilon_0$

D. zero

Answer:

Watch Video Solution

30. A charge Q is placed at the corner of a cube. The electric flux through all the six faces of the cube is

A. $\frac{Q}{\varepsilon_0}$

B. $\frac{Q}{6\varepsilon_0}$

C. $\frac{Q}{8\varepsilon_0}$

D. $\frac{Q}{3\varepsilon_0}$

Answer:

Watch Video Solution

31. An electric charge q is placed at one of the corner of a cube of side a . The electric flux on one of its faces will be

A. $q / a\varepsilon_0$

B. $q / \left(\varepsilon_0 a^2\right)$

C. $q / \left(4\pi\varepsilon_0 a^2\right)$

D. $\dfrac{q}{24\varepsilon_0}$

Answer:

Watch Video Solution

32. Some charge is being given to a conductor. Then, its potential.

A. is maximum at surface

B. is maximum at centre

C. remains the same througout the conductor

D. is maximum somewhere between surface and centre.

Answer:

Watch Video Solution

33. The electric potential at a point in free space due to charge Q coulomb is $Q \times 10^{11}$ volts. The electric field at that points is

A. $4\pi\varepsilon_0 Q \times 10^{20} Vm^{-1}$

B. $4\pi\varepsilon_0 Q \times 10^{22} Vm^{-1}$

C. $12\pi\varepsilon_0 Q \times 10^{20} Vm^{-1}$

D. $12\pi\varepsilon_0 Q \times 10^{22} Vm^{-1}$

Answer:

Watch Video Solution

34. Three concentric spherical metal sheels A,B and C of radii a,b and c a'< 'b'<'c have surface charge densities $+\sigma, -\sigma$ and $+\sigma$ respectively. Find the potentials of three sheels A,B and C.

A. $V_C \neq V_B \neq V_A$

B. $V_C = V_B = V_A$

C. $V_C = V_A \neq V_B$

D.

Answer:

Watch Video Solution

35. In bringing an electron towards another electrons, the electrostatic potential energy of the system

A. increases

B. decreases

C. remains unchanged

D. becomes zero.

Answer:

Watch Video Solution

36. Two metallic sphers of radii 1 cm and 2 cm are given charges $10^{-2}C$ and 5×10^{-2} C respectively. If they are connected by a conducting wire, the final charge on the smaller sphere is

A. $10^{-2}C$

B. $2 \times 10^{-2}C$

C. $3 \times 10^{-2}C$

D. $4 \times 10^{-2}C$

Answer:

Watch Video Solution

37. Three capacitors each of cpacitance C and breakdown voltage V are joined in series. The capacitance and break-down voltage of the combination will be

A. 3C, V/3

B. C/3, 3V

C. 3C, 3V

D. C/3,V/3

Answer:

Watch Video Solution

38. Three capacitors each of capacitance $4\mu F$ are to be connected in such a way that the effective capacitance is $6\mu F$. This can be done by connecting.

A. all of them in series

B. all of them in parallel

C. two in parallel and one in series

D. C/2

Answer:

Watch Video Solution

39. A parallel plate capacitor with oil between the plates has a capacitance C(dielectric constant of oil is 2). If the oil is removed, then capacitance of the capacitor becomes

A. $\sqrt{2}C$

B. 2C

C. $C / \sqrt{2}$

D. C/2

Answer:

Watch Video Solution

40. A capacitor of capacitance C_1 is charged upto potential V and then connected in parallel to an uncharged capacitor of capacitance C_2. The final potential difference across each capacitor will be

A. $\dfrac{C_2 V}{C_1 + C_2}$

B. $\dfrac{C_1 V}{C_1 + C_2}$

C. $\left(1+\left(\frac{C_2}{C_1}\right)V\right.$

D. $\left(1-\left(\frac{C_2}{C_1}\right)V\right.$

Answer:

Watch Video Solution

41. A parallel plate air capacitor is charged to a potential difference of V volts. After disconnecting the charging battery the distance between the plates of the capacitor is increased using an isulating handle. As a result the potential difference between the plates

A. increase

B. decreases

C. does not change

D. becomes zero.

Answer:

Watch Video Solution

42. Calculate the energy stored in a capacitor?

A. $\frac{1}{2}C^2V$

B. $\frac{1}{2}CV^2$

C. $\frac{1}{2}CV$

D. $\frac{1}{2}C^2V^2$

Answer:

Watch Video Solution

43. A $4\mu F$ capacitor is charged to 400 V. If its plates are joined through a resistance of$2K\omega$, then heat produced in the resistance is

A. 0.16J

B. 0.32 J

C. 0.64 J

D. 1.28 J

Answer:

Watch Video Solution

44. A capacitor is charged by connecting a battery across its plates. It stores energy U. Now the battery is disconnected and another identical capacior is connected across it, then the energy stores by both capacitors of the system will be

A. U

B. U/2

C. 3U/2

D. U/4

Answer:

Watch Video Solution

45. Two identical conductors of copper and aluminium are placed in an identical electric field. The magnitude of induced charge in the aluminium will be

A. zero

B. greater than in copper

C. less than in copper

D. equal to that of copper

Answer:

Watch Video Solution

46. When a body becomes negatively charged.

Its mass.

A. giving excess of elements to it

B. removing some electrons from it

C. giving some protons to it

D. removing some neutrons form it.

Answer:

Watch Video Solution

47. Two charge spheres separated at a distance d exert a force F on each other. If they are immersed in a liquid of dielectric constant K=2, then the force (if all conditions are same) is

A. F/2

B. F

C. 2F

D. 4F

Answer:

Watch Video Solution

48. Three charge q , Q and -4q are placed in a straight line , line of length L at points distant 0 ,L/2 and L respectively from one end. In order to make the net force on q zero, the charge Q must be equal to

A. $-q$

B. $-2q$

C. $-q/2$

D. 4q

Answer:

Watch Video Solution

49. The voltage of clouds is $4 \times 10^6 V$ with respect to ground. In a lighting strike lasting 100 ms, a charge of 4 C is delivered to the ground. The power of ligthing strike is

A. 160 MW

B. 80 MW

C. 20 MW

D. 500 MW

Answer:

Watch Video Solution

Watch Video Solution

50. The point charges Q and -2Q are placed at some distance apart. If the electirc field at the location of Q is E, the electric field at the location of -2Q will be

A. $-E/2$

B. $-3E/2$

C. $-E$

D. $-2E$

Answer:

Watch Video Solution

51. What happens when an electric dipole is held in a non-uniform electric field?

A. both, a torque and a net force

B. only a force but no torque

C. only a torque but no net force

D. no torque and no net force.

Answer:

Watch Video Solution

52. A charge (q) is enclosed in a cube, what is electric flux associated with one of the faces of the cube?

A. q / ε_0

B. ε_0 / q

C. $6q / \varepsilon_0$

D. $q / 6\varepsilon_0$

Answer:

Watch Video Solution

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

A. $1.5NC^{-1}$

B. $1.5 \times 10^{-10}NC^{-1}$

C. $3NC^{-1}$

D. $3 \times 10^{-10}NC^{-1}$

Answer:

Watch Video Solution

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

A. $0Vm^{-1}$

B. $\sigma / 2\varepsilon_0 Vm^{-1}$

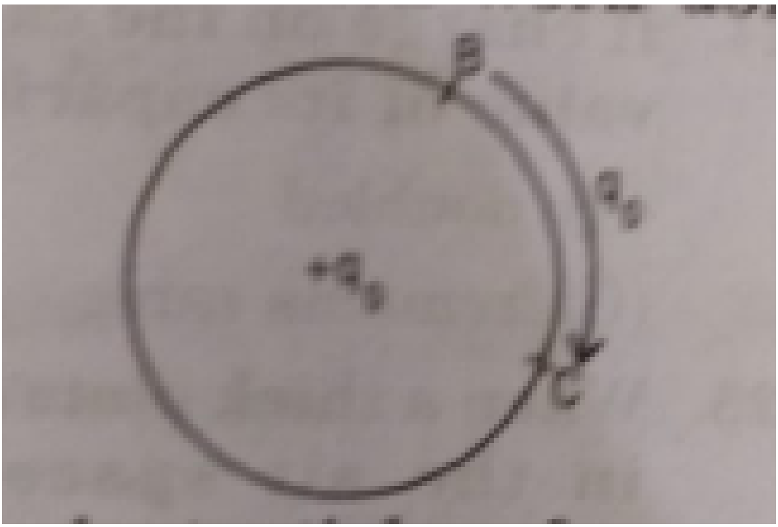
C. $\sigma / \varepsilon_0 Vm^{-1}$

D. $2\sigma / \varepsilon_0 Vm^{-1}$

Answer:

Watch Video Solution

55. A circle of radius 'r' is drawn with charge '+q' at the centre. A charge q_0 is brought from the point B to C. Then work done is:



A. positive

B. negative

C. infinite

D. zero

Answer:

Watch Video Solution

56. Is it possible to have a positively charged body at

A. zero potential

B. negative potential

C. positive potential

D. all of these

Answer:

Watch Video Solution

57. The potential at a point P due to an electric dipole is 1.8×10^5 volt. If P is at a distance of 50 cm apart from the centre O of the dipole and if OP makes an angle 60° with the positive side of the axial line of the dipole, what is the moment of the dipole?

A. 10 Cm

B. $10^{-3} Cm$

C. $10^{-4} Cm$

D. $10^{-5} Cm$

Answer:

Watch Video Solution

58. Describe schematically the equipotential surfaces corresponding to - a field that uniformly increases in magnitude but remains in a constant (say, z) direction.

A. planes parallel to YZ-plane

B. planes parallel to XY-plane

C. planes parallel to XZ-plane

D. coaxial cylinders of increasing radii around the X-axis.

Answer:

Watch Video Solution

59. In bringing an electron towards another electrons, the electrostatic potential energy of the system

A. increases

B. decreases

C. becomes zero

D. remains the same

Answer:

Watch Video Solution

60. What is the area of the plates of a 3 F parallel plate capacitor, if the separation between the plates is 5 mm?

A. $1.694 \times 10^9 m^2$

B. $4.529 \times 10^9 m^2$

C. $9.281 \times 10^9 m^2$

D. $12.281 \times 10^9 m^2$

Answer:

Watch Video Solution

61. The dielectric between the conductors reduces the electric intensity

A. to zero

B. between them

C. with no change

D. none of the above

Answer:

Watch Video Solution

62. Given a number of capacitors labelled as $8\mu F. 250V$. Find the minimum number of capacitors needed to get an arrangement equivalent to$16\mu F, 1, 000V$

A. 4

B. 16

C. 32

D. 64

Answer:

Watch Video Solution

63. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be

A. 0.333

B. 0.666

C. 2

D. 4

Answer:

Watch Video Solution

64. When a capacitor is connected to a battery

A. a current flows in the circuit for sometimes, them decreases to zero

B. no current flows in the circuit at all

C. an alternating current flows in the circuit

D. none of the above

Answer:

Watch Video Solution

65. A 40 muF capacitor in a defibrillator is charged to 3000 V. The energy stored in the capacitor is sent through the patient during a pulse of duration 2 ms. The power delivered to the patient is

A. 45 kW

B. 90 kW

C. 180 kW

D. 360 kW

Answer:

Watch Video Solution

66. Assertion. A metallic shield in the form of a hollow shell, can be built to block an electric field.

Reason. In a hollow spherical shell, the electric field inside is not zero at every point.

A. A

B. B

C. C

D. D

Answer:

Watch Video Solution

67. Assertion. Capacity of a parallel plate condenser remains unaffected on introduced a conducting or insulating slab between the plates.

Reason. In both the cases, electric field intensity between the plates increases.

A. A

B. B

C. C

D. D

Answer:

Watch Video Solution

68. Assertion: In the absence of an external electric field, the dipole moment per unit volume of a polar dielectric is zero.

Reason : The dipoles of a polar dielectric are randomly oriented.

A. If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion

C. If Assertion is true statement but Reason is false

D. If both Assertion and Reason ale false statements.

Answer:

Watch Video Solution

69. Assertion: A metal sphere of radius 1 cm can not hold a charge of 1 coulomb

Reason: For placing a charge of 1 coulomb on a shere of radius 1 cm, its potential has to eb raised to $= 9 \times 10^{22} V$

A. If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion

C. If Assertion is true statement but Reason is false

D. If both Assertion and Reason ale false statements.

Answer:

Watch Video Solution

70. Assertion : The total charge stored in a capaitor is zero.

Reason : The electric field just outside the capacitor is σ / ε_0. Where σ is the charge density

A. If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion

C. If Assertion is true statement but Reason is false

D. If both Assertion and Reason ale false statements.

Answer:

Watch Video Solution

71. Assertion : When two conductors charged to different potentials are conencted with a wire, there is always some loss of electric energy.

Reason : A part of the electric energy is lost in the form of heat and electromagnetic radiation.

A. If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion

C. If Assertion is true statement but Reason is false

D. If both Assertion and Reason ale false statements.

Answer:

Watch Video Solution

72. Assertion. Capacity of a parallel plate condenser remains unaffected on introduced a conducting or insulating slab between the plates.

Reason. In both the cases, electric field intensity between the plates increases.

A. both, Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. both, Assertion and Reason are true, but Reason is not the correct explanation of the Asserrtion.

C. Assertion is true, but the Reason is false.

D. both, Assertion and Reason are false.

Answer:

Watch Video Solution

73. Assertion : The electrostatic force between the plates of a charged isolated capacitor decreases when dielectric fills whole space between plates.

Reason : The electric field between the plates of a charged isolated capacitance decreases when dielectric fills whole space between plates.

A. both, Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. both, Assertion and Reason are true, but Reason is not the correct explanation of the Asserrtion.

C. Assertion is true, but the Reason is false.

D. both, Assertion and Reason are false.

Answer:

Watch Video Solution

74. Assertion : A parallel plate capacitor is connected across battery through a key. A dielectric slab dielectric constant K is introduced between the plates. The energy which is stored becomes K times.

Reason : The surface density of charge on the plate remains constant or unchanged.

Watch Video Solution

75. Assertion : A parallel plate capacitor is connected across battery through a key. A dielectric slab dielectric constant K is introduced between the plates. The energy which is stored becomes K times.

Reason : The surface density of charge on the plate remains constant or unchanged.

A. A

B. B

C. C

D. D

Answer:

Watch Video Solution

76. Assertion : The charge on a conductor can be transferred to a hollow spherical conductor irrespective of the potential, to which it gets raised

Reason : It is because of the principle of the spherical capacitor.

A. if both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

C. if Assertion is true, but the Reason is false.

D. if both Assertion and Reason are false

Answer:

Watch Video Solution

77. A comb run through one's dry hair attracts small bits of paper. This is due

A. a) the atoms of the paper get polarised by the charged comb

B. b) the comb possesses magnetic properties

C. c) comb is a good conductor

D. d) paper is a good conductor

Answer:

Watch Video Solution

78. What are the dimensions of $K = 1/4\pi\varepsilon_0$?

A. `

B.

C. `

D.

Answer:

Watch Video Solution

79. If both the charges and distance between them is doubled, then new electrostaic force will be

A. a) F

B. b) 2F

C. c) C

D. d) none of the above

Answer:

Watch Video Solution

80. When air is replaced by a dielectric medium of dielectric constant K, the maximum force of attraction between two charges separated by a distance

A. a) increases k^{-1} times

B. b) increases K times

C. c) decreases K times

D. d) remains constant

Answer:

Watch Video Solution

81. A hollow cylindrical conductor having positive charge is placed near another neutral conductor. The net charge induced on the neutral conductor is

A. positive

B. negative

C. depends on distance

D. zero

Answer:

Watch Video Solution

82. The number of electrons to be put on a spherical conductor of radius 0.1 m to produed electric field of $0.36NC^{-1}$ just above the surface is

A. 2.7×10^{6}

B. 2.6×10^6

C. 2.5×10^6

D. 2.4×10^6

Answer:

Watch Video Solution

83. An electric field required to keep a water drop of mass m just to remain suspended, when charged with one electron is

A. em /g

B. m g/e

C. e m g

D. m g

Answer:

Watch Video Solution

84. There is an electric field E in x-direction. If the work done on moving a charge of 0.2C through a distance of 2m along a line making a angle 60° with x-axis is 4 J, then what is the value of E?

A. $2\sqrt{3}NC^{-1}$

B. $4NC^{-1}$

C. $5NC^{-1}$

D. none of these

Answer:

Watch Video Solution

85. What is the angle between the electric dipole moment and the electric field strength due to it on the equitorial line?

A. 0°

B. 90°

C. 180°

D. none of these

Answer:

Watch Video Solution

86. An arbitraty surface enclose a dipole. What is the electric flux through this surface?

A. half that due to a single charge

B. double that due ot a single charge

C. dependent on the position of the dipole

D. zero

Answer:

Watch Video Solution

87. A hollow metallic sphere of radius 10 cm is charged, such that potential of its surface is 70 V. The potential at the centre of the sphere would be

A. 0V

B. 7V

C. 70V

D. 700V

Answer:

Watch Video Solution

88. Two equal and opposite charges (+q and -q) are situated at x distance from each other. The value of potential at very far point will depend on

A. only on q

B. only on x

C. on q x

D. on q/x

Answer:

Watch Video Solution

89. A charge q is distributed over two concentric hollow spheres of raddii r and R such that the surface densities are equal. Find the potential at the common centre.

A. `sigma/epsilon_0 (R-r)

B. `sigma/epsilon_0 (R+r)

C. $\frac{R\sigma}{\varepsilon_0}$

D. $\frac{\sigma}{\varepsilon_0}$

Answer:

Watch Video Solution

90. What is not true for equipotential surface for a uniform electric field?

A. Equipotential surface is flat

B. Equipotential surface is spherical

C. Electrical lines of force are perpendicular to the equipotential surface

D. work done is zero

Answer:

Watch Video Solution

91. Which of the following is not the property of equipotential surfaces?

A. They do not cross each other

B. They are concentric spheres for uniform electric field.

C. Rate of change of potential with distance on them is zero

D. They can be imaginary sphers.

Answer:

Watch Video Solution

92. The charge given to any conductor resides on its outer surface, because

A. the free charge tends to be in its minimum potential energy state

B. the free charge tends to be in its minimum kinetic energy state

C. the free charge tends to be in its maximum potential energy state.

D. the free charge tends to be in its maximum kinetic energy state.

Answer:

Watch Video Solution

93. The electrostatic capacitance depends on

A. nature of the conductor

B. size of the conductor

C. thickness of the conductor

D. none of these

Answer:

Watch Video Solution

94. n identical mercury droplets charged to the same potential V coalesce to form a single bigger drop. The potential of new drop will be

A. V/n

B. nV

C. nV^2

D. $n^{2/3}V$

Answer:

Watch Video Solution

95. The capacitance of a parallel plate capacitor increases with

A. decrease of its area

B. increase of its distance

C. increase of its area

D. decrease of its distance

Answer:

Watch Video Solution

96. 27 small drops, each having charge q and radius r coalesce to forma big drop. How many times charge and capacitance will become?

A. 3.27

B. 27,3

C. 27,27

D. 3,3

Answer:

Watch Video Solution

97. The potentials of the two plates of capacitors are +10 V and - 10V. The charge on one of the plates is 40 C. the capacitance of the capacitor is

A. 2 F

B. 4 F

C. 0.5 F

D. 0.25 F

Answer:

Watch Video Solution

98. A capacitor of $20\mu F$ charged uptp 500 V is connected in parallel with another capacitor of $10\mu F$ which is charged upto 200 V. The common potential is

A. 250 V

B. 300 V

C. 400 V

D. 600 V

Answer:

Watch Video Solution

99. Three capacitors 2,3 and $6\mu F$ are connected in series to a 10 V source. The charge on $3\mu F$ capacitor is

A. $5\mu C$

B. $10\mu C$

C. $12\mu C$

D. $15\mu C$

Answer:

Watch Video Solution

100. 700 pF capacitor is charged by a 50 V battery, How much electrostatic energy is stored by it?

A. $6.7 \times 10^{-7} j$

B. $8.7 \times 10^{-7} j$

C. $13.6 \times 10^{-9} j$

D. $17.0 \times 10^{-8} J$

Answer:

Watch Video Solution

101. The potential enery of a charged parallel plate capacitor is U_(0). If a slab of dielectric constant K is inserted between the plates, then the new potential energy will be

A. U_0 / K

B. $U_0 K^2$

C. U_0 / K^2

D. U_0^2

Answer:

Watch Video Solution

102. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be

A. 0.333

B. 0.666

C. 2

D. 4

Answer:

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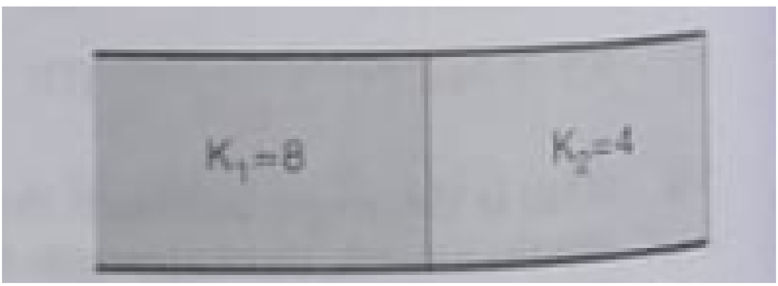
103. A capacitor, having capacitance $1\mu F$ with air, is filled with two dielectrics as shown in the figure. How many times the capacitance will increase?



A. 44411

B. 3

C. 6

D. 12

Answer:

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104. The force between the plates of a parallel plates capacitor of area A, capacitance C and having charge of will be

A. $q^2 / 2\varepsilon_0 A$

B. $-q^2 / 2\varepsilon_0 A$

C. $q^2 / 4\varepsilon_0 A$

D. $-q^2 / 4\varepsilon_0 A$

Answer:

Watch Video Solution

105. A soap bubble is given a negative charge.

Then, its radius

A. decreases

B. increases

C. remains unchanged

D. nothing can be predicted.

Answer:

Watch Video Solution

106. A charge q is placed at the centre of the line joining two exactly equal positive charges

Q. the system of three charges will be in equilibrium, if q is equal to:

A. $-Q/2$

B. $-Q/4$

C. $+Q/4$

D. $+Q/2$

Answer:

Watch Video Solution

107. Two equal negative charges -q are fixed at points (0, -a) and (0,a) on y-axis. A poistive charge Q is released from rest at point (2a, 0) on the x-axis. The charge Q will

A. execute simple harmonic motion above the origin

B. move to the origin and remain at rest

C. execute oscillatory but not simple harmonic motion

D. move to infinity

Answer:

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108. A positively charged thin metal ring of radius R is fixed in the xy plane with its centre at the origin O. A negatively charged particle P is released from rest at the point (0, 0, z_0) where $z_0 > 0$. Then the motion of P is

A. periodic for all the values of z_0 satisfying

$o < Z_0 < \infty$

B. simple harmonic for all the values of z_0 satisfying $0 < z_0 \leq R$

C. approximately simple harmonic, provided $Z_0 < \; < R$

D. such that P crosses O and continues to move along the negative Z-axis towars $z = \; - \infty$.

Answer:

Watch Video Solution

109. A given charge is situated at a certain distance from an electric dipole in the end-on position experiences a force F If the distance of the charge is doubled, the force acting on the charge will be

A. 2F

B. F/2

C. F/4

D. F/8

Answer:

Watch Video Solution

110. The diemnsion of energy density, $\frac{1}{2}\varepsilon_0 E^2$, where $elipson_0$ is permittivity of free space and E is electric field is :

A. MLT^{-1}

B. ML^2T^{-2}

C. MLT^{-2}

D. ML^2T^{-1}

Answer:

Watch Video Solution

111. A small metal ball is suspended in a uniform electric field with the help of an insulated thread. If high energy X-ray beam falls on it,

A. the ball will be deflected in the direction of field

B. the ball will be deflected opposite to the direction of field

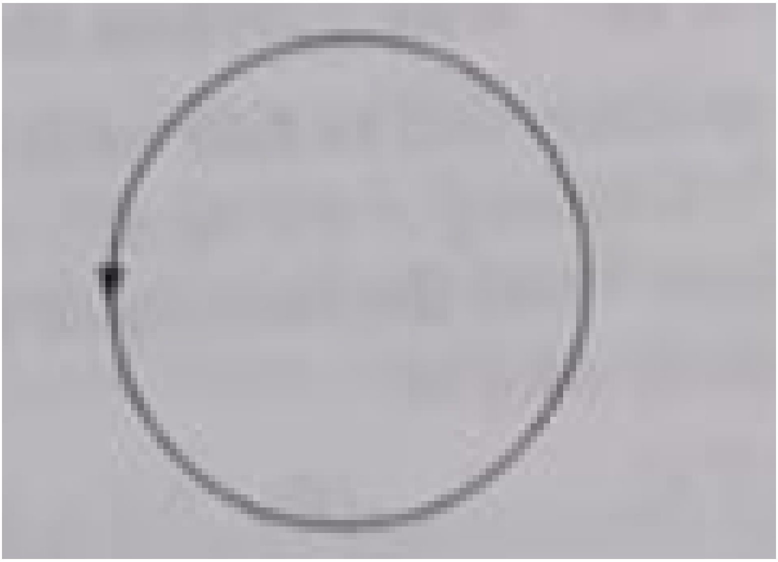
C. the ball will not deflect at all

D. the ball will fly to infinity

Answer:

Watch Video Solution

112. A field line is shown in the figure.



This field cannot represent

A. gravitational field

B. electrostatic field

C. induced electric field

D. magnetic field

Answer:

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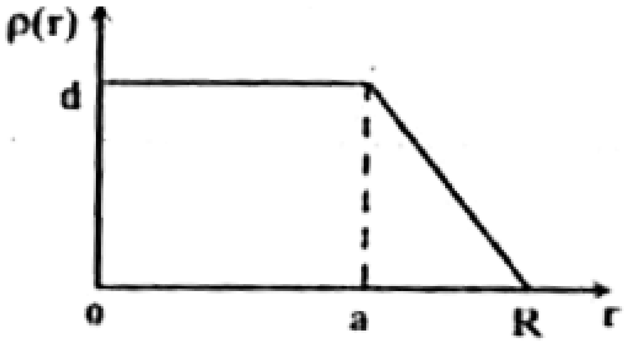
113. The nuclear charge (Ze) is nonuniformly distributed within a nucleus of radius R. The charge density p(r) (change per unit volume) is dependent only on the radial distance r from the center of the nucleus as shown in figure, the electric field is only along the radial direction.

The electric field at r = R



A. independent of a

B. directly proportional to a

C. directly proportional to a^2

D. inversely proportionaly to a

Answer:

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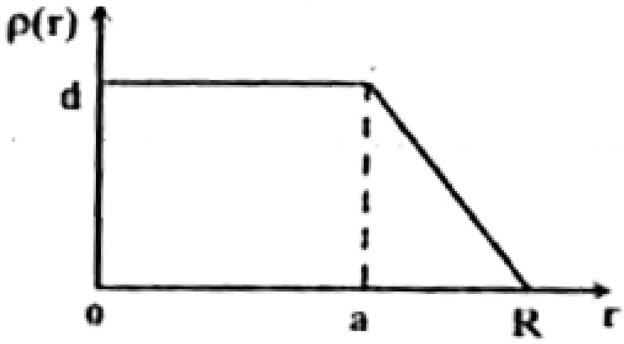
114. The nuclear charge (Ze) is nonuniformly distributed within a nucleus of radius R. The charge density p(r) (change per unit volume) is dependent only on the radial distance r from the center of the nucleus as shown in figure, the electric field is only along the radial direction.The electric field within the nucleus is generally observed to be linerarly dependent on r. This implies



A. a= 0

B. a = R/2

C. a = R

D. a = 2 R/3

Answer:

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115. A non-conducting solid sphere of radius R is uniformly charged. The magnitude of the electric field due to the sphere at a distance r form its centre

A. increases as r increases, for $r < R$

B. decreases as r increases, for $0 < r < \infty$

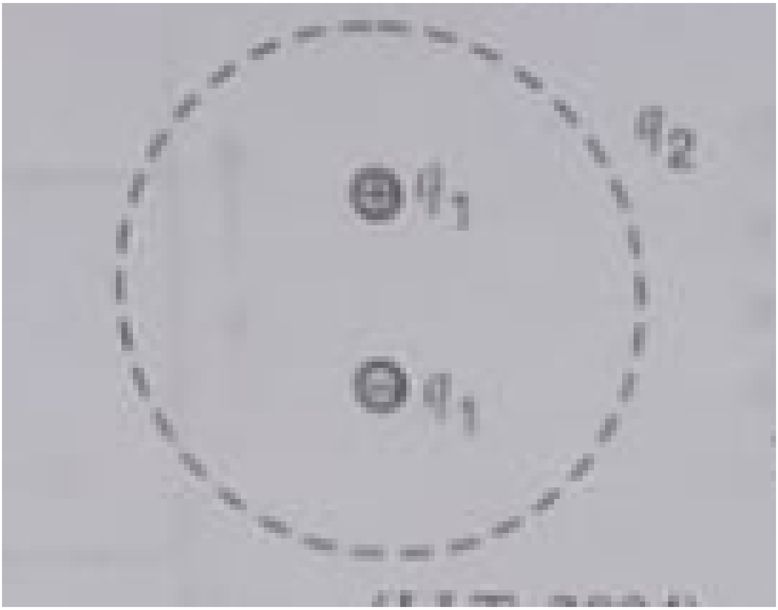
C. decreases as r increases , for $R < r < \infty$

D. is discontinuous at r = R

Answer:

Watch Video Solution

116. Consider the charge configuration and a spherical Gaussian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface, the electric field will be due to.



A. q_2

B. only the positive charges

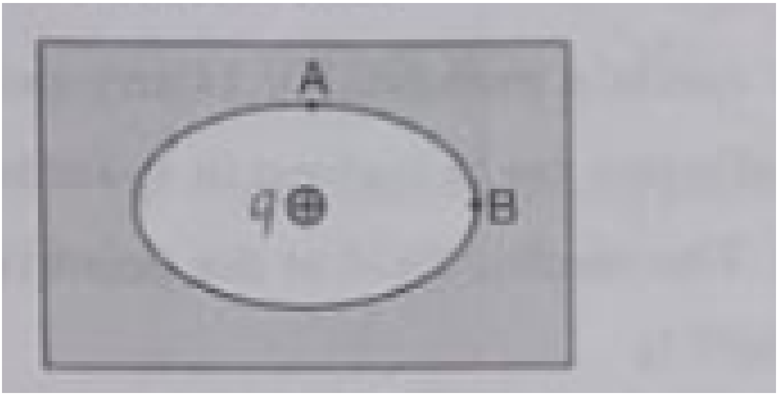
C. all the charges

D. $+q_1$ and $-q_1$

Answer:

Watch Video Solution

117. An ellipsoidal cavity is carved within a perfect conductor. A positive charge q is placed at the centre of the cavity. The points A and B are on the cavity surface as shown in the figure. Then



A. electric field near A in the cavity = electric field near B in the cavity

B. charge density at A = charge density at B

C. potential at A = potential at B

D. total electric field flux through the surface of the cavity is q / ε_0

Answer:

Watch Video Solution

118. A hollow sphere of charge does not produce an electric field at any

A. interior point

B. outer point

C. beyond 2 m

D. beyond 10 m

Answer:

Watch Video Solution

119. Which of the following statement (s) is/are correct?

A. If the electric field due to a point charge varies as $r^{-2.5}$ instead of r^{-2}, then the Gauss law will still be valid

B. The Gauss law can be used to calculate the field distribution around the electric dipole

C. If the electric field between two point charges is zero somewhere, then the sign of the two charges is the same

D. the work done by the external force in moving a unit positive charge from point A at potential V_A to point B at potential V_B is $(V_B - V_A)$

Answer:

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120. The electric potential V at any point (x,y,z) all in meters in space is given by $V = 4x^2$ volt. The electric field at the point (1,0,2) in V/m is

A. 8 along negative x-axis

B. 8 along positive X-axis

C. 16 along negative X-axis

D. 16 along positive X-axis

Answer:

Watch Video Solution

121. A uniform electric field pointing in positive x-direction exists in a region. Let A be the origin, B be the point on the x-axis at x=+1cm and C be the point on the y-axis at y=+1cm. then the potetial at the points A,B and C satisfy

A. $V_A < V_B$

B. $V_A > V_B$

C. $V_A < V_C$

D. $V_A > V_C$

Answer:

Watch Video Solution

122. A hollow metal sphere of radius 5 cm is charged, such that the potential on its surfae is 10 V. The potential at the centre of the sphere is

A. 0V

B. 10V

C. same as at a point 5 cm away from the surface

D. same as at a point 25 cm away from the surface

Answer:

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123. A particle A has chrage +q and a particle B has charge +4q with each of them having the same mass m. When allowed to fall from rest through the same electric potential difference, the ratio of their speed $\frac{v_A}{v_B}$ will become

A. $2:1$

B. $1:2$

C. $1:4$

D. $4:1$

Answer:

Watch Video Solution

124. A bal of mass 1 g carrying a chage 10^{-8} C moves from a point A at potential 600 V to a point B at zero potential. The change in its K.E. is

A. $-6 \times 10^{6} erg$

B. $-6 \times 10^{-6} j$

C. $6 \times 10^{-6} J$

D. $6 \times 10^{-6} erg$

Answer:

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125. A solid conducting sphere having a charge Q is surrounded by an uncharged concentric hollow spherical shell. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be v. If the shell is now given a charge of -3 Q, the new potential difference between the same two surfaces is _____.

A. V

B. 2V

C. 4 V

D. $-2V$

Answer:

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126. Two equal point charges are fixed at x=-a and x=+a on the x-axis. Another point charge Q is placed at the origin. The change in the electrical potential energy of Q, when it is displaced by a small distance x along the x-axis, is approximately proportional to

A. x

B. x^2

C. x^3

D. $1/x$

Answer:

Watch Video Solution

127. When the separation between two charges is increased, the electric potential energy of the system

A. remains the same

B. may increase or decrease

C. increases

D. decreases

Answer:

Watch Video Solution

128. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitence of the capacitor.

A. same

B. double

C. half

D. K times

Answer:

Watch Video Solution

129. 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?

A. hollow sphere has more charge

B. both have equal charge

C. only hollow sphere has charge

D. solid sphere has more charge

Answer:

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130. wo capacitors of capacitances C_1 and C_2 are connected in parallel across a battery. If Q_1 and Q_2 respectively be the charges on the capacitors, then $\frac{Q_1}{Q^2}$ will be equal to

A. C_1 / C_2

B. C_2 / C_1

C. $C_1 C_2$

D. $1 / C_1 C_2$

Answer:

Watch Video Solution

131. A dielectric slab of thickness d is inserted in a parallel plate capacitor whose negative plate is at $x=0$ and positive plate is at $x = 3d$. The slab is equidistant from the plates. The capacitor is given some charge. As one goes from 0 to 3d

A. the magnitude of the electric field remains the same

B. the direction of the electric field remains the same

C. the electric potential increases continuously.

D. the electric potential increases at first, then decreses and again increases.

Answer:

Watch Video Solution

132. The magnitude of electric field $\vec{E}$ in the annualr region of a charged cylidrical capacitor.

A. is same througout

B. varies as $1/r^2$, where r is the distance from the axis

C. varies as $1/r$, where r is the distance from the axis

D. is higher near the outer cylinder than near the inner cylinder.

Answer:

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133. A parallel plate capacitor is connected to a battery as shown in Figure.

(A) Key K is kept closed and the plates of the capacitor are moved apart using insulating handle.

(B) Key K is opened and plates of capacitors are moved apart using insulating handle.

Which of the following statement is correct?

A. the charge on the capacitor increases

B. the voltage across the plates increases

C. the capacitance increases

D. the electrostatic energy stored in the capacitor increases

Answer:

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134. A parallel plate air capacitor is connected to a battery. The quantities charge, voltage, electric field and energy associated with this capacitor are given by Q_0, V_0, E_0 and U_0 respectively. A dielectric slab is now introduced to fill the space between the plates with battery still in connection. The corresponding quantities now given by Q, V, E and U are related to the previous one as

A. $Q > Q_0$

B. $V > V_0$

C. $E > E_0$

D. $U > U_0$

Answer:

Watch Video Solution

135. Two identical capacitors, have the same capacitance C. One of them is charged to potential V_1 and the other V_2. The negative ends of the capacitors are connected together. When the poistive ends are also connected, the decrease in energy of the combined system is

A. $\frac{1}{4}C\left(V\hat{\ }2 - V_2^2\right)$

B. $\frac{1}{4}C\left(V\hat{\ }2 + V_2^2\right)$

C. $\frac{1}{4}C(V_1 - V_2)^2$

D. $\frac{1}{4}C(V_1 + V_2)^2$

Answer:

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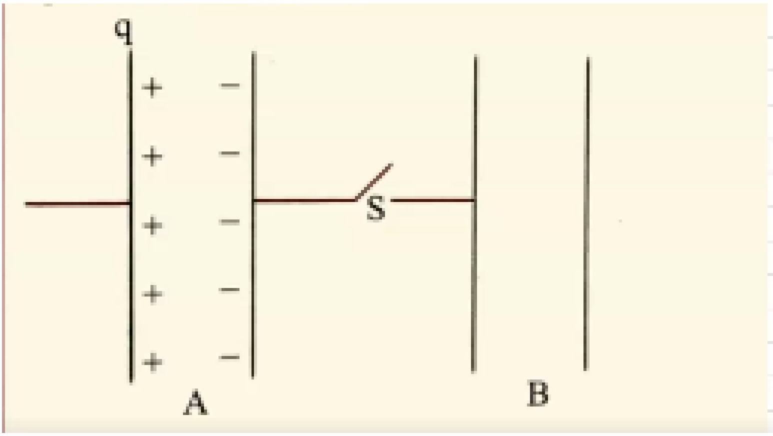
136. Consider the situation shown in the figure. The capacitor A has a charge q on it whereas B is uncharged. The charge appearing on the capacitor B a long time after the switch is closed is :



A. zero

B. q/2

C. q

D. 2q

Answer:

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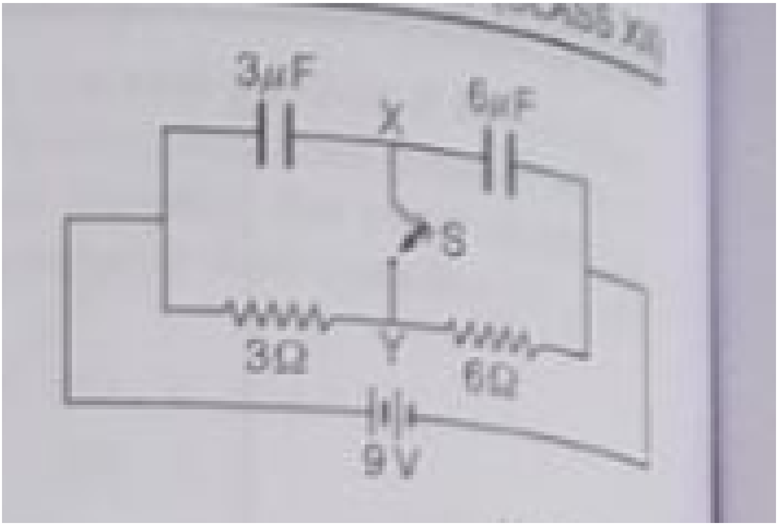
137. A circuit is connected as shown in the figure with the switch S open. When the switch is closed, the total amount of charge that flows from Y to X is



A. zero

B. $27 \mu C$

C. $54 \mu C$

D. $81 \mu C$

Answer:

Watch Video Solution

138. Static electricity is produced due to

A. friction

B. conduction

C. induction

D. all of these

Answer:

Watch Video Solution

139. A polythene piece rubbed with wool is found to have a negative charge of $3 \times 10^{-7} C$. Estimate the number of electrons transferred (from which to which?)

A. 10^{13} from wool to polythene

B. 10^{13} form polythene to wool

C. 2.56×10^{15} from wool to polythene

D. 10^{-13} form wool to polythene

Answer:

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140. Choose the correct answer

A. Total charge present in the universe is constant

B. Total positive charge present in the universe is constant

C. Total negative charge present in the universe is constant

D. Total number of charged particles present in the universe is constant.

Answer:

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141. A positively charged glass rod attracts a suspended pith-ball. Does it imply that te pith-ball is negatively charged?

A. attracted towards the rod

B. repelled away from the rod

C. not affected by therod

D. attracted towards the rod, touches it and is then thrown away from it

Answer:

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142. The unit of permittivity of free space (E_0) is :

A. Nm^2C^{-2}

B. $Nm^{-2}C^{-1}$

C. $C^2N^{-1}m^{-2}$

D. Am^{-1}

Answer:

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143. Two points charges of $+3\mu C$ and $+8\mu C$ repel each other with a force of $40N$. A charge of $-5\mu C$ is added to each of them. Now, the force will be

A. 10 N (attractive)

B. 1 N (repulsive)

C. zero

D. cannot be found

Answer:

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144. Force between the two stationary charges, when placed in freespace is 10 N. If they are placed in a medium of relative permittivity 5, the force between them is

A. 50 N

B. 2 N

C. 0.5 N

D. 10 N

Answer:

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145. A charge having magnitude Q is divided into two parts q and (Q-q) . If the two parts exerts a maximum force of repulsion on each other, then find the ratio Q/q.

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer:

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146. A charge q_1 exerts some force on a second charge q_2. A third charge q_3 is brought near them. Then, force exerted by q_1 on q_2 will:

A. decrease in magnitude

B. increase in magnitude

C. remain unchanged

D. increase if q_2 is of the same sign as q_1 and will decrease, if q_2 is of opposite sign.

Answer:

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147. Five balls numbered 1,2,3,4,and 5 are suspended using separated threads. The balls (1,2),(2,4) and (4,1) show electrostatic attraction while balls (2,3) and (4,5) show repulsion. Therefore, ball 1 must be

A. positively charged

B. negatively charged

C. neutral

D. made of metal

Answer:

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148. Two charges each of +q units are placed along a line. A third chare of -q/4 is placed midway between them. The system will

A. be in equilibrium

B. not be in equilibrium

C. lose charge

D. oscillate

Answer:

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149. Two equal and similar charges are placed along a straight line. A third equal and similar charge is placed midway between the two charges. Then, the system, will:

A. be in equilibrium

B. not be in equilibrium

C. lose charge

D. oscillate

Answer:

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150. Two equal and similar charges are placed along a straight line. A third equal but opposite to the charges is placed midway between them. Then, system will

A. be in equilibrium

B. not be in equilibrium

C. lose charge

D. oscillate

Answer:

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151. A stationary charges produces.

A. an electric field only

B. a magnetic field only

C. both electric and magnetic fields

D. an electromagnetic wave

Answer:

Watch Video Solution

152. A proton and an electron are placed in a uniform electric field . Then

A. the electric forces acting on them will be equal

B. the magnitudes of the forces acting on them will be equal

C. their acceleratioins will be equal

D. the magnitudes of their accelerations will be equal

Answer:

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153. In SI. Unit of electric field is:

A. Am^{-1}

B. NC^{-1}

C. Cm^{-1}

D. Cm^{-2}

Answer:

Watch Video Solution

154. Determine the magnitude of an electric field that will balance the weight of an electron.

A. e/m g

B. mg /e

C. mge

D. cannot be found

Answer:

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155. A dipole of electric dipole moment $\overrightarrow{P}$ is placed in a uniform electric field of strength $\overrightarrow{E}$. If θ is angle between $\overrightarrow{p}$ and $\overrightarrow{E}$ then potential energy of the dipole becomes largest, when θ is

A. zero

B. $\pi / 4$

C. $\pi / 2$

D. π

Answer:

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156. A positivity charges ball hangs from a silk thread Electric filed at a certain point (at the same horizontal level of ball) due to this charge is E.. We put a positive test charge Q_0 at a point and measure F/q_0 then, it can be prediced that the electric field strength E

A. $> F/q_0$

B. $= F/q_0$

C. $< F/q_0$

D. cannot be predicted

Answer:

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157. A cylinder of length L and radius R is placed in a uniform electric field E parallel to the axis o the cylinder. The total electric flux for the surface of the cylinder is given by

A. $(2\pi R^2)E$

B. $(2\pi RL)E$

C. $2\pi R(R+L)E$

D. zero

Answer:

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158. Gauss's theorem

A. does not hold, if the closed surface encloses a discrease distribution of charges

B. does not hold, if the closed surface encloses a line, a surface or a volume charge distribution

C. holds, if the surface encloses a point charge only

D. holds, irrespective of the form in which changes are enclosed by the closed surface.

Answer:

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159. Electric field varies as r^{-3} due to

A. a point charge

B. an infinite line charge

C. an electric dipole

D. an infintie plane sheet of charge

Answer:

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160. Electric field varies as r^{-1} due to

A. a point charge

B. a quadrupole

C. an infinite line charge

D. an infinite plane sheet of charge

Answer:

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161. The electric field inside a spherical shell of uniform surface charge density is

A. zero

B. uniform

C. non-uniform

D. proportional to distance from the centre

Answer:

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162. A spherical shell of radius R has a charge +Q units. The electric field due to the shell at a point

A. inside is zero and varies as r^{-1} outside it

B. inside is constant and varies as r^{-2} outside it

C. inside is zero and varies as r^{-2} outside it

D. inside is constant and varies as r^{-1} outside it

Answer:

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163. A sphere of charge of radius R has uniform volume charge density. The electric field due to the sphere of charge at a point

A. inside varies as r^{-2} and as r outside it

B. inside varies as r and as r^{-2} outside it

C. inside is zero and varies as r outside it

D. inside is constant and varies as r^{-2} outside it

Answer:

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164. A charge Q is placed at the corner of a cube. The electric flux through all the six faces of the cube is

A. q/ε_0

B. $q/3\varepsilon_0$

C. $q/6\varepsilon_0$

D. $q/8\varepsilon_0$

Answer:

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165. If the flux through a closed surface is zero, then

A. the electric field must be zero every where on the surface

B. the electric field may be zero everywhere on the surface

C. the charge inside the surface must be zero

D. the charge in the vicinity of the surface must be zero

Answer:

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166. An electric dipole is placed inside a hollow sphere at its centre. Then

A. the electric flux through the sphere is zero

B. the electric field is zero at every point on the surface of the sphere

C. the electric field is non-zero at every point on the surface of sphere

D. The electric field is zero on a circle on the sphere.

Answer:

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167. A metalli particle having no net charge is placed near a positively charged metal plate having finite size. The electric force on the particle will be

A. towards the plate

B. away from the plate

C. parallel to the plate

D. zero

Answer:

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168. If one penetrates a uniformly charged solid sphere, the electric field strength E

A. increases

B. decreases

C. remains the same as at the surface

D. is zero at all points.

Answer:

Watch Video Solution

169. Potentail at any point inside a charged hollow sphere

A. increase with distance

B. is a constant

C. decreases with distance from centre

D. is zero

Answer:

Watch Video Solution

170. Two small spheres, each carrying a charge q are placed r m apart and they interact with force F. If one of the sphere is taken around the other once in a circular path, the work done will be equal to

A. $F \times r$

B. $F \times 2\pi r$

C. $F / 2\pi r$

D. zero

Answer:

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171. The electric potential at the surface of an atomic nucleus (Z=50) of radius $9.0 \times 10^{-15} m$ is

A. 80 V

B. $8 \times 10^6 V$

C. 9V

D. $9 \times 10^5 V$

Answer:

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172. If a charge is moved against the Coulomb force of an electric field

A. work is done by the electric field

B. energy is used from some outside source

C. the strength of field is decreased

D. the energy of the system is decreased

Answer:

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173. Hydrogen ion and singly ionized helium atom are accelerated , from rest , through the same potential difference . The ratio of final speeds of hydrogen and helium ions is close to :

A. 1

B. $2/1$

C. $\frac{1}{4}$

D. $\sqrt{2}$

Answer:

Watch Video Solution

174. In SI. Unit of electric field is:

A. Cm^{-2}

B. Am^{-1}

C. Vm^{-1}

D. Cm^{-1}

Answer:

Watch Video Solution

175. A charge of $10\mu C$ experience a force of 5 N in an electric field. The potential gradient at that point is:

A. $0.4NC^{-1}$

B. $4 \times 10^5 NC^{-1}$

C. $2.5 \times 10^{-6} NC^{-1}$

D. cannot be found

Answer:

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176. There is an electric field E in x-direction. If the work done on moving a charge of 0.2C through a distance of 2m along a line making a angle 60° with x-axis is 4 J, then what is the value of E?

A. $\sqrt{3}NC^{-1}$

B. $4NC^{-1}$

C. $5NC^{-1}$

D. $20NC^{-1}$

Answer:

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177. Can a body have charge and still be at zero potential?

A. Yes, always

B. Yes, but not always

C. Never

D. Depends upon the nature of the charge

Answer:

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178. Can a body have electric potential and still be uncharged?

A. Yes, always

B. Yes, but not always

C. Never

D. Depends upon the nature of the charge

Answer:

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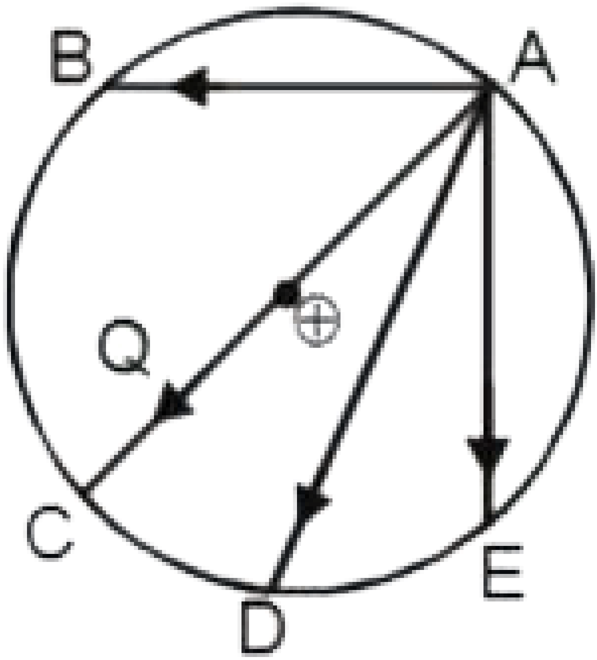
179. In the electric field of a point charge q, a certain charge is carried from point A to B, A to C,A to D and A to E. Then the work done



A. minimum along path AB

B. minimum along path AD

C. minimum along path AE

D. zero along all the paths

Answer:

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180. Which of the following quantites do not depend on the choice of zero potential or zero potential energy?

A. potential at a point

B. potential energy of a system of two point charges

C. change in potential energy of a system of two point charges

D. potential difference between two points

Answer:

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181. In SI, unit of permittivity is

A. Fm^{-1}

B. $N^{-1}m^{-2}C^{2}$

C. $Nm^{-2}C^{-1}$

D. Am^{-1}

Answer:

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182. The capacitance of the earth viewed as a spherical conductor of radius 6408 km is

A. $980\mu F$

B. $1424\mu F$

C. $712\mu F$

D. $600\mu F$

Answer:

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183. n identical mercury droplets charged to the same potential V coalesce to form a single bigger drop. The potential of new drop will be

A. V

B. V/N

C. V N

D. $VN^{2/3}$

Answer:

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184. A capacitor having capacity of 2 muF is charged to 200 V and then the plates of the capacitor are connected to a resistance wire. The heat produced in joule will be

A. 4×10^{-2}

B. 2×10^{-2}

C. 1×10^{-2}

D. 0

Answer:

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185. A parallel plate capacitor is charged. If the plates are pulled apart

A. the potential difference increases

B. the capacitance increases

C. the total charge increases

D. the charge and the potential difference remain the same.

Answer:

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186. When air is replaced by a dielectric medium of constant K, the maximum capacitance of the capacitor

A. increases K times

B. remains unchanged

C. increases k^2 times

D. decreases K times

Answer:

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187. An isolated capacitor of unknown capacitance has been charged to potential V_0. This capacitor is then connected to an uncharged capacitor of capacity C. If common potential is $V(< V_0)$, find unknown capacitance.

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188. In a charged capacitor, the energy resides

A. on the positive charged plate

B. on both the positive and negative charged plates

C. in the field between the plates

D. around the edge of the capacitor plates

Answer:

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189. A capacitor $10\mu F$ was originally charged to 10V. Now, the potential difference is increased to 20 V. The increase is potential energy is

A. $4 \times 10^{-4} J$

B. $10 \times 10^{-4} j$

C. $15 \times 10^{-4} j$

D. $5 \times 10^{-4} j$

Answer:

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190. Two idential capacitors are joined in parallel, charged to a potential V and then separated and then connected in series i.e. the positive plate of one is connected to negative of the other. Then

A. the charges on the free paltes connected together are destroyed

B. the charges on the free plates are enhanced

C. the energy stored in the system in increases

D. the potential difference between the free plates becomes 2 V.

Answer:

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191. The accumulation of charge on clouds, which produces lightining is caused by

A. rain drops changing on clouds, which produces lightning, is caused by

B. the electric field or the earth

C. ionisatino by the sun

D. electrification due to motion of water molecules.

Answer: electric

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192. In a guard ring capacitor, the purpose of the guard ring is

A. to increase the capacitance

B. to decrease the capacitance

C. to increase the effective area of the capacitor

D. to avoid the variation of the electric field intensity at the edges

Answer:

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193. wo capacitors of capacitances C_1 and C_2 are connected in parallel across a battery. If Q_1 and Q_2 respectively be the charges on the capacitors, then $\frac{Q_1}{Q^2}$ will be equal to

A. C_1 / C_2

B. V_1 / V_2

C. V_1^2 / V_2^2

D. C_1^2 / C_2^2

Answer:

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194. A parallel plate capacitor with air as medium between the plates has a capacitance of$10\mu F$. The area of capacitor is divided into two equal halves and filled with two media as shown in the figure having dielectric constnt $k_1 = 2$ and $k_2 = 4$. the capacitance of the system will now be

A. $10\mu f$

B. $20\mu F$

C. $30\mu F$

D. $40\mu F$

Answer:

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195. Van de Graaff generator is used to

A. measure high potential difference

B. produce high d.c. potential

C. produce higha.c. potential

D. comapre high d.c. potential

Answer:

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