PHYSICS

BOOKS - R G PUBLICATION

ELECTOSTATIC POTENTIAL AND CAPACITANCE

Exercise

1. Define one electon volt.

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2. Show that Weber = Volt Second

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3. A condenser of capacity 500 pF is charged to a potential 100V. Find the charge on the condenser and energy stored in it.

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4. What is electrostatic shielding? How can it be achieved?

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5. Calculate the electric potential for a point charge.

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6. A 400 pF capacitor is charged by a 100V battery. How much eletrostatic energy is stored by the capacitor?

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7. What is electric polarisation vector? Define the electric susceptibility.

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8. Deduce the expression for the capacity of a parallel plate condenser.

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9. A 100pF capacitor is charged by a potential difference of 100V. What is the amount of charge storeD? What is the electrostatic energy stored in the capacitor?

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10. What is electrostatic shielding? How can it be achieved?

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11. Define dielectric constant of a medium.

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12. The work done in moving a charge $2 \times 10^{-9}C$ from a point of potential -2kV to

another point P is $5 \times 10^{-5} J$. Find the potential at point P.

13. A parallel plate capacitor has plate separation "d" and the area of each plate is "A". The space between the plates is completely filled with a dielectric of constantK. Derive the expression for the capacity of the parallel plate capacitor.

14. Two spheres of radii 3cm and 8cm are charged with $4 \times 10^{-9}C$ and $1.6 \times 10^{-9}C$ of electricity respectively. If they are joined by a wire, how much charge will flow from one to the other sphere?

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15. A $600\mu F$ capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged

$600\mu F$ capacitor. How much electrostatic energy is lost in the process?

16. Derive the expression for field intensity due to an electric dipole in vacuum for points on its axis. Compare the variation of field intensity with distance for an electric dipole and a point charge when both are kept in vacuum.

17. Fill in the blanks

Potential energy v of a charge q at poistion vector $\overrightarrow{rr}$ in an external field is_____.

18. Fill in the blanks

Conductors contain mobile ___carriers.

19. Fill in the blanks

For linear isotropic dielectric $\overrightarrow{\longrightarrow} rP =$ _____

20. Fill in the blanks

The capacitance C depends only on the ___of the system of two conductors.

21. Define electrostatic potential at a point.

22. What do you mean by equipotential surface?

23. Give the relation between electric field E and potential V.

24. Why electrostatic potential is constant throughout the volume of the conductor?

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25. A comb run through one's dry hair attracts small bits of paper. Why?

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26. What are the dielectric substances?

27. What is linear isotropic dielectrics?

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28. "The dielectric is polarised", show , how?

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29. What is polarisation?

30. What is electric polarisation vector? Define

the electric susceptibility.

31. What are capacitors?

32. What is capacitance of a capacitor?

33. Show, in case of a capacitor, potential difference V is proportional to the charge Q.

34. What is the S.I. unit of capacitance?

35. What is dielectric strength of a dielectric medium?

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36. Find the value of capacitance C when $A = 1m^2$ and d = 1mm.

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37. What is a Van de Graaff Generator?

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38. Distinguish between electric potential and potential energy.

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39. Define electron volt. Express it in Joule.

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40. What is the unit of electric flux?

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41. Define dielectric constant of a medium.

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42. What is potential gradient.

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43. Deduce dimensinal formula of potential difference.

44. Where does the energy of a capacitor reside.

45. On which factor does the capacitance of a capacitor depend.

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46. How will you obtain maximum capacitance from three given condenser.

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47. A parallel plate capacitor has a capacity of $6\mu F$ in air and $60\mu F$, when dielectric medium is introduced. What is the dielectric constant of the medium.

48. Write the principle of Van de Graff generator.

49. What is the basic difference between charged capacitor and electric cell.

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50. When torque on a dipole in an electric field will be maximum?

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51. What is conservative forces? Give examples.

> ▶

52. What is potential energy? Explain it with an example.

53. Show the variation of electrostatic potential $\left(\alpha \dfrac{1}{r}\right)$ and the electrostatic field $\left(\alpha \dfrac{1}{r^2}\right)$ with distance r.

54. Show that in a equipotential surface, v is constant if r constant (v = potential and r = distance).

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55. Show that for any charge configuration, equipotential surface through a point is normal to the electric filed at that point.

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56. What is the potential energy of a charge q in a given filed?

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57. Give the expression for potential energy of a system of two charges q_1 and q_2 in an external field.

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58. Why electrostatic field inside a conductor is zero,

59. At the surface of a charged conductor, electrostatic filed must be normal to the surface at every point. Why?

60. What is electrostatic shielding? How can it be achieved?

61. Distinguish between a dielectric substance and conductor.

62. Give two examples of each polar and non-polar molecules.

**63.** What are the polar molecules? Give examples.

64. In a Van de Graaff type generator a spherical metal shell is to be a 15×10^6v electode. The dielectic strangth of the gas surrounding the electrode is $5 x 10^7 Vm^{-1}$. What is the minimum radius of the spherical shell required?

65. The sides of a rectangel ABCD are 15cm & 5cm as shown in figure point charge $-5\mu c$

and $+2\mu c$ are placed at the corner D and B respectively. Calculate the electric potential at A & C.

15cm

A   B

5cm

D   C
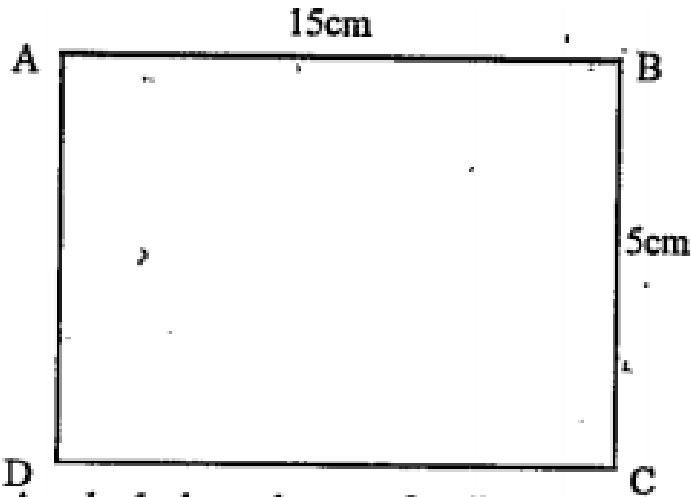
66. A spherical conductor of radius 12 cm has a charge 1.6×10^{-7}C distributed uniformly on

its surface. What is the electric filed inside the sphere

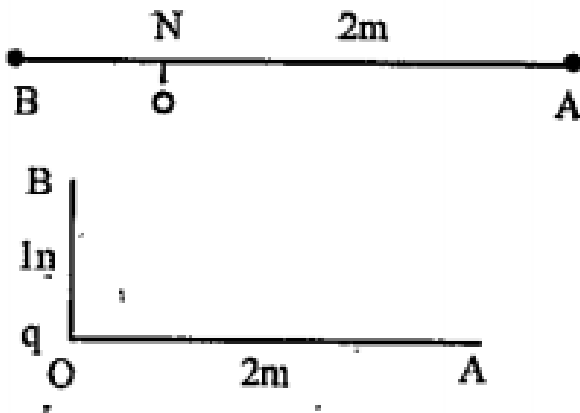**67.** A spherical conductor of radius 12 cm has a charge 1.6×10^{-7}C distributed uniformly on its surface. What is the electric filed outside the sphere.

68. A charge $\phi = +1\mu c$ is held at O between two point A and B such that $A^\circ = 2m$ and $B^\circ = 1m$. Calculate the value of potential difference $(V_A - V_B)$. What will be the value of potential difference $(V_A - V_B)$ if position of B is changed as shown in figure.

69. Show that the work done by an external force in bringing a unit positive charge from infinity to a point is equal to electrostatic potential (V) at that point.

70. Deduce the expression for potential due to a point charge.

71. Calculate the potential at a point P due to a charge of $1.2 \times 10^{-8}C$ located 108mm away.

72. Deduce the expression for potential due to an electric dipole.

73. Deduce the expression for potential energy of a system of charges?

74. Two charges $60 \times 10^{-9} C$ and $-30 \times 10^{-9} C$ are located 100mm apart. At what point on the line joining the two charges is the electric potential zero? (Taking the potential at infinity to be zero)

75. Deduce the expression for potential energy

of a system of charges?

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76. Consider a dipole with charges +q and -q.

Find out the expression of potential energy of

the dipole for an external field E.

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77. Show the difference in behaviour of a conductor and a dielectric in an external electric filed.

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78. Distinguish between polar and non-polar molecules.

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79. With a neat diagram, show how does the polarised dielectric modify the original external field inside it?

80. For a paralle plate capacitor, show that capacitance

$$C = \frac{\epsilon_0 A}{d}$$

A → area of each plate
d → separation between plates

81. Find out the area of the plates of a 1F parallel plate capacitor (Given d= 5mm)

82. The plates of a parallel plate capacitor have an area of $9cm^2$ each and are separated by 5mm. The capacitor is charged by connecting it to 320v supply. How much electrostatic energy is stored by the capacitor?

83. Establish the general formula for effective capacitance of a series combination of n capacitors.

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84. Establish the general formula for effective capacitance C for parallel combination of n capacitor.

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85. Deduce the expression of energy stored in a capacitor.

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86. Write the principle of Van de Graff generator.

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87. Calculate the electric filed intensity due to a dipole.

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88. Calculate the capacity for a spherical conductor.

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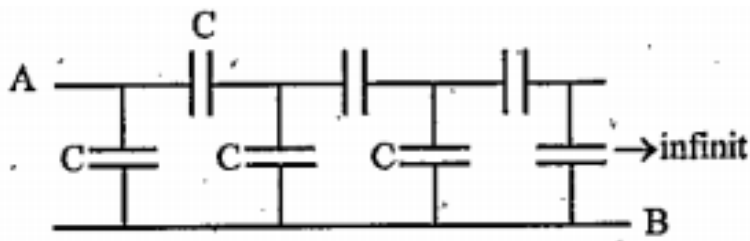**89.** Calculate the total capacity when three capacitors connected in series and parallel.

90. Write the principle of Van de Graff generator.

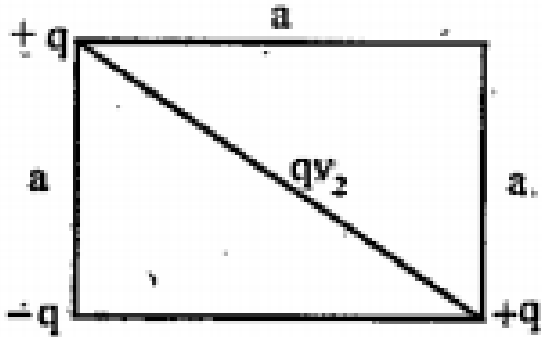**91.** Calculate the equivalent capacitance form the circuit $= 2\mu F$.

92. Calculate the electric potential energy of the system of charges shown in figure.