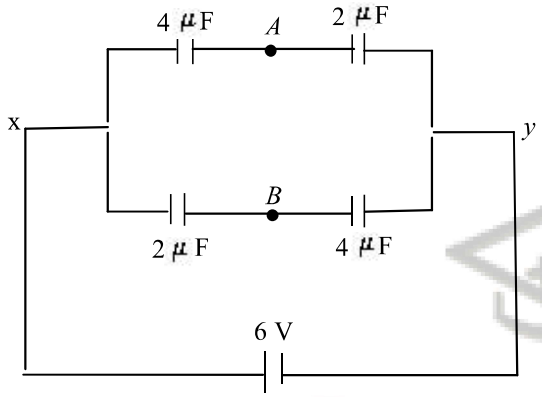
GPLUS EDUCATION

Date :
Time : **PHYSICS**
Marks :

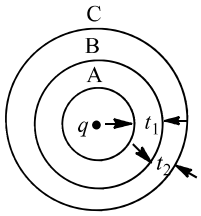
ELECTROSTATIC POTENTIAL AND CAPACITANCE

Single Correct Answer Type

1. A sphere of radius 1 m encloses a charge of 5 μC. Another charge of -5 μC is placed inside the sphere. The net electric flux would be
   a) Double b) Four times c) Zero d) None of these
2. A ball of mass 1 carrying a charge 10^{-8} Cmoves from a point A at potential 600 V to a point B at zero potential. The change in its KE is
   a) -6×10^{-6} erg b) -6×10^{-6} J c) 6×10^{-6} J d) 6×10^{-6} erg
3. What is the potential difference between points A and B in the circuit shown?



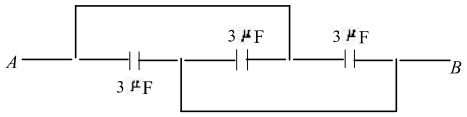
   a) 2 V b) 4 V c) 3 V d) 12 V
4. Figure shows three spherical and equipotential surfaces A, B and C round a point charge q. The potential difference $V_A - V_B = V_B - V_C$. If t_1 and t_2 be the distance between them. Then



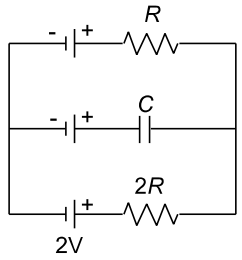
   a) $t_1 = t_2$ b) $t_1 > t_2$ c) $t_1 < t_2$ d) $t_1 \leq t_2$
5. A square of side a has charge Q at its centre and charge q at one of the corners. The work required to be done in moving the charge q from the corner to the diagonally opposite corner is
   a) Zero b) $\frac{Qq}{4\pi\varepsilon_0 a}$ c) $\frac{Qq\sqrt{2}}{4\pi\varepsilon_0 a}$ d) $\frac{Qq}{2\pi\varepsilon_0 a}$
6. Two metallic spheres of radii 1 cm and 2 cm are given charges of 10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the smaller sphere is
   a) 3×10^{-2} C b) 1×10^{-2} C c) 4×10^{-2} C d) 2×10^{-2} C
7. Capacitance of a capacitor made by a thin metal foil is 2μF. If the foil is folded with paper of thickness 0.15 mm, dielectric constant of paper is 2.5 and width of paper is 400 mm, the length of foil will be
   a) 0.34 m b) 1.33 m c) 13.4 m d) 33.9 m
8. The plates of a parallel plate capacitor with air as medium are separated by a distance of 8 mm. A medium of dielectric constant 2 and thickness 4 mm having the same area is introduced between the plates. For the capacitance to remain the same , the distance between the plates is

a) 8 mm b) 6 mm c) 4 mm d) 12 mm

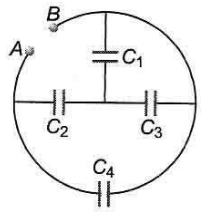
9. If the plates of a parallel plate capacitor are not equal in area, then quantity of charge
   a) On the plates will be same but nature of charge will differ
   b) On the plates as well as nature of charge will be different
   c) On the plates will be different but nature of charge will be same
   d) As well as nature of charge will be same
10. A hollow metal sphere of radius 10 cm is charged such that the potential on its surface becomes 80V. The potential at the centre of the sphere is
   a) 80 V b) 800 V c) 8 V d) Zero
11. The effective capacitance between points A and B is



   a) 9 μF b) 3 μF c) 6 μF d) 1 μF
12. The electric potential at centre of metallic conducting sphere is
   a) Zero b) Half from potential at surface of sphere
   c) Equal from potential at surface of sphere d) Twice from potential at surface of sphere
13. Capacitance of a parallel plate capacitor becomes $\frac{4}{3}$ times its original value, if a dielectric slab of thickness $t = \frac{d}{2}$ is inserted between the plates [d is the separation between the plates]. The dielectric constant of the slab is
   a) 4 b) 8 c) 2 d) 6
14. In the given circuit of figure with steady current, the potential drop across the capacitor must be



   a) V b) $\frac{V}{2}$ c) $\frac{V}{3}$ d) $\frac{2V}{3}$
15. In the arrangement of capacitors shown in figure, each capacitor is of 9 μF, Then the equivalent capacitance between in points A and B is

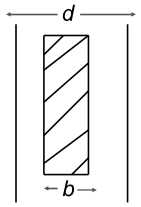


   a) 9 μF b) 18 μF c) 4.5 μF d) 15 μF
16. Electric potential at the centre of a charged hollow metal sphere is
   a) Zero b) Twice as that on the surface
   c) Half of that on the surface d) Same as that on the surface
17. An electron enters the space between the plates of a charged capacitor as shown. The charge density on the plate is σ. Electric intensity in the space between the plates is E.A uniform magnetic field Balso exists in the space perpendicular to the direction of E. The electron moves perpendicular to both **E** and **B** without any change in direction. The time taken by the electron to travel a distance l in the space is

a) $\frac{\sigma l}{\varepsilon_0 B}$ b) $\frac{\sigma B}{\varepsilon_0 l}$ c) $\frac{\varepsilon_0 l B}{\sigma}$ d) $\frac{\varepsilon_0 l}{\sigma B}$

18. Three capacitors each of capacitance 1 μF are connected in parallel. To the combination, a fourth capacitor of capacitance 1 μF is connected in series. The resultant capacitance of the system is
a) 4 μF b) $(4/3)$μF c) 2 μF d) $(3/4)$μF

19. A slab of copper of thickness b is inserted in between the plates of parallel plate capacitor as shown in figure. The separation between the plates is d if $b = d/2$, then the ratio of capacities of capacitors after and before inserting the slab will be



a) $\sqrt{2}:1$ b) $2:1$ c) $1:1$ d) $1:\sqrt{2}$

20. A solid conducting sphere having a charge Q us surrounded by an uncharged concentric conducting 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 $-3Q$. the new potential difference between the same two surface is
a) V b) $2V$ c) $4V$ d) $-2V$

21. Three capacitors of capacitance C (μF) are connected in parallel to which a capacitor of capacitance C is connected in series. Effective capacitance is 3.75, then capacity of each capacitor is
a) 4 μF b) 5 μF c) 6 μF d) 8 μF

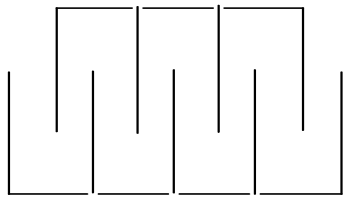
22. Two capacitors of capacitance 2 μF and 4μF respectively are connected in series. The combination is connected across a potential difference of 10 V. The ratio of energies stored by capacitors will be
a) $1:\sqrt{2}$ b) 2 : 1 c) 1 : 4 d) 4 : 1

23. If dielectric is inserted in charged capacitor (battery removed), then quantity that remains constant is
a) Capacitance b) Potential c) Intensity d) Charge

24. Number of electric lines of force from 0.5 C if positive charge in a dielectric medium of constant 10 is
a) 5.65×10^9 b) 1.13×10^{11} c) 9×10^9 d) 8.85×10^{-12}

25. In bringing an electron towards another electron, the electrostatic potential energy of the system
a) Decreases b) Increases c) Remains same d) Becomes zero

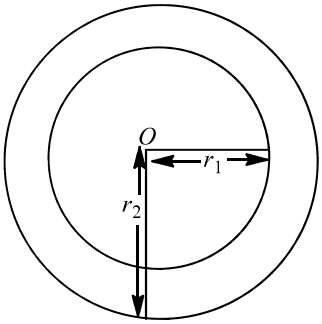
26. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm and the overlapping area of the plates is 5 cm^2. The capacity of the unit is



a) 1.06 pF b) 4 pF c) 6.36 pF d) 12.72 pF

27. The potential at a point Pwhich is forming a corner of a square of side 93mm with charges, $Q_1 = 33$ nC,$Q_2 = -51$ nC, $Q_3 = 47$nC located at the other three corners is nearly
a) 16kV b) 4kV c) 400V d) 160V

28. In the given figure, a hollow spherical capacitor is shown. The electric field will not be zero at

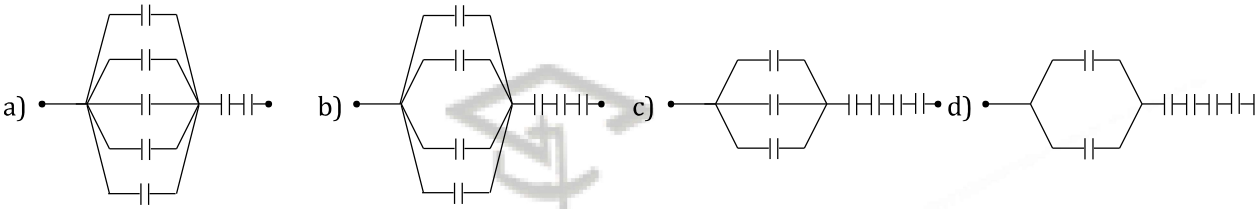


a) $r < r_1$ b) $r_1 < r_2$ c) $r < r_2$ d) $r_1 < r < r_2$

29. Two positive point charges of 12μC and 5μC are placed 10 cm apart in air. The work needed to bring them 4 cm closer is
a) 2.4 J b) 3.6 J c) 1.6 J d) 6.0 J

30. A thin spherical conducting shell of radius R has a charge q. Another charge Q is placed at the centre of the shell. The electrostatic potential at a point P at a distance $R/2$ from the centre of the shell is
a) $\frac{2Q}{4\pi\varepsilon_0 R}$ b) $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{2q}{4\pi\varepsilon_0 R}$ c) $\frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$ d) $\frac{(q+Q)}{4\pi\varepsilon_0}\frac{2}{R}$

31. Seven capacitors each of the capacitance 2μF are be connected in a configuration to obtain an effective capacitance of $\frac{10}{11}$ μ F. Which of the combination (S) shown in figure will achieve the desired result?



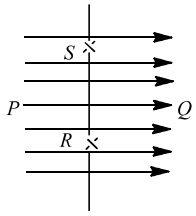
32. A 5.μF capacitor is charged to a potential difference of 800 V and discharged through a conductor. the energy given to the conductor during the discharge is
a) 1.6×10^{-2} J b) 3.2 J c) 1.6 J d) 4.2 J

33. A non-conducting ring of radius 0.5 m carries total charge of 1.11×10^{-10} C distributed non-uniformly on its circumference producting an electric field everywhere in space.
The value of the line integral $\int_{l=\infty}^{l=0} -E.dl$ ($l = 0$ being centre of ring) in volt is
a) $+2$
b) -1
c) -2
d) Zero

34. An AC source is rated at 220 V, 50 Hz. The time taken for voltage to change from its peak value to zero is
a) 50 s b) 0.02 s c) 5 s d) 5×10^{-3}s

35. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitance of the capacitor
a) Decreases b) Remain unchanged c) Becomes infinite d) Increases

36. The points resembling equal potentials are



a) P and Q b) S and Q c) S and R d) P and R

37. The energy required to charge a parallel plate condenser of plate separation d and plate area of cross-

section A such that uniform electric field between the plates is E,is

a) $\frac{1}{2}\frac{\varepsilon_0 E^2}{Ad}$ b) $\frac{\varepsilon_0 E^2}{Ad}$ c) $\varepsilon_0 E^2 Ad$ d) $\frac{1}{2}\varepsilon_0 E^2 Ad$

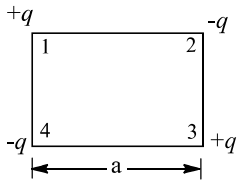
38. C, V, U and Q are capacitance, potential difference, energy stored and charge of a parallel plate capacitor respectively. The quantities that increase when a dielectric slab is introduced between the plates without disconnecting the battery are

a) V and C b) V and U c) U and Q d) V and Q

39. The energy of a charged capacitor is U. Another identical capacitor is connected parallel to the first capacitor, after disconnecting the battery. The total energy of the system of these capacitors will be

a) $\frac{U}{4}$ b) $\frac{U}{2}$ c) $\frac{3U}{2}$ d) $\frac{2U}{4}$

40. The work required to put the four charges at the corners of a square of side a, as shown in figure, is

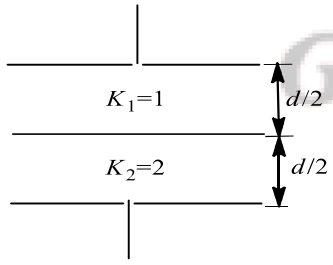


a) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{a}$ b) $-\frac{2.6}{4\pi\varepsilon_0}\frac{q^2}{a}$ c) $+\frac{2.6}{4\pi\varepsilon_0}\frac{q^2}{a}$ d) None of these

41. A positive point charge q is carried from a point B to a point A in the electric field of a point charge $+Q$ at O. If the permittivity of free space is ε_0, the work done in the process is given by (where a $= OA$ and $b = OR$)

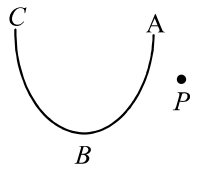
a) $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{1}{a}+\frac{1}{b}\right)$ b) $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{1}{a}-\frac{1}{b}\right)$ c) $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{1}{a^2}-\frac{1}{b^2}\right)$ d) $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{1}{a^2}+\frac{1}{b^2}\right)$

42. Two parallel plates of area A are separated by two different dielectric as shown in figure. The net capacitance is



a) $\frac{\varepsilon_0 A}{2d}$ b) $\frac{\varepsilon_0 A}{d}$ c) $\frac{3\varepsilon_0 A}{d}$ d) $\frac{4\varepsilon_0 A}{3d}$

43. In the following diagram the work done in moving a point charge from point P to point A, B and C is respectively as W_A, W_B and W_C then



a) $W_A = W_B = W_C$ b) $W_A = W_B = W_C = 0$ c) $W_A > W_B > W_C$ d) $W_A < W_B < W_C$

44. A parallel plate capacitor of capacitance 100 pF is to be constructed by using paper sheets of 1 mm thickness as dielectric. If the dielectric constant of paper is 4, the number of circular metal foils of diameter 2 cm each required for the purpose is

a) 40 b) 20 c) 30 d) 10

45. Identify the wrong statement.

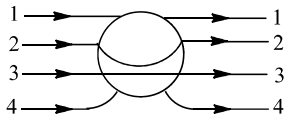
a) The electrical potential energy of a system of two protons shall increase if the separation between the two is decreased.

b) The electrical potential energy of a proton-electron system will increase if the separation between the two is decreased.

c) The electrical potential energy of a proton-electron system will increase if the separation between the two is increased.

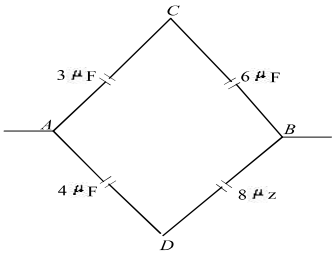
d) The electrical potential energy of system of two electrons shall increase if the separation between the two is decreased.

46. A metallic solid sphere is placed in a uniform electric field. The lines of force follow the paths shown in figure



a) 1 b) 2 c) 3 d) 4

47. Effective capacitance between points A and B in the figure, shown is



a) $\frac{3}{14}\mu F$ b) $\frac{14}{3}\mu F$ c) 21 μF d) 23 μF

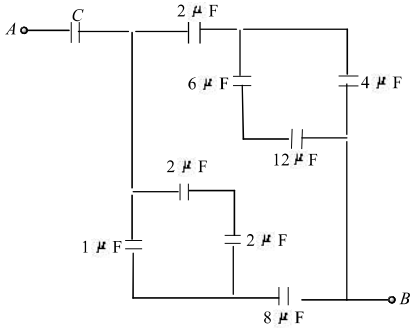
48. Three capacitors 2, 3 and 6 μF are joined with each other. What is the minimum effective capacitance?

a) $\frac{1}{2}$ μF b) 1 μF c) 2 μF d) 3 μF

49. If the electric flux entering and leaving an enclosed surface respectively is ϕ_1 and ϕ_1, then, charge enclosed in closed surface is

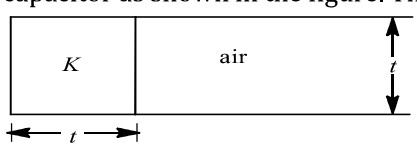
a) $\frac{\phi_2-\phi_1}{\varepsilon_0}$ b) $\frac{\phi_1+\phi_2}{\varepsilon_0}$ c) $\frac{\phi_1-\phi_2}{\varepsilon_0}$ d) $\varepsilon_0(\phi_2-\phi_1)$

50. In the given network, the value of C, so that an equivalent capacitance between A and B is 3μF, is



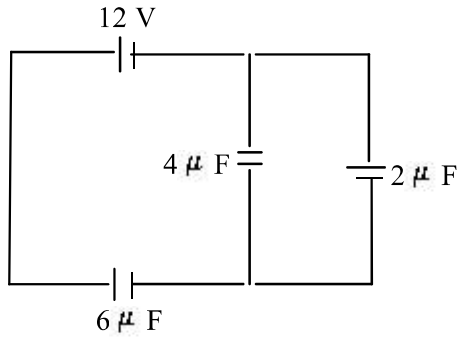
a) 36μF b) 48μF c) $\frac{31}{5}\mu F$ d) $\frac{1}{5}\mu F$

51. A parallel plate capacitor with air as the dielectric has capacitance C. A slab of dielectric constant K and having the same thickness as the separation between the plates is introduced so as to fill one-fourth of the capacitor as shown in the figure. The new capacitance will be

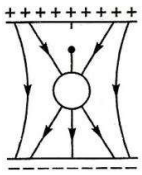
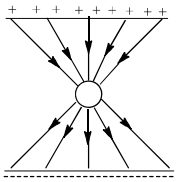
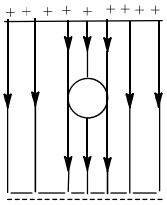
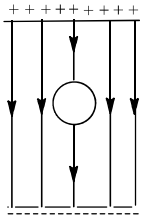


a) $(K+3)\frac{C}{4}$ b) $(K+2)\frac{C}{4}$ c) $(K+1)\frac{C}{4}$ d) $\frac{KC}{4}$

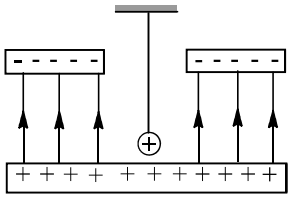
52. An electric charge $10^{-3}\mu C$ is placed at the origin (0, 0) of X-Y coordinate system. Two points A and B are situated at $(\sqrt{2}, \sqrt{2})$ and (2,0) respectively. The potential difference between the points A and B will be
    a) 9V b) Zero c) 2V d) 4.5V
53. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric constant 5, the percentage increase in the capacitance will be
    a) 400 % b) 66.6 % c) 33.3 % d) 200 %
54. In a charged capacitor the energy stored in
    a) The positive charges b) The negative charges
    c) The field between the plates d) None of the above
55. The charge deposited on 4μF capacitor the circuit is



    a) 6×10^{-6}C b) 12×10^{-6}C c) 24×10^{-6}C d) 36×10^{-6}C
56. A capacitor is charged to store an energy U. the charging battery is disconnected. An identical capacitor is now connected to the first capacitor in parallel. The energy in each of the capacitor is
    a) $3\,U/2$ b) U c) $U/4$ d) $U/2$
57. Work done in carrying a charge Q' once round the circle of radius r with a charge Q at the centre is
    a) $\frac{1}{4\pi\epsilon_0}\frac{Q}{r}$ b) $\frac{1}{4\pi\varepsilon_0}\frac{QQ'}{r}$ c) Zero d) $\frac{QQ'}{2r}$
58. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force will look like

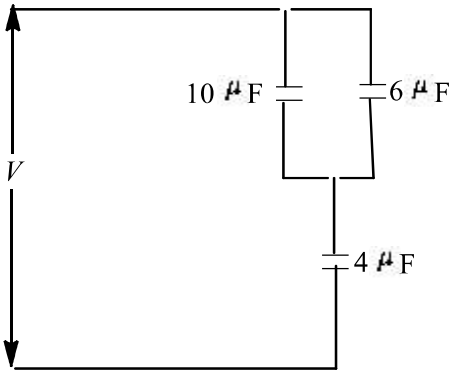
    a) 
    b) 
    c) 
    d) 

59. Two identical air core capacitors are connected in series to a voltage source of 15 V. If one of the capacitors is filled with a medium of dielectric constant 4, the new potential across this capacitor is
    a) 5 V b) 8 V c) 10 V d) 12 V
60. A spherical drop of mercury having a potential of 2.5V is obtained as a result of merging 125 droplets. The potential of a constituent droplets would be
    a) 1.0V b) 0.5V c) 0.2V d) 0.1V
61. The plates of a parallel plate capacitor are charged upto 200 V. A dielectric slab of thickness 4 mm is inserted between its plates. Then, to maintain the same potential difference between the plates of the capacitor, the distance between the plates is increased by 3.2 mm. The dielectric constant of the dielectric slab is
    a) 1 b) 4 c) 5 d) 6
62. If a positively charged pendulum is oscillating in a uniform electric field as shown in figure. Its time period as compared to that when it was uncharged will



a) Increase
b) Decrease
c) Not change
d) First increase and then decrease

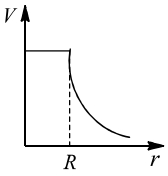
63. The equivalent capacitance of the combination of the capacitors is

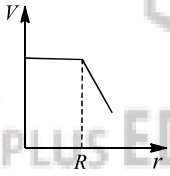


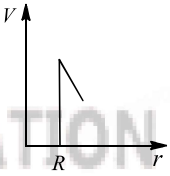
a) 3.20 μF
b) 7.80 μF
c) 3.90 μF
d) 2.16 μF

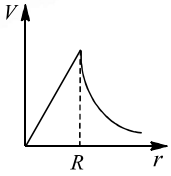
64. Two conducting sphere of radii r_1 and r_2 are at the same potential. The ratio of their charges is
a) r_1^2 / r_2^2
b) r_2^2 / r_1^2
c) r_1 / r_2
d) r_2 / r_1

65. Which one of the following graphs figure shows the variation of electric potential V with distance r from the centre of a hollow charged sphere of radius R

a) 

b) 

c) 

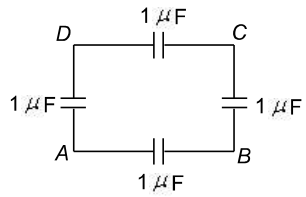
d) 

66. Two insulated metal spheres of adii 10 cm and 15 cm charged to a potential of 150V and 100 V respectively are connected by means of a metallic wire. What is the charge on the first sphere?
a) 2 esu
b) 4 esu
c) 6 esu
d) 8 esu

67. A 10 μF capacitor and a 20 μF capacitor are connected in series across 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. What is the potential difference across each capacitor?
a) $\frac{800}{9}$ V
b) $\frac{800}{3}$ V
c) 400 V
d) 200 V

68. A hollow charged metal sphere has radius r. If the potential difference between its surface and a point at a distance $3r$ from the centre is V, then electric field intensity at a distance $3r$ is
a) $\frac{V}{2r}$
b) $\frac{V}{3r}$
c) $\frac{V}{6r}$
d) $\frac{V}{4r}$

69. Four capacitors are connected as shown in figure. The equivalent capacitance between A and B is



a) 4 μF
b) 0.25 μF
c) 0.75 μF
d) 1.33 μF

70. A fully charged capacitor has a capacitance C. It is discharged through a small coil of resistance wire

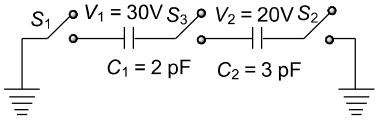
embedded in a thermally insulated block of specific heat capacity s and mass m. If the temperature of the block is raised by ΔT, the potential difference V across the capacitance is

a) $\sqrt{\frac{2mC\Delta T}{s}}$ b) $\frac{mC\Delta T}{s}$ c) $\frac{ms\Delta T}{C}$ d) $\sqrt{\frac{2m\,s\Delta T}{C}}$

71. Two parallel large thin metal sheets have equal surface charge densities ($\sigma = 26.4 \times 10^{-12}\text{Cm}^{-2}$)of opposite signs. The electric field between these sheets is

a) $1.5\ \text{NC}^{-1}$ b) $1.5\times 10^{-10}\text{NC}^{-1}$ c) $3\ \text{NC}^{-1}$ d) $3 \times 10^{-10}\ \text{NC}^{-1}$

72. For the circuit shown figure, which of the following statements is true?



a) With S_1 closed, $V_1 = 15$ V, $V_2 = 20$ V b) With S_3 closed, $V_1 = V_2 = 20$ V

c) With $S_1$and, S_3 closed, $V_1 = V_2 = 0$ d) With S_1 and S_3closed, $V_1 = 30$ V, $V_2 = 20$ V

73. Electric field on the axis of a small electric dipole at a distance r is $\vec{E}_1$ and $\vec{E}_2$ at a distance of $2r$ on a line of perpendicular dissector. Then

a) $\vec{E}_2 = -\frac{\vec{E}_1}{8}$ b) $\vec{E}_2 = -\frac{\vec{E}_1}{16}$ c) $\vec{E}_2 = -\frac{\vec{E}_1}{4}$ d) $\vec{E}_2 = \frac{\vec{E}_1}{8}$

74. On increasing the plate separation of a charged capacitor, the energy

a) Increases b) Decreases c) Remains unchanged d) Becomes zero

75. Two capacitors of capacitance C are connected in series. If one of them is filled with dielectric substance K, what is the effective capacitance?

a) $\frac{KC}{(1+K)}$ b) $C(K+1)$ c) $\frac{2KC}{(1+K)}$ d) None of these

76. 1000 similar electrified rain drops merge together into one drop so that their total charge remains unchanged. How is the electric energy affected?

a) 100 times b) 102 times c) 200 times d) 400 times

77. Three charges 1μC, 2μC, 3μC are kept at vertices of an equilateral triangle of side 1m. If they are brought nearer, so that they now form an equilateral triangle of side 0.5m, then work done is

a) 11J b) 1.1J c) 0.01J d) 0.11J

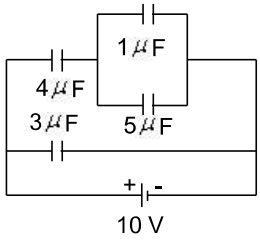
78. 27 identical drops of mercury are charged simultaneously to the same potential of 10 V each. Assuming drops to be spherical, if all the charged drops are made to combine to form one large drop, then the potential of larger drop would be

a) 45 V b) 135 c) 270 V d) 90 V

79. If the potential of a capacitor having capacity 6μF is increased from 10 V to 20 V, then increase in its energy is

a) 12×10^{-6} J b) 9×10^{-4} J c) 4.5×10^{-6} J d) 2.25×10^{-6} J

80. For the circuit shown in figure the charge on 4 μF capacitor is



a) 40 μC b) 30 μC c) 24 μC d) 54 μC

81. A hollow metallic sphere of radius R is given a charge Q. Then, the potential at the centre is

a) Zero b) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{R}$ c) $\frac{1}{4\pi\varepsilon_0}.\frac{2Q}{R}$ d) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{2R}$

82. Three capacitors of capacitance 1μF, 2μF and 3μF are connected in series and a potential difference of 11 V

is applied across the combination. Then, the potential difference across the plate of 1μF capacitor is

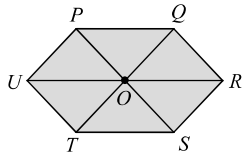
a) 2 V b) 4 V c) 1 V d) 6 V

83. Identify the wrong statement.
a) In an electric field two equipotential surfaces can never intersect.
b) A charged particle free to move in an electric field shall always move in the direction of **E.**
c) Electric field at the surface of a charged conductor is always normal to the surface.
d) The electric potential decrease along a line of force in an electric field.

84. The radius of nucleus of silver (atomic number Z=47) is 3.4×10^{-14}m.The electric potential on the surface of nucleus will be

a) $1.99 \times 10^{6}V$ b) $2.99 \times 10^{6}V$ c) $3.99 \times 10^{6}V$ d) None of these

85. Six charges, three positive and three negative of equal magnitude are to be placed at the vertices of a regular hexagon such that the electric field at O is double the electric field when only one positive charge of same magnitude is placed at R. which of the following arrangements of charges is possible for P, Q, R, S, T and U respectively?

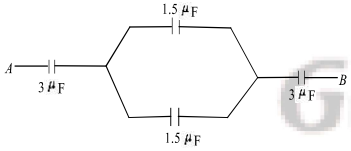


a) $+,-,+,-,-,+$ b) $+,-,+,-,+,-$ c) $+,+,-,+,-,-$ d) $-,+,+,-,+,-$

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

a) $\sqrt{2C}$ b) $2C$ c) $\frac{C}{\sqrt{2}}$ d) $\frac{C}{2}$

87. The equivalent capacitance between the points A and B in the following circuit is



a) 1 μF b) 2 μF c) 4 μF d) 8 μF

88. Charges$2q, -q$ and $-q$ lie at the vertices of an equilateral triangle. The value of E and V at the centroid of the triangle will be

a) $E \neq 0$ and $V \neq 0$ b) $E = 0$ and $V = 0$ c) $E \neq 0$ and $V = 0$ d) $E = 0$ and $V \neq 0$

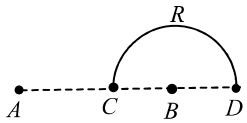
89. A capacitor of capacitance 10μF charged to 100V is connected to an uncharged capacitor. The effective potential now is 40 V. The capacitance of uncharged capacitor is

a) 12μF b) 15 μF c) 25 μF d) 30 μF

90. The work done in moving an alpha particle between two points having potential difference 25 V is

a) 8×10^{-18}J b) 8×10^{-19}J c) 8×10^{-20}J d) 8×10^{-16}J

91. Charges +q and –q are placed at points A and B respectively which are a distance $2L$ apart, C is the mid-point between A and B. The work done in moving a charge$+Q$ along the semicircle CRD is



a) $\frac{qQ}{4\pi\varepsilon_0 L}$ b) $\frac{qQ}{2\pi\varepsilon_0 L}$ c) $\frac{qQ}{6\pi\varepsilon_0 L}$ d) $-\frac{qQ}{6\pi\varepsilon_0 L}$

92. Three concentric conducting spherical shells carry charges as follows :$+Q$ on the inner shell, $-2Q$ on the middle shell and $-5\ Q$ on the outer shell. The charge in the inner surface of the outer shell is

a) Zero b) $+\ Q$ c) $-2\ Q$ d) $-3\ Q$

93. The capacitance of a parallel plate capacitor with air as medium is 3μF. With the introduction of a

dielectric medium between the plates, the capacitance becomes 15μF. The permittivity of the medium is

a) $5C^2N^{-1}m^{-2}$ b) $15C^2N^{-1}m^{-2}$

c) $0.44 \times 10^{-10}C^2N^{-1}m^{-2}$ d) $8.854 \times 10^{-11}C^2N^{-1}m^{-2}$

94. The work done in bringing a unit positive charge from infinity distance to a point at distance X from a positive charge Q is W. Then, the potential ϕat the point is

a) $\frac{WQ}{X}$ b) W c) $\frac{W}{Q}$ d) WQ

95. Two capacitor of capacity 6μF and 12μF in series are connected by potential of 150 V. the potential of capacitor of capacity 12μF will be

a) 25 V b) 50 V c) 100 V d) 150 V

96. A uniform electric field having a magnitude E_0 and direction along the positive X–axis, exists. If the potential V is zero at $x = 0$, then its value at $x = +x$ will be

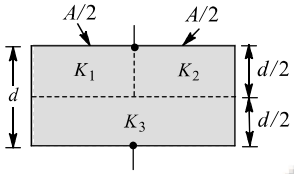
a) $V(x) = +x\ E_0$ b) $V(x) = -x\ E_0$ c) $V(x) = +x^2\ E_0$ d) $V(x) = -x^2\ E_0$

97. Two thin wire rings each having a radius R are placed at a distance d apart with their axes coinciding. The charges on the two rings are +q and –q. The potential difference between the centres of two rings is

a) $\frac{qR}{4\pi\varepsilon_0 d^2}$ b) $\frac{q}{2\pi\varepsilon_0}\left[\frac{1}{R} - \frac{1}{\sqrt{R^2+d^2}}\right]$

c) Zero d) $\frac{q}{4\pi\varepsilon_0}\left[\frac{1}{R} - \frac{1}{\sqrt{R^2+d^2}}\right]$

98. A parallel plate capacitor of area A, plate separation d and capacitance C is filled with three different dielectric materials having dielectric constants $K_1, K_2\ and\ K_3$ as shown. If a single dieletric material is to be used to have the same capacitance C is this capacitors, then its dielectric constant K is given by



a) $\frac{1}{K} = \frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{2K_3}$ b) $\frac{1}{K} = \frac{1}{K_1 + K_2} + \frac{1}{2K_3}$ c) $K = \frac{K_1 K_2}{K_1 + K_2} + 2K_3$ d) $K = K_1 + K_2 + 2K_3$

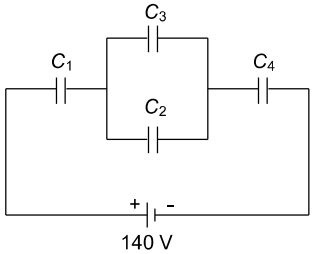
99. An automobile spring extends 0.2 m for 5000 N load. The ratio of potential energy stored in this spring when it has been compressed by 0.2 m to the potential energy stored in a 10μF capacitor at a potential difference of 10000 V will be

a) 1/4 b) 1 c) 1/2 d) 2

100. Find the potential at the centre of a square of side $\sqrt{2}$m. Which carries at its four corners charges $q_1 = 3 \times 10^{-6}$C,$q_2 = -3 \times 10^{-6}$C, q_3=-4×10^{-6}C, $q_4 = 7 \times 10^{-6}C$

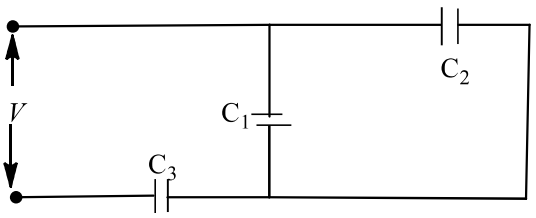
a) $2.7 \times 10^4 V$ b) $1.5 \times 10^3 V$ c) $3 \times 10^2 V$ d) $5 \times 10^3 V$

101. In the circuit arrangement shown in figure, the value of $C_1 = C_2 = C_3 = 30$ pF and $C_3 = 120$ pF. If the combination of capacitors is charged with 140V DC supply, the potential differences across the four capacitors will be respectively



a) 80, 40, 40 and 20 V b) 20, 40, 40 and 80 V c) 35, 35, 35 and 35 V d) 80, 20, 20 and 20 V

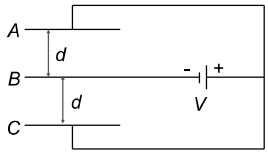
102. Three capacitors C_1, C_2 and C_3 are connected as shown in the figure to a battery of V volt. If the capacitor C_3 breaks down electrically the change in total charge on the combination of capacitors is



a) $(C_1 + C_2)V\left[1 - \left(\frac{C_3}{C_1 + C_2 + C_3}\right)\right]$ b) $(C_1 + C_2)V\left[1 - \left(\frac{(C_1 + C_2)}{C_1 + C_2 + C_3}\right)\right]$

c) $(C_1 + C_2)V\left[1 + \left(\frac{C_3}{C_1 + C_2 + C_3}\right)\right]$ d) $(C_1 + C_2)V\left[1 + \left(\frac{C_2}{C_1 + C_2 + C_3}\right)\right]$

103. Consider the arrangement of three metal plates *A, B,* and *C* of equal surface area and separation d as shown in figure. The energy stored in the arrangement, when the plates are fully charged, is



a) $\frac{\varepsilon_0 AV^2}{2d}$ b) $\frac{\varepsilon_0 AV^2}{d}$ c) $\frac{2\varepsilon_0 AV^2}{d}$ d) $\frac{3\varepsilon_0 AV^2}{2d}$

104. Two conducting spheres A and B of radius a and b respectively are at the same potential. The ratio of the surface charge densities of A and B is

a) $\frac{b}{a}$ b) $\frac{a}{b}$ c) $\frac{a^2}{b^2}$ d) $\frac{b^2}{a^2}$

105. The potential energy of system of two equal negative point charges of 2μC each held 1m apart in air is ($k = 9 \times 10^9$ SI unit)

a) 36J b) 3.6×10^{-3} J c) 3.6J d) 3.6×10^{-2}J

106. A metal foil of negligible thickness is introduced between two plates of a capacitor at the centre. The capacitance of capacitor will be

a) Same b) Double c) Half d) K times

107. The capacitance of an isolated conducting sphere of radius R is proportional to

a) R^{-1} b) R^2 c) R^{-2} d) R

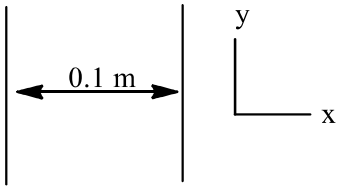
108. A dielectric of dielectric constant K is introduced such that half of its area of a capacitor of capacitance C is occupied by it. The new capacity is

a) $2C$ b) $\frac{C}{2}$ c) $\frac{(1+K)C}{2}$ d) $2C(1+K)$

109. A 20μF capacitor is connected to 45 V battery through a circuit whose resistance is 2000Ω. What is the final charge on the capacitor?

a) 9×10^{-4}C b) 9.154×10^{-4}C c) 9.8×10^{-4}C d) None of these

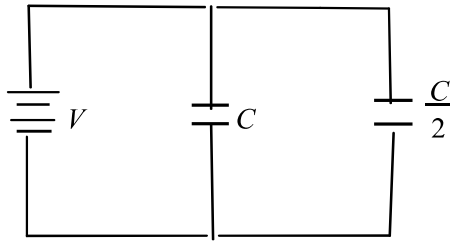
110. Two insulating plates are both uniformly charged in such a way that the potential difference between them is $V_2 - V_1 = 20$V. (ie, plate 2 is at a higher potential). The plates are separated by $d = 0.1$m and can be treated as infinitely large. An electron is released from rest on the inner surface of plate 1. What is its speed when it hits plate 2? (e=1.6× 10^{-19}C, $m_0 = 9.11 \times 10^{-31}$kg)



a) 2.65×10^6 ms^{-1} b) 7.02×10^{12} ms^{-1} c) 1.87×10^6 ms^{-1} d) 32×10^{-19} ms^{-1}

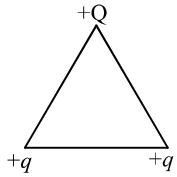
111. Two condensers, one of capacity C and the other of capacity $\frac{C}{2}$, are connected to a V volt battery , as

shown. The work done in charging fully both the condensers is



a) $2CV^2$ b) $\frac{1}{4}CV^2$ c) $\frac{3}{4}CV^2$ d)

112. Three charges are placed at the vertex of an equilateral triangle as shown in figure. For what value of Q, the electrostatic potential energy of the system is zero?



a) $-q$ b) $\frac{q}{2}$ c) $-2q$ d) $\frac{-q}{2}$

113. An air filled parallel plate capacitor has a capacity of 2pF. The separation of the plates is doubled and the interspace between the plates is filled with wax. If the capacity is increased to 6 pF, the dielectric constant of wax is

a) 2 b) 3 c) 4 d) 6

114. Three charges $2q, -q, -q$ are located at the vertices of an equilateral triangle. At the circumcentre of the triangle

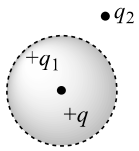
a) The field is zero but potential is non-zero b) Potential is zero and the field is infinity

c) Both the field and potential are zero d) The field is non-zero but potential is zero

115. The electric flux from a cube of edge l is ϕ. What will be its value if edge of cube is made 2 l and charge enclosed is halved

a) $\phi/2$ b) 2 ϕ c) 4 ϕ d) 5 ϕ

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 charge

c) All the charges d) $+q_1$ and $-q_1$

117. A parallel plate condenser with a dielectric of dielectric constant K between the plates has a capacity C and is charged to a potential V volt. The dielectric slab is slowly removed from between the plates and then reinserted. The net work done by the system in this process is

a) $\frac{1}{2}(K-1)CV^2$ b) $CV^2(K-1)/K$ c) $(K-1)CV^2$ d) Zero

118. Two identical capacitors each of capacitance 5μF are charged to potentials 2kV and 1kV respectively. Their –ve ends are connected together. When the +ve ends are also connected together, the loss of energy of the system is

a) 160 J b) Zero c) 5 J d) 1.25 J

119. A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the capacitor is.

a) $\frac{CV}{\varepsilon_0}$ b) $\frac{2CV}{\varepsilon_0}$ c) $\frac{CV}{2\varepsilon_0}$ d) Zero

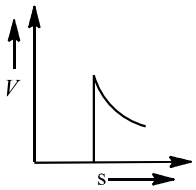
120. An air capacitor is charged with an amount of charge q and dipped into an oil tank. If the oil is pumped out , the electric field between the plates of capacitor will

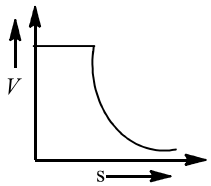
a) Increase b) Decrease c) Remain the same d) Become zero

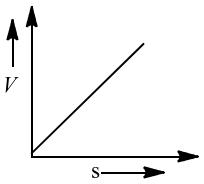
121. A sphere of radius r is charged to a potential V. The outward pull per unit area of its surface is given by

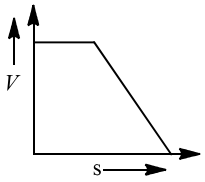
a) $\frac{4\pi\varepsilon_0 V^2}{r^2}$ b) $\frac{\varepsilon_0 V^2}{2r^2}$ c) $\frac{2\varepsilon_0 V^2}{r^2}$ d) $\frac{\varepsilon_0 V^2}{4r^2}$

122. In the case of a charged metallic sphere, potential (V) changes with respect to distance(S) from the centre as

a) 

b) 

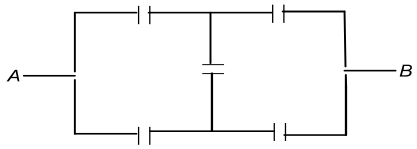
c) 

d) 

123. Capacitor of a capacitor is 48μF. When it is charged from 0.1 C to 0.5 C , change in the energy stored is

a) 2500 J b) 2.5×10^{-3} J c) 2.5×10^{6} J d) 2.42×10^{-2} J

124. Each capacitor shown in figure is 2 μF. Then the equivalent capacitance between points A and B is

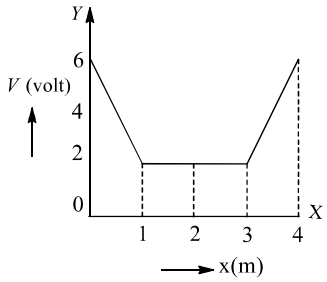


a) 2 μF b) 4 μF c) 6 μF d) 8 μF

125. Two metal pieces having a potential difference of 800 V are 0.2 m apart horizontally. A particle of mass 1.96×10^{-15}kg is suspended in equilibrium between the plates. If e is an elementary charge, then charge on the particle is

a) 8 e b) 6 e c) 3 e d) e

126. The variation of electric potential with distance from a fixed point is shown in figure. What is the value of electric field at x=2 m.



a) Zero b) 6/2 c) 6/1 d) 6/3

127. A parallel plate capacitor has the space between its plates filled by two slabs of thickness $\frac{d}{2}$ each and dielectric constant K_1andK_2. d Is the plate separation of the capacitor. The capacity of the capacitor is

a) $\frac{2\varepsilon_0 d}{A}\left(\frac{K_1+K_2}{K_1 K_2}\right)$ b) $\frac{2\varepsilon_0 A}{d}\left(\frac{K_1 K_2}{K_1+K_2}\right)$ c) $\frac{2\varepsilon_0 A}{A}(K_1+K_2)$ d) $\frac{2\varepsilon_0 A}{d}\left(\frac{K_1+K_2}{K_1 K_2}\right)$

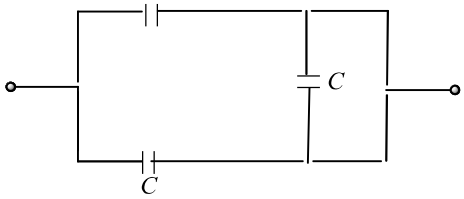
128. Two spheres of radii R_1 and R_2 joined by a fine wire are raised to a potential V. Let the surface charge densities at these two spheres be σ_1 and σ_2 respectively. Then the ratio $\frac{\sigma_2}{\sigma_1}$ has a value

a) $\frac{R_1}{R_2}$ b) $\frac{R_2}{R_1}$ c) 1 d) $\left(\frac{R_2}{R_1}\right)^2$

129. Charges $2q, -q$ and $-q$ lie at the vertices of a triangle. The value of $E$and Vat the centroid of equilateral triangle will be

a) $E \neq 0$ and $V \neq 0$ b) $E = 0$ and $V = 0$ c) $E \neq 0$ and $V = 0$ d) $E = 0$ and $V \neq 0$

130. The equivalent capacitance of the combination shown in figure below is



a) $2C$ b) C c) $\frac{1}{2}C$ d) None of these

131. Potential energy of two equal negative point charges 2μC each held 1 m apart in air is

a) 2 J b) 2 eV c) 4 J d) 0.036 J

132. The capacitance of a spherical condenser is 1 μF. If the spacing between two spheres is 1 mm, the radius of the outer sphere is

a) 3 m b) 7 m c) 8 m d) 9 m

133. A battery is used to charge a parallel plate capacitor till the potential difference 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) 1 b) 2 c) ¼ d) ½

134. A charged body has an electric flux ϕ associated with it the body is now placed inside a metallic container. The electric flux ϕ_1 associated with the container will be

a) $\phi_1 = 0$ b) $0 < \phi_1 < \phi$ c) $\phi_1 = \phi$ d) $\phi_1 > \phi$

135. Two plates are 20 cm apart and the potential difference between them is 10 V. The electric field between the plates is

a) 50 Vm^{-1} b) 500 Vm^{-1} c) 0.5 Vm^{-1} d) 20 Vm^{-1}

136. A parallel plate capacitor is made by stocking n equally spaced plates connected alternately. If the capacitance between any two plates is x, then the total capacitance is,

a) nx b) n/x c) nx^2 d) $(n-1)x$

137. Two capacitors each of capacity 2μF are connected in parallel. If they are connected to 100 V battery ,then energy stored in them is

a) 0.02 J b) 0.04 J c) 0.01 J d) 200 J

138. 4 point charges each +q is placed on the circumference of a circle of diameter $2d$ in such a way that they form a square. The potential at the centre is

a) 0 b) $\frac{4q}{d}$ c) $\frac{4d}{q}$ d) $\frac{q}{4d}$

139. Two point changes $+q$ and $-q$ are held fixed at $(-d, 0)$ and $(d, 0)$ respectively of a (x, y) coordinate system, then

a) The electric field $\vec{E}$ at all points on the x-axis has the same direction. b) $\vec{E}$ at all points on the y-axis is along $\hat{j}$

c) Work has to be done in bringing a test charge from infinity to the origin. d) The dipole moment is 2 qd directed along $\hat{j}$.

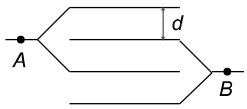
140. An electric field is given by $\vec{E} = (y\hat{i} + x\hat{j})$m NC^{-1}. The work done in moving a 1 C charge from $\vec{r}_A = (2\hat{i} + 2\hat{j})$m to $\vec{r}_B = (4\hat{i} + 2\hat{j})$m is

a) +8 J b) +4 J c) Zero d) −4 J

141. Two equally charged small balls placed at a fixed distance experience a force F. A similar uncharged ball after touching one of them is placed at the middle point between the two balls. The force experienced by this ball is

a) $\frac{F}{2}$ b) F c) 2 F d) 4 F

142. The equivalent capacity between points A and B in figure will be, while capacitance of each capacitor is 3 μF.

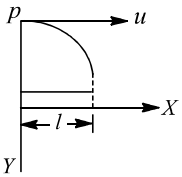


a) 2 μF b) 4 μF c) 7 μF d) 9 μF

143. How many 6 μF, 200 V condensers are needed to make a condenser of 18 μF, 600 V?

a) 9 b) 18 c) 3 d) 27

144. The electron is projected from a distance d and with initial velocity u parallel to a uniformly charged flat conducting plate as shown in figure. It strikes the plate after travelling a distance l along the direction. The surface charge density of conducting plate is equal to



a) $\frac{2d\varepsilon_0 mu^2}{el^2}$ b) $\frac{2d\varepsilon_0 mu}{el}$ c) $\frac{d\varepsilon_0 mu^2}{el}$ d) $\frac{d\varepsilon_0 mu}{el}$

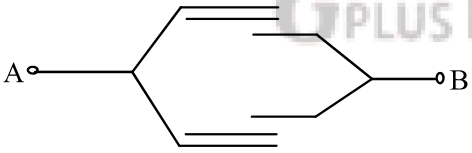
145. A hollow conducting sphere or radius R has a charge $(+Q)$ on its surface. What is the electric potential within the sphere at a distance $r = R/3$ from its centre?

a) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{r}$ b) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{r^2}$ c) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{R}$ d) Zero

146. The electric potential V at any point x, y, z (all the metre) in space is given by $V = 4x^2$ volt. The electric field at the point (1m, 0, 2m) in Vm^{-1} is

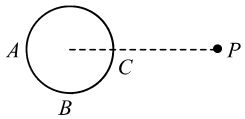
a) $-8\hat{i}$ b) $+8\hat{i}$ c) $-16\hat{i}$ d) $16\hat{k}$

147. Four plates of equal area A are separated by equal distance d and are arranged as shown in the figure. The equivalent capacity is



a) $\frac{2\varepsilon_0 A}{d}$ b) $\frac{3\varepsilon_0 A}{d}$ c) $\frac{3\varepsilon_0 A}{2d}$ d) $\frac{\varepsilon_0 A}{d}$

148. A hollow conducting sphere is placed in an electric field produced by a point charge placed at P as shown in figure. V_A, V_B, V_C be the potentials at points A, B and C respectively. Then



a) $V_C > V_B$ b) $V_B > V_C$ c) $V_A > V_B$ d) $V_A = V_C$

149. Two identical metal plates are given positive charges Q_1 and $Q_2 (< Q_1)$ respectively. If they are now brought close together to form a parallel plates capacitor with capacitance C, the potential difference between them is

a) $\frac{Q_1 + Q_2}{2C}$ b) $\frac{Q_1 + Q_2}{C}$ c) $\frac{Q_1 - Q_2}{C}$ d) $\frac{Q_1 - Q_2}{2C}$

150. A spherical drop of capacitance 1 μF is broken into eight drops of equal radius. Then, the capacitance of each small drop is

a) $\frac{1}{2}$μF b) $\frac{1}{4}$μF c) $\frac{1}{8}$μF d) 8μF

151. Two tree protons are separated by a distance of 1Å. If they are released, the kinetic energy of each proton

when at infinite separation is

a) 11.5×10^{-19} J b) 23×10^{-19} J c) 46×10^{-19} J d) 5.6×10^{-12} J

152. $ABCD$ is a rectangle. At corners B, C and D of the rectangle are placed charges $+10 \times 10^{-10}$C, -20×10^{-12}C, and 10×10^{-12}C, respectively. Calculate the potential at the fourth corner. (The side AB=4cm and BC=3cm)

a) 1.65 V b) 0.165V c) 16.5V d) 2.65V

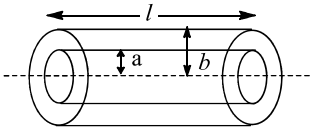
153. N identical drops of mercury are charged simultaneously to 10V. When combined to form one large drop, the potential is found to be 40V, the value of N is

a) 4 b) 6 c) 8 d) 10

154. Two charges -10C and +10 C are placed 10 cm apart. Potential at the centre of the line joining the two charges is

a) Zero b) 2 V c) -2 V d) None of these

155. The magnitude of electric field $\vec{E}$ in the annual region of a charged cylindrical capacitor



a) Is same throughout

b) Is higher near the outer cylinder than near the inner cylinder

c) Varies as $\frac{1}{r}$, where r is the distance from the axis

d) Varies as $\frac{1}{r^2}$, where r is the distance from the axis

156. A parallel plate capacitor or capacity C_0 is charged to a potential V_0.

I. The energy stored in the capacitor when the battery is disconnected and the plate separation is doubled is E_1.

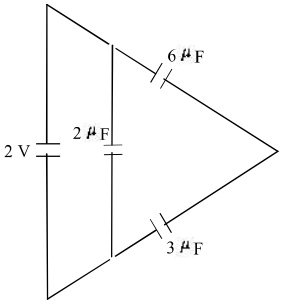
II. The energy stored in the capacitor when the charging battery is kept connected and the separation between the capacitor plates is doubled is E_2.Then $\frac{E_1}{E_2}$ value is

a) $\frac{4}{1}$ b) $\frac{3}{2}$ c) 2 d) $\frac{1}{2}$

157. Along the x-axis, three charges $\frac{q}{2}, -q$ and $\frac{q}{2}$ are placed at $x = 0, x = a$ and $x = 2a$ respectively. The resultant electric potential at a point P located at a distance r from the charge $-q (a << r)$ is (ε_0 is the permittivity of free space)

a) $\frac{qa}{4\pi\varepsilon_0 r^2}$ b) $\frac{qa^2}{4\pi\varepsilon_0 r^3}$ c) $\frac{q\left(\frac{a^2}{4}\right)}{4\pi\varepsilon_0 r^3}$ d) $\frac{q}{4\pi\varepsilon_0 r}$

158. The total energy stored in the condenser system shown in the figure will be

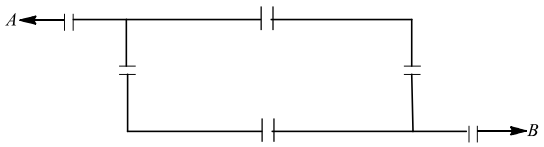


a) 2 μJ b) 4 μJ c) 8 μJ d) 16 μJ

159. A variable condenser is permanently connected to a 100 V battery. If capacity is changed from 2 μF and 10 μF, then energy change is equal to

a) 2×10^{-2} J b) 2.5×10^{-2} J c) 6.5×10^{-2} J d) 4×10^{-2} J

160. A network of six identical capacitors, each of value C, is made as shown in the figure.



The equivalent capacitance between the points A and B is

a) $\frac{4C}{11}$ b) $\frac{3C}{4}$ c) $\frac{3C}{2}$ d) $3C$

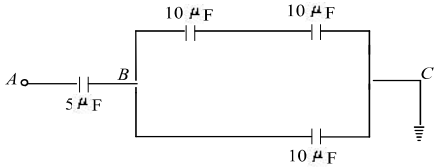
161. A simple pendulum has a length l and the mass of the bob is m. The bob is given a change q coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If E is the electric field strength between the plates, the time period of the pendulum is given by

a) $2\pi\frac{l}{g}$ b) $2\pi\sqrt{\frac{l}{\sqrt{g+\frac{qE}{m}}}}$ c) $2\pi\sqrt{\frac{1}{\sqrt{g-\frac{qE}{m}}}}$ d) $2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

162. There are 10 condensers each of capacity 5 μF. The radio between maximum and minimum capacities obtained from these condenses will be

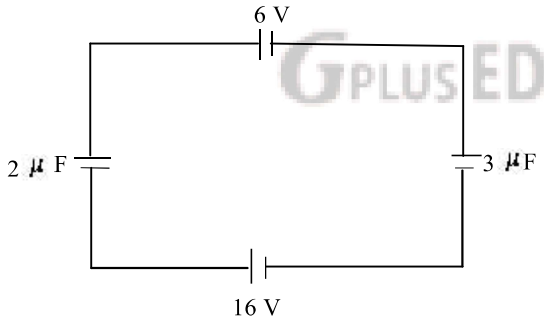
a) 25 : 5 b) 40 : 1 c) 60 : 3 d) 100 : 1

163. As shown in figure, if the point C is earthed and the point A is given a potential of 2000 V, then the potential at point B will be



a) 400 V b) 500 V c) 1000 V d) 1300 V

164. What is the potential difference across 2μF capacitor in the circuit shown?



a) 12 V b) 4 V c) 6 V d) 18 V

165. Four charges equal to$-Q$ are placed at the four corners of a square and a charge and a charge q is at its centre. If the system is nequili8brium, the value of q is

a) $-\frac{Q}{4}(1+2\sqrt{2})$ b) $\frac{Q}{2}(1+2\sqrt{2})$ c) $-\frac{Q}{2}(1+2\sqrt{2})$ d) $\frac{Q}{4}(1+2\sqrt{2})$

166. A dielectric slab is inserted between the plates of an isolated charged capacitor. Which of the following quantities remain unchanged?

a) The charge on the capacitor b) The stored energy in the capacitor
c) The potential difference between the plates d) The electric field in the capacitor

167. Two charged spheres of radii $R_1$and R_2 having equal surface charge density. The ratio of their potential is

a) R_1/R_2 b) R_2/R_1 c) $\left(\frac{R_1}{R_2}\right)^2$ d) $\left(\frac{R_2}{R_1}\right)^1$

168. A hollow metal sphere of radius 5 cm is charged such that potential at its surface is 10V. The potential at the centre of the sphere is

a) Zero b) 10 V

c) Same as at point 5cm away from the surface d) Same as at point 10cm away from the surface

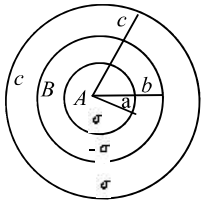
169. If eight similar charge drops combine to form a bigger drop, then the ratio of capacitance of bigger drop to that of smaller drop will be

a) 2:1 b) 8:1 c) 4:1 d) 16:1

170. A soap bubble is charged to a potential of 16V. Its radius is, then doubled. The potential of the bubble now will be

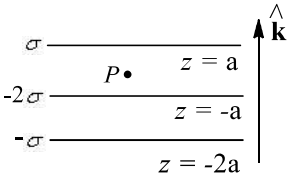
a) 16V b) 8V c) 4V d) 2V

171. Consider three concentric shells of metal *A, B* and *C* are having radii *a, b* and *c* respectively as shown in the figure ($a < b < c$). Their surface charge densities are $\sigma, -\sigma$ and σ respectively. Calculate the electric potential on the surface of shell *A*



a) $\frac{\sigma}{\varepsilon_0}(a-b+c)$ b) $\frac{\sigma}{\varepsilon_0}(a-b-c)$ c) $\frac{\sigma}{\varepsilon_0}(a^2+b^2+c^2)$ d) $\frac{\sigma}{\varepsilon_0}(a+b-c)$

172. Three large parallel plates have uniform surface change densities as shown in the figure. Find the electric field at point *P*.



a) $\frac{-4\sigma}{\varepsilon_0}\hat{k}$ b) $\frac{4\sigma}{\varepsilon_0}\hat{k}$ c) $\frac{-2\sigma}{\varepsilon_0}\hat{k}$ d) $\frac{2\sigma}{\varepsilon_0}\hat{k}$

173. Minimum number of 8μF and 250 V capacitors are used to make a combination 16μF and 1000 V are

a) 4 b) 32 c) 8 d) 3

174. *n* Small drops of same size are charged to *V* volt each. If they coalesce to form a single large drop, then its potential will be

a) Vn b) Vn^{-1} c) $Vn^{1/3}$ d) $Vn^{2/3}$

175. Two 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) $\frac{C_2}{C_1}$ b) $\frac{C_1}{C_2}$ c) $\frac{C_1^2}{C_2^2}$ d) $\frac{C_2^2}{C_1^2}$

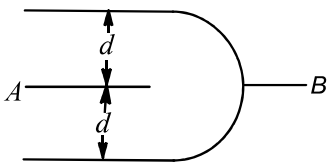
176. A spherical charged conductor has surface density of charge= σ, and electric field intensity on its surface is *E.* If radius of surface is doubled, point σ unchanged, what will be electric field intensity on the new sphere?

a) $E/2$ b) $2\,E$ c) $E/4$ d) E

177. Three capacitors of capacitance 1 μF, 2 μF and 4μF are connected first in a series combination, and then in a parallel combination. The ratio of their equivalent capacitance will be

a) 2 : 49 b) 49 :2 c) 4 : 49 d) 49 : 4

178. Three plates of common surface area *A* are connected as shown. The effective capacitance will be



a) $\frac{\varepsilon_0 A}{d}$ b) $\frac{3\varepsilon_0 A}{d}$ c) $\frac{3}{2}\frac{\varepsilon_0 A}{d}$ d) $\frac{2\varepsilon_0 A}{d}$

179. Charge Q is given a displacement $\vec{r} = a\hat{i} + b\hat{j}$ in an electric field $\vec{E} = E_1\hat{i} + E_2 b\hat{j}$. The work done is
a) $Q(E_1 a + E_2 b)$ b) $Q\sqrt{(E_1 a)^2 + (E_2 b)^2}$
c) $Q(E_1 + E_2)\sqrt{a^2 + b^2}$ d) $Q(\sqrt{E_1^2 + E_2^2})\sqrt{a^2 + b^2}$

180. Across each of two capacitors 1 μF and 4 μF, a potential difference of 10 V is applied. Then positive plate of one is connected to the negative plate of the other, and negative plate of one is connected to the positive plate of the other. After contact
a) Charge on each is zero b) Charge on each is same but non-zero
c) Charge on each is different but non-zero d) None of the above

181. In a capacitor of capacitance 20μF the distance between the plates is 2 mm. If a dielectric slab of width 1 mm and dielectric constant 2 is inserted between the plates , then the new capacitance will be
a) 22 μF b) 26.6 μF c) 52.2 μF d) 13 μF

182. A capacitor of capacitance value 1 μF is charged to 30 V and the battery is then disconnected. If the remaining circuit is connected across a 2μF capacitor, the remaining circuit is connected across a 2μF capacitor, the energy lost by the system is
a) 300 μJ b) 450 μJ c) 225 μJ d) 150 μJ

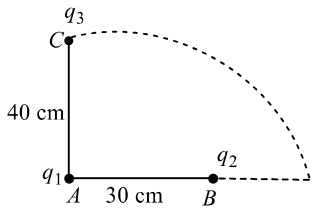
183. A small conducting sphere of radius r is lying concentrically inside a bigger hollow conducting sphere of radius R. The bigger and smaller spheres are charged with Q and q $(Q > q)$ and are insulated from each other. The potential difference between the spheres will be
a) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r} - \frac{q}{R}\right)$ b) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{R} - \frac{Q}{r}\right)$ c) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r} - \frac{Q}{R}\right)$ d) $\frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{R} - \frac{q}{r}\right)$

184. Two free protons are separated by a distance of 1 Å. If one proton is kept at least and the other is released, the kinetic energy of second proton when at infinite sparation is
a) 23.0×10^{-19} J b) 11.5×10^{-19} J c) 2.3×10^{-19} J d) Zero

185. The electric potential at any point x, y, z in meters is given by$V = 3x^2$. The electric field at a point (2,0,1) is
a) 12 Vm^{-1} b) -6 Vm^{-1} c) 6 Vm^{-1} d) -12 Vm^{-1}

186. The plates of a parallel plate capacitor are charged up to 100 V. A 2 mm thick plate is inserted between the plates, then to maintain the same potential difference, the distance between the capacitor plated is increase by 1.6 mm. the dielectric constant of the plate, is
a) 5 b) 1.25 c) 4 d) 2.5

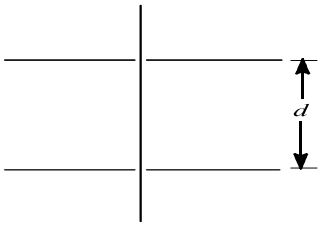
187. Two charges $q_1$and q_2 are placed 30 cm apart, as shown in the figure. A third charge $q_3$is moved along the arc of a circle of radius 40 cm from $C$to D. The change in the potential energy of the system is $\frac{q_3}{4\pi\varepsilon_0}\ k$, where $k$is



a) $8q_2$ b) $8q_1$ c) $6q_2$ d) $6q_1$

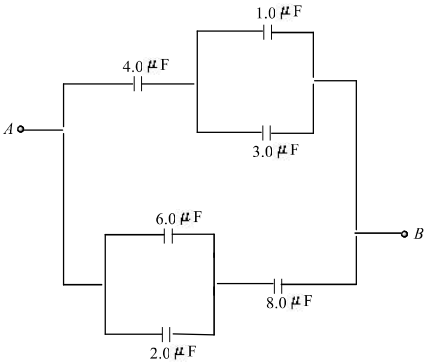
188. A 100 eV electron is fired directly towards a large metal plate having surface charge density -2×10^{-6} cm^{-2}. The distance from where the electrons be projected so that it just fails to strike the plate is
a) 0.22mm b) 0.44mm c) 0.66mm d) 0.88mm

189. A capacitor of capacitance 1 μF is filled with two dielectrics of dielectric constant 4 and 6. What is the new capacitance?



a) 10 μF b) 5 μF c) 4 μF d) 7 μF

190. The equivalent capacitance between points *A* and *B* for the combination of capacitors shown in figure, where all capacitances are in microfarad is

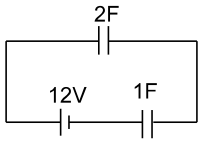


a) 6.0 μF b) 4.0 μF c) 2.0 μF d) 3.0 μF

191. A 10 μC capacitor is charged to a potential difference of 50 V and is connected to another uncharged capacitor in parallel. Now the common potential difference becomes 20 V. The capacitance of second capacitor is

a) 15 μF b) 30 μF c) 20 μF d) 10 μF

192. In a circuit shown in figure, the potential difference across the capacitor of 2 F is

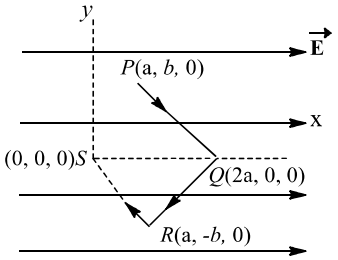


a) 8 V b) 4 V c) 12 d) 6 V

193. A parallel plate capacitor having air as dielectric medium is charged by a potential difference of *V* volt. After disconnecting the battery, the distance between the plates of the capacitor is increased using an insulated handle. As a result ,potential difference between the plates

a) Increases b) Does not change c) Becomes zero d) Decreases

194. A point charge *q* moves from point $\overset{P}{\rightarrow}$ to point S along the path *PQRS* in a uniform electric field $\vec{E}$ pointing parallel to the positive direction of the *x*-axis, figure. The coordinates of the points *P, Q, R* and *S* are (a, *b*, 0), (2a, 0, 0), (a, -*b*, 0) and (0, 0, 0) respectively. The work done by the field in the above process is given by the expression



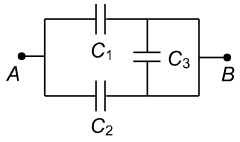
a) qE b) $-qaE$ c) $q(\sqrt{a^2+b^2})E$ d) $3qE\sqrt{a^2+b^2}$

195. The SI unit of the line integral of electrical field I s

a) NC^{-1} b) Nm^2C^1 c) JC^{-1} d) Vm^{-1}

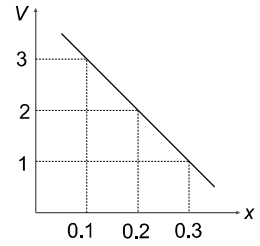
196. The equivalent capacitance of the combination of three capacitors, each of capacitance *C* shown in figure

between points A and B is



a) $\frac{C}{2}$ b) $\frac{3C}{2}$ c) $\frac{1}{3C}$ d) 2C

197. The variation of potential V with distance x from a fixed point charge is shown in figure. The electric field strength between $x = 0.1$ m and 0.3 m is



a) $+0.4\ \text{Vm}^{-1}$ b) $-0.4\ \text{Vm}^{-1}$ c) $+10\ \text{Vm}^{-1}$ d) $-10\ \text{Vm}^{-1}$

198. A parallel plate capacitor with air between the plates has a capacitance of 9 pF. 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 $\frac{d}{3}$ 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) 45 pF c) 40.5 pF d) 20.25 pF

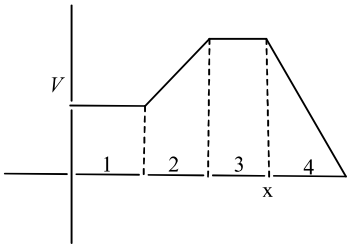
199. The energy stored in a capacitor is in the form of

a) Kinetic energy b) Potential energy c) Elastic energy d) Magnetic energy

200. Taking earth to be a metallic spheres, its capacity will approximately be

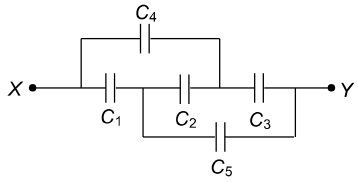
a) 6.4×10^6F b) 700 F c) 711 μF d) 700 pF

201. The figure shows electric potential V as a function of x. Rank the four regions according to the magnitude of x-component of the electric field E within them, greatest first



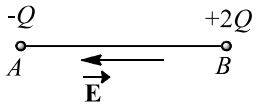
a) $E_4 > E_2 > E_3 > E_1$ b) $E_2 > E_4 > E_1 = E_3$ c) $E_1 > E_2 > E_3 > E_4$ d) $E_1 > E_3 > E_2 > E_4$

202. The effective capacitance between points X and Y shown in figure. Assuming $C_2 = 10$ μF and that outer capacitors are all 4 μF is



a) 1 μF b) 3 μF c) 4 μF d) 5 μF

203. Charges $+2Q$ and $-Q$ are placed as shown is figure. The point at which electric filed intensity is zero will be



a) Somewhere between $-Q$ and $+2Q$ b) Somewhere on the left of $-Q$

c) Somewhere on the right of $+2Q$ d) Somewhere on the right bisector of line joining $-Q$ and $+2Q$.

204. A charge $(-q)$ and another charge $(+Q)$ are kept at two points A and B respectively. Keeping the charge $(+Q)$ fixed at B, the charge $(-q)$ at A is moved to another point C such that ABC forms an equilateral triangle of side l. The net work done in moving the charge $(-q)$ is

a) $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{l}$ b) $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{l^2}$ c) $\frac{1}{4\pi\varepsilon_0}Qql$ d) Zero

205. A cylindrical capacitor has charge Q and length L. If both the charge and length of the capacitors are doubled, by keeping other parameters fixed, the energy stored in the capacitor

a) Remains same b) Increases two times c) Decreases two times d) Increase four time

206. A particle A has charge $+q$ and particle B has charge $+4q$ with each of them having the save mass m. when allowed to fall from rest through the same electrical potential difference, the ration of their steeds v_A/v_B will become

a) 2 : 1 b) 1 : 2 c) 1 : 4 d) 4 : 1

207. The electric flux for Gaussian surface A that encloses the charged particles in free space. (Given, $q_1 = -14$ nC, $q_2 = 78.85$ nC, $q_3 = -56$ nC)

a) $10^3 \mathrm{Nm^2C^{-1}}$ b) $10^3 \mathrm{CN^{-1}m^{-2}}$

c) $6.32 \times 10^3\ \mathrm{Nm^2C^{-1}}$ d) $6.32 \times 10^3\ \mathrm{CN^{-1}m^{-2}}$

208. The electrostatic potential energy between proton and electron separated by a distance 1Å is

a) 13.6eV b) 27.2eV c) 14.4eV d) 1.44eV

209. The flux entering and leaving a closed surface are 5×10^5 and 4×10^5 MKS units respectively, then the charge inside the surface will be

a) -8.86×10^{-7}C b) 8.85×10^{-7}C c) 8.85×10^{7}C d) 6.85×10^{-7}C

210. If a charged spherical conductor of radius 10 cm has potential V at a point distant 5cm from its centre, then the potential at a point distant 15 cm from the centre will be

a) $\frac{1}{3}V$ b) $\frac{2}{3}V$ c) $\frac{3}{2}V$ d) 3V

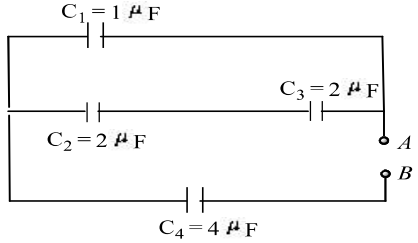
211. On moving a charge of 20 C by 2cm, 2J of work is done, then the potential difference between the points is

a) 0.1V b) 8V c) 2V d) 0.5V

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

a) $\frac{1}{4}C(V_1^2 - V_2^2)$ b) $\frac{1}{4}C(V_1^2 + V_2^2)$ c) $\frac{1}{4}C(V_1 - V_2)^2$ d) $\frac{1}{4}C(V_1 + V_2)^2$

213. Four capacitors are connected in a circuit as shown in the following figure. Calculate the effective capacitance between the points A and B.



a) $\frac{4}{3}\mu$F b) $\frac{24}{5}\mu$F c) 9 μF d) 5 μF

214. Three capacitors of capacitances 4 μF, 6 μF and 12 μF are connected first in series and then in parallel.

What is the ratio of equivalent capacitance in the two cases?

a) 2 : 3 b) 1 : 11 c) 11 : 1 d) 1 : 3

215. 64 identical sphere of charge q and capacitance C each are combined to form a large sphere. The charge and capacitance of the large sphere is

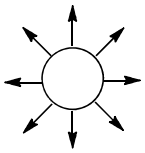
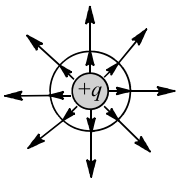
a) $64q, C$ b) $16\ q, 4C$ c) $64\ q, 4C$ d) $16\ q, 64C$

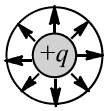
216. Out of two copper spheres of the same size, x is hollow while y is solid. If they are charged at the same potential, what can be said about the charges on them?

a) Charge on both the spheres is zero b) Charge on both the spheres is equal

c) Sphere y will have more charge d) Sphere x will have more charge

217. If a point charge q is placed at a point inside a hollow conducting sphere, then which of the following electric lines of force pattern is correct?

a)  b) 

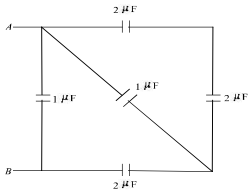
c) 

d) None of these

218. In a region of space having a uniform electric field E, a hemispherical bowl of radius r is placed. The electric flux ϕ through the bowl is

a) $2\pi rE$ b) $4\pi r^2E$ c) $2\pi r^2E$ d) πr^2E

219. Equivalent capacitance between A and B is



a) 14 μF b) 4 μF c) 6 μF d) 2 μF

220. The charges$Q$, +q and +q are placed at the vertices of an equilateral triangle of side l. If the net electrostatic potential energy of the system is zero, then Q is equal to

a) $-\frac{q}{2}$ b) $-q$ c) $\frac{+q}{2}$ d) Zero

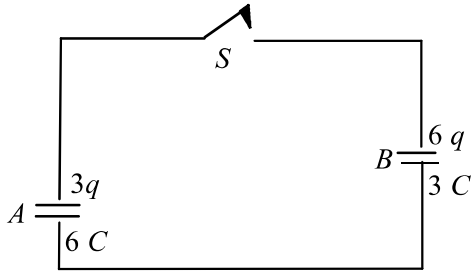
221. The ratio of momenta of an electron and proton which are accelerated from rest by a potential difference 50 V is

a) $\frac{m_e}{m_p}$ b) $\sqrt{\frac{m_e}{m_p}}$ c) $\frac{m_p}{m_e}$ d) $\sqrt{\frac{m_p}{m_e}}$

222. Large number of capacitors of rating 10 μF/200 V are available. The minimum number of capacitors required to design a 10 μF/700 capacitor is

a) 16 b) 4 c) 8 d) 7

223. In given circuit when switch S has been closed then charge on capacitor A and B respectively are



a) $3q, 6q$ b) $6q, 3q$ c) $4.5\ q, 4.5\ q$ d) $5q, 4q$

224. In a parallel plate capacitor , the capacity increases if

a) Area of the plate is decreased b) Distance between the plates increases

c) Area of the plate is increased
d) Dielectric constant decrease

225. 27 small drops each having charge q and radius r coalesce to form big drop. How many times charge and capacitance will become?
a) 3, 27 b) 27, 3 c) 27, 27 d) 3, 3

226. The SI unit of surface integral of electric field is
a) V-m b) V c) $NC^{-1}m$ d) Cm^{-3}

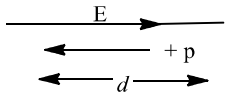
227. The electric potential V at any point (x, y, z) in space is given by $V = 4x^2$V. the electric field at (1,0,2) m inVm^{-1} is
a) 8, along negative X-axis
b) 8, along positive X-axis
c) 16,along negative X-axis
d) 16, along positive X-axis

228. A 10μF capacitors and a 20μF capacitor are connected in series across a 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. The potential difference across each capacitor is
a) $\frac{400}{9}$V b) $\frac{800}{3}$V c) 400 V d) 200 V

229. A 500 μF capacitor is charged at a steady rate of $100\mu Cs^{-1}$. The potential difference across the capacitor will be 10 V after in interval of
a) 5 s b) 25 s c) 20 s d) 50 s

230. A capacitor connected to a 10 V battery collects a charge of 40 μC with air as dielectric and 100 μC with a given oil as dielectric. The dielectric constant of the oil is
a) 1.5 b) 2.0 c) 2.5 d) 3.0

231. In the figure, a proton moves a distance d in a uniform electric field **E** as shown in the figure. Does the electric field do a positive or negative work on the proton? Does the electric potential energy of the proton increase or decrease?



a) Negative, increase b) Positive, decrease c) Negative, decrease d) Positive, increase

232. An air parallel plate capacitor has capacity C. The capacity and distance between plates are doubled when immersed in a liquid then dielectric constant of the liquid is
a) 1 b) 2 c) 3 d) 4

233. A large insulated sphere of radius r charged with Q units of electricity is placed in contact with a small insulated uncharged sphere of radius r' and in then separated. The charge on smaller sphere will now be
a) $Q(r + r')$ b) $\frac{Qr'}{r'+r}$ c) $Q(r - r')$ d) $\frac{Q}{r'+r}$

234. 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=+1 cm and C be the point on the y-axis at y=+1 cm. them the potentials at the points A, B and C satisfy the condition
a) $V_A < V_B$ b) $V_A > V_B$ c) $V_A < V_C$ d) $V_A > V_C$

235. Two insulated charged conducting spheres of radii 20 cm and 15 cm respecting and having an equal charge of 10 μC are connected by a copper wire and then they are separated. Then
a) Both spheres will have equal charges
b) Surface charge density on the 20 cm sphere will be greater than that on the 15 cm sphere
c) Surface charge density on the 15 cm sphere will be greater than that on the 20 cm sphere
d) Surface charge density on the two sphere will be equal

236. The work done in placing a charge of 8×10^{-18}C on a condenser of capacity 100μF is
a) 16×10^{-32} J b) 3.1×10^{-26}J c) 4×10^{-10}J d) 32×10^{-32}J

237. Two identical parallel plate capacitors are placed in series and connected to a constant voltage source of V volt. If one of the capacitor is completely immersed in a liquid of dielectric constant K, then the potential

difference between the plates of the other capacitor will change to

a) $\frac{K}{K+1}V$ b) $\frac{K+1}{K}$ c) $\frac{2K}{K+1}V$ d) $\frac{K+1}{2K}V$

238. Work done in carrying a charge Q_1 once round a circle of radius R with a charge Q_2 at the centre I s

a) $\frac{Q_1Q_2}{4\pi\varepsilon_0R^2}$ b) Zero c) $\frac{Q_1Q_2}{4\pi\varepsilon_0R}$ d) Infinite

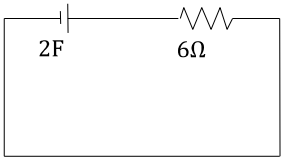
239. In a region of space, the electric field is given by $\vec{E} = 8\hat{i} + 4\hat{j} + 3\hat{k}$. The electric flux through a surface of area of 100 units x-y plane is

a) 800 units b) 300 units c) 400 units d) 1500 units

240. Two parallel plate capacitors of capacitance C and $2C$ are connected in parallel and charged to a potential difference V_0. The battery is then disconnected and the region between the plates of the capacitor C is completely filled with a material of dielectric constant 2. The potential difference across the capacitors now becomes

a) $\frac{F_0}{4}$ b) $\frac{V_0}{2}$ c) $\frac{3V_0}{4}$ d) V_0

241. In the capacitor shown in the circuit is changed to 5 V and left in the circuit, in 12s the charge on the capacitor will become $(e = 2.718)$



a) $\frac{10}{e}$C b) $\frac{e}{10}$C c) $\frac{10}{e^2}$C d) $\frac{e^2}{10}$C

242. The displacement of a charge Qin the electric field $\boldsymbol{E} = e_1\hat{\boldsymbol{i}} + e_2\hat{\boldsymbol{j}} + e_3\hat{\boldsymbol{k}}$ is $\boldsymbol{r} = a\hat{\boldsymbol{i}} + b\hat{\boldsymbol{j}}$. The work done is

a) $Q(ae_1 + be_2)$ b) $Q\sqrt{(ae_1)^2 + (be_2)^2}$

c) $Q(e_1 + e_2)\sqrt{a^2 + b^2}$ d) $Q\left(\sqrt{e_1^2 - e_2^2}\right)(a + b)$

243. A 10 μF capacitor is charges to 500 V and its plates are joined together through a resistance of 10 Ω. The heat produced in the resistance is

a) 500 J b) 125 J c) 250 J d) 1.25 J

244. The electric potential at a point (x, y) in the x-y plane is given by

$V = -Kxy$

The electric field intensity at a distance r from the origin varies as

a) r^2 b) r c) $2r$ d) $2r^2$

245. A technician has only two capacitors. By using these singly, in series or in parallel he can obtain capacitances of 3 μF, 4 μF, 12 μF and 16 μF. The capacitances of these capacitors are

a) 6 μF and 10 μF b) 4 μF and 12 μF c) 7 μF and 9 μF d) 4 μF and 16 μF

246. The capacitance of a metallic sphere is 1 μF, then its radius will be

a) 10 m b) 1.11 km c) 9 km d) 1.11 m

247. Two identical metal plates are given positive charges Q_1 and Q_2 $(< Q_1)$ respectively. If they are now brought close together to form a parallel plate capacitor with capacitance C, the potential difference between them is

a) $\frac{Q_1 + Q_2}{2C}$ b) $\frac{Q_1 + Q_2}{C}$ c) $\frac{Q_1 - Q_2}{C}$ d) $\frac{Q_1 - Q_2}{2C}$

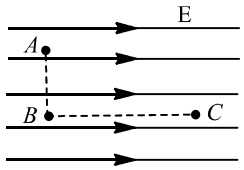
248. Two spherical conductors A and B of radii 1 mm and 2 mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire, then in equilibrium condition, the radio of the magnitude of the electric fields at the surfaces of spheres A and B is

a) 4 : 1 b) 1 : 2 c) 2 : 1 d) 1 : 4

249. When two conductors of charges and potentials C_1, V_1 and C_2, V_2 respectively are joined, the common potential will be

a) $\frac{C_1V_1 + C_2V_2}{V_1 + V_2}$ b) $\frac{C_1V_1^2 + C_2V_2^2}{V_1^2 + V_2^2}$ c) $C_1 + C_2$ d) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

250. Figure shows three points A, B and C in a region of uniform electric field **E**. The line AB is perpendicular and BC is parallel to the field lines. Then which of the following holds good?



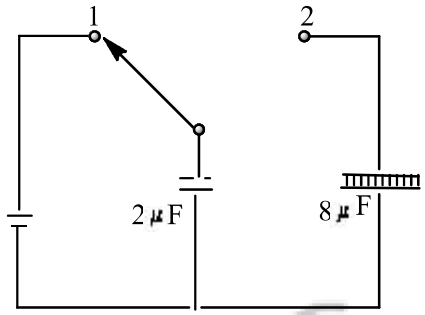
Where V_A, V_B and V_C represent the electric potential at the points A, B and C respectively.

a) $V_A = V_B = V_C$ b) $V_A = V_B > V_c$ c) $V_A = V_B < V_C$ d) $V_A > V_B = V_C$

251. Two points P and Q are maintained at the potentials of 10V and -4V respectively. The work done in moving 100 electrons from P to Q is

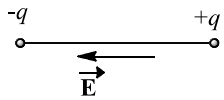
a) -19×10^{-17}J b) 9.60×10^{-17}J c) -2.24×10^{-16}J d) 2.24×10^{-16}J

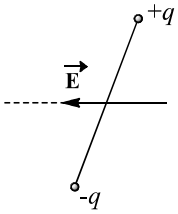
252. A 2μF capacitor is charged as shown in the figure. The percentage of its stored energy dissipated after the switch s is turned to positions 2 is

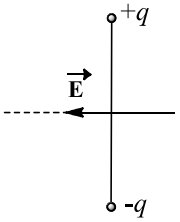


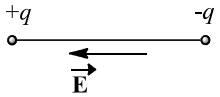
a) 0 % b) 20 % c) 75% d) 80%

253. In which of the states shown in figure is the potential energy of a electric dipole maximum?

a) 

b) 

c) 

d) 

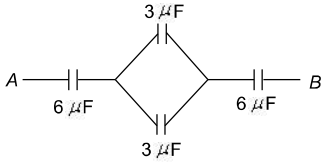
254. A 4μF capacitor is charged to 400V and then its plates are joined through a resistance. The heat produced in the resistance is

a) 0.16 J b) 0.32 J c) 0.64 J d) 1.28 J

255. Two concentric spheres of radii R and r have similar charges with equal surface densities(σ). What is the electric potential at their common centre?

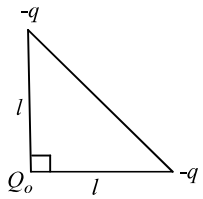
a) $\frac{\sigma}{\varepsilon_0}$ b) $\frac{\sigma}{\varepsilon_0}(R - r)$ c) $\frac{\sigma}{\varepsilon_0}(R + r)$ d) None of these

256. The equivalent capacitance between A and B in figure is



a) 4 μF b) 2 μF c) 10.5 μF d) 3 μF

257. Three charges Q_0, $-q$ and $-q$ are placed at the vertices of an isosceles right angle triangle as in the figure. The net electrostatic potential energy is zero if Q_0 is equal to



a) $\frac{q}{4}$ b) $\frac{2q}{\sqrt{32}}$ c) $\sqrt{2q}$ d) +q

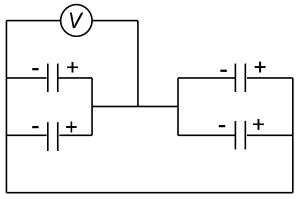
258. The maximum field intensity on the axis of a uniformly charged ring of charge q and radius R will be

a) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{3\sqrt{3R^2}}$ b) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{2q}{3R^2}$ c) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{2q}{3\sqrt{3R^2}}$ d) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{3q}{3\sqrt{3R^2}}$

259. Two charges $+q$ and $-q$ are kept apart. Then at any point on the right bisector of line joining the two charges

a) The electric field strength is zero
b) The electric potential is zero
c) Both electric potential and electric field strength are zero.
d) Both electric potential and electric field strength are non-zero.

260. The four capacitors, each of 25 μF are connected as shown in figure. The DC voltmeter reads 200 V. the change on each plate of capacitor is



a) $\pm 2\times10^{-3}$C b) $\pm 5\times10^{-3}$C c) $\pm 2\times10^{-2}$C d) $\pm 5\times10^{-2}$C

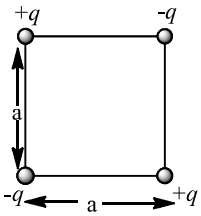
261. Small drops of the same size are charged to V volt each. If n such drops coalesce to form a single large drop, its potential will be

a) Vn b) V/n c) $Vn^{1/3}$ d) $Vn^{2/3}$

262. A parallel plate air capacitor has a capacitance 18 μF.If the distance between the plates is trapled and a dielectric medium is introduced, the capacitance becomes 72 μF. The dielectric constant of the medium is

a) 4 b) 9 c) 12 d) 2

263. Work required to set up the four charge configuration (as shown in the figure) is



a) $-0.21q^2/\varepsilon_0 a$ b) $-1.29q^2/\varepsilon_0 a$ c) $-1.41q^2/\varepsilon_0 a$ d) $+2.82q^2/\varepsilon_0 a$

264. The work of electric field done during the displacement of a negatively charged particle towards a fixed positively charged particle is 9 J. As a result the distance between the charges has been decreased by half. What work is done by the electric field over the first half of this distance?

a) 3 J b) 6 J c) 1.5 J d) 9 J

265. Six identical capacitors are joined in parallel, charged to a potential difference of 10 V, separated and then connected in series, *ie*, the positive plate of one is connected to negative plate of other. Then potential difference between free plates is

a) 10 V b) 30 V c) 60 V d) $\frac{10}{6}V$

266. A capacitor of capacity 10μF is charged to a potential of 400V. When its both plates are connected by a conducting wire , then heat generated will be
a) 80 J b) 0.8 J c) 8×10^{-3} J d) 8×10^{-6} J

267. The potential to which a conductor is raised, depends on
a) The amount of charge
b) Geometry and size of the conductor
c) Both (a) and (b)
d) Only on (a)

268. 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

269. A parallel plate capacitor is charged. If the plates are pulled apart
a) The capacitance increases
b) The potential difference increases
c) The total charge increases
d) The charge and potential difference remain the same

270. If dielectric constant and dielectric strength be denoted by K and X respectively, then a material suitable for use as a dielectric in a capacitor must have
a) High K and high X b) High K and low X c) Low K and high X d) Low K and low X

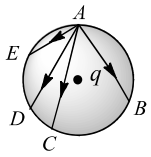
271. The electric potential inside a conducting sphere
a) Increases from centre to surface
b) Decreases from centre to surface
c) Remains constant from centre to surface
d) Is zero at every point inside

272. Two positive point charges of 12 μ C and 8 μC are placed 10 cm, apart in air. The work done to bring them 4 cm closer is
a) Zero b) 3.5 J c) 4.8 J d) 5.8 J

273. A charge q is fixed. Another charge Q is brought near it and rotated in a circle of radius r around it. Work done during rotation is
a) Zero b) $\frac{Qq}{4\pi\varepsilon_0 r}$ c) $\frac{Qq}{2\pi\varepsilon_0 r}$ d) None of these

274. The voltage of clouds is $4 \times 10^6 V$ with respect to ground. In a lightning strike lasting 100ms, a charge of 4C is delivered to the ground. The power of lightning strike is
a) 160 MW b) 80 MW c) 20 MW d) 500 kW

275. In the electric field of a point charge q, a certain point charges is carried from point A to B, C, D and E as shown in figure. The work done is



a) Least along the path AE
b) Least along the path AC
c) Zero along any one of the paths
d) Least along AB

276. The capacitance C of a capacitor is
a) Independent of the charge and potential of the capacitor
b) Dependent on the charge and independent of potential
c) Independent of the geometrical configuration of the capacitor
d) Independent of the dielectric medium between the two conducting surface of the capacitor

277. An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm. the linear density is
a) 2×10^{-7} Cm^{-1} b) 10^{-7} Cm^{-1} c) 9×10^4 Cm^{-1} d) None of these