PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

ELECTROSTATICS

Classical Thinking

1. The T.N.E.I. is independent of the

A. position of charge density inside a closed surface only.

B. charges outside the closed surface only.

C. both (A) and (B)

D. neither (A) nor (B)

Answer: C

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2. Gauss' law helps in

A. determination of electric force between point charges.

B. situations where Coulomb's law fails.

C. determination of electric field due to symmetric charge distribution.

D. determing electric potential due to symmetric charge distribution.

Answer: C

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3. The Gaussian surface needed for calculating the electric field due to a charge distribution is

A. any surface around the charge distribution

B. only spherical surface.

C. any closed surface around the charge.

D. only cylindrical surface.

Answer: C

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4. GAUSS LAW

A. there were magnetic monopoles.

B. the inverse square law were not exactly true.

C. the velocity of light were not a universal constant.

D. none of these.

Answer: B

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5. Electric intensity at a place due to a charge is a __________ quantity.

A. vector

B. scalar

C. unitless

D. dimensionless

Answer: A

6. Gauss's law is true only if force due to a charge varies as

A. r^{-1}

B. r^{-2}

C. r^{-3}

D. r^{-4}

Answer: B

7. The dimensions of electric intensity are

A. $\left[M^0 L^0 T^1 A^1\right]$

B. $\left[M^1 L^3 T^{-3} A^{-1}\right]$

C. $\left[M^1 L^1 T^{-3} A^{-1}\right]$

D. $M^1 L^{-1} T^3 A^1]$

Answer: C

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8. The angle between electric field intensity $\overrightarrow{E}$ and the area vector $\overrightarrow{ds}$ at which the T.N.E.I. is maximum is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

C. zero

D. $\frac{\pi}{3}$

Answer: C

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9. The unit of electric field is not equivalent to

A. N/C

B. J/C

C. V/m

D. J/Cm

Answer: B

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10. When electric field intensity at any point in the electric field is directed towards or away from the same fixed point, then the field is

A. circular electric field

B. uniform electric field.

C. radial electric field.

D. tangential electric field.

Answer: C

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

A. $2\pi R^2 E$

B. $(2\pi R^2 + 2\pi RL)E$

C. $(\pi R^2 + 2\pi RL)E$

D. zero

Answer: D

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12. Electric field of an isolated charged metallic sphere at any interior point is

A. zero

B. one

C. proportional to field

D. infinite

Answer: A

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13. Unit of electric flux is

A. weber

B. newton per coulomb

C. $\text{volt} \times \text{metre}$

D. joule per coulomb

Answer: C

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14. If charge q induced on outer surface of sphere of radius R, then intensity at point P at distance S from centre is

A. inversely proportional to $(S+R)^2$

B. inversely proportional to R^2.

C. inversely proportional to S^2.

D. directly proportional to S^2.

Answer: C

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15. The mechanical force acting on a unit area of a charged conductor is

A. $f = \frac{\sigma^2}{2\varepsilon_0 K}$

B. $f = \frac{\sigma}{2\varepsilon_0 K}$

C. $f = \frac{\sigma^2}{\varepsilon_0 K}$

D. $f = \frac{\sigma}{\varepsilon_0 K}$

Answer: A

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16. The mechanical stress of a charged conductor of charge density σ is always directed outwards because

A. σ^2 is always positive

B. σ^2 is always negative

C. σ^2 is always zero

D. σ^2 is scalar

Answer: A

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17. Which of the following factors does not affect the mechanical force per unit area of charged conductor ?

A. Surface charge density

B. Electric field intensity

C. Permittivity of medium

D. Distance of point

Answer: D

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18. If S is the surface area of charged conductor on which the surface density of charge is and K is the dielectric constant of the medium around it, then outward force acting on the surface of the conductor is

A. $\frac{\sigma^2}{2\varepsilon_0 K}$

B. $\frac{\sigma}{\varepsilon_0 K} S$

C. $\frac{\sigma^2}{2\varepsilon_0 K} S$

D. $\frac{\sigma^2}{\varepsilon_0 K} S$

Answer: C

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19. The energy per unit volume of a dielectric medium is directly proportional to square of

A. relative permittivity

B. charge

C. energy

D. electric intensity

Answer: D

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20. The energy density in the electric field created by a point change falls off with the distance from the point charge as

A. $\frac{1}{\mathrm{r}}$

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

C. $\frac{1}{r^3}$

D. $\frac{1}{r^4}$

Answer: D

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21. The energy density in an electric field of intensity $200 \text{volt} / m$, if K=4 and $\varepsilon_0 = 8.85 \times 10^{-12} C^2 / Nm^2$ is

A. $8.85 \times 10^{-9} J / m^3$

B. $8.85 \times 10^{-8} J / m^3$

C. $17.70 \times 10^{-10} J / m^3$

D. $7.08 \times 10^{-7} J / m^3$

Answer: D

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22. Electrical intensity and energy density at a point in an electric field are E and u respectively. If the intensity E is reduced by 50% then energy density will be

A. 4 u

B. u/4

C. 2 u

D. u/2

Answer: B

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23. dielectrics are

A. conducting substances

B. non-conducting substances

C. combustible substances

D. preservative substances

Answer: B

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24. Which of the following is not a solid dielectrics ?

A. Ceramic

B. Glasses

C. Mica

D. magnesia

Answer: D

25. Which of the following is not a polar molecule ?

A. HCl

B. H_2O

C. CO_2

D. N_2O

Answer: C

26. In non-polar molecules, centre of gravity of positive nuclei and revolving electrons

A. coincide

B. are parallel

C. are far apart

D. intersect

Answer: A

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27. Assertion. Dielectric polarization means formation of positive and negative charges inside the dielectric.

Reason. Free electrons are formed in this process.

A. zero

B. ε_0

C. $\frac{1}{\varepsilon_0}$

D. $\frac{1}{4\pi\varepsilon_0}$

Answer: A

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28. The electric dipole moment per unit volume of electric dipole is

A. electrification

B. magnetisation

C. polarisation

D. neutralisation

Answer: C

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29. Which of the following represents electric polarisation ?

A. $P = \frac{1}{\sigma_P}$

B. $P = \sigma_P$

C. $P = \sigma_P E$

D. $P = \varepsilon_0 \sigma_P$

Answer: B

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30. The ability of a conductor to store electrical charge is called as

A. capacitance

B. resistance

C. inductance

D. reactance

Answer: A

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31. The S.I unit of capacitance of capacitor is

A. henry

B. ohm

C. farad

D. volt

Answer: C

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32. The relation between electric charge, electric potential and capacity is

A. $C = \frac{Q}{V}$

B. $C = \frac{V}{Q}$

C. V = QC

D. $C = \frac{Q^2}{V}$

Answer: A

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33. The ratio of charge to potential of a body is known as

A. capacitance

B. conductance

C. inductance

D. resistance

Answer: A

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34. When a conducting slab fills the space between the two plates of a capacitor, its capacitance

A. becomes infinite

B. becomes four times the original one.

C. remains same.

D. becomes zero

Answer: A

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35. When a metal slab is placed between the charged identical , parallel plates , the potential difference between the plates

A. decreases

B. increases

C. remains unchanged.

D. may increase or decrease

Answer: A

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36. To reduce the capacity of a parallel plate condenser, separation between the plates is

A. reduced and area of the plates decreased.

B. decreased and area of the plates increased.

C. increased and area of the plates decreased

D. increased and area of the plates increased.

Answer: C

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37. Capacitance of parallel plate capacitor has dimensions.

A. $[M^{1}L^{-2}T^{2}]$

B. $M^{1}L^{2}T^{-4}A^{-2}]$

C. $\left[M^{-1}L^{-2}T^{4}A^{2}\right]$

D. $\left[M^{1}L^{2}T^{-2}\right]$

Answer: C

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38. The capacitance of a parallel plate capacitor can be increased by

A. increasing the area of the plates.

B. decreasing the distances between the plates.

C. using a dielectric of higher permitivity.

D. all of above

Answer: D

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39. An electric field of magnitude $400NC^{-1}$ can be produced by applying a potential difference of 20 V to a pair of parallel metal plates separated by

A. 2 cm

B. 5 cm

C. 20 cm

D. 50 cm

Answer: B

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40. Each plate of a parallel plate condenser has surface area of $5 cm^2$. The distance between the plates is 2 mm. The dielectric constant of the medium between the plates is 5. Then the capacity of the condenser is

$\left(\varepsilon_0 = 8.85 \times 10^{-12} C^2 / Nm^2\right)$

A. 0.5 pF

B. 0.25 pF

C. 0.75 pF

D. 11 pF

Answer: D

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41. When a dielectric is inserted in the space between parallel plates of a charged capacitor, then

A. induced charges of opposite signs appear on each surface of dielectric

B. induced charges of same sign appear on each surface of dielectric.

C. induced e.m.f. is generated between plates.

D. migration of electrons stop.

Answer: A

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42. Induced surface density of a medium with dielectric is represented as

A. $\sigma_i = \sigma(1 + K)$

B. $\sigma_i = \sigma\left(1 - \frac{1}{K}\right)$

C. $\sigma_i = \sigma\left(1 + \frac{1}{K}\right)$

D. $\sigma_i = \sigma\left(\frac{1}{K} - 1\right)$

Answer: B

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43. When dielectric is inserted in the space between plates of a capacitor, then

A. magnitude of charge increases.

B. magnitude of charge decreases.

C. charge remains the same.

D. charge becomes zero.

Answer: C

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44. Which of the following will not change if dielectric slab is introduced in a charged condenser ?

A. Charge

B. Potential

C. Capacity

D. Energy

Answer: A

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45. A parallel plate capacitor has a capacity c. If a medium of dielectric constant K is introduced between plates, the capacity of capacitor becomes

A. $\frac{\mathrm{C}}{K}$

B. $\frac{\mathrm{C}}{K^2}$

C. K^2C

D. KC

Answer: D

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46. In a charged capacitor, the energy resides in

A. in the positive charges.

B. in both the positive and negative charges.

C. in the field between the plates.

D. around the edges of the capacitor plates.

Answer: C

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47. During the process of charging a capacitor, some work is done which is stored in the form of

A. heat energy

B. potential energy

C. kinetic energy

D. electrostatic energy

Answer: D

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48. Magnitude of work done during the charging of a condenser from q=0 to q=Q is

A. $W = \frac{C^2}{Q}$

B. $W = \frac{Q^2}{2\mathrm{C}}$

C. $W = \sqrt{\frac{Q}{\mathrm{C}}}$

D. $W = \frac{Q}{\mathrm{C}}$

Answer: B

49. The energy of a charged capacitor is given by the expression $(q =$ charge on the conductor and $C =$ its capacity

A. $\frac{q^2}{2C}$

B. $\frac{q^2}{\mathrm{C}}$

C. 2qC

D. $\frac{q}{2C^2}$

Answer: A

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50. A parallel plate air condenser of capacity $10\mu F$ is charged to a potential of 1000V. The energy of the condenser is

A. 5 J

B. 4 J

C. 2.5 J

D. 10 J

Answer: A

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51. When a capacitor having a capacitance 8×10^{-6} F and potential difference of 100 volt is discharged , the energy released in joules is

A. 0.02

B. 0.04

C. 0.025

D. 0.05

Answer: B

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52. A capacitor carries a charge of $6\mu C$ at a potential 500 V. The electrostatic energy stored in it is

A. $20 \times 10^{-4} J$

B. $15 \times 10^{-4} J$

C. $2.4 \times 10^{-4} J$

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

Answer: B

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53. If the number of condensers are connected in series then

A. charge on each conderser is same and potentials are different.

B. potential is same but charges are different.

C. both charge and potential are same.

D. both charge and potential are different.

Answer: A

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54. In parallel arrangement of capacitor,

i. the p.d across individual capacitor is same.

ii. The charge is shared by the capacitor in the ratio of the capacitance.

iii. The resultant capacitance is equal to sum of the capacitance of capacitors used.

A. Only statement (i) is correct.

B. Only statement (ii) is correct.

C. Only statement (iii) is correct.

D. All three statements are correct.

Answer: D

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55. Four capacitors of equal capacitance have an equivalent capacitance C_1 when connected in series and an equivalent capacitance C_2 when connected in parallel. The ratio $\frac{C_1}{C_2}$ is

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

B. $\frac{1}{16}$

C. $\frac{1}{8}$

D. $\frac{1}{12}$

Answer: B

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56. Three capacitors of capacitances $3\mu F, 9\mu F$ and $18\mu F$ are connected one in series and another time in parallel. The ratio of equivalent capacitance in the two cases $\left(\frac{C_s}{C_p}\right)$ will be

A. $1:15$

B. $15:1$

C. $1:1$

D. $1:3$

Answer: A

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57. How do you arrange four equal capacitor of $4\mu F$ to get effective capacitance $3\mu F$?

A. Three in series , one in parallel

B. Two in parallel, two in series

C. three in parallel, one in series

D. All four in series

Answer: C

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58. When threee capacitors of equal capacities are connected in parallel and one of the same capacity is connected in series withs its combination . The resultant capacity is $3.75\mu F$. The capacity of each capacitor is

A. $3\mu F$

B. $5\mu F$

C. $9\mu F$

D. $14\mu F$

Answer: B

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59. Van de Graaff generator is used for the production of

A. high potential difference.

B. low potential difference.

C. moderate potential difference.

D. high temperature.

Answer: A

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60. Van de Graaff generator is

A. an electromagnetic machine.

B. an electrostatic difference.

C. an electrodynamic machine.

D. used to produce charged particles.

Answer: B

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61. In van de Graaff generator, potential difference is of the order of

A. 10^9 volt

B. 10^{13} volt

C. 10^{12} volt

D. 10^7 volt

Answer: D

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62. The energy density of air medium is $44.25 \times 10^{-8} J/m^3$. The intensity of the electric field in the medium is

A. 300 N/C

B. 3 N/C

C. 305 N/C

D. 316.2 N/C

Answer: D

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63. Two metal spheres of capacitance C_1 and C_2carry some charges . They are put in contact and then separated. final charges Q_1 and Q_2 on them will satisfy

A. $\frac{Q_1}{Q_2} < \frac{C_1}{C_2}$

B. $\frac{Q_1}{Q_2} = \frac{C_1}{C_2}$

C. $\frac{Q_1}{Q_2} > \frac{C_1}{C_2}$

D. $\frac{Q_1}{Q_2} < \frac{C_2}{C_1}$

Answer: B

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

A. 2F

B. 4F

C. 0.5 F

D. 0.25 F

Answer: A

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65. A $100\mu F$ capacitor is to have an energy content of $50J$ in order to operate a flash lamp. The voltage required to charge the capacitor is

A. 500 V

B. 1000 V

C. 1500 V

D. 2000 V

Answer: B

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Critical Thinking

1. Assertion: Electric flux represents the number of electric lines passing normally through the given surface in the electric field.

Reason: Electric flux through a surface is given as

$$\phi = \frac{q}{\varepsilon_0}$$

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is true, Reason is true, Reason is not a correct explanation for Assertion.

C. Assertion is True , Reason is False.

D. Assertion is False, Reason is True.

Answer: B

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2. A cube of side l is placed in a uniform field E, where E= $E\hat{i}$ .The net electric flux through the cube is

A. zero

B. l^2E

C. $4l^2E$

D. $6l^2E$

Answer: A

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3. A point charge causes an electric flux of $-200Nm^2/C$ to pass through spherical Guassian surface of 10 cm radius centered on the charge. If the radius of the Guassian surface is doubled, the total electric flux passing through the surface is

A. $-200Nm^2/C$

B. $-100Nm^2/C$

C. $+200Nm^2/C$

D. $-50Nm^2/C$

Answer: A

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4. A cubical guassian surface encloses 24 C of charge. The electric flux through each surface of the cube is

A. $\dfrac{24}{\varepsilon_0}V-m$

B. $\dfrac{4}{\varepsilon_0}V-m$

C. $\dfrac{12}{\varepsilon_0}V-m$

D. $\dfrac{2.4}{\varepsilon_0}V-m$

Answer: B

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5. The magnitude of an electric intensity at a point which is at a distance 'r' from the centre of a charged spherical conductor of radius 'R' in terms of the surface charge density $'\sigma'$ is given by 'E' where

A. $E = \dfrac{\sigma}{K\varepsilon_0 r^2}$

B. $E = \dfrac{\sigma R}{K\varepsilon_0 r^2}$

C. $E = \dfrac{\sigma R^2}{K\varepsilon_0 r^2}$

D. $E = \dfrac{\sigma^2 R}{K\varepsilon_0 r^2}$

Answer: C

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6. The electric field near a conducting surface having a uniform surface charge density σ is given by

A. $\dfrac{\sigma}{\varepsilon_0}$ and is parallel to the surface.

B. $\frac{2\sigma}{\varepsilon_0}$ and is parallel to the surface.

C. $\frac{\sigma}{\varepsilon_0}$ and is normal to the surface.

D. $\frac{2\sigma}{\varepsilon_0}$ and is normal to the surface.

Answer: C

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7. Equal charges are given to two spheres of different radii. The potential will

A. be more on the smaller sphere

B. be more on the bigger sphere.

C. be equal on both the spheres.

D. depend on the nature of the materials of the spheres.

Answer: A

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8. Electric intensity at a point outside a charged spherical conductor surrounded by air is 6 N/C. If the space around the conductor is filled with a medium of dielelctric constant 3, then the electric intensity at the same point will be

A. 20 N/C

B. 2 N/C

C. 2.5 N/C

D. 6.25 N/C

Answer: B

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9. A cyclinder of radius 5 mm and surface charge density of $2\mu C/m^2$ is surrounded by a medium of dielectric constant 6.28. The magnitude of electric field at a point 2 m away from the axis of the cyclinder is $\left(\frac{1}{4}\pi\varepsilon_0 = 9\times 10^9 Nm^2/C^2\right)$

A. 180 V/m

B. 50 V/m

C. 90 V/m

D. 45 V/m

Answer: C

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10. An infinite line charge produces a field of $4.5 \times 10^4 N / C$ at a distance 2 m from it. The linear charge density is

A. $5\mu C / m$

B. $6\mu C / m$

C. $4\mu C / m$

D. $7\mu C / m$

Answer: A

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11. 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.

Answer: C

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12. For a point situated at a distance 20 cm from the axis of a long cyclindrical charged conductor, the electric intensity is $0.4N/C$. The electric intensity at another point situated at 4o cm from the axis is

A. 0.1 N/C

B. 0.4 N/C

C. 0.2 N/C

D. 0.8 N/C

Answer: C

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13. The surface charge density of a conductor is $12 \times 10^{-12} C / m^2$ .If the conductor is surrounded by a medium of dielectric constant 3.14, the magnitude of electric field just outside the conductor is

$$\left(\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 Nm^2 / C^2\right)$$

A. 0.18 V/m

B. 0.36 V/m

C. 0.43 V/m

D. 3.6 V/m

Answer: C

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14. The maximum charge that can be conveyed to a conducting sphere of diameter 20 cm (breakdown field of air $= 2 \times 10^6 Vm^{-1}$) is

A. $\frac{5}{9} \times 10^{-6} C$

B. $\frac{2}{9} \times 10^{-5} C$

C. $10^{-9} C$

D. $10^{-7} C$

Answer: B

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15. Two spheres A and B are having radii 5 cm and 10 cm and carrying charges of +5C and +15 C respectively, distributed uniformaly. Their centres are separated by 80 cm. The electric field on the line joining the centres of the spheres will be zero at a distance from the centre of A equal to

A. 20 cm

B. 33 cm

C. 47 cm

D. 29 cm

Answer: D

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16. A conducting sphere of radius 0.1 m has a uniform positive charge density of $1.8\mu C / m^2$ on its surface. The electric field in V/m in free space at a radial distance of 0.2m from a point on the surface of the sphere is given by

A. $6.0 \times 10^{-8} / \varepsilon_0$

B. $2.0 \times 10^{-7} / \varepsilon_0$

C. $4.5 \times 10^{-7} / \varepsilon_0$

D. $6.0 \times 10^{-6} / \varepsilon_0$

Answer: B

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17. Two conducting spheres of radii r_1 and r_2 are charged to the same surface charge density . The ratio of electric field near their surface is

A. r_1^2 / r_2^2

B. r_2^2 / r_1^2

C. r_1 / r_2

D. $1 : 1$

Answer: D

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18. A charge $Q = 1.8 \mu C$ is placed at the centre of a cube of adge 55 cm. The electric flux through one of the faces of the cube is

A. Q/ε_0

B. $Q/2\varepsilon_0$

C. $Q/4\varepsilon_0$

D. $Q/6\varepsilon_0$

Answer: D

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19. The electric field in a region is radially outward with magnitude $E = \dfrac{A}{\gamma}$. The charge contained in a sphere of radius γ_0 centered at the origin is

A. $\dfrac{1}{4\pi\varepsilon_0} A\gamma_0^2$

B. $4\pi\varepsilon_0 A\gamma_0$

C. $\dfrac{4\pi\varepsilon_0 A}{\gamma_0}$

D. $\dfrac{1}{4\pi\varepsilon_0} \dfrac{A}{\gamma_0}$

Answer: B

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20. Cyclinder is charged by 10mC. Length of cyclinder is 1km and radius is 1 mm. Surface charge density of cyclinder is

A. $1.59 \times 10^{-4} C/m^2$

B. $1.59 \times 10^{-6} C/m^2$

C. $1.59 \times 10^{-3} C/m^2$

D. $1.59 \times 10^{-2} C/m^2$

Answer: C

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21. A metal of surface area $1m^2$ is charged with $\sqrt{8.85}\mu C$ in air. The mechanical force acting on it is

A. 1N

B. 0.5 N

C. 10 N

D. 50N

Answer: B

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22. The surface density of charge on the surface of a charged conductor in air is $0.885 \mu C / m^2$. If $\varepsilon_0 = 8.85 \times 10^{-12} C^2 / N - m^2$, then the outward force per unit area of the charged conductor is

A. $5 \times 10^{-2} N / m^2$

B. $4.425 \times 10^{-2} N / m^2$

C. $8.85 \times 10^{-2} N / m^2$

D. $5 \times 10^{-3} N / m^2$

Answer: B

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23. A metal sphere of radius 10 cm is given a charge of $12\mu C$. The force acting on unit area of its surface is

A. $5.15 \times 10^{2} N/m^{2}$

B. $5.15 \times 10^{3} N/m^{2}$

C. $5.15 \times 10^{-2} N/m^{2}$

D. $5.15 \times 10^{-3} N/m^{2}$

Answer: A

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24. The energy density per unit volume of medium in an electric field of intensity $400V/m$ is (dielectric constant of material is 2 and $\varepsilon_0 = 8.85 \times 10^{-12}$units)

A. $35.40 \times 10^{-8} J/m^3$

B. $40.35 \times 10^{-8} J/m^3$

C. $43.5 \times 10^{-8} J/m^3$

D. $1.416 \times 10^{-6} J/m^3$

Answer: D

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25. A sphere of radius 1 cm has potential of 10000V, then energy density near its surface will be

A. $64 \times 10^5 J/m^3$

B. $8 \times 10^3 J/m^3$

C. $32J/m^3$

D. $4.425J/m^3$

Answer: D

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26. A molecule in which centre of gravity of positive nuclei and revolving electrons coincide is

A. polar molecules

B. polarised molecules

C. non-polar molecules

D. unpolarised molecules

Answer: A

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27. In polar dielectrics , tiny electric dipoles are randomly oriented

A. in absence of electric field

B. in presence of electric field.

C. in presence of magnetic field.

D. all of these

Answer: A

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28. Choose the correct relation between polarisation and electric susceptibility of dielectric material.

A. $P = \dfrac{\chi}{E}$

B. $P = \chi / E^2$

C. $P = \chi E$

D. $P = \chi^2 E$

Answer: C

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29. A parallel plate capacitor is charged by connecting is plates to the terminals of a battery. The battery remains connected to the condenser plates and a glass plate is interposed between the plates of the capacitor, then

A. the charge on the plates will be reduced.

B. the potential difference between the plates will be reduced.

C. the charge on the plates will increase.

D. the potential difference between the plates will increase.

Answer: C

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30. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles:

A. the charge on the capacitor increases.

B. the voltage across the plate increases.

C. the capacitance increases.

D. the electrostatic energy stored in the capacitor increases.

Answer: C

Watch Video Solution

31. A parallel plate capacitor is charged to a potential difference of 50V. It is discharged through a resistance. After 1 second, the potential difference between plates becomes 40V. Then

A. fraction of stored energy after 1 second is 16/25.

B. potential difference between the plates after 2 seconds will be 32 V.

C. potential difference between the plates after 2 seconds will be 20V.

D. fraction of stored energy after 1 second is 4/5.

Answer: A

Watch Video Solution

32. Two identical parallel plate capacitors are connected in parallel combination. Total charge on capacitors is Q_0. If one of the capacitors is kept in a dielectric medium of constant K, then the total charge on both the capacitors will change to (P.D. across them is kept constant)

A. $\dfrac{KQ_0}{2}$

B. $\dfrac{KQ_0}{(1+K)}$

C. $\dfrac{(1+K)Q_0}{2}$

D. $\dfrac{(1+K)Q_0}{(1-K)}$

Answer: C

View Text Solution

33. The distance between the circular plates of a parallel plate condenser 40 mm in diameter, in order to have same capacity as a sphere of radius 1 m is

A. 0.01 mm

B. 0.1 mm

C. 1.0 mm

D. 10 mm

Answer: B

Watch Video Solution

34. A parallel plate capacitor with air between the plates has a capacitance of 8pF. The separation between the plates is now reduced by half and the space between them is filled with medium of dielectric constant 5. The value of capacitance of a capacitor in the second case is

A. 0.8 pF

B. 3.2 pF

C. 80 pF

D. 40 pF

Answer: C

Watch Video Solution

35. A parallel plate capacitor is charged to a certain potential difference. A slab of thickness 3 mm is inserted between the plates and it becomes necessary to increase the distance between the plates by 2.4 mm to maintain the same potential difference. The dielectric constant of the slab is

A. 3

B. 5

C. 1.8

D. 2.438

Answer: B

Watch Video Solution

36. The capacity of a parallel plate condenser filled with material of dielelctric constant 8 is $16\mu F$. Its capacity, if the dielectric is removed , will be

A. $1\mu F$

B. $2\mu F$

C. $4\mu F$

D. $0.5 \mu F$

Answer: B

Watch Video Solution

37. Between the plates of a parallel plate condenser, a plate of thickness t_1 and dielectric constant k_1 is placed. In the rest of the space, there is another plate of thickness t_2 and dielectric constant k_2. The potential difference across the condenser will be

A. $\frac{Q}{A\varepsilon_0}\left(\frac{t_1}{K_1}+\frac{t_2}{K_2}\right)$

B. $\frac{\varepsilon_0 Q}{A}\left(\frac{t_1}{K_1}+\frac{t_2}{K_2}\right)$

C. $\frac{Q}{A\varepsilon_0}\left(\frac{K_1}{t_1}+\frac{K_2}{t_2}\right)$

D. $\frac{\varepsilon_0 Q}{A}(K_1 t_1 + K_2 t_2)$

Answer: A

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38. The capacitance of a capacitor made by a thin metal foil is $2\mu F$. If the foil is filled with paperr of thickness 0.15 mm, dielectric constant of paper is 2.5 and width of the paper is 400 mm. what is the length of foil?

A. 0.34 m

B. 1.33 m

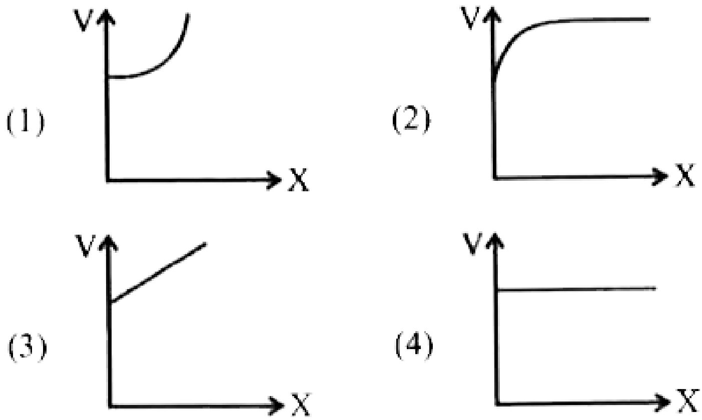
C. 13.4 m

D. 33.9 m

Answer: D

Watch Video Solution

39. Between the plates of a parallel plate capacitor a dielectric plate in introduced just to fill the complete space between the plates. The capacitor is charged and later disconnected from the battery. The dielectric plate is then slowly drawn out of the capacitor plates. the plot of the potential difference across the plates and the length of the dielectric plate drawn out is



A.

B.

C.

D.

Answer: B

Watch Video Solution

40. If the potential difference across a capacitor is increased from 10V to 30V, then the energy stored with the capacitor.

A. increases to 3 times its initial value.

B. increases to 9 times its initial value.

C. increases to 27 times its initial value.

D. decreases to 1/3 times its initial value.

Answer: B

Watch Video Solution

41. A conductor of capacity $10\mu F$ is at potential of 10V. If the potential increases by 1V, the increase in energy is

A. $1\mu J$

B. $210\mu J$

C. $105\mu J$

D. $10.5\mu J$

Answer: C

Watch Video Solution

42. A capacitor $4\mu F$ charged to $50V$ is connected to another capacitor of $2\mu F$ charged to $100V$ with plates of like charges connected together. The total energy before and after connection in multiples of $(10^{-2}J)$ is

A. $(4/3) \times 10^{-2}J$

B. $(3/2) \times 10^{-2}J$

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

D. $2.67 \times 10^{-2} J$

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

44. A capacitor of capacitance C is charged to potential difference V and then disconnected from the battery. The air dielectric of capacitor is replaced by another dielectric of dielectric constant K. The fractional decrease in energy of the capacitor is

A. $\frac{1}{K}$

B. K

C. $1-\frac{1}{K}$

D. $\frac{1}{K^2}$

Answer: C

Watch Video Solution

45. If a $4\mu F$ capacitor is charged to 1KV, then energy stored is conductor is

A. 1J

B. 8J

C. 4J

D. 2J

Answer: D

Watch Video Solution

46. Two capacitors of capacities $1\mu F$ and $4\mu F$ are connected in series with battery of 200V. The voltage across them are in the ratio of

A. $\frac{1}{2}$

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

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

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

Answer: D

Watch Video Solution

47. Condensers of capacity $4\mu F, 5\mu F$ and $6\mu F$ are connected first in series . The effective capacitance is C_1. When they are connected in parallel, the effective capacitance is C_2. Then the ratio C_2 / C_1 will be

A. 10

B. 11

C. 12

D. $\frac{37}{4}$

Answer: D

Watch Video Solution

48. A capacitor of $30\mu F$ charged up to 500 volt is connected in parallel with another capacitor of $15\mu F$ which is charged up to 300V. The common potential is

A. 433 V

B. 450 V

C. 333V

D. 350 V

Answer: A

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49. A $8\mu F$ capacitor is fully charged across a 12V battery, it is then disconnected from the battery and connected to an uncharged capacitor. If the voltage across the capacitor becomes 3V, then the capacitance of the uncharged capacitor will be

A. $24\mu F$

B. $20\mu F$

C. $28\mu F$

D. $30\mu F$

Answer: A

Watch Video Solution

50. A condenser of of capacity $2\mu F$ is charged to a potential of 100V. It is now connected to an uncharged condenser of capacity $3\mu F$. The common potential will be

A. 40 V

B. 60 V

C. 20 V

D. 30 V

Answer: A

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51. When two capacitors are connected in series, the equivalent capacitance is $\frac{15}{4}\mu F$. When they are connected in parallel, the equivalent capacitance is $16\mu F$. The individual capacitance are

A. $5\mu F, 11\mu F$

B. $6\mu F, 10\mu F$

C. $4\mu F, 12\mu F$

D. $8\mu F, 8\mu F$

Answer: B

Watch Video Solution

52. Six identical capacitors, each of $1\mu F$ are joined in parallel and the combination is put across a battery of e.m.f. 2V. Now, the battery is disconnected and the capacitors are joined in series. The total energy are potential difference across the series combination is

A. $2\mu J \text{and} 2V$

B. $2\mu J$ and 12 V

C. $12\mu J$ and 2V

D. $12\mu J$ and 12V

Answer: D

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53. Three capacitors of capacitanes C_1, C_2 and C_3 are connected (i) in series, (ii) in parallel. Show that the energy stored in the series combination is the same as that in parallel combination.

A. $1:1:1$

B. $C_1:C_2:C_3$

C. $C_1^2:C_2^2:C_3^2$

D. $1/C_1:1/C_2:1/C_3$

Answer: D

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54. Two capacitors of capacitance $2\mu F$ and $3\mu F$ are joined in series. Outer plate first capacitor is at 1000 volt and outer plate of second capacitor is earthed (grounded). Now the potential on inner plate of each capacitor will be

A. 700V

B. 200V

C. 600V

D. 400V

Answer: D

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55. When three identical capacitors are connected in series, their equivalent capacitance is $2\mu F$. Now they are connected in parallel across a source of e.m.f. 200 V. The total energy stored is

A. 0.36 J

B. 0.48 J

C. 1.6 J

D. 3.2 J

Answer: A

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56. In van de Graaff generator, the process of spraying the charge is called

A. gases discharge.

B. corona discharge

C. electron discharge

D. none of these.

Answer: B

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57. Artificial transmutation is the process in which

A. bombardment of highly energetic particles on nucleus of an element causes it to form some other element.

B. bombardment of lower energy particles on nulceus causes it to get transformed into other element.

C. energetic particles become inactive

D. energetic particles become reactive

Answer: A

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58. A parallel plate capacitor carries a harge Q. If a dielectric slab with dielectric constant K=2 is dipped between the plates, then

A. the stored energy remains unchanged.

B. the stored energy is increased by a factor of 2.

C. the stored energy is reduced to half its previous value.

D. none of the above is correct.

Answer: C

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59. A cyclinder of radius 4mm and surface density of charge $0.25\mu C/m^2$ is surrounded by a medium of dielectric constant 6.28. The magnitude of electric field at a point 2 m away from the axis of the cyclinder is

A. 9 V/m

B. 12 V/m

C. 6 V/m

D. 4.5 V/m

Answer: A

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

A. $2 \times 10^{-7} Cm^{-1}$

B. $10^{-7}Cm^{-1}$

C. $9 \times 10^{4}Cm^{-1}$

D. none of these

Answer: A

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61. A cylinder of radius R and length L is placed in the uniform electric field E parallel to the cylinder axis.The total flux from the two flat surface of the cylinder is given by

A. $2\pi R^2 E$

B. $\pi R^2 E$

C. zero

D. $\frac{\pi R^2 E}{2}$

Answer: C

Watch Video Solution

62. The electrostatic energy stored in 1 litre volume of air when it is placed in uniform electric field of intensity $10^3 V / m$ is

A. $44.25 \times 10^{-9} J$

B. $4.424 \times 10^{-9} J$

C. $44.25 \times 10^{-6} J$

D. $44.25 \times 10^{-5} J$

Answer: B

Watch Video Solution

63. Two parallel metal plates 2.0 cm apart, are connected to a 200 V battery. A proton with a positive charge 1.6×10^{-19} C is located between the plates . The electric field intensity between the plates is

A. 5000 V/m

B. 10000 V/m

C. $3.2 \times 10^{-6} V / m$

D. $50, 000 V / m$

Answer: B

Watch Video Solution

64. A capacitor $4\mu F$ charged to $50V$ is connected to another capacitor of $2\mu F$ charged to $100V$ with plates of like charges connected together. The total energy before and after connection in multiples of $\left(10^{-2}J\right)$ is

A. $1.33 \times 10^{-2} J \text{and} 1.5 \times 10^{-2} J$

B. $1.5 \times 10^{-2} J \text{and} 1.33 \times 10^{-2} J$

C. $3.0 \times 10^{-2} J \text{and} 2.67 \times 10^{-2} J$

D. $2.67 \times 10^{-2} J \text{and} 3.0 \times 10^{-2} J$

Answer: B

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65. A parallel plate capacitor is connected to a battery. The plates are pulled apart with uniform speed. If x is the separation between the plates, then the rate of change of electrostatic energy of the capacitor is proportional to

A. x^2

B. x

C. $\dfrac{1}{x}$

D. $\dfrac{1}{x^2}$

Answer: D

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66. What will be the capacity of a parallel-plate capacitor when the half of parallel space between the plates is filled by a material of dielectric constant ε_r ? Assume that the capacity of the capacitor in air is C.

A. $\dfrac{2\varepsilon_r C}{1+\varepsilon_r}$

B. $\dfrac{C(\varepsilon_r+1)}{2}$

C. $\dfrac{C\varepsilon_r}{1+\varepsilon_r}$

D. $\varepsilon_r C$

Answer: A

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67. STATEMENT-1: A parallel plate capacitor is charged by a battery. The battery is then disconnected. If the distance the plates is increased, the enegry strored in the capacitor will decrease.

STATEMENT-2: Work has to be done to increase the separation between the plates of a charged capacitor.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is true, Reason is true, Reason is not a correct explanation for Assertion.

C. Assertion is True , Reason is False.

D. Assertion is False, Reason is True.

Answer: B

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Competitive Thinking

1. If the electric flux entering and leaving an enclosed surface respectively are ϕ_1 and ϕ_2, the electric charge inside the surface will be

A. $\dfrac{\phi_2 - \phi_1}{\varepsilon_0}$

B. $\dfrac{\phi_1 + \phi_2}{\varepsilon_0}$

C. $\dfrac{\phi_1 - \phi_2}{\varepsilon_0}$

D. $\varepsilon_0(\phi_1 + \phi_2)$

Answer: D

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2. When a 10 μC charge is enclosed by a closed surface, the flux passing through the surface is ϕ. Now another 10 μC charge is placed inside the closed surface, then the flux passing through the surface is ______.

A. 4ϕ

B. ϕ

C. 2ϕ

D. zero

Answer: C

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3. If there were only one type of charge of the universe then

A. $\oint \overrightarrow{E} . \overrightarrow{d} s \neq 0$ on any surface

B. $\oint \overrightarrow{E} \cdot \overrightarrow{d} s$ could not be defined

C. $\oint \overrightarrow{E} . \overrightarrow{d} s = \infty$ if charge is inside

D. $\oint \overrightarrow{E} \cdot \overrightarrow{d} s = 0$ if charge is outside, $= \frac{q}{\varepsilon_0}$ if charge is inside.

Answer: D

Watch Video Solution

4. Eight dipoles of charges of magnitude e are placed inside a cube. The total electric flux coming out of the cube will be

A. $\frac{8e}{\varepsilon_0}$

B. $\frac{16e}{\varepsilon_0}$

C. $\frac{e}{\varepsilon_0}$

D. zero

Answer: D

Watch Video Solution

5. A charge q is located at the centre of a cube. The electric flux through any face is

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

B. $4\pi Q$

C. $\frac{Q}{4\pi\varepsilon_0}$

D. $\frac{Q}{6\pi\varepsilon_0}$

Answer: A

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6. What is the nature of Gaussian surface involved in Gauss's law of electrostatics?

A. Scalar

B. Electrical

C. Magnetic

D. Vector

Answer: A

Watch Video Solution

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

A. be doubled.

B. increase four times.

C. be reduced to half.

D. remain the same.

Answer: D

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8. The total electric flux through a cube when a charge 8q is placed at one corner of the cube is

A. $\varepsilon_0 q$

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

C. $\dfrac{q}{\varepsilon_0}$

D. $\dfrac{q}{4\pi\varepsilon_0}$

Answer: C

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9. The inward and outward electric flux for a closed surface unit of $N - m^2 / C$ are respectively 8×10^3 and 4×10^3. Then the total charge inside the surface is [where $\varepsilon_0 =$ permittivity constant]

A. $4 \times 10^3 C$

B. $-4 \times 10^3 C$

C. $-4 \times 10^{-3} C$

D. $-4 \times 10^{3} \varepsilon_0 C$

Answer: D

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10. The electric field in a certain region is acting radially outwards and is given by $E = Ar$. A charge contained in a sphere of radius $'a'$ centred at the origin of the field, will given by

A. $4\pi\varepsilon_0 Aa^2$

B. $A\varepsilon_0 a^2$

C. $4\pi\varepsilon_0 Aa^3$

D. $\varepsilon_0 Aa^3$

Answer: C

Watch Video Solution

11. In case of infinite long wire electric field is proportional to

A. r

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

C. $\frac{1}{r^3}$

D. $\frac{1}{r}$

Answer: D

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12. The expression for electric field intensity at a points outside uniformly charged thin plane sheet is (where, d is the distance of point from plane sheet)

A. independent of d

B. directly proportional to $\sqrt{d}$

C. directly proportional to d

D. directly proportional to $\frac{1}{\sqrt{d}}$

Answer: A

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13. An infinite line charge produce a field of $7.182 \times 10^{8} NC^{-1}$ at a distance of 2 cm. The linear charge density is

A. $7.27 \times 10^{-4} C/m$

B. $7.98 \times 10^{-4} C/m$

C. $7.11 \times 10^{-4} C/m$

D. $7.04 \times 10^{-4} C/m$

Answer: B

Watch Video Solution

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

A. become zero

B. increase

C. decrease

D. remain same

Answer: C

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15. Consider a sphere of radius R and cylinder of length L. If both have same charge density σ and E_s and E_e are electric intensity at a point at a distance r from axis of sphere and cylinder respectively, then E_s=

A. $\frac{E_c R}{r}$

B. $\frac{E_c r}{R}$

C. $\frac{E_c r}{2R}$

D. $\frac{E_c R}{2r}$

Answer: A

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16. 4×10^{10} electrons are removed from a neutral metal sphere of diameter 20 cm placed in air. The magnitude of the electric field (in NC^{-1}) at a distance of 20 cm from its centre is

A. 640

B. 5760

C. Zero

D. 1440

Answer: D

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17. The number of electrons to be put on a spherical conductor of radius $0.1m$ to produce an electric field of $0.036N/C$ just above its surface is

A. 2.7×10^5

B. 2.6×10^5

C. 2.5×10^5

D. 2.4×10^5

Answer: C

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18. A spherical conductor of radius $2m$ is charged to a potential of $120V$. It is now placed inside another hollow spherical conductor of radius $6m$. Calculate the potential to which the bigger sphere would be raised

A. 20 V

B. 60 V

C. 80 V

D. 40 V

Answer: D

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19. A hollow metal sphere of radius $5cm$ is charged such that the potential on its surface is $10V$. The potential at a distance of $2cm$ from the centre of the sphere

A. zero

B. 10 V

C. 4 V

D. 10/3 V

Answer: B

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20. A conducting sphere of radius $10cm$ is charged $10\mu C$. Another uncharged sphere of radius $20cm$ is allowed to touch it for some tome. After that if the sphere are separted, then surface density of chsrges, on the spheres will be in the ratio of

A. $1:4$

B. $1:3$

C. $2:1$

D. $1:1$

Answer: C

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21. 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

Answer: D

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22. Three charges +5C, +7C and -4C are situated within a body and charges -5C, -7C and +4C are situated outside the body. The T.N.E.I over the closed surface is

A. $-8C$

B. 0

C. $+8C$

D. 10 C

Answer: C

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23. A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are

A. zero and $\frac{Q}{4\pi\varepsilon_0 R^2}$

B. $\frac{Q}{4\pi\varepsilon_0 R}$ and zero

C. $\frac{Q}{4\pi\varepsilon_0 R}$ and $\frac{Q}{4\pi\varepsilon_0 R^2}$

D. both zero

Answer: B

Watch Video Solution

24. Consider two concentric spherical metal shells of radii r_1 and $r_2 (r_2 > r_1)$. If the outer shell has a charge q and the inner one is grounded, then the charge on the inner shell is

A. $\frac{-r_2}{r_1}q$

B. zero

C. $\frac{-r_1}{r_2}q$

D. $-q$

Answer: C

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25. Two concentric spheres kept in air have radii R and r. They have similar charge and equal surface charge density σ. The electrical potential at their common centre is (where, $\varepsilon_0 =$ permittivity of free space)

A. $\frac{\sigma(R+r)}{\varepsilon_0}$

B. $\frac{\sigma(R-r)}{\varepsilon_0}$

C. $\frac{\sigma(R+r)}{2\varepsilon_0}$

D. $\frac{\sigma(R+r)}{4\varepsilon_0}$

Answer: A

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26. A spherical conductor of radius 2 cm is uniformly charged with 3 nC. What is the electric field at a distance of 3 cm from the centre of the sphere?

A. $3 \times 10^{6} Vm^{-1}$

B. $3 Vm^{-1}$

C. $3 \times 10^{4} Vm^{-1}$

D. $3 \times 10^{-4} Vm^{-1}$

Answer: C

Watch Video Solution

27. What is the magnitude of a point charge due to which the electric field 30 cm away has the magnitude $2N/C[1/4\pi\varepsilon_0 = 9 \times 10^9 N - m^2/C^2]$

A. $2 \times 10^{-11} C$

B. $3 \times 10^{-11} C$

C. $5 \times 10^{-11} C$

D. $9 \times 10^{-11} C$

Answer: A

Watch Video Solution

28. An infinite sheet carrying a unifom surface charge density σ lies on the xy-plane. The work done to carry a charge q from the point $\overrightarrow{A} = a\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$ to the point $\overrightarrow{B} = a\left(\hat{i} - 2\hat{j} + 6\hat{k}\right)$ (where a is a constant with the dimensions of length and ε_0 is the permittivity of free space) is

A. $\dfrac{3\sigma aq}{2\varepsilon_0}$

B. $\dfrac{2\sigma aq}{\varepsilon_0}$

C. $\dfrac{5\sigma aq}{2\varepsilon_0}$

D. $\dfrac{3\sigma aq}{\varepsilon_0}$

Answer: A

Watch Video Solution

29. The electric field intensity at point near and outside the surface of a charged conductor of any shape is E_1 the electric field intensity due to uniformly charged infinite thin plane sheet is E_2 the relation between E_1 and E_2 is

A. $2E_1 = E_2$

B. $E_1 = E_2$

C. $E_1 = 2E_2$

D. $E_1 = 4E_2$

Answer: C

Watch Video Solution

30. Force acting upon charged particle kept between the plates of a charged condenser is F. If one of the plates of the condenser is removed, force acting on the same particle will become.

A. 0

B. $\frac{F}{2}$

C. F

D. 2F

Answer: B

Watch Video Solution

31. Electric field intensity at a point in between two parallel sheets with like charges of same surface charge densities (σ) is

A. $\sigma / \varepsilon_0, \sigma / \varepsilon_0$

B. $0, \sigma / \varepsilon_0$

C. 0,0

D. $\sigma / \varepsilon_0, 0$

Answer: B

Watch Video Solution

32. In air , a charged soap bubble of radius 'r' is in equilibrium having outside and inside pressures being equal . The charge on the drop is (ε_0 = permittivity of free space , T = surface tension of soap solution)

A. $4\pi r^2\sqrt{\frac{2T\varepsilon_0}{r}}$

B. $4\pi r^2\sqrt{\frac{4T\varepsilon_0}{r}}$

C. $4\pi r^2\sqrt{\frac{6T\varepsilon_0}{r}}$

D. $4\pi r^2\sqrt{\frac{8T\varepsilon_0}{r}}$

Answer: D

Watch Video Solution

33. If E is the electric field intensity of an electrostatic field, then the electrostatic energy density is proportional to

A. E

B. E^2

C. $1 / E^2$

D. E^3

Answer: B

Watch Video Solution

34. A piece of cloud is having area $25 \times 10^6 m^2$ and electric potential of 10^5 volts. If the height of cloud is 0.75 km, the energy of electric field between earth and cloud will be

A. 250 J

B. 750 J

C. 1225 J

D. 1475 J

Answer: D

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35. A force F acts between sodium and chlorine ions of salt (sodium chloride) when put 1 cm apart in air. The permittivity of air and dielectric constant of water are ε_0 and k respectively. When a piece of salt is put in water, electrical force acting between sodium and chlorine ions 1cm apart is

A. $\frac{F}{k}$

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

C. $\dfrac{F}{k\varepsilon_0}$

D. $\dfrac{F\varepsilon_0}{k}$

Answer: A

Watch Video Solution

36. Two parallel plates have equal and opposite charge. When the space between them is evacuated, the electric field between the plates is 2×10^5 V/m. When the space is filled with dielectric, the electric field becemes

1×10^5 V/m. The dielectric constant of the dielectric material is

A. $1/2$

B. 1

C. 2

D. 3

Answer: C

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37. The capacity of the conductor does not depend upon

A. charge

B. voltage

C. nature of the material

D. all of these

Answer: D

Watch Video Solution

38. The outer sphere of a spherical air capacitor is earthed.For increasing its capacitance

A. vacuum is created between two spheres.

B. dielectric material is filled between the two spheres.

C. the space between two spheres is increased.

D. the earthing of the outer sphere is removed.

Answer: B

Watch Video Solution

39. While a capacitor remains connected to a battery and dielectric slab is applied between the plates, then

A. potential difference between the plates is changed.

B. charge flows from the battery to the capacitor

C. electric field between the plates increases.

D. energy stored in the capacitor decreases.

Answer: B

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40. The electrostatic force between the metal plate of an isolated parallel plate capacitro C having charge Q and area A, is

A. independent of the distance between the plates.

B. linearly proportional to the distance between the plates.

C. proportional to the square root of the distance between the plates.

D. inversely propertional to the distance between the plates.

Answer: A

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41. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles:

A. the energy stored in the capacitor decreases.

B. the capacitance of the capacitor increases.

C. the charge on the capacitor decreases.

D. the voltage across the capacitor increases.

Answer: D

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42. A parallel plate capacitor is charged and then isolated. The effect of increasing the plate separation on charge, potential and capacitance respectively are

A. constant, decreases, increases

B. constant, decreases, decreases.

C. constant, increases, decreases.

D. increases, decreases, decreases.

Answer: C

Watch Video Solution

43. The earth has volume V and surface area A then capacitance would be

A. $4\pi\varepsilon_0\dfrac{A}{V}$

B. $4\pi\varepsilon_0\dfrac{V}{A}$

C. $12\pi\varepsilon_0\dfrac{V}{A}$

D. $12\pi\varepsilon_0\dfrac{A}{V}$

Answer: C

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44. Eight drops of mercury of equal radii possessing equal charges combine to from a big drop. Then the capacitance of bigger drop compared to each individual small drop is

A. 16 times

B. 8 times

C. 2 times

D. 32 times

Answer: C

Watch Video Solution

45. The respective radii of the two spheres of a spherical condenser are $12cm$ and $9cm$. The dielectirc constant of the medium between them is 6. The capacity of the condenser will be

A. 240 pF

B. 240 μF

C. 240 F

D. none of the above

Answer: A

Watch Video Solution

46. An air capacitor of capacity $C = 10\mu F$ is connected to a constant voltage battery of $12V$. Now the space between the plates is filled with a liquid of dielectirc constant 5. The charge that flows now from battery to the capacitor is

A. $120\mu C$

B. $699\mu C$

C. $480\mu C$

D. $24\mu C$

Answer: C

Watch Video Solution

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

A. $1.695 \times 10^9 m^2$

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

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

D. $12.981 \times 10^9 m^2$

Answer: A

Watch Video Solution

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

A. 1

B. 2

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

D. $\frac{1}{2}$

Answer: D

Watch Video Solution

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

A. decreases

B. increases

C. becomes zero

D. does not change

Answer: B

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50. The capacity of a parallel plate condenser is 15 μ F when the distance between its plates is 6 cm. if the distance between the plates is reduced to 2 cm, then the capacity of this prarallel condenser will be

A. $15\mu F$

B. $30\mu F$

C. $45\mu F$

D. $60\mu F$

Answer: C

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51. A capacitor of $20\mu F$ is charged to 500 volts and connected in parallel ith another capacitor of $10\mu F$ and charged to 200 volts. The common potential is

A. 500 V

B. 400 V

C. 300 V

D. 200 V

Answer: B

Watch Video Solution

52. A parallel plate capacitor of 6 μF is connected across 18 V battery and charged.

The battery is k = 2.1 is introduced between the plates. What will be the charge on capacitor ?

A. $51.4\mu C$

B. $108\mu C$

C. $8.5\mu C$

D. $92.5 \times 10^2 C$

Answer: B

Watch Video Solution

53. A condenser having a capacity of $6 \mu F$ is charged to $100 V$ and is then joined to an uncharged condenser of $14 \mu F$ and then removed. The ratio of the charges on $6 \mu F$ and $14 \mu F$ and the potential of $6 \mu F$ will be

A. $\frac{6}{14}$ and $50 V$

B. $\frac{14}{6}$ and $30 V$

C. $\frac{6}{14}$ and $30 V$

D. $\frac{14}{6}$ and $0 V$

Answer: C

Watch Video Solution

54. The capacitance of a parallel plate capacitor is $12\mu F$. If the distance between the plates is doubled and area is halved, then new capacitance will be

A. $3\mu F$

B. $12\mu F$

C. $8\mu F$

D. $6\mu F$

Answer: A

Watch Video Solution

55. A parallel plate capacitor is made of two circular plates separated by a distance 5mm and with a dielectric of dielectric constant 2.2 between them. When the electric field in the dielectric is $3 \times 10^4 V/m$ the charge density of the positive plate will be close to:

A. $6 \times 10^{-7} C/m^2$

B. $3 \times 10^{-7} C / m^2$

C. $3 \times 10^4 C / m^2$

D. $6 \times 10^4 C / m^2$

Answer: A

Watch Video Solution

56. A parallel plate air capacitor has capcity C distance of separtion between plates is d and potential difference V is applied between the plates force of attraction between the plates of the parallel plate air capacitor is

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

B. $\frac{C^2V^2}{2d}$

C. $\frac{CV^2}{2d}$

D. $\frac{CV^2}{d}$

Answer: C

Watch Video Solution

57. The insulated plates of a charged parallel plate capacitor (with small separation between the plates) are approaching each other due to electrostatic attraction. Assuming no other force to be operative and no radiation taking place, which of the following graphs approximately shows the variation with time (t) of the potential difference (V) between the plates ?

A.

B.

C.

D.

Answer: A

View Text Solution

58. A parallel plate condenser has a capacitance $50\mu F$ in air and $100\mu F$ when immersed in an oil. The dielectric constant k of the oil is

A. 0.45

B. 0.55

C. 1.10

D. 2.20

Answer: D

Watch Video Solution

59. A parallel plate capacitor of capacitance 90 pF is connected to a battery of emf 20 V. If a dielectric material of dielectric constant

$K = \frac{5}{3}$ is inserted between the plates, the magnitude of the induced charge will be :

A. 2.4 nC

B. 0.9 nC

C. 1.2 nC

D. 0.3 nC

Answer: C

Watch Video Solution

60. On increasing the plate separation of a charged condenser, the energy

A. increases

B. decreases

C. remains unchanged

D. become zero

Answer: A

Watch Video Solution

61. A charge of 40 μC is given to a capacitor having capacitance C = $10 \mu F$. The stored energy in ergs is

A. 80×10^{-6}

B. 800

C. 80

D. 8000

Answer: B

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

A. 1.5×10^{-8} J

B. 2.5×10^{-7} J

C. 3.5×10^{-5} J

D. 4.5×10^{-2} J

Answer: A

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63. A system of 2 capacitors of capacitance 2 μF and 4 μF is connected in series across a potential difference of 6 V. The electric charge and energy stored in the system are

A. $36\mu C$ and $108\mu J$

B. $8\mu C$ and $24\mu J$

C. $1\mu C$ and $3\mu J$

D. $10\mu C$ and $30\mu J$

Answer: B

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64. A 5 μF capacitor is connected in series with a 10 μF capacitor. When a 300 Volt potential difference is applied across this combination, the energy stored in the capacitors is

A. 15 J

B. 1.5 J

C. 0.15 J

D. 0.10 J

Answer: C

Watch Video Solution

65. The energy required to charge a parallel plate condenser of plate separtion d and plate area of cross-section A such that the unifom field between the plates is E is

A. $\varepsilon_0 E^2 Ad$

B. $\frac{1}{2}\varepsilon_0 E^2 Ad$

C. $\frac{1}{2}\varepsilon_0 E^2 / Ad$

D. $\frac{\varepsilon_0 E^2}{Ad}$

Answer: A

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66. A capacitor of capacitance 6μ F is charged upto 100 volt. The energy stored in the capacitor is

A. 0.6 joule

B. 0.06 joule

C. 0.03 joule

D. 0.3 joule

Answer: C

Watch Video Solution

67. The work done in placing a charge of 8×10^{-18} coulomb on a condenser of capacity 100 micro-farad is

A. 32×10^{-32} joule

B. 16×10^{-32} joule

C. 3.1×10^{-26} joule

D. 4×10^{-10} joule

Answer: A

Watch Video Solution

68. The voltage of clouds is 4×10^{6} volt with respect to ground. In a a lightening strike lasting 100 m sec, a charge of 4 coulomb is delivered to the ground. The power of lightening strike is

A. 160 MW

B. 80 MW

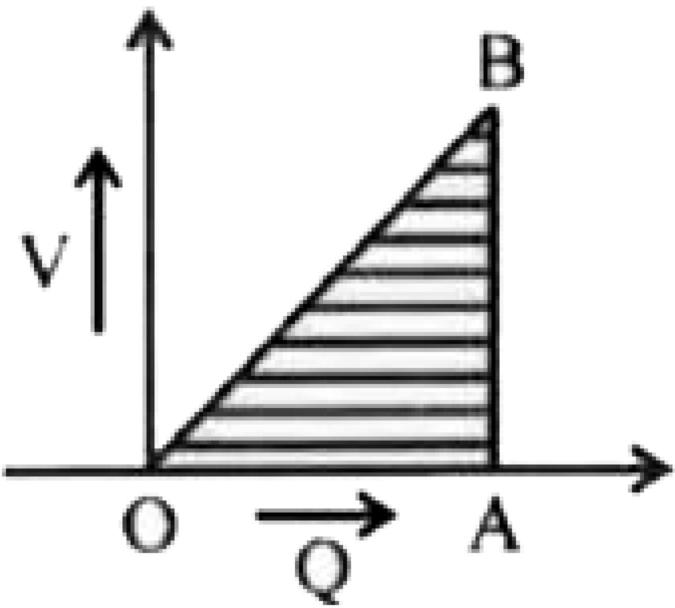
C. 20 MW

D. 500 kW

Answer: B

Watch Video Solution

69. The graph between the voltage and charrge of a capacitor is as shown in the figure. The area of the triangle OAB given the



A. capacitance

B. capacitive reactance

C. magnetic field between the plants

D. energy stored in the capacitor

Answer: D

Watch Video Solution

70. A $4\mu F$ conductor is charged to 400 volts and then its plates are joined through a resistance of $1k\Omega$. The heat produced in the resistance is

A. 0.16 J

B. 0.32 J

C. 0.64 J

D. 1.28 J

Answer: B

Watch Video Solution

71. A 700 pF capacitor is charged by a 50 V battery. The electrostatic energy stored it is

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

B. $8.75 \times 10^{-7} J$

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

D. 17.0×10^{-8} J

Answer: B

Watch Video Solution

72. Capacity of a capacitor is $48 \mu F$. When it is charged from 0.1 C to 0.5 C , change in the energy stored is

A. 2.42×10^{-6} J

B. $250J$

C. 2500 J

D. 2.5×10^{-6} J

Answer: C

Watch Video Solution

73. The amount of work done in increasing the voltage across the plates of capacitor from 5 V to 10 V is W. The work done in increasing it from 10 V to 15 V will be

A. W

B. 0.6 W

C. 1.25 W

D. 1.67 W

Answer: D

Watch Video Solution

74. A series combination of N_1 capacitors (each of capacity C_1) is charged to potential difference 3V. Another parallel combination of N_2 capacitors (each of capacity C_2) is charged to potential difference V. The total energy stored in both the combinations is same, The value of C_1 in terms of C_2 is

A. $\frac{C_2 N_1 N_2}{9}$

B. $\frac{C_2 N_1^2 N_2^2}{9}$

C. $\frac{C_2 N_1}{9 N_2}$

D. $\dfrac{C_2N_2}{9N_1}$

Answer: A

Watch Video Solution

75. Three capacitors of capacities C_1, C_2, C_3 are connected in series. Their total capacity will be

A. $(C_1 + C_2 + C_3)$

B. $1/(C_1 + C_2 + C_3)$

C. $\left(C_1^{-1} + C_2^{-1} + C_2^{-1}\right)^{-1}$

D. $\left(C_1 + C_2 + C_3\right)^{-1}$

Answer: C

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76. Three parallel plate air capacitors are connected in parallel. Each capacitor has plate area $\frac{A}{3}$ and the separation between the plates is d, 2d and 3d respectively. The equivalent capacity of combination is (ε_0 = absolute permittivity of free space)

A. $\frac{7\varepsilon_0 A}{18d}$

B. $\frac{11\varepsilon_0 A}{18d}$

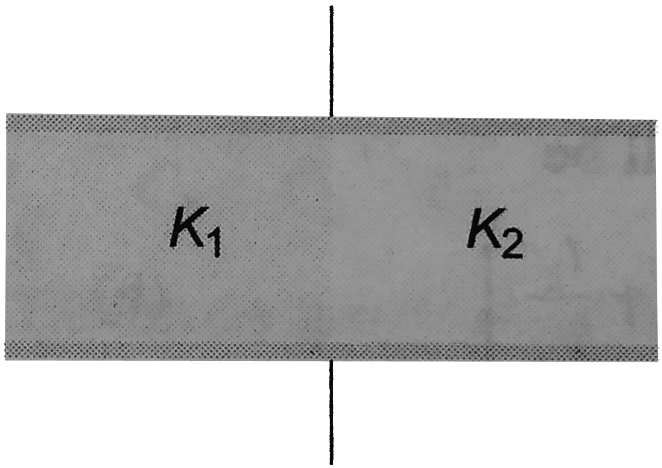
C. $\frac{13\varepsilon_0 A}{18d}$

D. $\frac{17\varepsilon_0 A}{18d}$

Answer: B

Watch Video Solution

77. A parallel plate condenser is filled with two dielectrics as shown. Area of each plate is $A \mathrm{metre}^2$ and the separtion is t metre. The dielectric constants are K_1 and K_2, respectively. Its capacitance in farad will be



A. $\frac{\varepsilon_0 A}{t}(k_1 + k_2)$

B. $\dfrac{\varepsilon_0 A}{t}\dfrac{k_1 + k_2}{2}$

C. $\dfrac{2\varepsilon_0 A}{t}(k_1 + k_2)$

D. $\dfrac{\varepsilon_0 A}{t}\dfrac{k_1 - k_2}{2}$

Answer: B

Watch Video Solution

78. 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. C

B. nC

C. (n-1)C

D. (n+1) C

Answer: C

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79. Three capacitors each of capacitance C and of breakdown voltage V are joined in series. The capacitance and breakdown voltage of the combination will be

A. $\frac{C}{3}, \frac{V}{3}$

B. $3C, \frac{V}{3}$

C. $\frac{C}{3}, 3V$

D. 3C, 3V

Answer: C

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80. A capacitor $C_1 = 4\mu$ F is connected is series with another capacitor $C_2 = 1\mu$F the combination is connected across DC source of 200 V the ratio of potential across C_2 to C_1 is

A. $2:1$

B. $4:1$

C. $8:1$

D. $16:1$

Answer: B

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81. When threee capacitors of equal capacities are connected in parallel and one of the same capacity is connected in series withs its combination . The resultant capacity is $3.75\mu F$. The capacity of each capacitor is

A. $5\mu F$

B. $6\mu F$

C. $7\mu F$

D. $8\mu F$

Answer: A

Watch Video Solution

82. Three capacitors of capacitance $3\mu F, 10\mu F$ and $15\mu F$ are connected in series to a voltage source of $100V$. The charge on $15\mu F$ is

A. $50\mu F$

B. $100\mu C$

C. $200\mu C$

D. $280\mu C$

Answer: C

Watch Video Solution

83. The differeence in the effective capacity of two similar capacitor when joined in series and then in paralllel is 6 μ F the capacity of each capacitor is

A. $2\mu F$

B. $4\mu F$

C. $8\mu F$

D. $16\mu F$

Answer: B

Watch Video Solution

84. Three capacitors of capacitacnce 1.0, 2.0 and $5.0\mu F$ are connected in series to a 10 V source. The potential difference across the $2.0\mu F$ capacitor is

A. $\frac{100}{17}V$

B. $\frac{20}{17}V$

C. $\frac{50}{17}V$

D. 10 V

Answer: C

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85. Two capacitors of $3\mu F$ and $6\mu F$ are connected in series and a potential difference of 900 V is applied across the combination. They are then disconnected and reconnected in parallel. The potential difference across the combination is

A. Zero

B. 100 V

C. 200 V

D. 400 V

Answer: D

Watch Video Solution

86. Suppose the charge of a proton and an electron differ slightly. One of them is $-e$, the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero. Then Δe is of the order of [Given mass of hydrogen $m_h = 1.67 \times 10^{-27} kg$]

A. $10^{-23} C$

B. $10^{-37} C$

C. $10^{-47} C$

D. $10^{-20} C$

Answer: B

Watch Video Solution

87. An electron falls from rest through a vertical distance h in a uniform and vertically upwards directed electric field E. The direction of electric field is now reversed , keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall proton is

A. smaller.

B. 5 times greater.

C. 10 times greater.

D. equal.

Answer: A

Watch Video Solution

88. The insulated spheres of radii R_1 and R_2 having charges Q_1 and Q_2 respectively are connected to each other. There is

A. no change in the energy of the system.

B. no increase in the energy of the system,

C. always a decrease in the energy of the system

D. a decrease in the energy of the system unless $Q_1 R_2 = Q_2 R_1$

Answer: D

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89. The plates of a parallel plate capacitor are charged up to $100v$. Now, after removing the battery, a $2mm$ thick plate is inserted between the plates Then, to maintain the same potential deffernce, the distance betweem the capacitor plates is increase by $1.6 mm$. The dielectric canstant of the plate is .

A. 5

B. 1.25

C. 4

D. 2.5

Answer: A

Watch Video Solution

90. Force between two identical charges placed at a distance of r in vacuum is F.Now a slab of dielectric constant 4 is inserted between these two charges . If the thickness of the slab is $r/2$, then the force between the charges will becomes

A. $\frac{F}{3}$

B. $\frac{F}{2}$

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

D. $\frac{4F}{9}$

Answer: D

Watch Video Solution

91. Separation between the plates of a parallel plate capacitor is d and the area of each plates is A. When a slab of material of dielectric constant k and thickness $t(t < d)$ is introduced between the plates. Its capacitance becomes

A. $\dfrac{\varepsilon_0 A}{d + t\left(1 - \frac{1}{k}\right)}$

B. $\dfrac{\varepsilon_0 A}{d + t\left(1 + \frac{1}{k}\right)}$

C. $\dfrac{\varepsilon_0 A}{d - t\left(1 - \frac{1}{k}\right)}$

D. $\dfrac{\varepsilon_0 A}{d - t\left(1 + \frac{1}{k}\right)}$

Answer: C

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92. Two identical parallel plate air capacitors are connected in series to a battery of emf V. If one of the capacitor is completely filled with dielectric material of constant K, then potential difference of the other capacitor will become

A. $\dfrac{K}{V(K+1)}$

B. $\dfrac{KV}{K+1}$

C. $\dfrac{K-1}{KV}$

D. $\dfrac{V}{K(+1)}$

Answer: B

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93. Two parallel plate air capacitance of same capacity C are connected in series to a battery of emf E. Then one of the capacitors is completely filled with dielectric material of constant K. The change in the effective capacity of the series combination is

A. $\frac{C}{2}\left[\frac{K-1}{K+1}\right]$

B. $\frac{2}{C}\left[\frac{K-1}{K+1}\right]$

C. $\frac{C}{2}\left[\frac{K+1}{K-1}\right]$

D. $\frac{C}{2}\left[\frac{K-1}{K+1}\right]^2$

Answer: A

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94. A parallel plate capcitor has plate area A and separation d. It is charged to a potential difference V_0. The charging battery is disconnected and the plates are pulled apart to three times the initial separation. The work required to separate the plates is

A. $\dfrac{3\varepsilon_0 A V_0^2}{d}$

B. $\frac{\varepsilon_0 A V_0^2}{2d}$

C. $\frac{\varepsilon_0 A V_0^2}{3d}$

D. $\frac{\varepsilon_0 A V_0^2}{d}$

Answer: D

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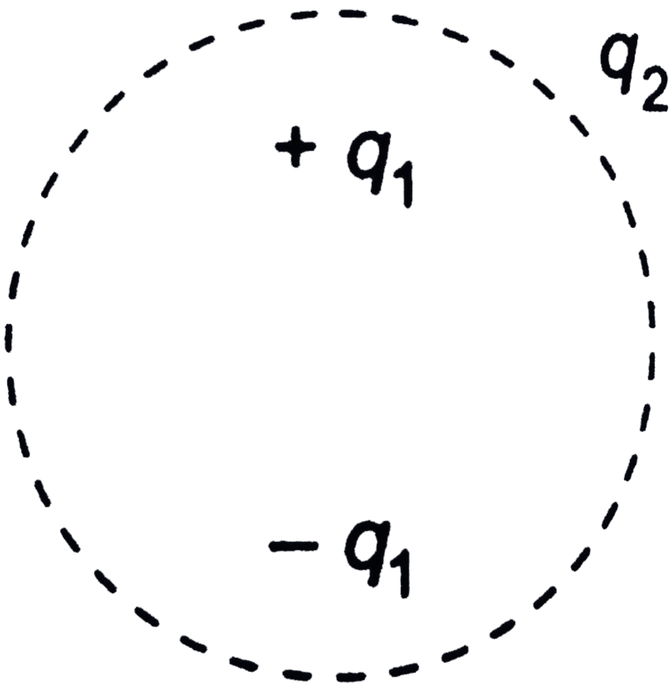
95. Consider the charge configuration and a spherical Gaussian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface, the electric field will be due to.



A. q_2

B. only the positive charges

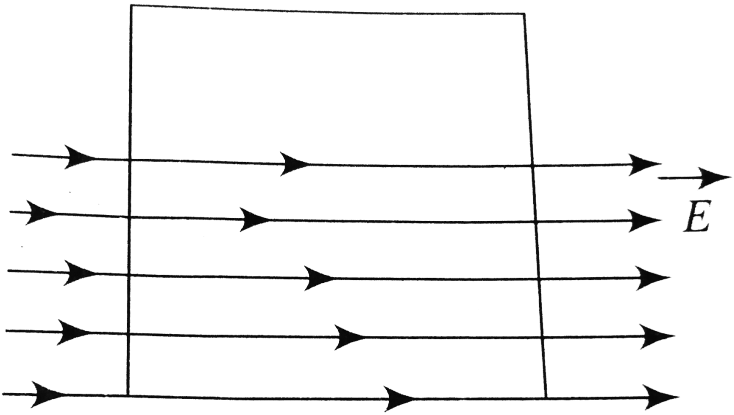
C. all the charges

D. $^{+}q_1 \text{ and } -q_1$

Answer: C

Watch Video Solution

96. A square surface of side Lm is in the plane of the paper. A uniform electric field $\overrightarrow{E}(V/m)$, also in the plane of the paper, is limited only to the lower half of the square surface (see figure). The electric flux in SI units associated with the surface is:



A. zero

B. EL^2

C. $EL^2 / (2\varepsilon_0)$

D. $EL^2 / 2$

Answer: A

Watch Video Solution

97. The electric charges are distributed in a small volume. The flux of the electric field through a spherica surface of radius 10 cm surrounding the total charge is $20V - m$. The flux over a concentric sphere of radius 20 cm will be

A. 20 Vm

B. 25 Vm

C. 40 Vm

D. 200 Vm

Answer: A

Watch Video Solution

98. What is the flux through a cube of side $'a'$ if a point charge of q is at one of its corner :

A. $\frac{2q}{\varepsilon_0}$

B. $\frac{q}{8\varepsilon_0}$

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

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

Answer: B

Watch Video Solution

99. If the charge on a capacitorn is increased by 2C, then the energy stored in it increases by 20 %. The original charge on the capacitor is

A. 10 C

B. 20 C

C. 30 C

D. 40 C

Answer: B

Watch Video Solution

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

A. 45 pF

B. 40. 5 pF

C. 20.25 pF

D. 1.8 pF

Answer: B

Watch Video Solution

101. A parallel plate air capacity 'C' farad, potential 'V' volt and energy 'E' joule . When the gap between the plates is completely filled with dielectric

A. both V and E increase.

B. both V and E decreas.

C. V decreases, E increases,

D. V increases, E decreases.

Answer: B

Watch Video Solution

102. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system:

A. increases by a factor of 4.

B. decreases by a factor of 2.

C. remains the same.

D. increases by a factor of 2.

Answer: B

Watch Video Solution

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

A. remains same.

B. increases two times.

C. dereases two times.

D. increases four times.

Answer: B

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104. A parallel plate air capacitor of capacitance C is connected to a cell of $emFV$ and then disconnected from it. A dielectric slab of dielectric constant K, which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is incorrect ?

A. The potential differnce between the plates decreases K times.

B. The energy stroed in the capacitor decreases K times.

C. The change in energy stored is $\frac{1}{2}CV^2\left(\frac{1}{K}-1\right)$

D. The charge on the capacitor is not conserved.

Answer: D

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105. A $2\mu F$ capacitor is charged to $100V$, and then its plates are connected by a conducting Wire. The heat produced is .

A. 1 J

B. 0.1 J

C. 0.01 J

D. 0.001 J

Answer: C

Watch Video Solution

106. $A 40 \mu F$ capacitor in a defibrillator is charged to $3000V$. The energy stored in the capacitor is sent through the patient during a pulse of duration $2ms$. The power delivered to the patient is

A. 45 kW

B. 90 kW

C. 180 kW

D. 360 kW

Answer: B

Watch Video Solution

107. n small drops of the same size of the same size are charged to V volt each. They coalesce to form a big drop. The potential of the big drop will be

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

B. $n^{1/3}V$

C. nV

D. V/n

Answer: A

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108. If n drops, each of capacitance C and charged to a potential V, coalesce to form a big drop, the ratio of the energy stored in the big drop to that in each small drop will be

A. n:1

B. $n^{4/3}:1$

C. $n^{5/3}:1$

D. $n^2:1$

Answer: C

Watch Video Solution

109. A parallel plate condenser has a unifrom electric field $E(V/m)$ in the space between the plates. If the distance between the plates is $d(m)$ and area of each plate is $A(m^2)$ the energy (joule) stored in the condenser is

A. $\frac{1}{2}\varepsilon_0 E^2 Ad$

B. $\frac{E^2 Ad}{E\varepsilon_0}$

C. $\frac{1}{2}\varepsilon_0 E^2$

D. $\varepsilon_0 EAd$

Answer: A

Watch Video Solution

110. The combined capacity of the parallel combination of two capacitors is four times their combined capacity when connected in series. This means that

A. their capacities are equal

B. their capacities are $1\mu F$ and $2\mu F$

C. their capacities are $0.5\mu F$ and $1\mu F$

D. their capacities are infinite.

Answer: A

Watch Video Solution

111. A slab of material of dielectric constant K has the same area as the plates of a parallel capacitor, but has a thickness $\left(\frac{3}{4}d\right)$,

where d is the separation of the plates. How is the capacitance changed when the slab is inserted between the plates

A. $\frac{3k}{k+4}$

B. $\frac{3}{4}k$

C. $\frac{4k}{k+3}$

D. $\frac{4}{3}k$

Answer: C

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112. A capacitance of $2 \mu F$ is required in an electrical circuit across a potential difference of $1.0 kV$ A large number of $1 \mu F$ capacitors are available which can withstand a potential difference of not more than $300 v$.

The minimum number of capacitors required to achieve this is

A. 24

B. 32

C. 2

D. 16

Answer: B

Watch Video Solution

113. The electric field due to uniformly charged sphere of radius R as a function of the distance from its centre is represented graphically by

A.

B.

C.

D.

Answer: B

Watch Video Solution

114. Energy stored in a condenser of capacity $10uF$, charged to 6kV is used to lift mass of 10 gm. The height to which the body can be raised is (Take $g = 10m / s^2$)

A. $180m$

B. $18m$

C. $1.8m$

D. $1800m$

Answer: D

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115. A thunder cloud and the earth's surface may be regarded as a pair of charged parallel plates separated by a distance h and the capacitance of the system is c. When a flash of mean current 'I' occurs for a time duration 't' the electric field strenght between the cloud and earth reduced by

A. $\frac{\text{it}}{C}$

B. C it

C. $\frac{\text{it}}{Ch}$

D. $\frac{C\text{it}}{h}$

Answer: C

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116. A string is compressed by 2 mm by a force of 8 N and condenser is charged through a potential difference of 200 V possess a charge of 80 microcoulomb the ratio of energy stored in the two bodies is

A. 1

B. $1/2$

C. $3/2$

D. $2/1$

Answer: A

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

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

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

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

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

Answer: C

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118. A sphere of radius R has a charge density σ. The electric intensity at a point at a distance r from its centre is

A. $\sigma r^2 / \varepsilon_0 k R^2$

B. $\sigma t / \varepsilon_0 k R$

C. $\dfrac{\sigma R^2}{\varepsilon_0 k r^2}$

D. $\dfrac{\sigma R}{\varepsilon_0 k r}$

Answer: C

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119. Two capacitors C_1 and C_2 are charged to 120V and 200V respectively. It is found that connecting them together the potential on each one can be made zero. Then

A. $5C_1 = 3C_2$

B. $3C_1 = \ = 5C_2$

C. $3C_1 + 5C_2$

D. $9C_1 = 4C_2$

Answer: B

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120. The radius of the earth is 6400 km. Its capacitance in microfarad is................

A. zero

B. $7.1 \times 10^{-4} F$

C. $6.4 \times 10^{-4} F$

D. $6.4 \times 10^{6} F$

Answer: B

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121. The capacity of an isolated sphere of radius 9 cm is C. When it is connected to an earthed concentric thin hollow sphere of radius R, the capacity becomes 10 C. Then the value of R is

A. 9cm

B. 10 cm

C. 90 cm

D. 100 cm

Answer: B

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

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

A. Assertion is True, Reason is True' Reason is a correct exaplanation for Assertion.

B. Assertion is True, Reason is True' Reason is nota correct exaplanation for Assertion.

C. Assertion is True, Reason is False

D. Assertion, is False, Reason is True.

Answer: C

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123. Assertion: The lightening conductor at the top of high building has sharp pointed ends.

Reason: The surface density of charge at sharp points is very high resulting in setting up of electric wind.

A. Assertion is True, Reason is True' Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True' Reason is nota correct explanation for Assertion.

C. Assertion is True, Reason is False

D. Assertion, is False, Reason is True.

Answer: A

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124. Putting a dielectric substance between two plates of condenser : capacity, potential and potential energy respectively.

A. Increase, decrease, decrease

B. Decrease, increase, increase

C. Increase, decrease, decrease

D. Decrease,decrease,decrease

Answer: A

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Evaluation Test

1. An electric field $\overrightarrow{E} = \left(2\hat{i} + \hat{J}\right)\frac{N}{C}$ exists in space. The potential difference $(V_P - V_Q)$

between two points whose positions vectors

$\overrightarrow{r_P} = \hat{i} + 2\widehat{J}$ and $\overrightarrow{r_Q} = 2\hat{i} + \hat{j} + \hat{k}$ is

A. 1V

B. $-2V$

C. $-3V$

D. $+4V$

Answer: A

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2. Two concentric spherical conducting shells of radii R and 2R are carrying charges q and 2q, respectively. Both are now connected by a conducting wire. Find the change in electric potential (inV) on the outer shell.

A. zero

B. $\frac{KQ}{\mathrm{R}}$

C. $\frac{2KQ}{\mathrm{R}}$

D. $\frac{3kQ}{\mathrm{R}}$

Answer: A

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3. Assertion: Two concentric charged spherical shells are given. The potential difference between the shells depends on charge of inner shell.

Reason: Potential due to charge of outer shell remains same at every point inside the sphere.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is true, Reason is true, Reason is not a correct explanation for Assertion.

C. Assertion is True , Reason is False.

D. Assertion is False, Reason is True.

Answer: A

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4. A charge 2q is placed at the mouth of a conical flask. The electric flux through the flask will be

A. zero

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

C. $\frac{Q}{2\varepsilon_0}$

D. $< \frac{Q}{2\varepsilon_0}$

Answer: B

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5. A wire is bent to form a semi circle such that the radius of the semicircle is R. The charge per unit length is λ. The total electric field at the centre will be

A. $2\lambda / \pi\varepsilon_0 R$

B. $\lambda / 2\pi\varepsilon_0 R$

C. $2\lambda / \pi\varepsilon_0 R^2$

D. $\lambda / \pi\varepsilon_0^2 R$

Answer: B

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6. A spherical distribution of charge density $\rho = \rho_0 \left(1 - r^2 / 9\right)$ exists in the region $0 \leq r \leq 2$. The dielectric constant of the medium is 2. Find the electric field inside the sphere at a distance r from the centre.

A. $\dfrac{\rho_0}{90\varepsilon_0}\left[15r - r^3\right]$

B. $\dfrac{\rho_0}{45\varepsilon_0}\left[5r - 8r^3\right]$

C. $\dfrac{\rho_0}{5\varepsilon_0}\left[45r - 2r^3\right]$

D. $\dfrac{\rho_0}{2\varepsilon_0}\left[3r - 4r^3\right]$

Answer: A

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7. Two concentric cylinder have radii a and 2a. The charges on the cylinders are +q and -q respectively. Two dielectric, each filling half the cylinder length-wise is introduced in between the cylinders. The dielectric constants are K and K/2. The capacitance of the arrangement (consider the innermost and outermost points) is

A. $\dfrac{\pi L\varepsilon_0 K}{ln2}$

B. $\dfrac{\pi L\varepsilon_0 K}{2ln2}$

C. $\dfrac{3\pi L\varepsilon_0 K}{2\ln 2}$

D. $\dfrac{2\pi L\varepsilon_0 K}{\ln 2}$

Answer: C

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8. A solid cyclindrical insulator of uniform density having length 4 and radius 2 contains charge Q. Find the value of the electric field at a distance L along the axis from one end.

(L=length of insulator)

A. $\frac{Q}{16\pi\varepsilon_0}(2-\sqrt{17})$

B. $\frac{Q}{32\pi\varepsilon_0}(2+\sqrt{5})$

C. $\frac{Q}{16\pi\varepsilon_0}(\sqrt{5}-\sqrt{17})$

D. $\frac{Q}{16\pi\varepsilon_0}(2-\sqrt{17}-\sqrt{5})$

Answer: D

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9. A sphere of radius R contains charge density $\rho(r) = A(R - r)$, for $0 < r < R$. The total electric charge inside the sphere is Q.

The value of A in terms of Q and R is

A. $\dfrac{2Q}{\pi R^2}$

B. $\dfrac{3Q}{\pi R^4}$

C. $\dfrac{Q}{\pi R^2}$

D. $\dfrac{5Q}{\pi R^2}$

Answer: B

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10. Electric field is given by $\overrightarrow{E} = \left(8\hat{i} + 4\hat{j} + 3\hat{k}\right) NC^{-1}$. Electric flux through Y-Z plane X-Z plane are in ratio

A. $4 : 3 : 8$

B. $8 : 4 : 3$

C. $3 : 8 : 4$

D. $3 : 4 : 8$

Answer: C

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11. 64 small droplets of the same size are charged to 10V each. They coalesce to form a bigger drop. Potential of the bigger drop is

A. 160V

B. 640V

C. 320V

D. 180V

Answer: A

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12. Two spheres of different capacitancies charged to different potentials when joined by wire. The total energy will

A. increase

B. decrease

C. remains same.

D. decrease

Answer: D

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13. A capacitor of capacitance $5\mu F$ is being charged from a d.c. source of 20V. The capacitance as a function of potential is given by (10V+4) volt. The energy stored on the capacitor is

A. 10400 J

B. 14000 J

C. 10040 J

D. 10000 J

Answer: A

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14. The plates of a charged capacitor are connected to a voltmeter. If the distance between the plates is increased , then the reading of the voltmeter

A. decrease

B. increase

C. remains same.

D. reduces to zero

Answer: B

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