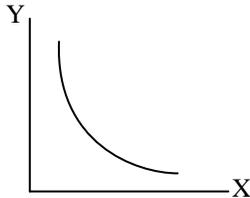


LEVEL # 1

Question based on

Capacitance and Energy

- Q.1** What physical quantities may X and Y represent ?



- (A) pressure v/s temperature of a given gas (constant volume)
(B) kinetic energy v/s velocity of a particle
(C) capacitance v/s charge at a constant potential
(D) potential v/s capacitance at a constant charge
- Q.2** The capacitance of a spherical conductor of radius r is proportional to-
- (A) r (B) $1/r$
(C) r^2 (D) $1/r^3$
- Q.3** The capacitance of a metallic sphere will be $1\mu\text{F}$, if its radius is nearly-
- (A) 9 km (B) 10 m
(C) 1.11 m (D) 1.11 cm
- Q.4** The energy of a charged conductor is given by the expression-
- (A) $\frac{q^2}{2C}$ (B) $\frac{q^2}{C}$
(C) $2qC$ (D) $\frac{q^2}{2C^2}$
- Q.5** No current flows between two charged bodies connected together when they have the same-
- (A) capacitance or Q/V ratio
(B) charge
(C) resistance
(D) potential or Q/C ratio
- Q.6** Which of the following expressions represents a Farad ?
- (A) joule/volt (B) volt / coulomb
(C) coulomb/volt (D) coulomb/joule

- Q.7** Two spherical conductors A and B of radii R and $2R$ respectively are each given a charge Q . When they are connected by a metallic wire. The charge will-
- (A) flow from A to B
(B) flow from B to A
(C) remain stationary on conductor
(D) none of these

- Q.8** The potential energy of a charged conductor of charge (q) and potential (V) is given by-

(A) $\frac{1}{2} qV$ (B) $\frac{1}{2} q^2V$
(C) $\frac{1}{2} \frac{q}{V}$ (D) $\frac{1}{2} qV^2$

- Q.9** A conductor of capacitance $0.5\mu\text{F}$ has been charged to 100 volts. It is now connected to uncharged conductor of capacitance $0.2\mu\text{F}$. The loss in potential energy is nearly -
- (A) $7 \times 10^{-4} \text{ J}$ (B) $3.5 \times 10^{-4} \text{ J}$
(C) $14 \times 10^{-4} \text{ J}$ (D) $7 \times 10^{-3} \text{ J}$

- Q.10** Two spherical conductors of capacitance $3.0\mu\text{F}$ and $5.0\mu\text{F}$ are charged to potentials of 300 volt and 500 volt. The two are connected resulting in redistribution of charges. Then the final potential is -
- (A) 300 volt (B) 500 volt
(C) 425 volt (D) 400 volt

- Q.11** N spherical drops of mercury of equal radii and possessing equal charges combine to form a big spherical drop. Then the capacitance of the bigger drop compared to each individual drop is-
- (A) N times (B) $N^{2/3}$ times
(C) $N^{1/3}$ times (D) $N^{5/3}$ times

Question based on

Parallel plate capacitor

- Q.12** The capacity of a parallel plate condenser is C . Its capacity when the separation between the plates is halved will be-
- (A) $4C$ (B) $2C$ (C) $C/2$ (D) $C/4$

- Q.13** A parallel plate condenser has a capacitance $50\mu\text{F}$ in air and $110\mu\text{F}$. 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
- Q.14** The capacity of a parallel plate condenser is $5\mu\text{F}$. When glass plate is placed between the plates of the conductor, its potential becomes $1/8$ th of the original value. The value of dielectric constant will be -
 (A) 1.6 (B) 5 (C) 8 (D) 40
- Q.15** Capacitance of parallel plate condenser having a medium of dielectric constant K is given by
 (A) $C = QV$
 (B) $C = \frac{KA}{9 \times 10^9 4\pi d}$ farad
 (C) $C = \frac{Kd}{9 \times 10^9 4\pi A}$ farad
 (D) $C = \frac{A}{9 \times 10^9 4\pi Kd}$ farad
- Q.16** The capacity of a parallel plate air condenser is $2\mu\text{F}$. If the distance between the plates is 4cm and the area of each plate is 0.01m^2 , the value of permittivity of air and units are respectively -
 (A) 8×10^{-12} farad metre $^{-1}$
 (B) 5×10^{-13} farad metre $^{-1}$
 (C) 8×10^{-14} farad metre
 (D) 5×10^{-14} farad-metre
- Q.17** If the p.d. across the ends of a capacitor $4\mu\text{F}$ is 1.0 kilovolt. Then its electrical potential energy will be-
 (A) 4×10^{-3} ergs (B) 2 ergs
 (C) 2 joules (D) 4 joules
- Q.18** A $6\mu\text{F}$ capacitor charged from 10 volts to 20 volts. Increase in energy will be -
 (A) 18×10^{-4} joule (B) 9×10^{-4} joule
 (C) 4.5×10^{-4} joule (D) 9×10^{-9} joule
- Q.19** The energy of a charged capacitor resides in
 (A) the electric field only-
 (B) the magnetic field only
 (C) both the electric and magnetic field
 (D) neither in electric nor magnetic field
- Q.20** The capacity and the energy stored in a parallel plate condenser with air between its plates are respectively C_0 and W_0 . If the air is replaced by glass (dielectric constant = 5) between the plates, the capacity of the plates and the energy stored in it will respectively be -
 (A) $5C_0, 5W_0$ (B) $5C_0, \frac{W_0}{5}$
 (C) $\frac{C_0}{5}, 5W_0$ (D) $\frac{C_0}{5}, \frac{W_0}{5}$
- Q.21** By inserting a plate of dielectric material between the plates of a parallel plate capacitor, the energy is increased five times. The dielectric constant of the material is -
 (A) $1/25$ (B) $1/5$ (C) 5 (D) 25
- Q.22** A capacitor of capacity C has charge Q and stored energy is W . If the charge is increased to $2Q$ the stored energy will be -
 (A) $2W$ (B) $W/2$ (C) $4W$ (D) $W/4$
- Q.23** A glass slab is put with in the plates of a charged parallel plate condenser. Which of the following quantities does not change?
 (A) energy of the condenser
 (B) capacity
 (C) intensity of electric field
 (D) charge
- Q.24** A parallel plate capacitor is connected to a battery and inserted a dielectric plate between the place of plates then which quantity increase-
 (A) potential difference
 (B) electric field
 (C) stored energy
 (D) E . M . F of battery

- Q.25** A parallel plate capacitor is connected to a battery and decreased the distance between the plates then which quantity is same on the parallel plate capacitor-
 (A) potential difference
 (B) capacitance
 (C) intensity of electric field
 (D) stored energy
- Q.26** A parallel plate capacitor is charged by a battery after charging the capacitor, battery is disconnected. And if a dielectric plate is inserted between the place of plates. Then which one of the following statements is not correct-
 (A) increase in the stored energy
 (B) decrease in the potential difference
 (C) decrease in the electric field
 (D) increase in the capacitance
- Q.27** A parallel plate capacitor has a capacity C. The separation between plates is doubled and a dielectric medium is inserted between plates. The new capacity is 3C. The dielectric constant of medium is-
 (A) 1.5 (B) 3.0
 (C) 6.0 (D) 12.0
- Q.28** A parallel plate capacitor is charged by a battery after charging the capacitor, battery is disconnected and decrease the distance between the plates then which following statement is correct ?
 (A) electric field is not constant
 (B) potential difference is increased
 (C) decrease the capacitance
 (D) decrease the stored energy
- Q.29** The capacitance of a parallel plate condenser does not depend upon-
 (A) the distance between the plates
 (B) area of the plates
 (C) medium between the plates
 (D) metal of the plates
- Q.30** A metallic plate of thickness (t) and face area of one side (A) is inserted between the plates of a parallel plate air capacitor with a separation (d) and face area (A). Then the equivalent capacitance is -
 (A) $\frac{\epsilon_0 A}{d}$ (B) $\frac{\epsilon_0 A}{(d \times t)}$
 (C) $\frac{\epsilon_0 A}{(d - t)}$ (D) $\frac{\epsilon_0 A}{(d + t)}$
- Q.31** An air capacitor of $1\mu\text{F}$ is immersed in a transformer oil of dielectric constant 3. The capacitance of the oil capacitor is-
 (A) $1\mu\text{F}$ (B) $\frac{1}{3}\mu\text{F}$
 (C) $3\mu\text{F}$ (D) $2\mu\text{F}$
- Q.32** Two metal plates form a parallel plate condenser. The distance between the plates is d. Now a metal plate of thickness $d/2$ and of same area is inserted completely between the plates, the capacitance -
 (A) remains unchanged
 (B) is doubled
 (C) is halved
 (D) reduced to one fourth
- Q.33** The capacity of a parallel plate capacitor with air as medium is $2\mu\text{F}$. After inserting a sheet of mica in whole space, it becomes $5\mu\text{F}$. The dielectric constant of mica is -
 (A) 0.1 (B) 0.4
 (C) 2.5 (D) 10
- Q.34** A parallel plate capacitor has rectangular plates of 400 cm^2 and are separated by a distance of 2 mm with air as medium. What charge will appear on the plates. If a 200 volt potential difference is applied across the condenser?
 (A) $3.54 \times 10^{-6}\text{ C}$ (B) $3.54 \times 10^{-8}\text{ C}$
 (C) $3.54 \times 10^{-10}\text{ C}$ (D) $1770.8 \times 10^{-13}\text{ C}$
- Q.35** A parallel plate condenser is immersed in an oil of dielectric constant 2. The field between the plates is-
 (A) increased proportional to 2.
 (B) decreased proportional to $1/2$
 (C) increased proportional to $\sqrt{2}$
 (D) decreased proportional to $1/\sqrt{2}$
- Q.36** A parallel plate capacitor consists of two plates of $2\text{m} \times 1\text{m}$. The space between the plates is of 1mm and filled with a dielectric of relative permittivity of 7. A potential difference of 300 volts is applied across the plates. Find the potential gradient -
 (A) $6 \times 10^5\text{ N/C}$ (B) $3 \times 10^5\text{ N/C}$
 (C) $18 \times 10^5\text{ N/C}$ (D) $12 \times 10^5\text{ N/C}$

- Q.37** The energy of a charged capacitor resides in -
 (A) the electric field only
 (B) the magnetic field only
 (C) both the electric and magnetic fields
 (D) neither in electric nor magnetic field
- Q.38** Two conductors insulated from each other, charged by transferring electrons from one conductor to the other. After 25×10^{12} electrons have been transferred. The potential difference between the conductors is found to be 16V. The capacitance of the system is -
 (A) $25\mu\text{F}$ (B) $0.25\mu\text{F}$
 (C) 25 nF (D) 25 PF
- Q.39** The energy density in a parallel plate capacitor is given as $2.2 \times 10^{-10}\text{ J/m}^3$. The value of the electric field in the region between the plates is -
 (A) 7 NC^{-1} (B) 3.6 NC^{-1}
 (C) 72 NC^{-1} (D) 8.4 NC^{-1}
- Q.40** If a $10\mu\text{F}$ capacitor is to have an energy content of 1 Joule. It must be placed across a p.d. of (in volts) -
 (A) 900 (B) 450×10^8
 (C) 200 (D) 450
- Q.41** A capacitor of capacitance $\frac{1}{3}\mu\text{F}$ is connected to a battery of 300 volt and charged. Then the energy stored in capacitor is -
 (A) $3 \times 10^{-2}\text{ joule}$ (B) $1.5 \times 10^{-2}\text{ joule}$
 (C) $6 \times 10^2\text{ joule}$ (D) $12 \times 10^2\text{ joule}$
- Q.42** The two parallel plates of a condenser have been connected to a battery of 300V and the charge collected at each plate is $1\mu\text{C}$. The energy supplied by battery is -
 (A) $6 \times 10^{-4}\text{ J}$ (B) $3 \times 10^{-4}\text{ J}$
 (C) $1.5 \times 10^{-4}\text{ J}$ (D) $4.5 \times 10^{-4}\text{ J}$
- Q.43** The plates of a parallel plate capacitor are charged with a battery so that the plates of the capacitor have acquired the P.D. equal to e.m.f of the battery. The ratio of the work done by the battery and the energy stored in capacitor is -
 (A) 2 : 1 (B) 1 : 1
 (C) 1 : 2 (D) 1 : 4

- Q.44** A parallel plate condenser has plates of area 200 cm^2 and separation 0.05cm has been filled with a dielectric having $K = 8$ and then charged to 300volts. The final energy of condenser is -
 (A) $1.6 \times 10^{-5}\text{ J}$ (B) $2.0 \times 10^{-6}\text{ J}$
 (C) $12.8 \times 10^{-5}\text{ J}$ (D) $64 \times 10^{-5}\text{ J}$

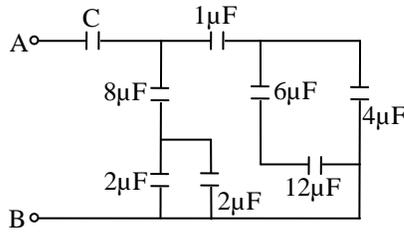
Question based on

Combination of capacitors

- Q.45** Three capacitors of capacity C_1, C_2, C_3 are connected in series. Their total capacity will be -
 (A) $C_1 + C_2 + C_3$ (B) $\frac{1}{(C_1 + C_2 + C_3)}$
 (C) $(C_1^{-1} + C_2^{-1} + C_3^{-1})$ (D) none of these
- Q.46** Three capacitors each of capacitance $1\mu\text{F}$ are connected in parallel. To this combination a fourth capacitor of capacitance $1\mu\text{F}$ connected in series. The resultant capacitance of the system is -
 (A) $4\mu\text{F}$ (B) $2\mu\text{F}$
 (C) $4/3\mu\text{F}$ (D) $3/4\mu\text{F}$
- Q.47** Two capacitances of capacity C_1 and C_2 are connected in series and potential difference V is applied across it. Then the potential difference across C_1 will be -
 (A) $V \frac{C_2}{C_1}$ (B) $V \frac{C_1 + C_2}{C_1}$
 (C) $V \frac{C_2}{C_1 + C_2}$ (D) $V \frac{C_1}{C_1 + C_2}$
- Q.48** Two condensers of capacities $1\mu\text{F}$ and $2\mu\text{F}$ are connected in series and system charged to 120 volts. Then the P.D on $1\mu\text{F}$ capacitor (in volts) will be -
 (A) 40 (B) 60 (C) 80 (D) 120
- Q.49** Two condensers of capacity $0.3\mu\text{F}$ and $0.6\mu\text{F}$ respectively are connected in series. The combination is connected across a potential of 6 volts. The ratio of energies stored by the condensers will be -
 (A) 1/2 (B) 2
 (C) 1/4 (D) 4

- Q.50** Three capacitors $C_a < C_b < C_c$ are connected in series. Their resultant capacitance will be-
- (A) equivalent capacitance greater than C_c
 (B) equivalent capacitance less than C_c but greater than C_a
 (C) equivalent capacitance less than C_a
 (D) equivalent capacitance is infinite

- Q.51** In the following circuit the resultant capacitance between A and B is $1\mu\text{F}$. Then value of C is-

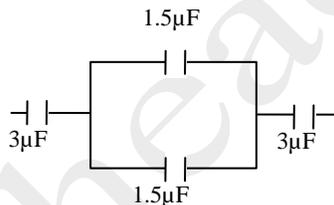


- (A) $\frac{32}{11} \mu\text{F}$ (B) $\frac{11}{32} \mu\text{F}$
 (C) $\frac{23}{32} \mu\text{F}$ (D) $\frac{32}{23} \mu\text{F}$

- Q.52** The condensers of capacity C_1 and C_2 are connected in parallel, then the equivalent capacitance is -

- (A) $C_1 + C_2$ (B) $\frac{C_1 C_2}{C_1 + C_2}$
 (C) C_1 / C_2 (D) C_2 / C_1

- Q.53** The equivalent capacity in the system of capacitance will be-



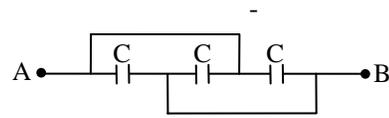
- (A) $1\mu\text{F}$ (B) $2\mu\text{F}$ (C) $1.5 \mu\text{F}$ (D) $3\mu\text{F}$

- Q.54** Three capacitors of capacitance $3\mu\text{F}$, $9\mu\text{F}$ and $18\mu\text{F}$ are connected once 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 -

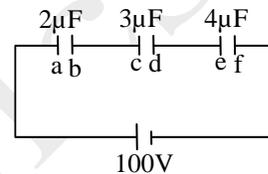
- (A) 1 : 15 (B) 15 : 1 (C) 1 : 1 (D) 1 : 3

- Q.55** Three equal capacitors, each with capacitance C are connected as shown in figure. Then the equivalent capacitance between A and B is



- (A) C (B) $3C$
 (C) $C/3$ (D) $3C/2$

- Q.56** Three capacitors are connected to D.C. source of 100 volts as shown in the adjoining figure. If the charge accumulated on plates of C_1 , C_2 and C_3 are q_a , q_b , q_c , q_d , q_e , q_f respectively then -



- (A) $q_b + q_d + q_f = 100/9 \text{ Cou.}$
 (B) $q_b + q_d + q_f = 0$
 (C) $q_a + q_c + q_e = 50 \text{ Cou.}$
 (D) $q_b = q_d = q_f$

- Q.57** A capacitor $C_1 = 4\mu\text{F}$ is connected in series with another capacitor $C_2 = 1\mu\text{F}$. The combination is connected across a d.c. source of voltage 200V. The ratio of potential across C_1 and C_2 is -

- (A) 1 : 4 (B) 4 : 1
 (C) 1 : 2 (D) 2 : 1

- Q.58** Two condensers of 20 and 30 microfarads are connected in series across a 200 volt D.C. supply. Find the charge on each condenser ?

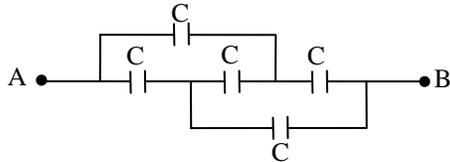
- (A) $2400 \mu\text{C}$ (B) $4200 \mu\text{C}$
 (C) $2600 \mu\text{C}$ (D) $3000 \mu\text{C}$

- Q.59** Two condensers of capacities C_1 and C_2 respectively are connected in parallel. The equivalent capacitance of the system is -

- (A) $C_1 + C_2$ (B) $\frac{C_1 C_2}{C_1 + C_2}$
 (C) $C_1 - C_2$ (D) $\frac{1}{C_1} + \frac{1}{C_2}$

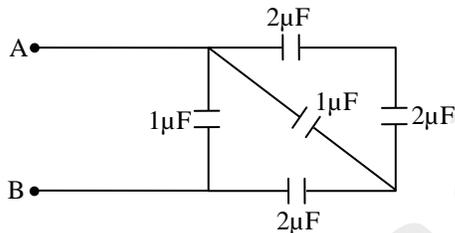
- Q.60** The three condensers of capacitances 10, 20 and $30\mu\text{F}$ are first connected in series and then connected in parallel. The ratio of the resultant capacitance in the two cases is -
 (A) 1 : 11 (B) 11 : 1
 (C) 1 : 6 (D) 6 : 1

- Q.61** Five equal capacitors, each with capacitance (C) are connected as shown in the adjoining fig. Then the equivalent capacitance between A and B is -



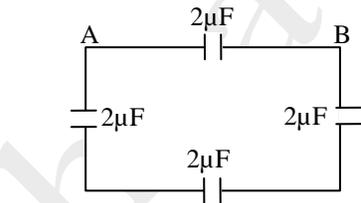
- (A) C (B) 5C (C) C/5 (D) 3C

- Q.62** The total capacity of the system of capacitors shown in adjoining figure between the points A and B is -



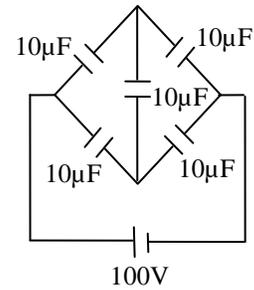
- (A) $1\mu\text{F}$ (B) $2\mu\text{F}$
 (C) $3\mu\text{F}$ (D) $4\mu\text{F}$

- Q.63** The equivalent capacitance between the points A and B in the given diagram is -



- (A) $8\mu\text{F}$ (B) $6\mu\text{F}$
 (C) $\frac{8}{3}\mu\text{F}$ (D) $\frac{3}{8}\mu\text{F}$

- Q.64** Five capacitors of $10\mu\text{F}$ capacitor each are connected to a D.C. potential of 100 volts as shown in the adjoining figure. The equivalent capacitance between the points A and B will be equal to-



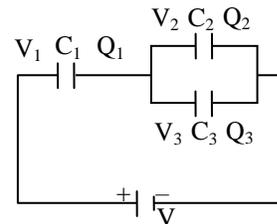
- (A) $40\mu\text{F}$ (B) $20\mu\text{F}$
 (C) $30\mu\text{F}$ (D) $10\mu\text{F}$

- Q.65** Three capacitors of capacity $10\mu\text{F}$, $5\mu\text{F}$ and $5\mu\text{F}$ are connected in parallel. The total capacity will be -
 (A) $10\mu\text{F}$ (B) $5\mu\text{F}$
 (C) $20\mu\text{F}$ (D) none of the above

- Q.66** Two capacitors connected in parallel having the capacities C_1 and C_2 are given 'q' charge, which is distributed among them. The ratio of the charge on C_1 and C_2 will be -

- (A) $\frac{C_1}{C_2}$ (B) $\frac{C_2}{C_1}$
 (C) $C_1 C_2$ (D) $\frac{1}{C_1 C_2}$

- Q.67** In an adjoining figure are shown three capacitors C_1 , C_2 and C_3 joined to battery. The correct condition will be-



- (A) $Q_1 = Q_2 = Q_3$ and $V_1 = V_2 = V_3 = V$
 (B) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2 + V_3$
 (C) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2$
 (D) $Q_2 = Q_3$ and $V_2 = V_3$

(Symbols have their usual meanings)

- Q.68** Two capacitors of equal capacity are first connected in parallel and then in series. The ratio of the total capacities in the two cases will be -

- (A) 2 : 1 (B) 1 : 2
 (C) 4 : 1 (D) 1 : 4

Q.69 A $4\mu\text{F}$ condenser is connected in parallel to another condenser of $8\mu\text{F}$. Both the condensers are then connected in series with a $12\mu\text{F}$ condenser and charged to 20 volts. The charge on the plate of $4\mu\text{F}$ condenser is-

(A) $3.3\ \mu\text{C}$ (B) $40\ \mu\text{C}$
 (C) $80\ \mu\text{C}$ (D) $240\ \mu\text{C}$

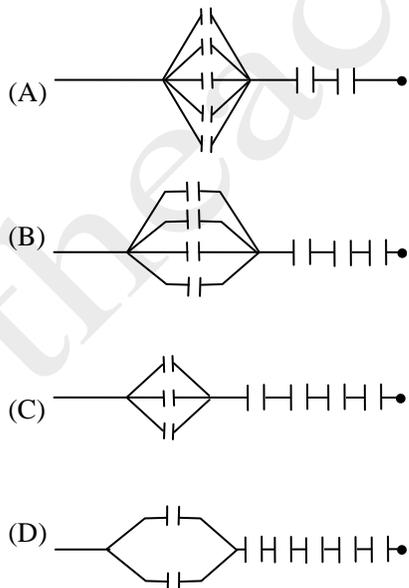
Q.70 If three capacitors each of capacity $1\mu\text{F}$ are connected in such a way that the resultant capacity is $1.5\mu\text{F}$ then-

(A) all the three are connected in series
 (B) all the three are connected in parallel
 (C) two of them are in parallel and then connected in series to the third
 (D) two of them are in series and then connected in parallel to the third

Q.71 Two capacitors each of capacity $2\mu\text{F}$ are connected in parallel. This system is connected in series with a third capacitance of $12\mu\text{F}$ capacity . The equivalent capacity of the system will be-

(A) $16\mu\text{F}$ (B) $13\ \mu\text{F}$
 (C) $4\mu\text{F}$ (D) $3\ \mu\text{F}$

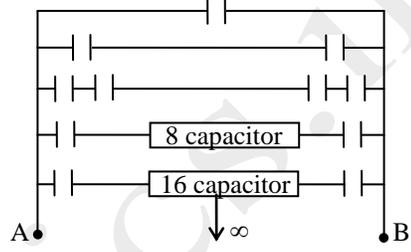
Q.72 Seven capacitors each of capacitance $2\mu\text{F}$ are to be so connected to have total capacity $\frac{10}{11}\mu\text{F}$. Which will be the necessary figure as shown-



Q.73 Two capacitor each of $1\mu\text{F}$ capacitance are connected in parallel and are then charged by 200 volts D.C. supply. The total energy of their charges (in joules is)-

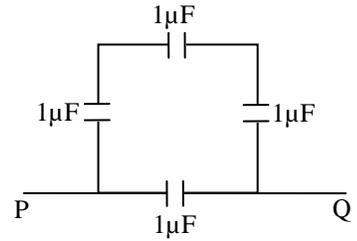
(A) 0.01 (B) 0.02
 (C) 0.04 (D) 0.06

Q.74 An infinite number of identical capacitors each of capacitance $1\mu\text{F}$ are connected as in adjoining figure. Then the equivalent capacitance between A and B is-



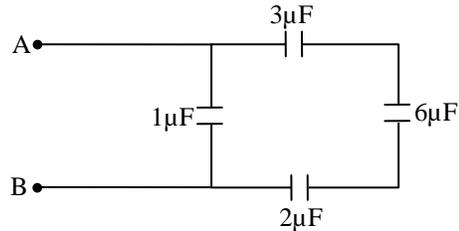
(A) $1\mu\text{F}$ (B) $2\mu\text{F}$
 (C) $1/2\mu\text{F}$ (D) ∞

Q.75 Four capacitors are connected as shown in the fig. The equivalent capacitance between the points P and Q is-



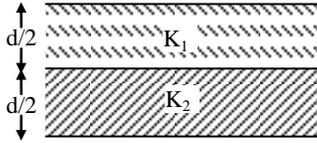
(A) $4\mu\text{F}$ (B) $1/4\ \mu\text{F}$
 (C) $3/4\ \mu\text{F}$ (D) $4/3\ \mu\text{F}$

Q.76 The total capacity of the system of capacitors shown in the adjoining figure between the points A and B will be-



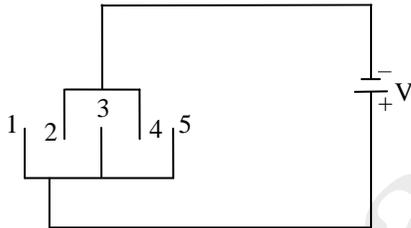
(A) $1\mu\text{F}$ (B) $2\mu\text{F}$
 (C) $3\mu\text{F}$ (D) $4\mu\text{F}$

Q.77 Two dielectric slabs of constant K_1 and K_2 have been filled in between the plates of a capacitor as shown below. What will be the capacitance of the capacitor -



- (A) $\frac{2\epsilon_0 A}{d} (K_1 + K_2)$ (B) $\frac{2\epsilon_0 A}{d} \left(\frac{K_1 + K_2}{K_1 \times K_2} \right)$
 (C) $\frac{d}{2\epsilon_0 A}$ (D) $\frac{2\epsilon_0 A}{d} \left(\frac{K_1 \times K_2}{K_1 + K_2} \right)$

Q.78 Five identical plates each of area A are joined as shown in the figure. The distance between the plates is d . The plates are connected to a p.d. of V volts. The charges on plates 1 and 4 will be-



- (A) $\frac{\epsilon_0 AV}{d}, \frac{2\epsilon_0 AV}{d}$
 (B) $\frac{-\epsilon_0 AV}{d}, \frac{2\epsilon_0 AV}{d}$
 (C) $\frac{\epsilon_0 AV}{d}, \frac{-2\epsilon_0 AV}{d}$
 (D) $\frac{-\epsilon_0 AV}{d}, \frac{-2\epsilon_0 AV}{d}$

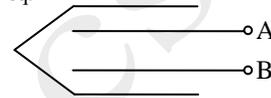
Q.79 A parallel plate capacitor with air as medium between the plates has a capacitance of $10\mu\text{F}$. The area of capacitor is divided into two equal halves and filled with two media having dielectric constant $K_1 = 2$ and $K_2 = 4$. The capacitance of the system will now be-

(A) $10\mu\text{F}$ (B) $20\mu\text{F}$
 (C) $30\mu\text{F}$ (D) $40\mu\text{F}$

Q.80 Separation between the plates of a parallel plate capacitor is d and the area of each plate is A . When a slab of material of dielectric constant K and thickness t ($t < d$) is introduced between the plates, its capacitance becomes-

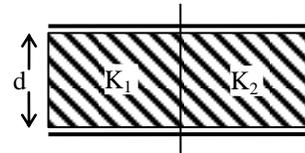
- (1) $\frac{\epsilon_0 A}{d+t\left(1-\frac{1}{K}\right)}$ (B) $\frac{\epsilon_0 A}{d+t\left(1+\frac{1}{K}\right)}$
 (C) $\frac{\epsilon_0 A}{d-t\left(1-\frac{1}{K}\right)}$ (D) $\frac{\epsilon_0 A}{d-t\left(1+\frac{1}{K}\right)}$

Q.81 If area of each plate is A and plates are separated from each other by a distance d then C_{eq} between A and B is -



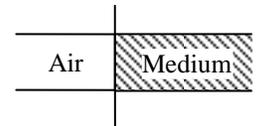
- (A) $\frac{3\epsilon_0 A}{d}$ (B) $\frac{\epsilon_0 A}{3d}$
 (C) $\frac{3\epsilon_0 A}{2d}$ (D) $\frac{2\epsilon_0 A}{3d}$

Q.82 The capacitance of a capacitor, filled with two dielectrics of same dimensions but of dielectric constants K_1 and K_2 respectively as shown will be -



- (A) $\frac{\epsilon_0 A}{2d} (K_1 + K_2)$
 (B) $\frac{\epsilon_0 A}{d} (K_1 + K_2)$
 (C) $\frac{\epsilon_0 A}{2d} \left(\frac{K_1 K_2}{K_1 + K_2} \right)$
 (D) $\frac{\epsilon_0 A}{d} \left(\frac{K_1 K_2}{K_1 + K_2} \right)$

Q.83 The capacitance of a parallel plate capacitor is $2.5\mu\text{F}$. When it is half filled with a dielectric as shown in the figure. Its capacitance becomes $5\mu\text{F}$, the dielectric constant of the dielectric is-



- (A) 7.5 (B) 3.0
(C) 0.33 (D) 4.0

Question based on

Spherical capacitor

- Q.84** The capacitance of a spherical condenser is $1\mu\text{F}$. If the spacing between the two spheres is 1mm, then the radius of the outer sphere is-
- (A) 30cm (B) 6 m
(C) 5 cm (D) 3m
- Q.85** The capacitance (C) for an isolated conducting sphere of radius (a) is given by $4\pi\epsilon_0 a$. If the sphere is enclosed with an earthed concentric sphere. The ratio of the sphere being $(n/n-1)$ then the capacitance of such a sphere will be increased by a factor -
- (A) n (B) $n/(n-1)$
(C) $(n-1)/n$ (D) a.n
- Q.86** A_1 is a spherical conductor of radius (r) placed concentrically inside a thin spherical hollow conductor A_2 of radius (R). A_1 is earthed and A_2 is given a charge +Q then the charge on A_1 is -
- (A) -Q (B) Qr/R
(C) $-rQ/R$ (D) $-Q(R-r)/R$
- Q.87** Two spherical conductors A_1 and A_2 of radii (r_1) and (r_2) ($r_2 > r_1$) are placed concentrically in air. A_1 is given a charge +Q while A_2 is earthed. Then the capacitance of the system is -
- (A) $4\pi\epsilon_0 \frac{r_1 \cdot r_2}{r_2 - r_1}$ (B) $4\pi\epsilon_0 (r_1 + r_2)$
(C) $4\pi\epsilon_0 \cdot r_2$ (D) $4\pi\epsilon_0 \frac{r_2^2}{r_2 - r_1}$

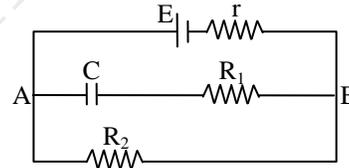
Question based on

Charging & discharging

- Q.88** A capacitor of capacitance $100\mu\text{F}$ is charged by connecting it to a battery of emf 12V and internal resistance 2Ω . The time taken before 99% of the maximum charge is stored on the capacitor-
- (A) 0.92 ms (B) 0.4 ms
(C) 0.8 ms (D) 0.1 ms

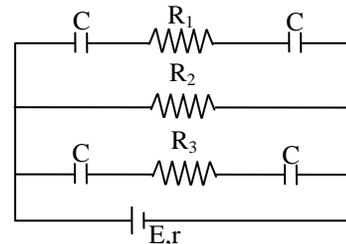
- Q.89** A capacitor of capacitance $0.1\mu\text{F}$ is charged to certain potential and allow to discharge through a resistance of $10\text{M}\Omega$. How long will it take for the potential to fall to one half of its original value-
- (A) 0.1s (B) 0.2346 s
(C) 1.386 s (D) 0.693 s
- Q.90** A $500\mu\text{F}$ capacitor is charged at a steady rate of $100\mu\text{C}/\text{sec}$. The potential difference across the capacitor will be 10V after an interval of-
- (A) 5 sec. (B) 20 sec.
(C) 25 sec. (D) 50 sec.
- Q.91** A CR series circuit is connected to a battery of e.m.f E. The time required by the capacitor to acquire maximum charge, depends upon -
- (A) R only
(B) C only
(C) RC
(D) applied potential difference

- Q.92** Calculate the charge on the plates of the capacitor C in the given circuit -



- (A) $C \times \frac{ER_2}{R_2 + r}$ (B) $C \times \frac{ER_1}{R_1 + r}$
(C) $C \times \frac{ER_1 \cdot R_2}{R_1 + R_2}$ (D) $C \times \frac{ER_1}{R_2 + r}$

- Q.93** In the adjoining circuit diagram $E = 5$ volt, $r = 1$ ohm, $R_2 = 4$ ohm, $R_1 = R_3 = 1$ ohm and $C = 3\mu\text{F}$. Then the numerical value of the charge on each plate of the capacitor is -



- (A) $24\mu\text{C}$ (B) $12\mu\text{C}$
(C) $6\mu\text{C}$ (D) $3\mu\text{C}$

- Q.94** Two condensers of capacities $2C$ and C are joined in parallel and charged upto potential V . The battery is removed and the condenser of capacity C is filled completely with a medium of dielectric constant K . The p.d. across the capacitors will now be -
- (A) $\frac{3V}{K+2}$ (B) $\frac{3V}{K}$
(C) $\frac{V}{K+2}$ (D) $\frac{V}{K}$
- Q.95** $0.2F$ capacitor is charged to $600V$ by a battery. On removing the battery. It is connected with another parallel plate condenser ($1.0F$). The potential decreases to-
- (A) 100 volts (B) 120 volts
(C) 300 volts (D) 600 volts
- Q.96** A $0.01\mu F$ capacitor is charged to a potential of $500V$. It is then connected to an instrument of input capacitance $1.0\mu F$. The p.d across the instrument in V is now-
- (A) 1.00 (B) 4.95
(C) 5.00 (D) 50.0
- Q.97** A condenser of capacitance $10\mu F$ has been charged to $100V$. It is now connected to another uncharged condenser. The common potential becomes $40V$. The capacitance of another condenser is -
- (A) $5\mu F$ (B) $10\mu F$
(C) $15\mu F$ (D) $20\mu F$
- Q.98** A capacitor having capacitance C is charged to a voltage V . It is then removed and connected in parallel with another identical capacitor which is uncharged. The new charge on each capacitor is now-
- (A) CV (B) $CV/2$
(C) $2CV$ (D) $CV/4$
- Q.99** Two capacitors of capacities C_1 and C_2 are charged to voltages V_1 and V_2 respectively. There will be no exchange of energy in connecting them in parallel. If-
- (A) $C_1 = C_2$ (B) $C_1V_1 = C_2V_2$
(C) $V_1 = V_2$ (D) $\frac{C_1}{V_1} = \frac{C_2}{V_2}$

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