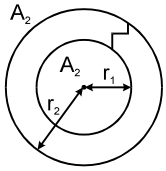
JEE MAIN : CHAPTER WISE TEST PAPER-2

SUBJECT :- PHYSICS **DATE.....**
CLASS :- 12th **NAME.....**
CHAPTER :- CAPACITANCE **SECTION.....**

(SECTION-A)

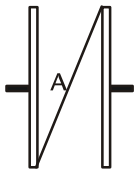
1. Two spherical conductors A_1 and A_2 of radii r_1 and r_2 are placed concentrically in air. The two are connected by a copper wire as shown in figure. Then the equivalent capacitance of the system is



(A) $\frac{4\pi\varepsilon_0 k\, r_1 r_2}{r_2 - r_1}$ (B) $4\pi\in_0 (r_1 + r_2)$

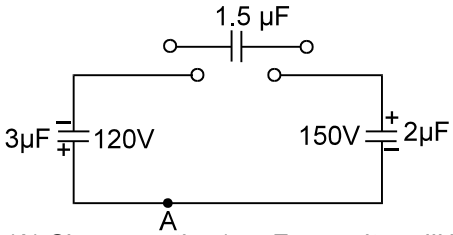
(C) $4\pi\in_0 r_2$ (D) $4\pi\in_0 r_1$

2. A parallel plate capacitor of capacitance C is as shown. A thin metal plate A is placed between the plates of the given capacitor in such a way that its edges touch the two plates as shown. The capacity now be comes.



(A) 0 (B) 3C (C) 4C (D) ∞

3. Two capacitors of 2 μF & 3 μF are charged to 150 volt & 120 volt respectively. The plates of a capacitor are connected as shown in the fig. A discharged capacitor of capacity 1.5 μF falls to the free ends of the wire and connected through the free ends of the wire, Then :



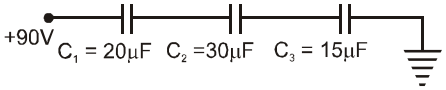
(A) Charge on the 1.5 μF capacitor will become 150 μC at steady state.

(B) Charge on the 2 μF capacitor will become 100 μC at steady state.

(C) Positive charge flows through point A from left to right.

(D) Positive charge flows through point A from right to left.

4. We have a combination as shown in following figure. Choose the wrong options :



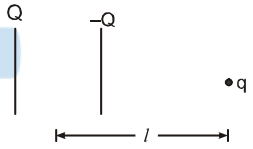
(A) Total charge in this series combination is 600 μC

(B) The potential difference between the plates of C_1 is 30 V

(C) The potential difference between the plates of C_2 is 20 V

(D) The potential difference between the plates of C_3 is 10 V

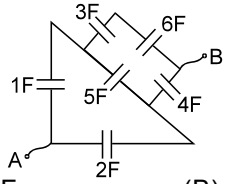
5. The plates of small size of a parallel plate capacitor are charged as shown . The force on the charged particle of 'q' at a distance ' ℓ ' from the capacitor is : (Assume that the distance between the plates is d << ℓ)



(A) zero (B) $\frac{Qqd}{2\pi\in_0 \ell^3}$

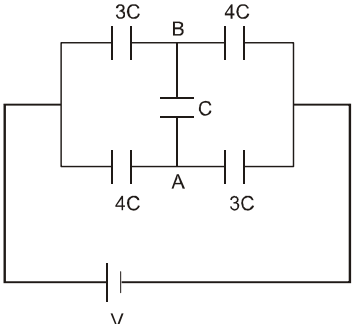
(C) $\frac{Qqd}{\pi\in_0 \ell^3}$ (D) $\frac{Qqd}{4\pi\in_0 \ell^3}$

6. In the figure shown the equivalent capacitance between 'A' and 'B' is :



(A) 3.75 F (B) 2 F
(C) 21 F (D) 16 F

7. Consider the given circuit.



if $V_A - V_B$ = 3 volt, potential different across the terminals of battery is :

(A) 18 volt (B) 9 volt
(C) 27 volt (D) 36 volt

8. The radii of two metallic spheres are 5 cm and 10 cm and both carry equal charge of 75μC. If the two spheres are shorted then charge will be transferred–
(A) 25 μC from smaller to bigger
(B) 25 μC from bigger to smaller
(C) 50 μC from smaller to bigger
(D) 50 μC from bigger to smaller

9. Stored energy in a charged conductor is
(A) $\frac{1}{2}CV^2$ (B) $\frac{1}{2}Q^2V^2$
(C) $\frac{1}{2}\frac{Q^2}{C^2}$ (D) $\frac{1}{2}\frac{Q}{C^2}$

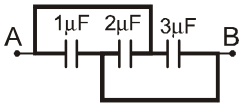
10. If the energy of a capacitor of capacitance 2μF is 0.16 joule, then its potential difference will be
(A) 800 V (B) 400 V
(C) 16×10^4 V (D) 16×10^{-4} V

11. The work done against electric forces in increasing the potential difference of a condenser from 20V to 40V is W. The work done in increasing its potential difference from 40V to 50V will be
(A) 4W (B) $\frac{3W}{4}$ (C) 2W (D) $\frac{W}{2}$

12. A capacitor of capacitance $10\mu F$ is charged to a potential of 100 V. Now connecting it in parallel with an uncharged capacitor, the resultant potential difference becomes 40 volt. The capacitance of this capacitor is
(A) $2.5\mu F$ (B) $5\mu F$
(C) $10\mu F$ (D) $15\mu F$

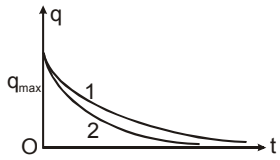
13. Two conducting spheres of capacitances $3\mu F$ and $5\mu F$ are charged to 300 V and 500 V respectively and are connected together. The common potential in steady state will be
(A) 400 V (B) 425 V
(C) 350 V (D) 375 V

14. The equivalent capacitance between A and B of the combination, shown in the figure, will be



(A) $1.5\mu F$ (B) $3.0\mu F$
(C) $\frac{6}{11}\mu F$ (D) $6\mu F$

15. The instantaneous charge on capacitor in two discharging RC circuits is plotted with respect to time in figure. Choose the correct statement(s) (where E_1 and E_2 are emfs of two DC sources in two different charging circuits and capacitor are fully charged).



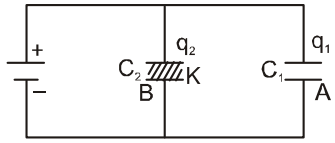
(A) $R_1C_1 < R_2C_2$ (B) $\frac{R_1}{R_2} < \frac{C_2}{C_1}$
(C) $R_1 > R_2$ if $E_1 = E_2$ (D) $C_2 > C_1$ if $E_1 = E_2$

16. The distance between the plates of a parallel plate condenser is d. If a copper plate of same area but thickness $\frac{d}{2}$ is placed between the plates then the new capacitance will become-
(A) half (B) double
(C) one fourth (D) unchanged

17. In the above problem if the battery is disconnected before placing the plate, then new energy will be–
(A) K^2U_0 (B) $\frac{U_0}{K^2}$ (C) $\frac{U_0}{K}$ (D) KU_0

18. To reduce the capacitance of a parallel plate capacitor, the space between the plates is
(A) filled with dielectric material
(B) reduced and area of the plates is increased
(C) increased and area of the plates is decreased
(D) increased and area is increased relatively

19. In the adjoining diagram two geometrically identical capacitors A and B are connected to a battery. Air is filled between the plates of C_1 and a dielectric is filled between the plates of C_2, then -



(A) $q_1 < q_2$ (B) $q_1 > q_2$
(C) $q_1 = q_2$ (D) None of these

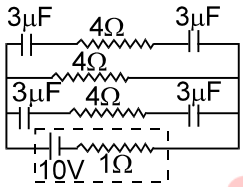
20. **STATEMENT-1 :** If the potential difference across a plane parallel plate capacitor is doubled then the potential energy of the capacitor becomes four times under all conditions.
STATEMENT-2 : The potential energy U stored in the capacitor is $U = \frac{1}{2}CV^2$, where C and V have usual meaning.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

(SECTION-B)

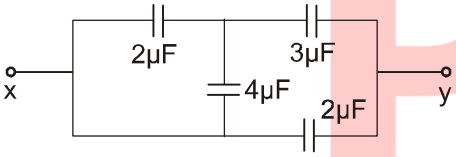
21 Three capacitors of same capacitance are connected in parallel. When they are connected to a cell of 2 volt, total charge of $1.8\mu C$ is accumulated on them. Now after discharging they are connected in series and then charged by the same cell. The total charge (μc) stored in them will be

22. A capacitor of capacitance $500\mu F$ is charged at the rate of $100\mu C/s$. The time (second) in which the potential difference will become 20 V, is

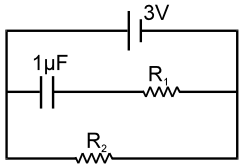
23. In the following figure, the charge on each condenser in the steady state will be–(in μC)



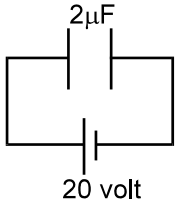
24. The equivalent capacitance between x and y is μF:



25. A 1 μF capacitor is connected in the circuit shown below. The e.m.f. of the cell is 3 volts and internal resistance is 0.5 ohms. The resistors R_1 and R_2 have values 4 ohms and 1 ohm respectively. The charge on the capacitor μC in steady state must be :

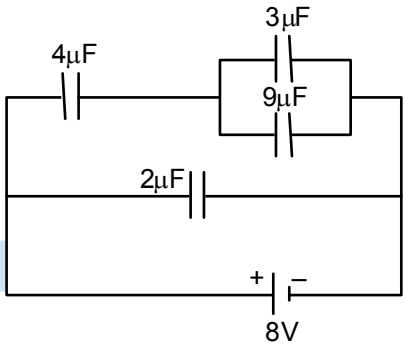


26. In the figure a capacitor of capacitance 2μF is connected to a cell of emf 20 volt. The plates of the capacitor are drawn apart slowly to double the distance between them. The work done (In μJ) by the external agent on the plates is :

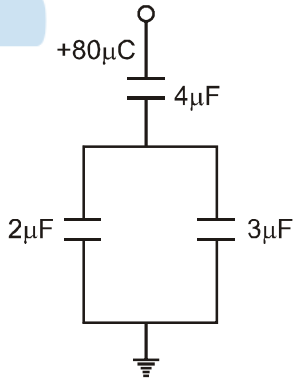


27. A parallel plate capacitor is made of two circular plates separated by a distance of 5 mm and with a dielectric of dielectric constant 2.2 between them. When the electric field in the dielectric is 3×10^4 V/m, the charge density of the positive plate will be close to n n $\times 10^{-7}$ c/m^2 find the value of N.

28. A combination of capacitors is set up as shown in the figure. The magnitude of the electric field, due to a point charge Q (having a charge equal to the sum of the charges on the 4μF and 9μF capacitors), at a point distance 30 m from it, would equal X N/C so find the value of X.



29. In the given circuit, a charge of +80 μC is given to the upper plate of the 4μF capacitor. Then in the steady state, the charge on the upper plate of the 3μF capacitor is.....μC.



30. The work done in placing a charge of 8×10^{-18} coulomb on a condenser of capacity 100 micro-farad is m $\times 10^{-32}$J. Find the value of m.