DPP No: 35

Maximum Time 50 Min

PHYSICS

TARGET JEE-MAINS

SYLLABUS : CAPACITANCE

1. Two isolated charged metallic spheres of radii R_1 and R_2 having charges Q_1 and Q_2 respectively are connected to each other, then there is:

(A) No change in the electrical energy of the system

(B) An increase in the electrical energy of the system

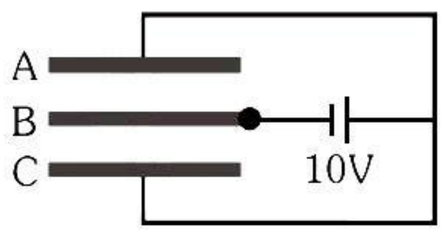
(C) A decrease in the electrical energy of the system in any case

(D) A decrease in electrical energy of the system if $Q_1 R_2 \neq Q_2 R_1$

2. A parallel plate capacitor is charged and then isolated. On increasing the plate separation–

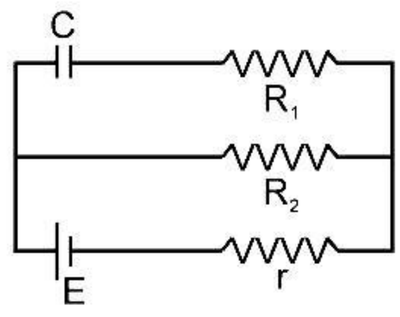
	Charge	**Potential**	**Capacitance**
(A)	remains constant	remains constant	decreases
(B)	remains constant	increases	decreases
(C)	remains constant	decreases	increases
(D)	increases	increases	decreases

3. Three plates A,B and C each of area 0.1 m^2 are separated by 0.885 mm from each other as shown in the figure. A 10V battery is used to charge the system. The energy stored in the system is:



(A) 1 μJ (B) 10^{-1} μJ (C) 10^{-2} μJ (D) 10^{-3} μJ

4. The magnitude of charge in steady state on either of the plates of condenser C in the adjoining circuit is-



(A) CE (B) $\frac{CER_2}{(R_1+r)}$ (C) $\frac{CER_2}{(R_2+r)}$ (D) $\frac{CER_1}{(R_2+r)}$

5. The plate separation in a parallel plate condenser is d and plate area is A. If it is charged to V volt & battery is disconnected then the work done in increasing the plate separation to 2d will be–

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

6. When a charged capacitor is connected with an uncharged capacitor, then which of the following is/are correct option/options.

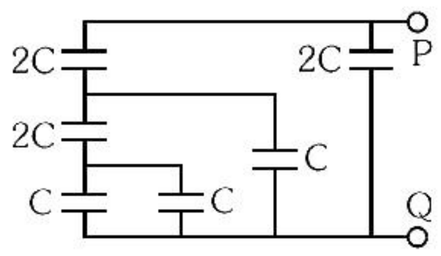
(A) the magnitude of charge on the charged capacitor decreases.

(B) a steady state is obtained after which no further flow of charge occurs.

(C) the total potential energy stored in the capacitors remains conserved.

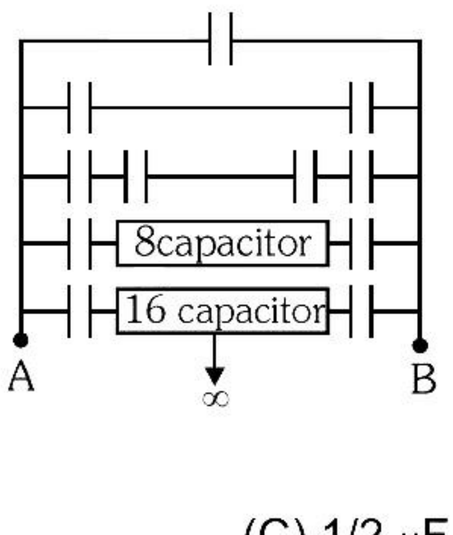
(D) the charge conservation is always true.

7. The value of equivalent capacitance of the combination shown in figure between the points P and Q is :–



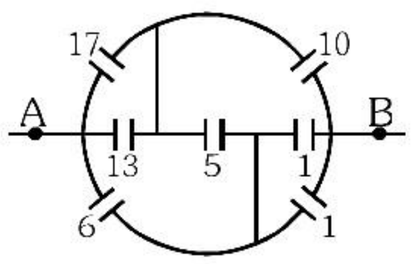
(A) 3 C (B) 2 C (C) C (D) C/3

8. An infinite number of identical capacitors each of capacitance 1μF are connected as in adjoining figure. Then the equivalent capacitance between A and B is



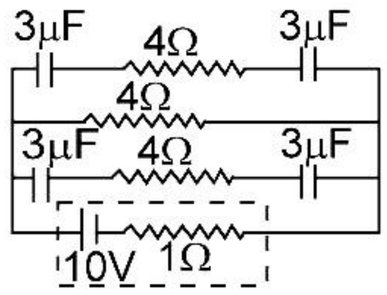
(A) 1μF (B) 2μF (C) 1/2 μF (D) ∞

9. The equivalent capacitance across AB (all capacitance in μF) is



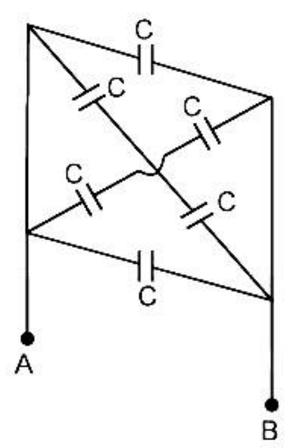
(A) $\frac{20}{3}\mu$F (B) 9μF (C) 48μF (D) None of these

10. In the following figure, the charge on each condenser in the steady state will be–



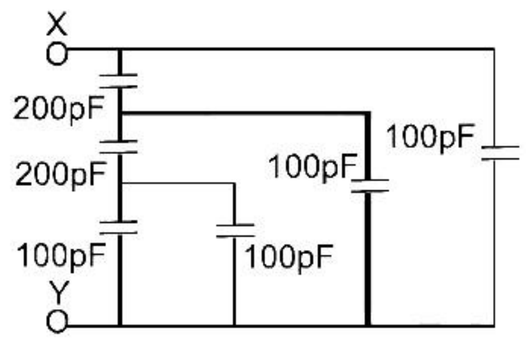
(A) 3μC (B) 6μC (C) 9μC (D) 12μC

11. The resultant capacity between the points A and B in the adjoining circuit will be -



(A) C (B) 2C (C) 3C (D) 4C

12. The equivalent capacitance between the terminals X and Y in the figure shown will be–



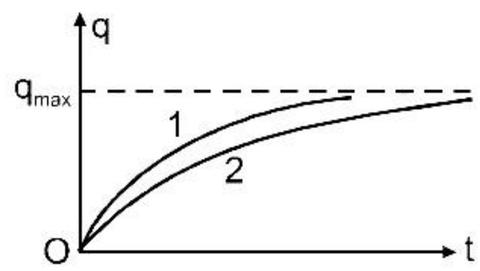
(A) 100 pF (B) 200 pF (C) 300 pF (D) 400 pF

13. Two parallel plate condensers of capacity of 20μF and 30μF are charged to the potentials of 30V and 20V respectively. If likely charged plates are connected together then the common potential difference will be-

(A) 100 V (B) 50 V (C) 24 V (D) 10 V

14. The charge on capacitor in two different RC circuits 1 and 2 are plotted as shown in figure.

Choose the correct statement(s) related to the two circuits.



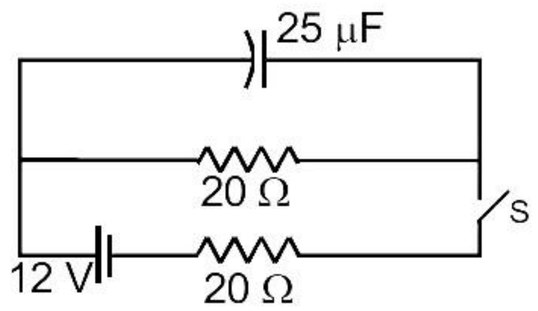
(A) Both the capacitors are charged to the same magnitude of charge

(B) The emf's of cells in both the circuits are equal.

(C) The emf's of the cells may be different

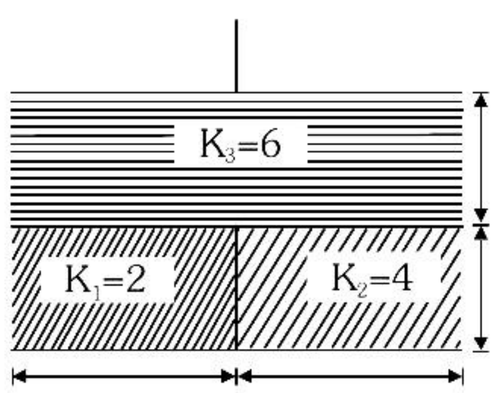
(D) The emf E_1 is more than E_2

15. The switch S shown in figure is kept closed for a long time and then opened at t = 0, then the current in the middle 20 Ω resistor at t = 0.25 ms is :



(A) 0.629 A (B) 0.489 A (C) 0.189 A (D) 23 mA

16. A parallel plate capacitor of capacitance C (without dielectrics) is filled by dielectric slabs as shown in figure. Then the new capacitance of the capacitor is



(A) 3.9 C (B) 4 C (C) 2.4 C (D) 3 C

17. On placing a dielectric slab between the plates of an isolated charged condenser its–

	Capacitance	Charge	Potential Difference	Energy stored	Electric field
(A)	decreases	remains	decreases	increases	unchanged
(B)	increases	remains	increases	decreases	unchanged
(C)	increases	remains	decreases	decreases	unchanged
(D)	decreases	remains	increases	remains	unchanged

18. The plates of a parallel plate capacitor with no dielectric are connected to a voltage source. Now a dielectric of dielectric constant K is inserted to fill the whole space between the plates with voltage source remaining connected to the capacitor.

(A) the energy stored in the capacitor will become K–times

(B) the electric field inside the capacitor will decrease to K-times

(C) the force of attraction between the plates will increase to K^2 – times

(D) the charge on the capacitor will increase to K-times

19. A parallel plate condenser is connected to a battery of e.m.f. 4 volt. If a plate of dielectric constant 8 is inserted into it, then the potential difference on the condenser will be-

(A) 1/2 V (B) 2V (C) 4V (D) 32V

20. A parallel plate condenser with plate separation d is charged with the help of a battery so that U_0 energy is stored in the system. A plate of dielectric constant K and thickness d is placed between the plates of condenser while battery remains connected. The new energy of the system will be-

(A) KU_0 (B) K^2U_0 (C) $\frac{U_0}{K}$ (D) $\frac{U_0}{K^2}$

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

(A) 16×10^{-32} joule (B) 3.1×10^{-26} joule (C) 4×10^{-10} joule (D) 32×10^{-32} joule

22. A fully charged capacitor has a capacitance 'C'. It is discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat capacity 's' and mass 'm'. If the temperature of the block is raised by 'ΔT', the potential difference 'V' across the capacitance is :

(A) $\sqrt{\frac{2mC\Delta T}{s}}$ (B) $\frac{mC\Delta T}{s}$ (C) $\frac{ms\Delta T}{C}$ (D) $\sqrt{\frac{2ms\Delta T}{C}}$

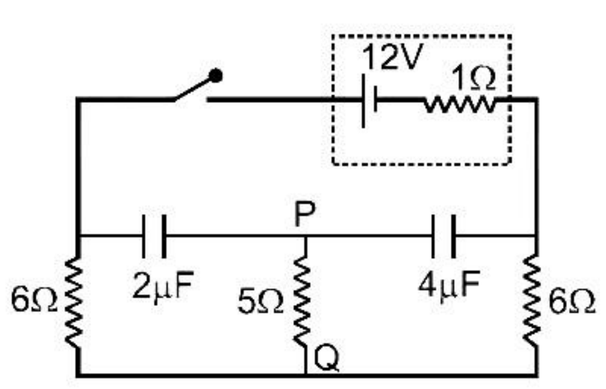
23. A battery is used to charge a parallel plate capacitor till the potential difference between the plates becomes equal to the electromotive force of the battery. The ratio of the energy stored in the capacitor and the work done by the battery will be

(A) 1 (B) 2 (C) 1/4 (D) 1/2

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

(A) $\frac{1}{2}(K-1)CV^2$ (B) $CV^2(K-1)/K$ (C) $(K-1)CV^2$ (D) zero

25. In the circuit shown in figure the capacitors are initially uncharged. The current through resistor PQ just after closing the switch is :



(A) 2A from P to Q (B) 2A from Q to P (C) 6A from P to Q (D) zero

ANSWER KEY

1.	(D)	**2.**	(B)	**3.**	(B)	**4.**	(C)	**5.**	(D)
6.	(ABD)	**7.**	(A)	**8.**	(B)	**9.**	(B)	**10.**	(D)
11.	(C)	**12.**	(B)	**13.**	(C)	**14.**	(AC)	**15.**	(C)
16.	(A)	**17.**	(C)	**18.**	(ACD)	**19.**	(C)	**20.**	(A)
21.	(D)	**22.**	(D)	**23.**	(D)	**24.**	(D)	**25.**	(D)