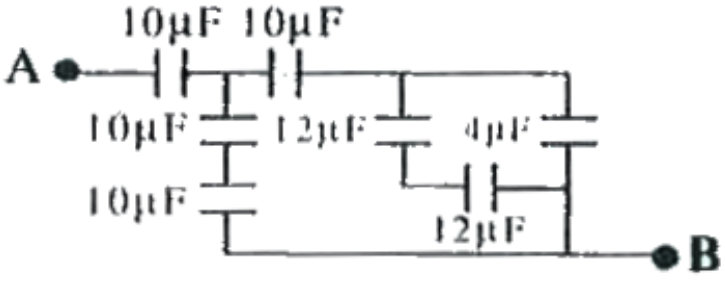
PHYSICS

BOOKS - AAKASH SERIES

CAPACITORS

Lecture Sheet Exercise I Level I Main Straight Objective Type Questions

1. In the given circuit the effective capacity between A and B is



A. $20\mu F$

B. $5\mu F$

C. $30\mu F$

D. $10\mu F$

Answer: B

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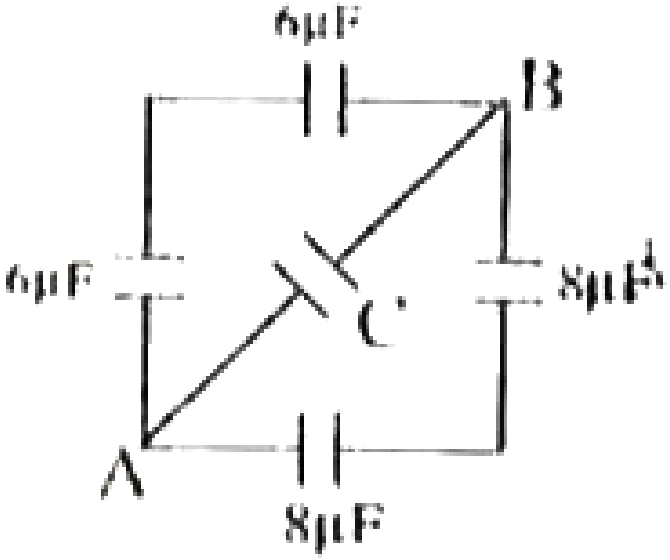
2. If the equivalent capacity between A and B in the circuit is $12\mu F$, the capacity C is



A. $5\mu F$

B. $3\mu F$

C. $4\mu F$

D. $8\mu F$

Answer: A

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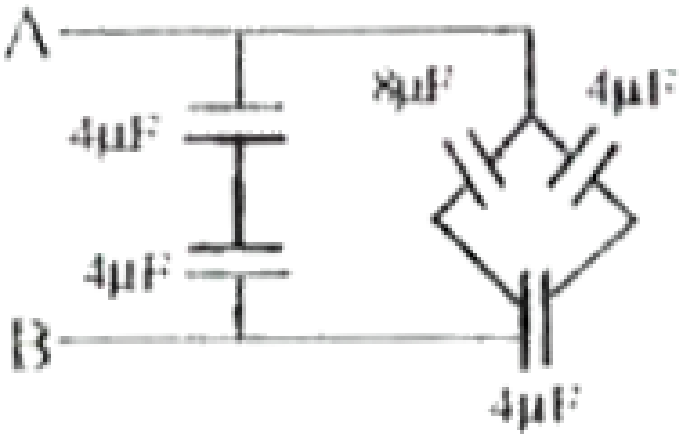
3. The net capacity across AB in ____ μF



A. $8\mu F$

B. $6\mu F$

C. $2\mu F$

D. $4\mu F$

Answer: A

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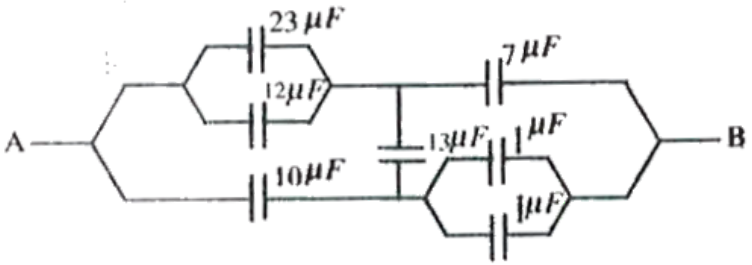
4. Find the equivalent capacitance across . A & B



A. $\frac{28}{3}mf$

B. $\frac{15}{2}mF$

C. $15mF$

D. none

Answer: B

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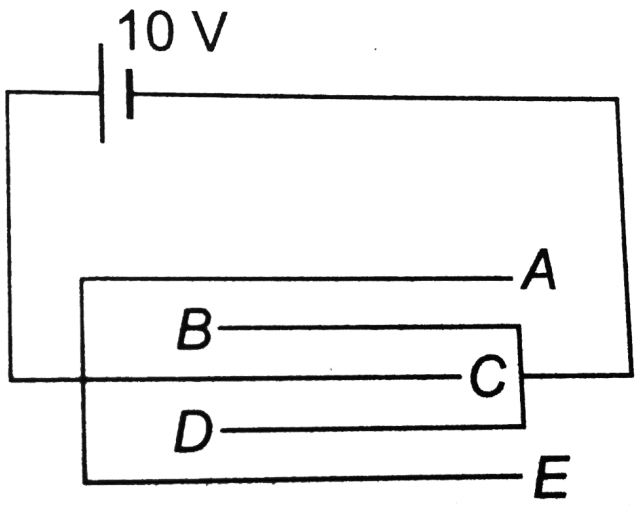
5. Five identical capacitor plates are arranged such that they make four capacitors each of $2\mu F$. The plates are connected to a source of emf $10V$. The charge on plate C is



A. $+20\mu C$

B. $+40\mu C$

C. $+60\mu C$

D. $+80\mu C$

Answer: B

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Lecture Sheet Exercise I Level Ii Advanced Straight Objective Type Questions

1. Find the capacitance of a system of two identical metal balls of radius . a . if the distance between their centres in equal to .b., with to $b > > a$ The system is located in a uniform dielectric with relative permittivity ε

A. $C = \pi\varepsilon_0\varepsilon a$

B. $C = 5\pi\varepsilon_0\varepsilon a$

C. $C = 2\pi\varepsilon_0\varepsilon a$

D. $C = 2\pi\varepsilon_0\varepsilon / a$

Answer: C

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2. Two long straight wires with equal cross-sectional radii a are located parallel to each other in air. The distance between their axes equal b. Find the mutual capacitance of the wires per unit length under the condition $b > > a$.

A. $C \approx \pi\varepsilon_0 / \ln(b/a)$

B. $C \approx \dfrac{\pi\varepsilon_0}{\ln(a/b)}$

C. $C \approx \pi / \varepsilon_0 \ln(b/a)$

D. $C \approx \pi\varepsilon_0 \ln(ba)$

Answer: A

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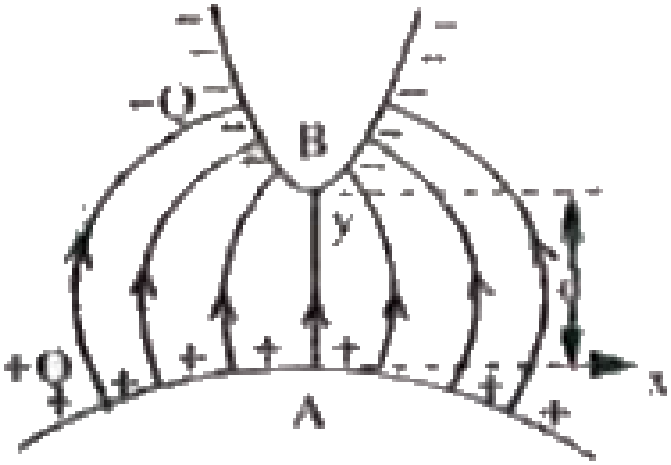
3. Two conductors carrying equal and opposite changes create a non-uniform field as shown in fig. What is the capacity of this capacity if the

field along Y-axis varies as $E = \frac{Q}{\varepsilon_0 A}\left[1 + By^2\right]$ with B = constant



A. A) $C = \frac{\varepsilon_0 A}{d}$

B. B) $C = \frac{\varepsilon_0 A}{d\left[1 + \frac{1}{3}Bd^2\right]}$

C. C) $C = \frac{\varepsilon_0 AB}{2d}$

D. D) $C = \frac{\varepsilon_0 A}{d\left[1 + \frac{1}{2}Bd^2\right]}$

Answer: B

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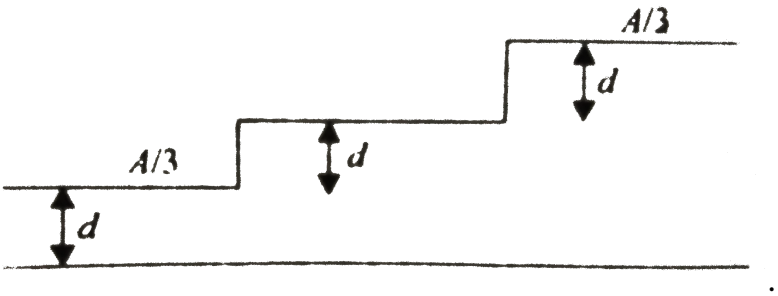
4. A capacitor is made of a flat plate of area A and B second plate having a stair-like structure as shown in. The area of each stair is $A/3$, and the height is

d. Find the capacitance of this arrangement.



A. $\frac{\varepsilon_0 A\left(3d^2+6bd+2b^2\right)}{3d(d+b)(d+2b)}$

B. $\frac{\varepsilon_0 A\left(3d^2-6bd-2b^2\right)}{3d(d-b)(d-2b)}$

C. $\frac{\varepsilon_0 A\left(2d^2-bd-2b^2\right)}{3d(d+b)(d+2b)}$

D. $\frac{\varepsilon_0 A\left(d^2-bd-b^2\right)}{3d(d+b)(d+b)}$

Answer: A

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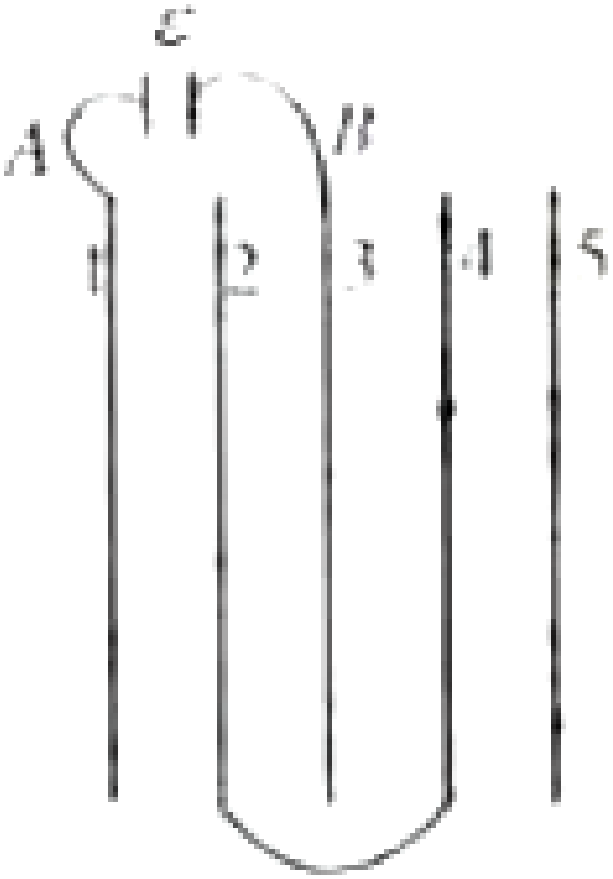
5. Five conducting parallel plates having area A and separation between them d, are placed as shown in the fig. Plate number 2 and 4 are connected with a conducting wire and between point A and B a cell of emf. . ε. is connected . The change flows through the cell is



A. $\frac{3}{4}\frac{\varepsilon_0 A\varepsilon}{d}$

B. $\frac{2}{3}\frac{\varepsilon_0 A\varepsilon}{d}$

C. $\frac{4\varepsilon_0 A\varepsilon}{d}$

D. $\frac{\varepsilon_0 A\varepsilon}{2d}$

Answer: B

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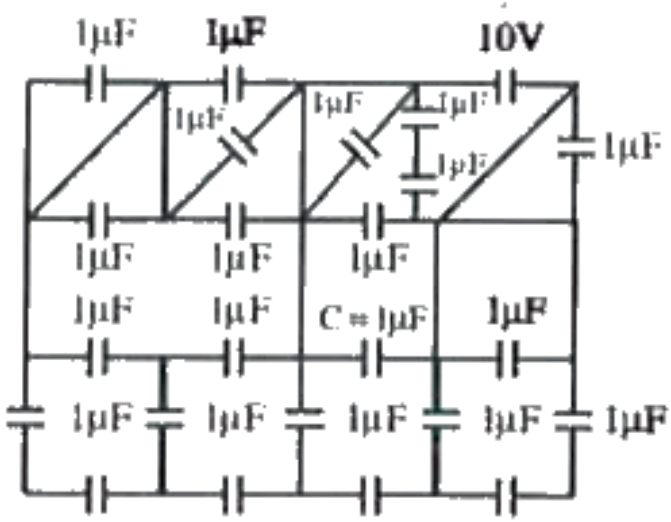
6. Find the change on the capacity $C = 1\mu F$ in the circuit shown in the figure .



A. $10\mu C$

B. $13\mu C$

C. $12\mu C$

D. $24\mu C$

Answer: A

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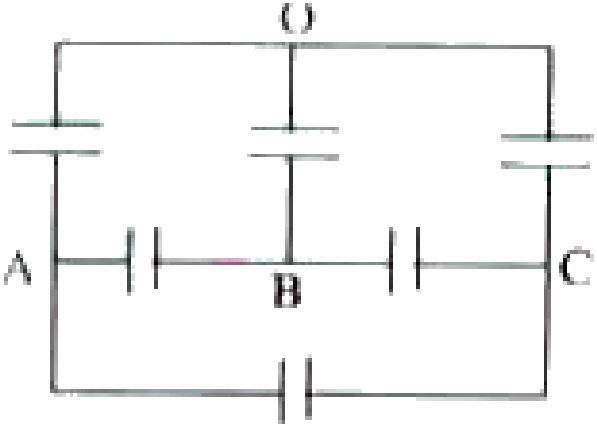
Lecture Sheet Exercise I Level Ii Advanced Matrix Matching Type Questions

1. Six identical capacitors of each capacitance C_0 are arranged as shown in fig .In column-I, equivalent capacitance between two selected points is defined . Match them for their value given in Column-II

COLUMN - I	COLUMN - II
A) C_{AB}	p) $2C_0$
B) C_{AC}	q) $\frac{3}{2}C_0$
C) C_{OA}	r) $\frac{5}{3}C_0$
D) C_{OB}	s) $\frac{4}{3}C_0$



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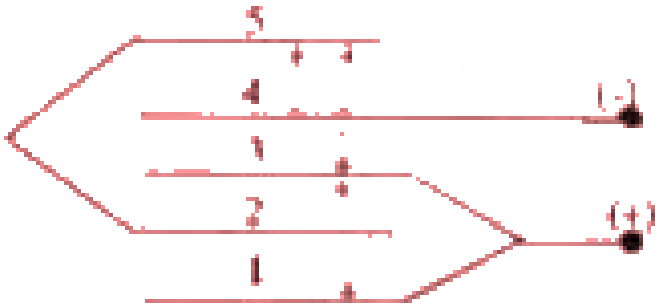
2. Five identical conducting plates 1,2,3,4 and 5 are fixed parallel to and equidistant from each other as shown in figure. Plate 2 and 5 are connected by a conductor while 1 and 3 are joined by another conductor . The junction of 1 and 3 and the plate 4 are connected to a source of constant emf V_0.

Match the following :



COLUMN - I	COLUMN - II
A) Charge on plate - 3	p) $+\frac{CV_0}{3}$
B) Charge on plate - 5	q) $\frac{2\epsilon_0 AV_0}{3d}$
C) Charge on plate - 1	r) $-\frac{5\epsilon_0 AV_0}{3d}$
D) Charge on plate - 4	s) $\frac{4}{3}\frac{\epsilon_0 AV_0}{d}$

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Lecture Sheet Exercise I Level Ii Advanced Integer Type Questions

1. Six identical capacitors of each capacitance .C. are arranged as shown in fig .The equivalent capacitance between A and B is $\frac{KC}{8}$. The value of .K.

is .....

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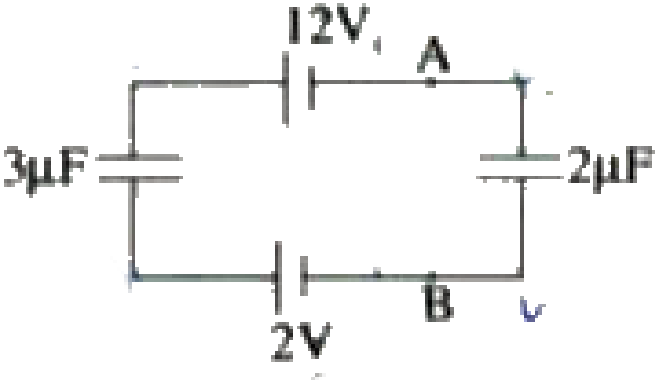
Lecture Sheet Exercise Ii Level I Main Straight Objective Type Questions

1. The P.D in volts between the points A and B is



A. 6V

B. 4V

C. 8V

D. 10V

Answer: A

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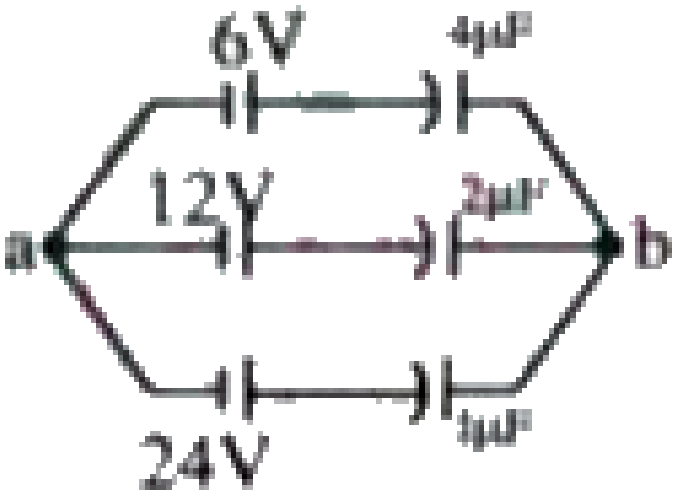
2. Find the potential difference $V_a - V_b$, between the points a and b shown in each part of the figure.



A. $-5.2V$

B. $-6.3V$

C. $-10.3V$

D. $-12.5V$

Answer: C

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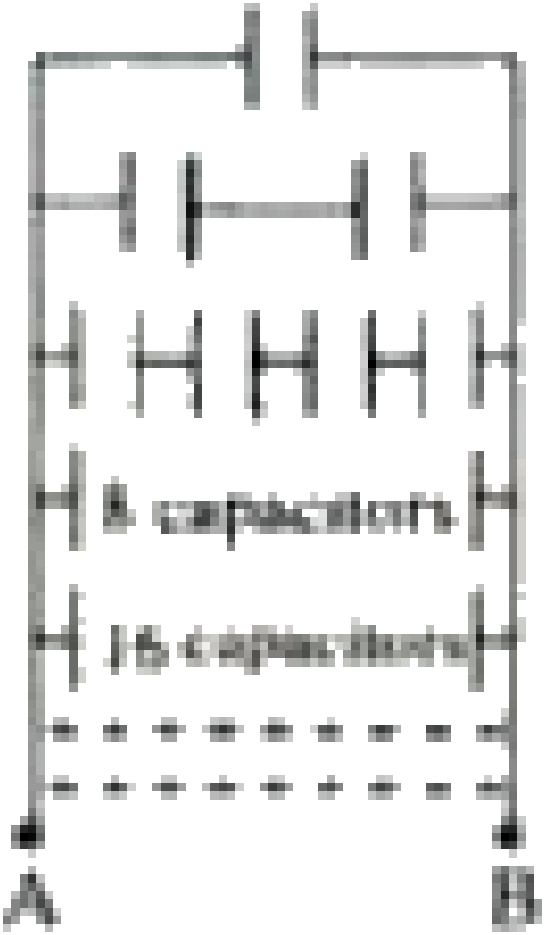
3. In the circuit, all capacitor are identical, each of capacity $2\mu F$ and they are infinite in number. If AB is connected to a battery of 10V then the

charge drawn from the battery is :



A. $40\mu C$

B. $20\mu C$

C. $10\mu C$

D. $5\mu C$

Answer: A

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4. Three capacitors with capacitances of $1\mu F, 2\mu F$ and $3\mu F$ are connected in series. Each capacitor gets punctured, if a potential difference just exceeding 100 volt is applied. If the group is connected across 220 volt circuit then the capacitor most likely to puncture first is

A. capacitance $1\mu F$

B. capacitance $2\mu F$

C. capacitance $3\mu F$

D. capacitance $1\mu F$ (or) $2\mu F$ (or) $3\mu F$

Answer: A

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5. A parallel plate capacitor of capacity C_0 is charged to a potential V_0, E_1 is the energy stored in the capacitor when the battery is disconnected and the plate separation is doubled, and E_2 is the energy stored in the capacitor when the charging battery is kept connected and the separation between the capacitor plates is dounled. find the ratio E_1 / E_2.

A. 4

B. $3/2$

C. 2

D. $1/2$

Answer: A

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6. A capacitor of capacitance $C_1 = 1\mu F$ withstand a maximum voltage of $V_1 = 6KV$, and another capacitor of capacitance $C_2 = 2\mu F$, can with

stand a maximum voltage of $V_2 = 4KV$. If they are connected in series, what maximum voltage will the system withstand?

A. 2 KV

B. 4 KV

C. 6 KV

D. 9 KV

Answer: D

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Lecture Sheet Exercise Ii Level I Advanced Straight Objective Type Questions

1. A condenser of $21\mu F$ is charged to 100V and then discharged through a wire of mass 0.25 gm and specific heat 0.1 cal $\mathrm{gm}^{-1\circ}C^{-1}$. The rise in temperature of the wire is

A. $0.5^\circ C$

B. $1^{\circ} C$

C. $1.5^{\circ} C$

D. $2^{\circ} C$

Answer: B

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2. When a number of liquid drops each of surface charge density σ and energy E combine, a large drop is formed. If the charge density of the large drop is 3 σ , its energy is

A. 81E

B. 3E

C. 27E

D. 243 E

Answer: D

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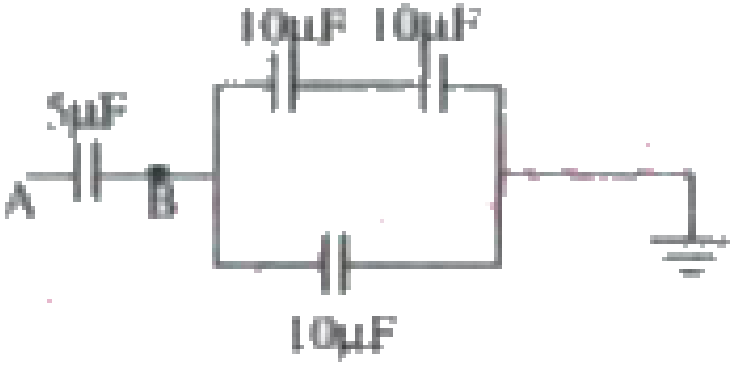
3. If the potential at A is 2000V the potential at B is



A. 1500V

B. 1000V

C. 500V

D. 400V

Answer: C

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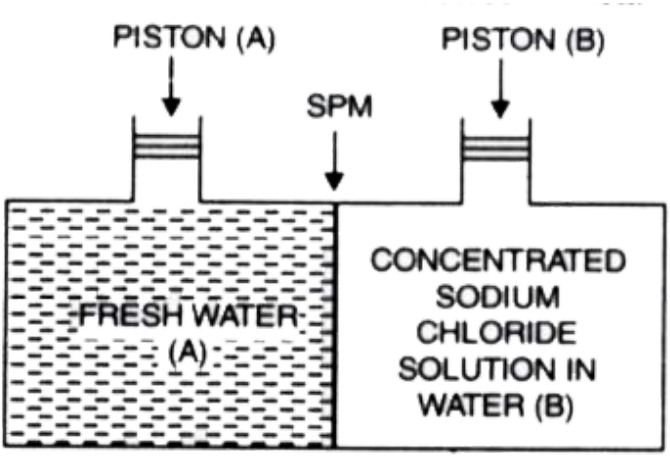
Lecture Sheet Exercise Ii Level I Advanced More Than One Correct Answer Type Questions

1. Consider the Fig. and make the correct option.



A. Both the $4\mu F$ capacitors carry equal charges in opposite sense.

B. Both the $4\mu F$ capacitors carry equal charges in same sense.

C. $V_B - V_D > 0$

D. $V_D - V_B > 0$

Answer: B::C

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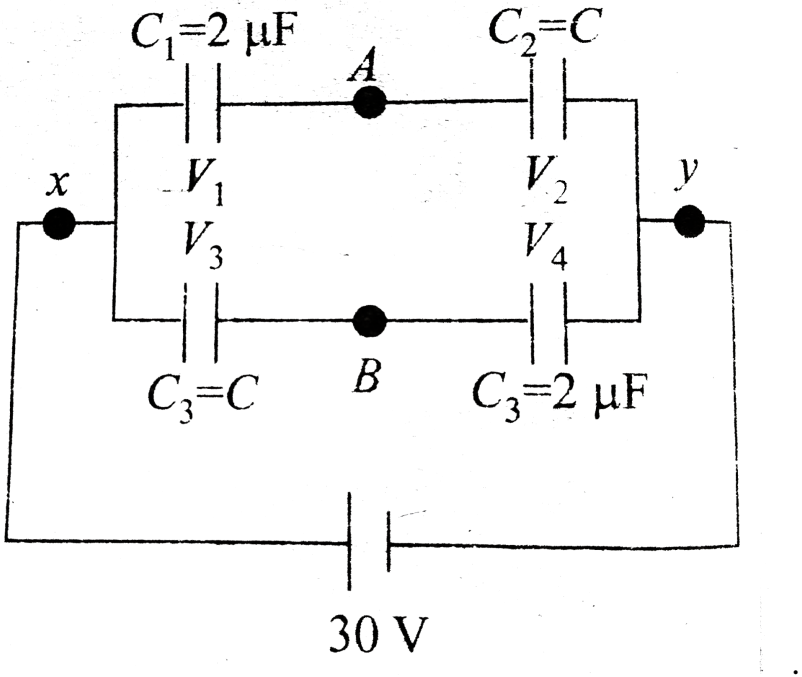
Lecture Sheet Exercise Ii Level I Advanced Linked Comprehensiontype Questions

1. The given circuit shows an arrangement of four capacitors. A potential differnce $30V$ is applied across the combination. It is observed that potentials at connected between $AandB$ differ by $5V$. Also if a conducting wire is connected between A and B, electrons will flow from A to B. Of course, we have bot actually connected any wire between A and B, we have described only an if situation. Answer the following question.



Potential differnce across C_4 is.

A. 12.5 V

B. 15.5 V

C. 17.5 V

D. 22.5 V

Answer: C

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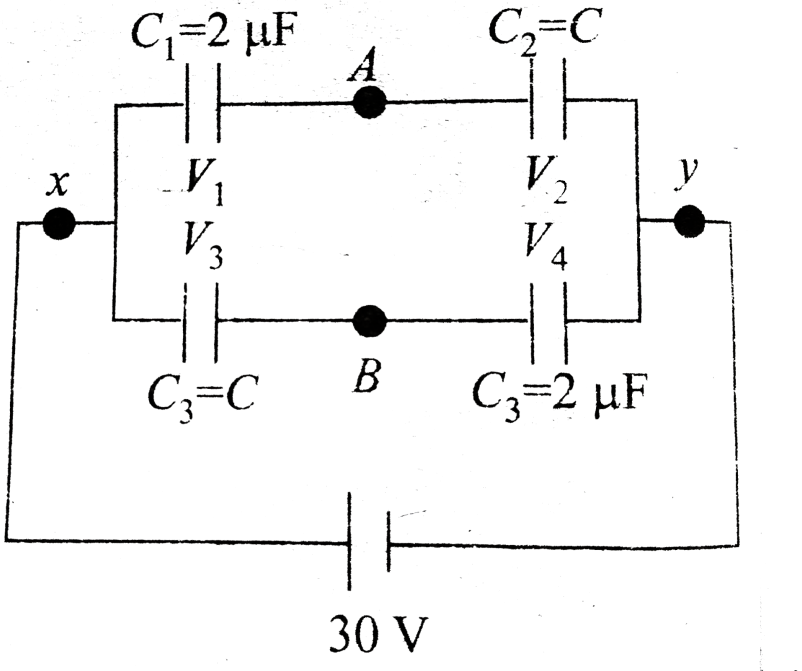
2. The given circuit shows an arrangement of four capacitors. A potential differnce $30V$ is applied across the combination. It is observed that potentials at connected between A and B differ by $5V$. Also if a conducting wire is connected between A and B, electrons will flow from A to B. Of course, we have bot actually connected any wire between A and B, we have described only an if situation. Answer the following question.



Equivalent capacitor between X and Y is.

A. $2.34\mu F$

B. $1.54\mu F$

C. $1.22\mu F$

D. $0.77\mu F$

Answer: A

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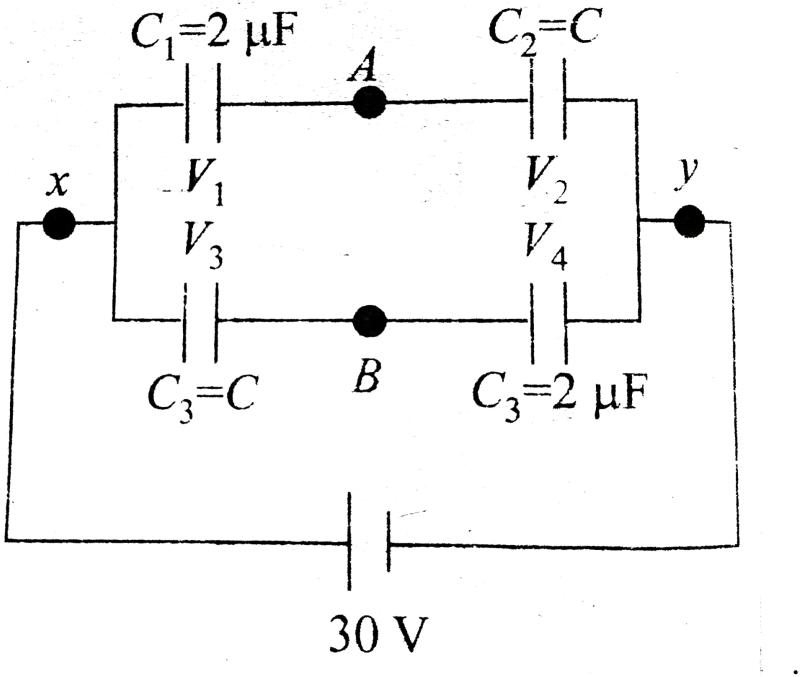
3. The given circuit shows an arrangement of four capacitors. A potential differnce $30V$ is applied across the combination. It is observed that potentials at connected between A and B differ by $5V$. Also if a conducting wire is connected between A and B, electrons will flow from A to B. Of course, we have bot actually connected any wire between A and B, we have described only an if situation. Answer the following question.



Equivalent capacitor between X and Y is.

A. $60\mu C$

B. $52\mu C$

C. $42\mu C$

D. $35\mu C$

Answer: D

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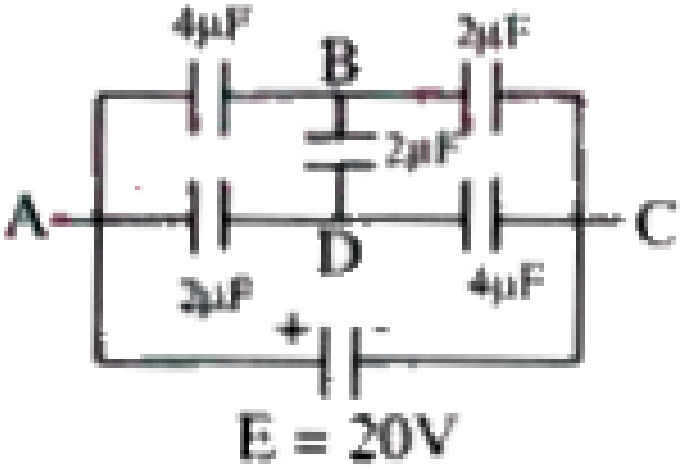
4. The figure shows a diagonal symetric arrangement of capacitors and a battery.

Identify the correct statements



A. Both the $4\mu F$ capacitors carry equal charges in opposite sense

B. Both the $4\mu F$ capacitors carry equal charges in same sense

C. $V_B - V_D < 0$

D. $V_D - V_B > 0$

Answer: B::C::D

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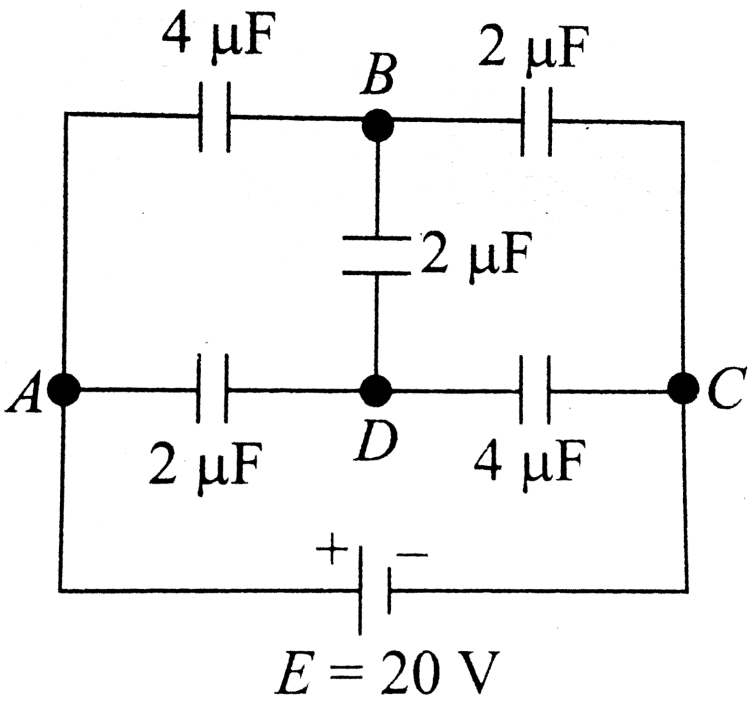
5. Shows a diagonal symmetric arrangement of capacitors and a battery.



If the potential of C is zero, then identify the incorrect statement.

A. $V_A = +20V$

B. $4(V_A - V_B) + 2(V_D - V_B) = 2V_B$

C. $2(V_A - V_D) + 2(V_B - V_D) = 4V_D$

D. $V_A = V_B + V_D$

Answer: A::B::C::D

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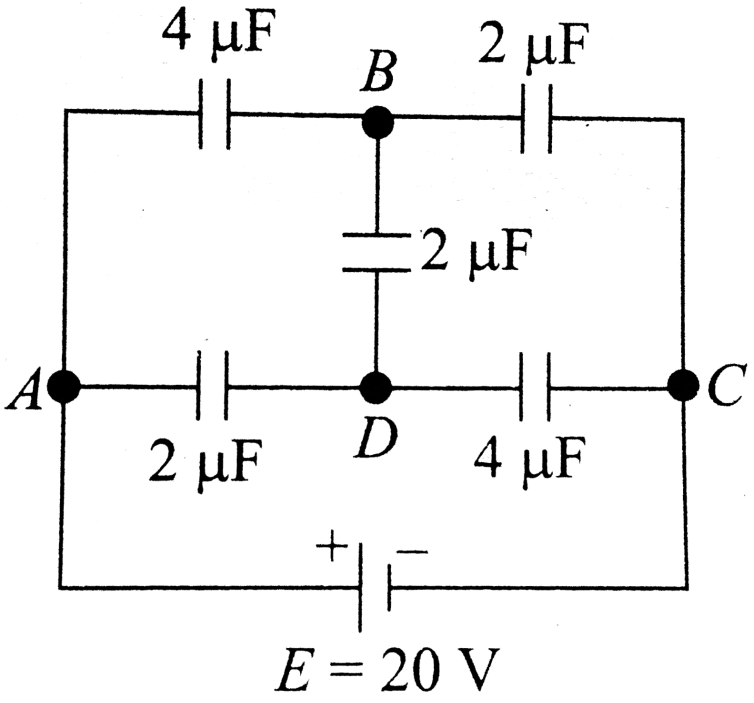
6. Shows a diagonal symmetric arrangement of capacitors and a battery.



If the potential of C is zero, then identify the incorrect statement.

A. $V_B = 8V$

B. $V_B = 12V$

C. $V_D = 8V$

D. $V_D = 12V$

Answer: B::C

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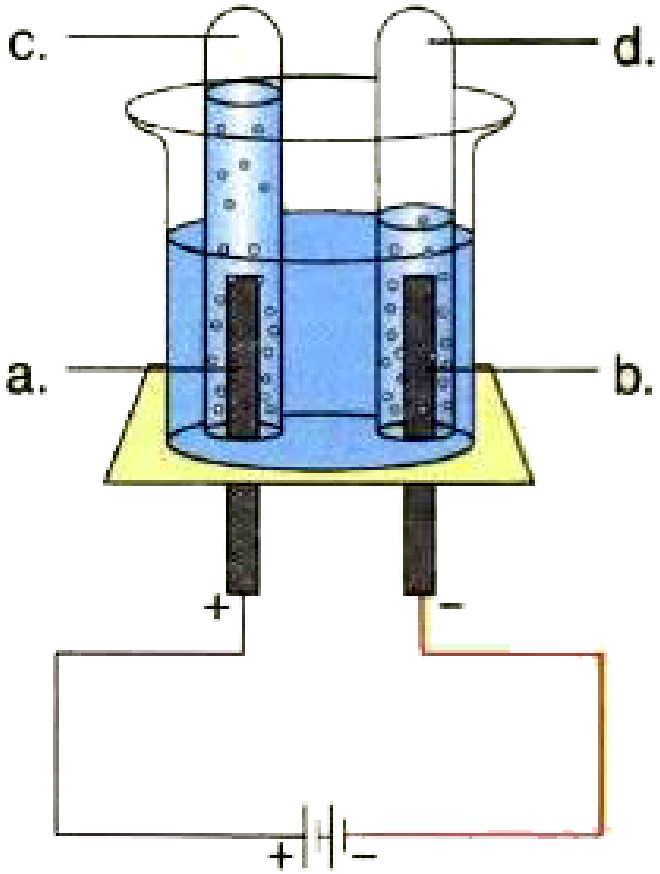
7. Name the process shown in the figure.



A. $q_1 = 32\mu C, q_2 = 24\mu C, q_3 = -8\mu C$

B. $q_1 = 48\mu C, q_2 = 16\mu C, q_3 = +8\mu C$

C. $q_1 = 32\mu C, q_2 = 24\mu C, q_3 = +8\mu C$

D. VA=+15V

Answer: C

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Lecture Sheet Exercise Ii Level I Advanced Integer Type Questions

1. In the circuit shown in the figure, the potential difference across the $4.5\mu F$ capacitor is

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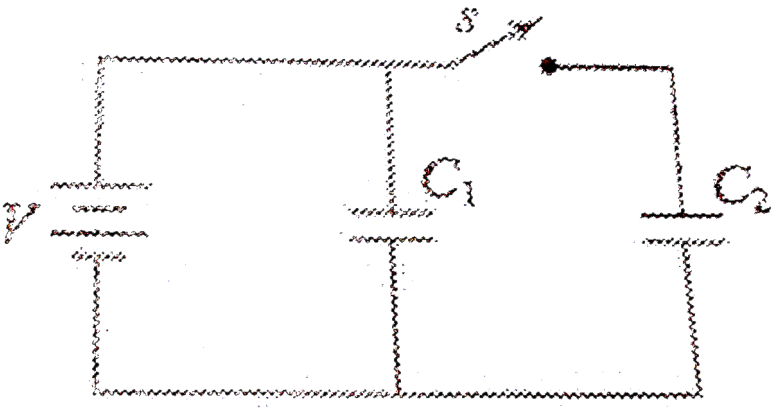
Lecture Sheet Exercise Iii Level I Main Straight Objective Type Questions

1. Two capacitors of equal capacitance $(C_1 = C_2)$ are as shown in the figure. Initially, while the swithc is open (as shown) one of the capacitors is uncharged and the other carries charge Q_0. The energy stored in the charged capacitor is U_0. Sometime after the switch is closed, the

capacitors $C_1 \text{and} C_2$ carry charged $Q_1 \text{and} Q_2$ respectively, the energy stored in the capacitors are $U_1 \text{and} U_2$ respectively. Which of the following expression is correct?



A. $Q_0 = \frac{1}{2}(Q_1 + Q_2)$

B. $Q_1 = Q_2$

C. $V_1 = V_2$

D. $U_0 = U_1 + U_2$

Answer: D

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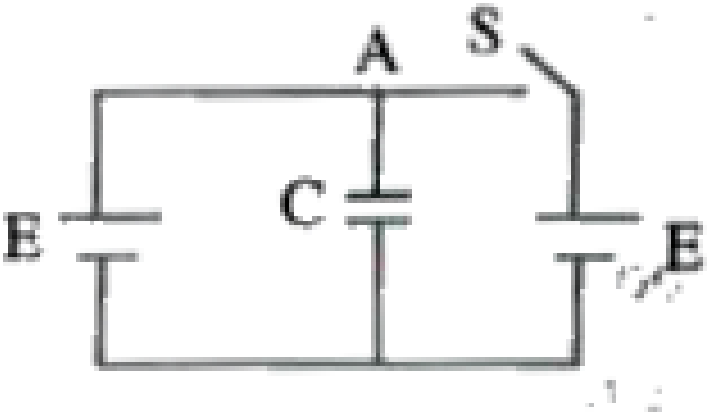
2. Initially the circuit is in steady state. When the switch S is closed, the heat generated in the circuit will be



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

B. $2\varepsilon^2 C$

C. $\frac{3\varepsilon^2 C}{2}$

D. Zero

Answer: D

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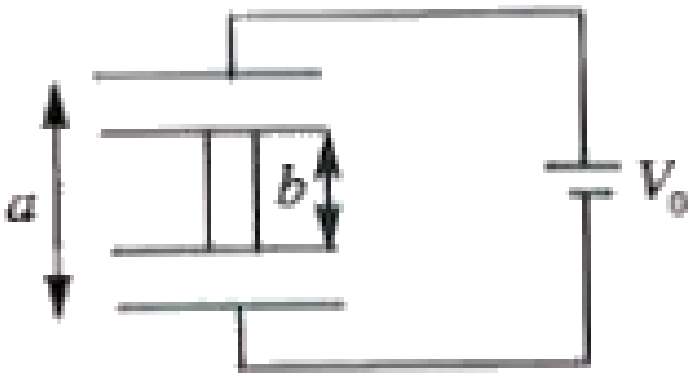
3. Figure shows two capacitors in series. The rigid center section of length .b. is movable. The area of each plate is S. If the voltage difference between the plates is maintained constant at V_0 The change in stored energy if the center section is removed is



A. $\frac{S\varepsilon_0 V_0^2 a}{2b(a-b)}$

B. $\frac{S\varepsilon_0 V_0^2 b}{2a(a-b)}$

C. $\frac{S\varepsilon_0 V_0^2 b}{a(a-b)}$

D. $\frac{S\varepsilon_0 V_0^2 b}{b(a-b)}$

Answer: B

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Lecture Sheet Exercise Iii Level Ii Advanced More Than One Correct Answer Type Questions

1. Two capacitors of $2\mu F$ and $3\mu F$ are charged to 150 V and 120 V respectiely. The plates of capacitor are connected as shown in the figure. A discharged capacitor of capacity $1.5\mu F$ falls to the free ends of the wire. Then,

A. charge on the $1.5\mu F$ capacitors is $180\mu F$

B. charge on the $2\mu F$ capacitor is $120\mu C$

C. charge flows through A from right to left.

D. charge flows through A from left to right.

Answer: A::B::C

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2. A parallel plate capacitor is charged and then the battery is disconnected. When the plates of the capacitor are brought closer, then

A. Charge from the battery flows into the capacitor after reconnection

B. Charge from capacitor flows into the battery after reconnection.

C. The potential difference between the plates increases when the plates are pulled apart.

D. After reconnection of battery potential difference between the plate will immediately becomes half of the initial potential difference. (Just after disconnecting the battery)

Answer: B::C

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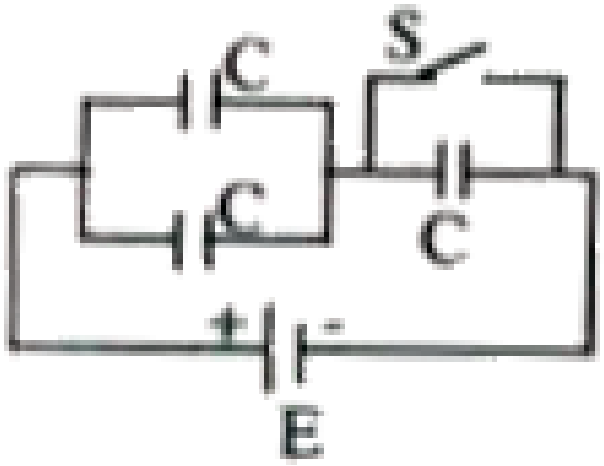
3. In the circuit shown, each capacitor has a capacitance C. The emf of the cell is E. If the switch S is closed



A. positive charge will flow out of the positive terminal of the cell

B. positive charge will enter the positive terminal of the cell

C. the amount of charge flowing through the cell will be CE.

D. the amount of charge flowing through the cell will be 4/3 CE.

Answer: A::D

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4. Two identical capacitors are charged to different potentials φ_1 and φ_2 relative to the negative earthed electrodes. The capacitors are then connected in parallel (Fig. 24.21). Find the potential of the battery after the connection was made and the change in the energy of the system.

A. net charge on connected plates is less than the sum of initial individual charges.

B. net charge on connected plates equals the sum of initial charges.

C. the net potential difference across them is different from the sum of the individual initial potential differences.

D. the net energy stored in the two capacitors is less than the sum of the initial individual energies.

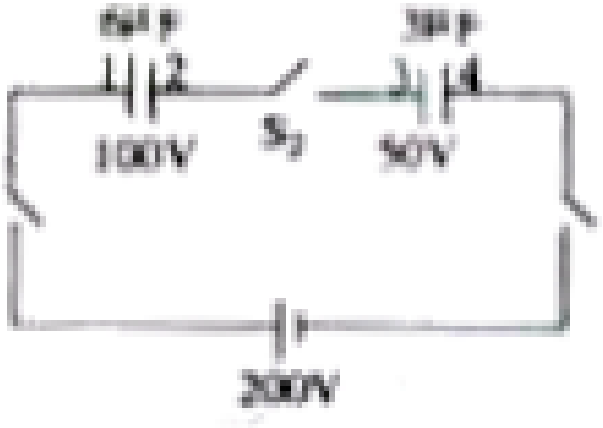
Answer: A::C::D

Watch Video Solution

1. (i) In an isolated system (neither connected to the terminal of a battery nor to any other source of charge e.g each) net charge remains constant.

(ii) From two terminal of a battery or from two plates of a capacitor equal and opposite charges enter or leave.

Question : Two capacitors of capacity $6\mu F$ and $3\mu F$ are charged to 100 V and 50 V separatelly and connected as shown. Now all the three swiches $S_1 S_2$ and S_3 are closed.



Which plate (s) form an isolated system .

A. plate 1 and plate 4 separately

B. plate 1 and 4 jointly

C. plates 1 and 3 jointly

D. plates 2 and 3 jointly

Answer: D

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2. Two capacitros of capacity $6 \text{ and } 3\mu F$ are charged to 100 V and 50 V separately and connected as shown. Now all the three switches S_1, S_2 and S_3 are closed.

Charges on both the capacitors in steady state will be (on $6\mu F$ first)

A. $400\mu C, 400\mu C$

B. $700\mu C, 250\mu C$

C. $800\mu C, 350\mu C$

D. $300\mu C, 350\mu C$

Answer: B

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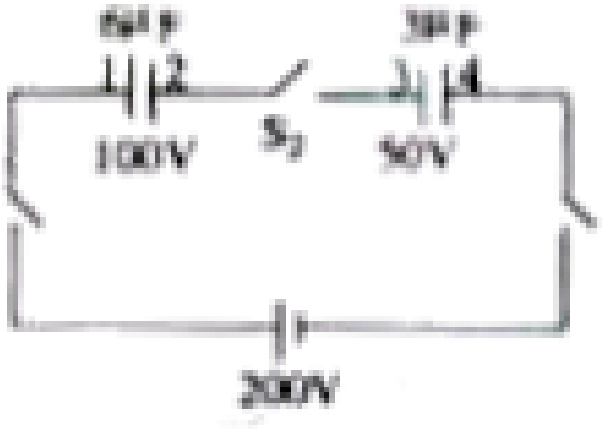
3. (i) In an isolated system (neither connected to the terminal of a battery nor to any other source of charge e.g each) net charge remains constant.

(ii) From two terminal of a battery or from two plates of a capacitor equal and opposite charges enter or leave.

Question : Two capacitors of capacity $6\mu F$ and $3\mu F$ are charged to 100 V and 50 V separatelly and connected as shown. Now all the three swiches $S_1 S_2$ and S_3 are closed.



Which plate (s) form an isolated system .

A. $q_1 = q_3$ and $q_2 = 0$

B. $q_1 = q_3 = \frac{q_2}{2}$

C. $q_1 = q_3 = 2q_2$

D. $q_1 = q_2 = q_3$

Answer: D

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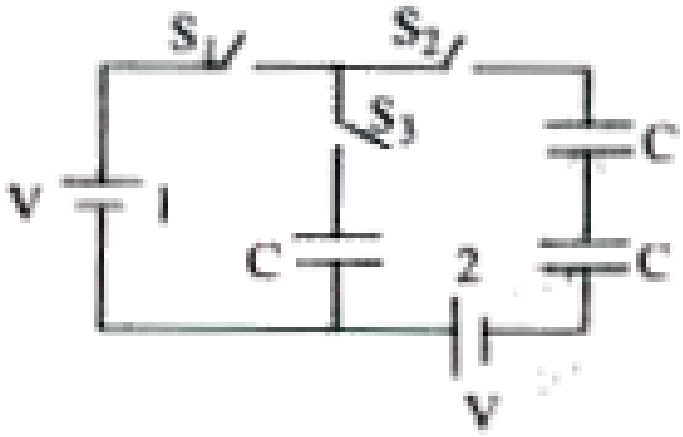
4. Three identical capacitors and two identical batteries of negligible internal resistance are connected as shown in figure. Neglect the resistance of the wires and all the three switches are initially open. There is no charge on any capacitor initially



In the above situation, what is work done by battery 2 due to closing of switch S_1 ?.

A. CV^2

B. $\frac{2}{3}CV^2$

C. $\frac{4}{3}CV^2$

D. $2CV^2$

Answer: D

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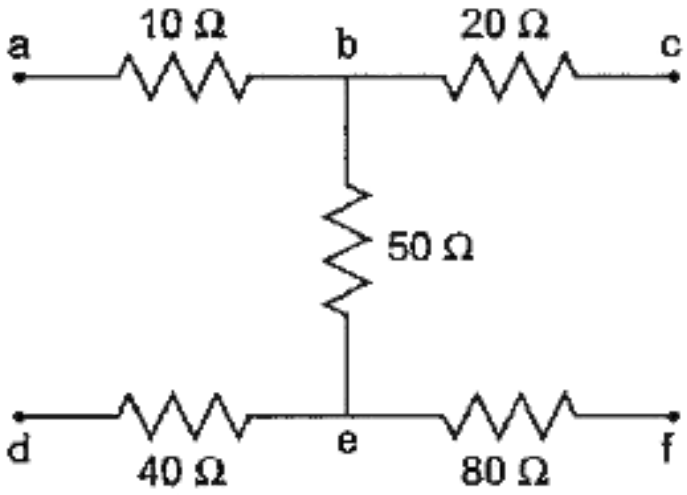
5. The equivalent resistance between points a and f of the network shown in figure below is



A. Zero

B. $-\frac{2}{3}CV^2$

C. `2/3CV

D. $\frac{CV^2}{3}$

Answer: C

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Lecture Sheet Exercise Iii Level Ii Advanced Integer Type Questions

1. A capacitor of capacitance C is initially charged to a potential difference of V. Now it is connected to a battery of 2V with opposite polarity. The ratio of heat generated to the final energy stored in the capacitor will be

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2. A parallel plate capacitor of capacity C_0 is charged to a potential V_0, E_1 is the energy stored in the capacitor when the battery is disconnected and the plate separation is doubled, and E_2 is the energy stored in the capacitor when the charging battery is kept connected and the separation between the capacitor plates is dounled. find the ratio E_1 / E_2.

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3. Calculate the amount of energy consumed in carrying a charge of 1 coulomb through a battery of 3 V.

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Lecture Sheet Exercise Iv Level I Main Straight Objective Type Questions

1. A parallel -plate capacitor having plate area $400cm^2$ and separation between the plate 1.0mm is connected to a power supply of $100V$. A dielectric slab of thickness1.0mm and dielectric constant 5.0 is inserted into the gap .(a)Find the increase in electrostatic energy .(b) If the power supply is now disconnected and the dielectric slab is taken out , find the further increase in energy. (c) Why does the energy increase in inserting the slab as well as in taking it out?

A. $5.1\mu J$

B. $1.1\mu J$

C. $7.1\mu J$

D. $9.1\mu J$

Answer: C

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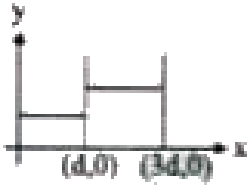
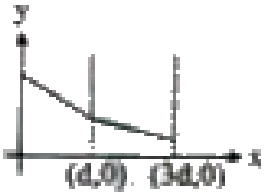
2. A parallel plate capacitor has two layers of dielectrics as shown in figure. This capacitor is connected across a battery, then the ratio of potential difference across the dielectric layers is

A.

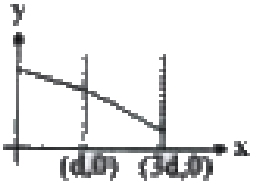
B.



C.



D.



Answer: A

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3. Calculate the capacitance of a parallel plate condenser, with plate area A and distance between plates d, when filled with a dielectric whose dielectric constant varies as,

$$K(x) = 1 + \frac{\beta x}{\in_0} \quad 0 < x < \frac{d}{2}, \quad K(x) = 1 + \frac{\beta}{\in_0}(d - x) \quad \frac{d}{2} < x <$$

.

For what value of β would the capacity of the condenser be twice that when it is without any dielectric?

A. $\frac{\beta\frac{A}{2}}{\log_e\left(\frac{\in_0}{\frac{\beta d}{2}}\right)}$

B. $\frac{A}{2}\log_e\left(\frac{\in_0}{\frac{\beta d}{2}}\right)$

C. $\frac{A}{2}\log_e\left(\frac{\in_0}{\in_0 - \frac{\beta d}{2}}\right)$

D. $\frac{\beta\frac{A}{2}\in_0}{\log_e\left(\frac{\in_0+\frac{\beta d}{2}}{\in_0}\right)}$

Answer: D

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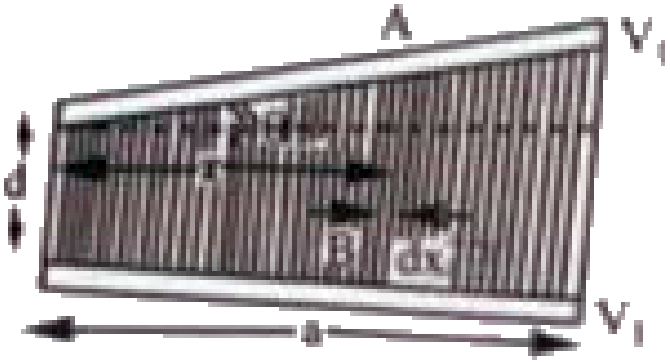
4. A capacitor has square plates each of side .a. making an angle small θ , the capacitance is given by:



A. $C = \frac{\varepsilon_0 a^2}{d}\left[1 - \frac{\theta a}{2d}\right]$

B. $C = \frac{\varepsilon_0 a^2}{d}\left[1 - \frac{\theta a}{d}\right]$

C. $C = \frac{\varepsilon_0 a}{d^2}\left[1 - \frac{\theta a}{d}\right]$

D. $C = \frac{\varepsilon_0 a^2}{d}$

Answer: A

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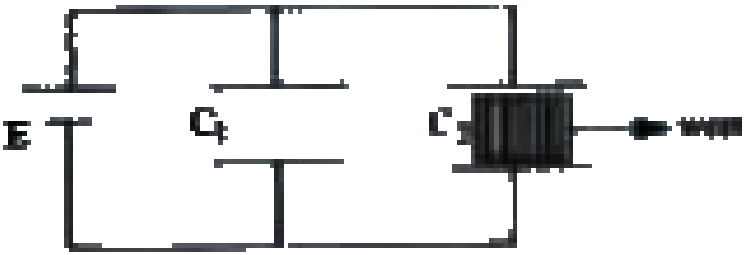
5. When capacitors are fully charged, an external agent removes the dielectric slab from the capacitor C_2 Find the change in potential energy of capacitor $C_1 (E = 10V, C_1 = 2\mu F, C_2 = 4\mu F \text{ and } k = 2)$



A. 0J

B. 1J

C. 5J

D. 10J

Answer: A

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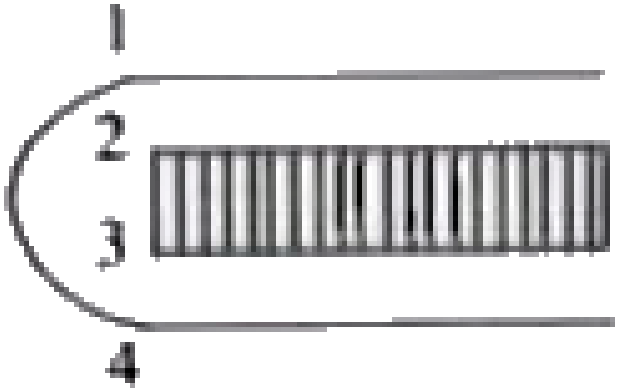
6. Four identical plates 1, 2, 3 and 4 are placed parallel to each other at equal distance as shown in the figure. Plates 1 and 4 are joined together and the space between 2 and 3 is filled with a dielectric of dielectric constant k = 2. The capacitance of the system between 1 and 3 & 2 and 4 are C_1 and C_2 respectively . The ratio $\frac{C_1}{C_2}$ is



A. $\frac{5}{3}$

B. 1

C. $\frac{3}{5}$

D. $\frac{5}{7}$

Answer: B

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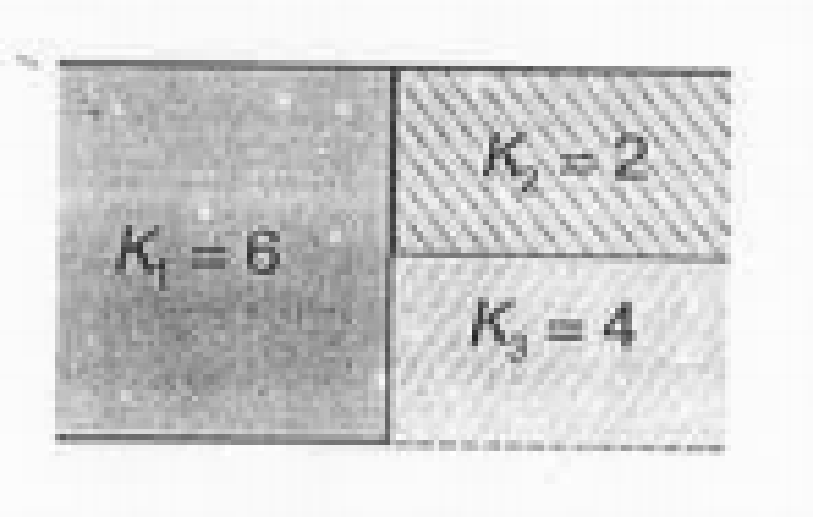
7. A parallel plate capacitor of capacitance C (without dielectric) is filled by dielectric slabs as shown in figure. Then the new capacitance of the capacitor is



A. 3.9 C

B. 4 C

C. 2.4 C

D. 3 C

Answer: A

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8. Figure shows two parallel plate capacitors with fixed plates and connected to two batteriers. The separation between the plates is the same for the two capacitors. The plates are rectangular in shape with width b and lengths l_1 and l_2. The left half of the dielectric slab has a dielectric constant K_1 and the right half K_2 Neglecting any friction, find the ratio of the emf of the left battery to that of the right battary for

which the dielectric slab may remain in equilibrium

A. $\sqrt{\frac{K_2-1}{K_1-1}}$

B. $\sqrt{\frac{K_1-1}{K_2-1}}$

C. $\sqrt{\frac{K_1+1}{K_2+1}}$

D. $\sqrt{\frac{K_2+1}{K_1+1}}$

Answer: A

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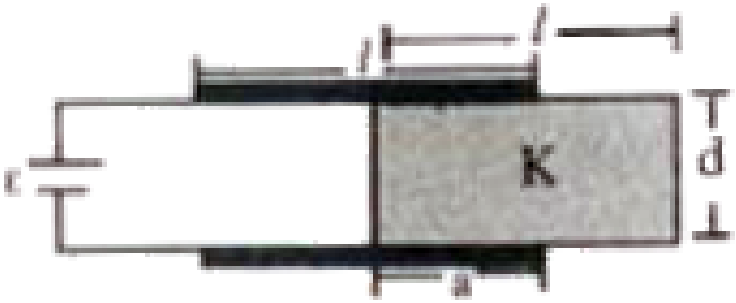
Lecture Sheet Exercise Iv Level Ii Advanced Straight Objective Type Questions

1. Consider the situation shown in figure. The plates of the capacitor have plate area A and are clamped in the laboratory, the dielectric slab is released from rest with a length a inside the capacitor. Neglecting any effect of friction or gravity . Show that the slab will execute periodic motion and find its time period.



A. $8\sqrt{\frac{(l-a)lmd}{\varepsilon_0 A\varepsilon^2(K-1)}}$

B. $8\sqrt{\frac{(l-a)lmd}{\varepsilon_0 A\varepsilon^2(K+1)}}$

C. $8\sqrt{\frac{(l+a)lmd}{\varepsilon_0 A\varepsilon^2(K+1)}}$

D. $8\sqrt{\frac{(l+a)md}{\varepsilon_0 A\varepsilon^2(K+1)}}$

Answer: A

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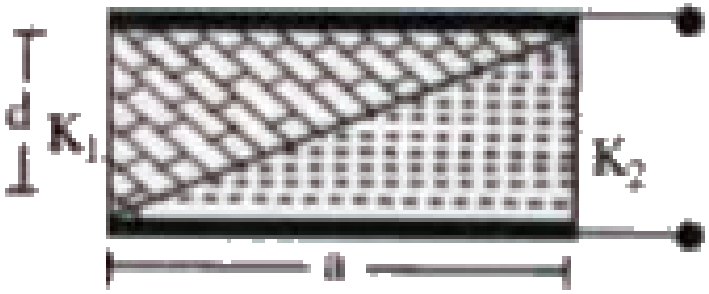
2. A capacitor is formed by two square metal-plates of edge a, separated by a distance d. Dielectrics of dielectric constants K_1 and K_2 are filled in the gap as shown in fig. Find the capacitance.



A. $\frac{\varepsilon_0 K_1 K_2 a^2 \ln\left(\frac{K_1}{K_2}\right)}{(K_1 - K_2)d}$

B. $\frac{\varepsilon_0 (K_1 + K_2) a^2 \ln\left(\frac{K_1}{K_2}\right)}{(K_1 - K_2)d}$

C. $\frac{\varepsilon_0 (K_1 + K_2) a^2 \ln\left(\frac{K_2}{K_1}\right)}{(K_1 - K_2)d}$

D. $\frac{\varepsilon_0 K_1 K_2 a^2 \ln\left(\frac{K_2}{K_1}\right)}{(K_1 - K_2)d}$

Answer: A

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3. A parallel plate capacitor of plate area a and plate separation d is charged to potential difference V and then the battery is disconnected. A slab of dielectric costant K is then inserted between the plates of the capacitor so as to fill the space between the plates. If Q,E,and W denote, respectively, the magnitude of charge on each plate, the electric field between the plates (after the slab is inserted) and work done on the system, in question, in the process of inserting the slab, then

A. $Q = \frac{\varepsilon_0 AV}{d}$

B. $Q = \frac{\varepsilon_0 KAV}{d}$

C. $E = \frac{V/K}{d}$

D. $W = \frac{\varepsilon_0 AV^2}{2 \quad d}\left(1 - \frac{1}{K}\right)$

Answer: A::C::D

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4. Assertion: Capacity of a parallel plate capacitor increases when distance between the plates is decreased.

Reason : Capacitance of capacitor is inversely proporational to distance between them.

A. $\frac{\varepsilon_0 A(K_2 - K_1)}{d \ \ln(K_2/K_1)}$

B. $\frac{2\varepsilon_0 A(K_2 - K_1)}{d \ \ln(K_2 - K_1)}$

C. $\frac{3}{2}\frac{\varepsilon_0 A(K_2 - K_1)}{d \ \ln(K_2/K_1)}$

D. $\frac{3}{2}\frac{\varepsilon_0 A(K_2 - K_1)}{d \ \ln(K_2 - K_1)}$

Answer: A

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Lecture Sheet Exercise Iv Level Ii Advanced More Than One Correct Answer Type Questions

1. An LR circuit with a battery connected at t =0. Which of the following quantities will be zero just after the connection?

A. A are $25C_0$ and $25V$

B. A are $25C_0$ and $5V$

C. B are $5C_0$ and $5V$

D. B are $5C_0$ and $25V$

Answer: B::C

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2. A parallel plate air-core capacitor is connected across a source of constant potential difference. When a dielectric plate is introduced between the two plates then:

A. some charge from the capacitor will flow back into the source.

B. some extra charge from the source will flow back into the capacitor.

C. the electric field intensity between the two plate does not change.

D. the electric field intensity between the two plates will decrease.

Answer: B::C

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3. A parallel plate capacitor has a parallel sheet of copper inserted between and parallel to the two plates, without touching the plates. The capacity of the capacitor after the introduction of the copper sheet is :

A. minimum when the copper sheet touches one of the plates.

B. maximum when the copper sheet touches one of the plates.

C. invariant for all positions of the sheet between the plates.

D. greater than that before introducing the sheet.

Answer: C::D

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Lecture Sheet Exercise Iv Level Ii Advanced Matrix Matching Type Questions

1. In Column some operation performed on capacitor are given, while in Column-II are given some probable effects on capacitor. Malch the entries of Column with the entries of Column-II

COLUMN - I	COLUMN - II
A) A dielectric slab is inserted into the capacitor slowly keeping the charge constant	p) Work done by external agent is negative
B) The plates of capacitor are moved apart keeping the charge constant	q) Work done by external agent is positive
C) A dielectric slab is inserted into the capacitor slowly keeping the voltage constant	r) Electric potential energy stored in the electric field in between the capacitor plates is decreasing
D) The plates of capacitor are moved apart keepingthe voltage constant	s) Electric potential energy stored in the electric field in between the capacitor plates is increasing

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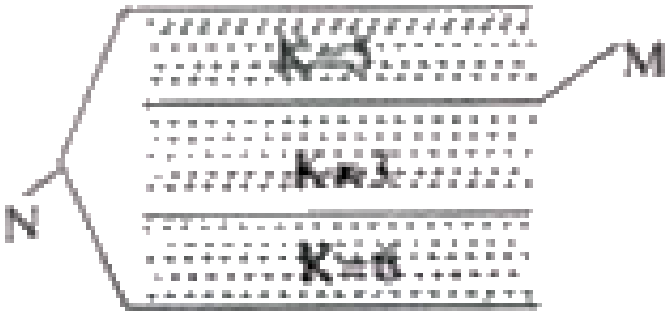
Lecture Sheet Exercise Iv Level Ii Advanced Integer Type Questions

1. In the given arrangement of parallel plates area A and distance btween two consecutive plates is d. Equivalent capacitance of the structure

between MN is n times of $\frac{\in_0 A}{d}$ then the value of n is



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2. A parallel plate capacitor is filled by a dielectric whose relative permittivity varies with the applied voltage (U) as $\varepsilon = \alpha U$ where $\alpha = 2V^{-1}$. A similar capacitor with no dielectric is charged to $U_0 = 78V$. It is then is connected to the uncharged capacitor with the dielectric. Find the final voltage on the capacitors.

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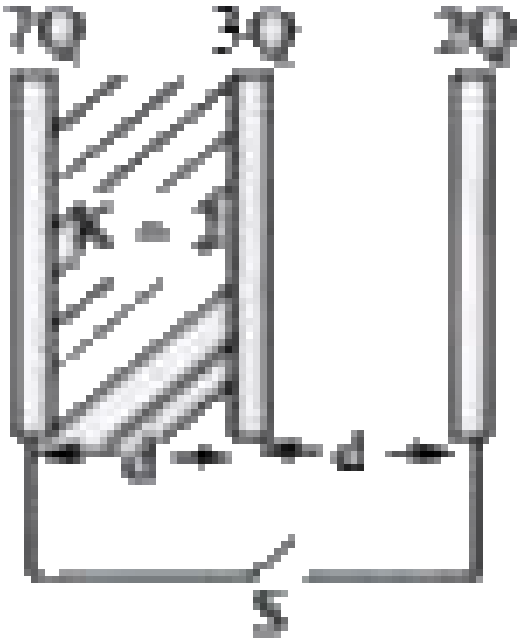
3. Three large identical conducting plates are placed at a distance d in air. The space between the first two plates is filled completely with dielectric of dielectric constant 2 as shown. The plates are given charges 7Q,3Q and 2Q respectively. The outer plates are connected by good conducting wire through switch .S.. When .S. is closed, the charge that flows through switch is nQ Find the value of n?



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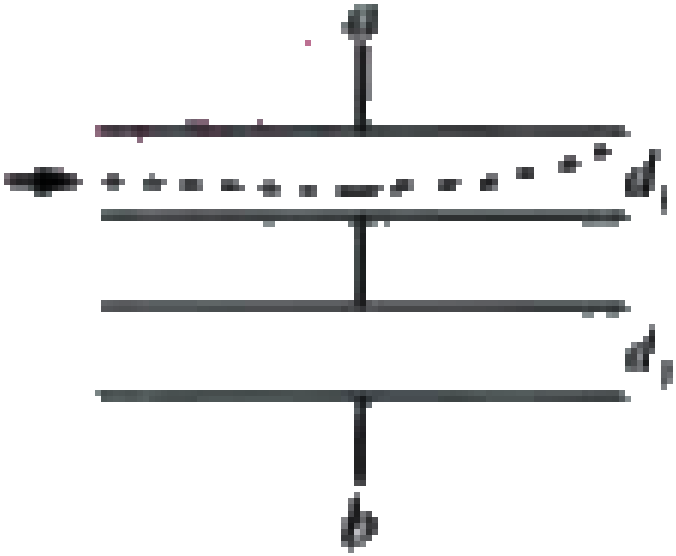
Lecture Sheet Exercise V Level I Main Miscelleneous Straight Objective Type Questions

1. Both the capacitors shown in figure are made of square plates of edge a. The separatiopn between the plates of the capacitors are d_1 and d_2 as shown in the figure. A potential difference V is applied between the points a and b. An electron is projected between the plates of the upper capacitor along the central line. With what minimum speed should the electron be projected so that it does not collide with any plate ? Consider only the electric forces.



A. $\left[\frac{\text{Vea}^2}{md_2(d_1-d_2)}\right]^{1/2}$

B. $\left[\frac{\text{Vea}^2}{md_1(d_1+d_2)}\right]^{1/2}$

C. $\left[\frac{\text{Vea}^2}{md_2(d_1-d_2)}\right]^{2}$

D. $\left[\frac{\text{Vea}^2}{md_1(d_1+d_2)}\right]^{1/2}$

Answer: B

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2. If an electron enters into a space between the plates capacitor at an angle α with the plates and leaves at an angle β to the plates. The ratio of its kinetic energy while entering the capacitor to that while leaving will be

A. $\left[\frac{\cos\alpha}{\cos\beta}\right]^2$

B. $\left[\frac{\cos\beta}{\cos\alpha}\right]^2$

C. $\left[\frac{\sin\alpha}{\sin\beta}\right]^2$

D. $\left[\frac{\sin\beta}{\sin\alpha}\right]^2$

Answer: B

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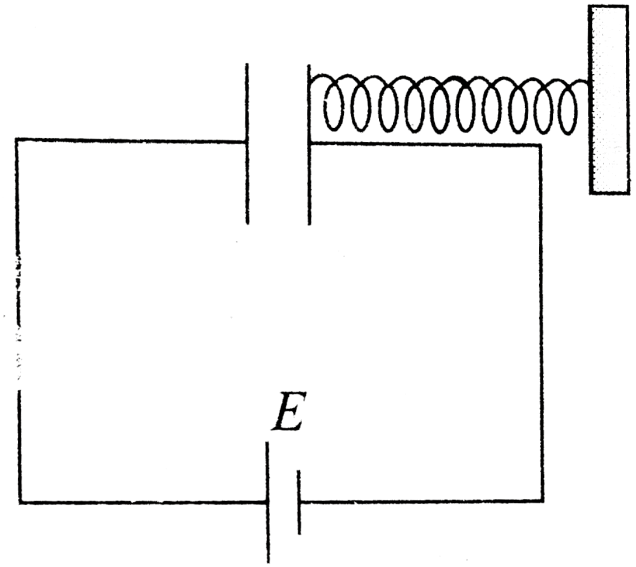
3. One plate of a capacitor is fixed, and the other is connected to a spring as shown in. Area of both the plates is A In strady state (equilibrium), separation between the plates is $0.8d$ (spring was unstretched , and the distance between the plates was d when capacitor was uncharged). The force conntant of the spring is approximately.



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

B. $\frac{2\varepsilon_0 A E}{d}$

C. $\frac{6\varepsilon_0 A E^2}{2d^3}$

D. $\frac{4\varepsilon_0 A E^2}{d}$

Answer: D

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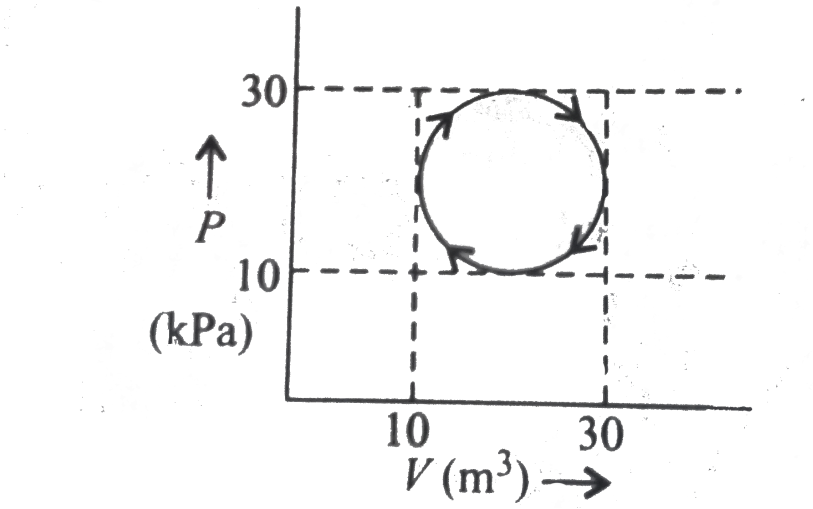
4. Which one is not correct for a cyclic process as shown in the figure ?



A. $\sqrt{2mgA\ \in_0}$

B. $\sqrt{\frac{4mgA \in_0}{k}}$

C. $\sqrt{mgA \in_0}$

D. $\sqrt{\frac{2mgA \in_0}{k}}$

Answer: A

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5. Two parallel plate capacitors are arranged perpendicular to the common axis. The separation d between the capacitors is much larger than the separation / between their plates and than their size. The capacitors are charged to q_1 and q_2 respectively (figure). Find the force of interaction between the capacitors.

A. $\frac{1}{2}\frac{q_1 q_2}{\pi\varepsilon_0 d^4}l^2$

B. $\frac{2}{3}\frac{q_1 q_2}{\pi\varepsilon_0 d^4}l^2$

C. $\frac{3}{2}\frac{q_1 q_2}{\pi\varepsilon_0 d^4}l^2$

D. $\frac{1}{3}\frac{q_1 q_2}{\pi\varepsilon_0 d^4}l^2$

Answer: C

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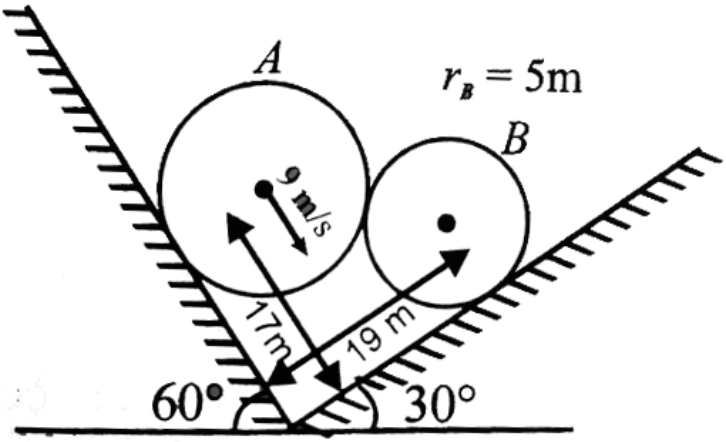
6.



System is shown in the figure. Velocity of sphere A is 9 $\frac{m}{s}$. Find the speed of sphere B.

A. $\frac{4\pi \in_0 ac}{c+a}$

B. $\frac{\pi \in_0 ac}{c+a}$

C. $\frac{\pi \in_0 ac}{c-a}$

D. $\frac{4\pi \in_0 ac}{c-a}$

Answer: D

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7. Three long concentric conducting cylindrical shells have radii R, 2R and $2\sqrt{2}R$ Inner and outer shells are connected to each other. The capacitance across middle and inner shells per unit length is:

A. $\frac{\frac{1}{3} \in_0}{\ln 2}$

B. $\frac{6\pi \in_0}{\ln 2}$

C. $\frac{\pi \in_0}{\ln 2}$

D. None

Answer: B

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Practice Sheet Exercise I Level I Main Straight Objective Type Questions

1. The capacities of three capacitors are in ratio 1:2:3. Their equivalent capacity when connected in parallel is $\frac{60}{11}\mu F$ more than that when they are connected in series. The individual capacitors are of capacities in μF.

A. $4, 6, 7$

B. $1, 2, 3$

C. $2, 3, 4$

D. $1, 3, 6$

Answer: B

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2. Three.condensers of capacity $4mF, 2mF$ and $3mF$ are connected such that 2 mF and 3 mF are in series and 4 mF is parallel to them. The equivalent capacity of the combination is

A. 9 mF

B. 5.2 mF

C. 2.6 mF

D. 10 mF

Answer: B

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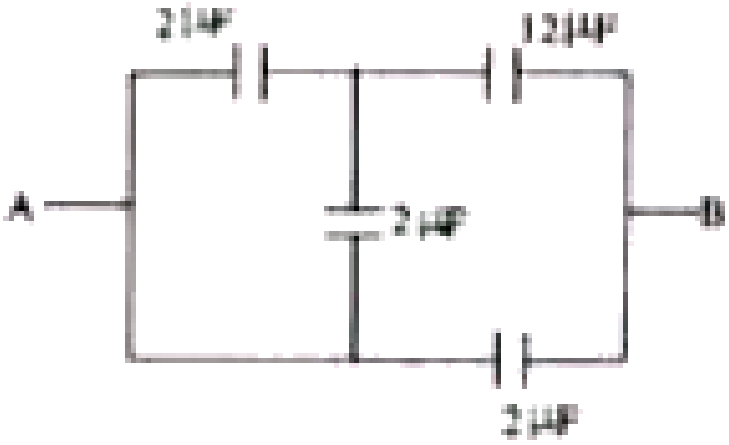
3. The effective capacitence in μF in between A and B will be



A. $28/9$

B. 4

C. 5

D. 18

Answer: C

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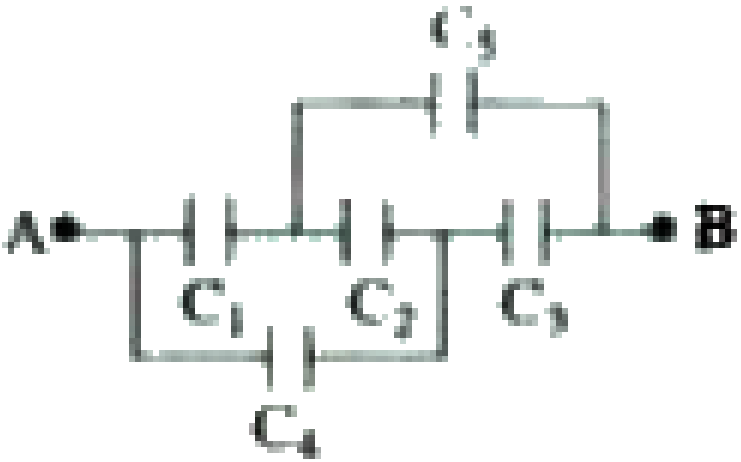
4. The equivalent capacity between A and B in the given circuit is $(C_1 = 4\mu F, C_2 = 12\mu F, C_3 = 8\mu F, C_4 = 4\mu F, C_5 = 8\mu F)$



A. $24\mu F$

B. $36\mu F$

C. $\frac{16}{3}\mu F$

D. $\frac{8}{3}\mu F$

Answer: C

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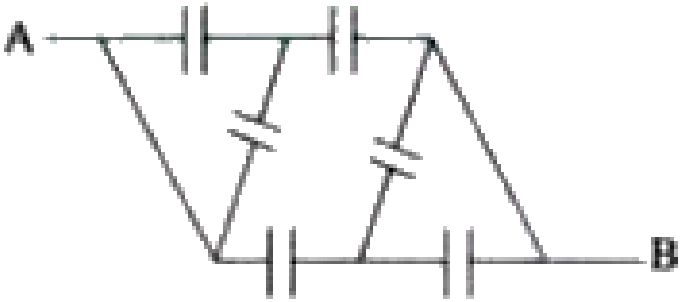
5. The capacity of each condenser in the following fig. is .C.. Then the equivalent capacitance across A and B is



A. C/4

B. 3C/4

C. 4C/3

D. 3C

Answer: C

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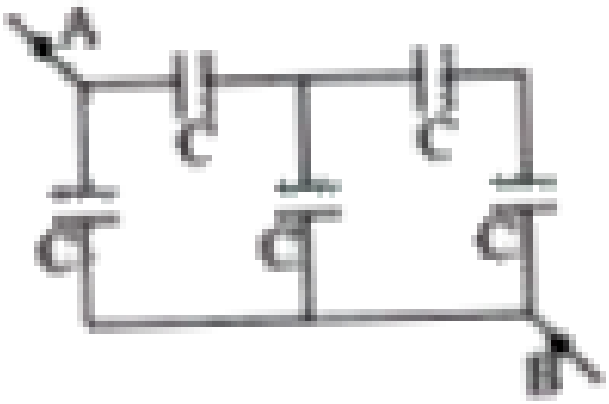
6. What is the equivalent capacitance of the system of capacitor between A & B



A. $\frac{7}{6}C$

B. $1.6C$

C. C

D. none

Answer: B

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7. Minimum number of capacitors each of $8\mu F$ and 250 V used to make a composite capacitor of $16\mu F$ and 1000 V are

A. 2

B. 4

C. 16

D. 32

Answer: D

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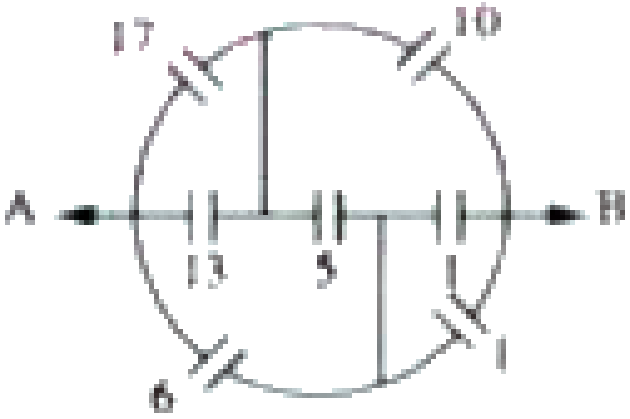
8. Find equivalent capacitance across AB (all capacitances in μF)



A. $\frac{20}{3}\mu F$

B. $9\mu F$

C. $48\mu F$

D. none

Answer: B

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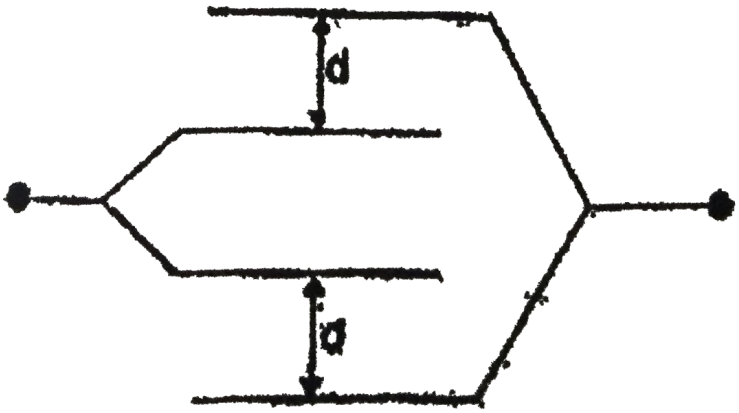
9. Four plates are arranged as shown in the diagram. If area of each plate is A and the distance between two neighbouring parallel plates is d, then the capacitance of this system will be



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

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

C. $\frac{3\varepsilon_0 A}{d}$

D. $\frac{4\varepsilon_0 A}{d}$

Answer: B

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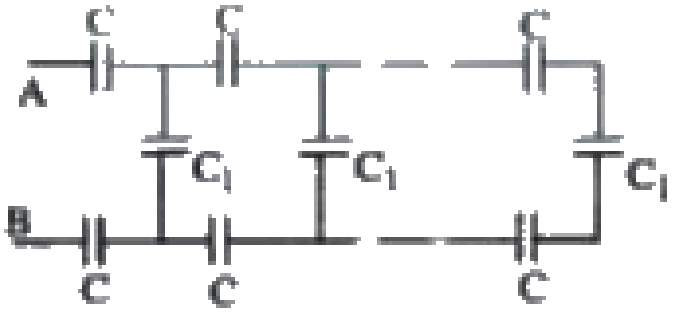
Practice Sheet Exercise I Level Ii Advanced Straight Objective Type Questions

1. If in the infinete series circuit $C = 9\mu F$ and $C_1 = 6\mu F$ then the capacity across AB is in ..... μF



A. $3\mu F$

B. $6\mu F$

C. $9\mu F$

D. $4.5\mu F$

Answer: A

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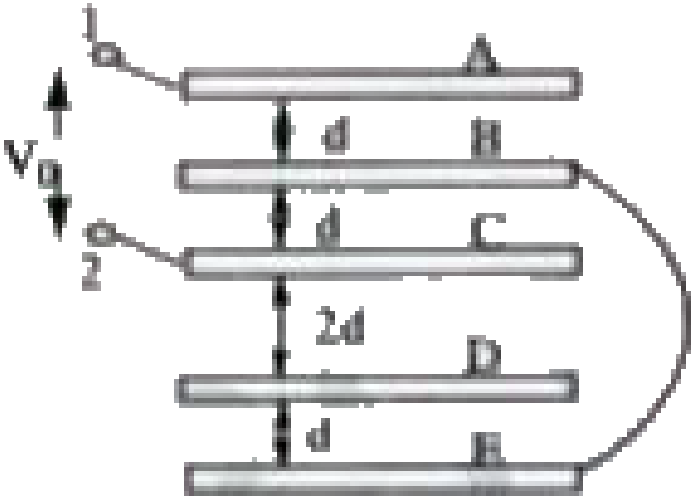
2. Five identical conducting plates each of face area .A. are arranged as shown in figure. If a potential. difference of . $V._0$ is created between

plate A and C then the charge on plate .E. will be [Given $C = \frac{\varepsilon_0 A}{d}$]



A. $\frac{3CV_0}{8}$

B. $\frac{5CV_0}{7}$

C. $\frac{5CV_0}{8}$

D. $\frac{CV_0}{7}$

Answer: D

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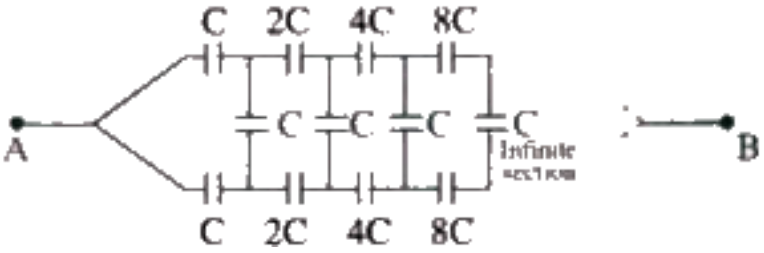
3. Find the equivaent capacitance of the circuit between point A and B.



A. 2C

B. 4C

C. C

D. 5C

Answer: C

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4. In the pure inductive circuit, the curves between frequency f and reciprocal of inductive reactance $1/X_L$ is

A. $\frac{32}{23}\mu F$

B. $\frac{11}{23}\mu F$

C. $6\mu F$

D. $1\mu F$

Answer: A

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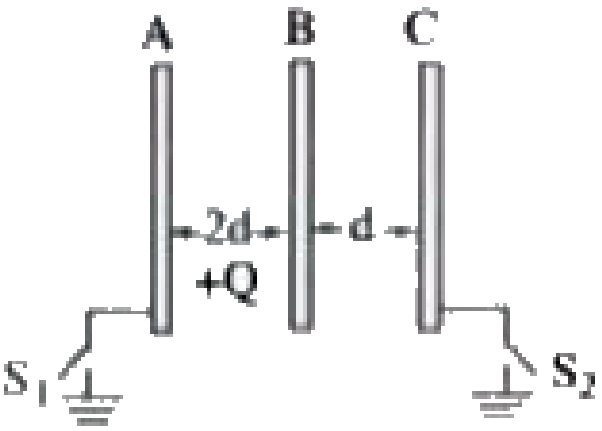
Practice Sheet Exercise I Level Ii Advanced More Than One Correct Answer Type Questions

1. Three identical parallel conducting plates A, B and C are placed as shown. Switches S_1 and S_2 are opened and connect A and C to earth

when closed. +Q charge is given to B.



A. If S_1 is closed with S_2 open, a charge of amount will pass through S_1

B. If S_2 is closed with S_1 open, a charge of amount Q will pass through S_2

C. If S_1 and S_2 are closed together, a charge of amount $\frac{Q}{3}$ will pass through S_1 and a charge of amount $\frac{2Q}{3}$ will pass through S_2

D. All the above statements are incorrect

Answer: A::B::C

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Practice Sheet Exercise I Level Ii Advanced Matrix Matching Type Questions

1. There identical point masses, each of mass 1 kg lie in the xy-plane at points (0, 0), (0, 0.2 m) and (0, 2m, 0). The net gravitational force on the mass at the origin is:

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Practice Sheet Exercise Ii Level Ii Main Straight Objective Type Questions

1. Three condensers of capacities 3 mF, 6 mF, 12mF are connected in series with a battery. If the charge on 12 mF condenser is 24 mC, the P.D. across the battery is

A. 2 V

B. 4 V

C. 8 V

D. 14 V

Answer: D

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2. Three condensers of same capacity connected in series has effective capacity 2mF. If they are connected in parallel and charged using a battery of emf 12V, the total energy stored in the combination is

A. 1296 mJ

B. 648 mJ

C. 162 mJ

D. 48 mJ

Answer: A

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3. Match the columns

1. Smallest unit of a compound	a. molecule
2. Sulphur	b. noble gas
3. Helium	c. non-metal
4. A diatomic molecule	d. carbon
5. An element having valency four	e. hydrogen
	f. metalloid

A. $250 \times 10^{-6}, 36 \times 10^{-4}$

B. $250 \times 10^{-6}, 240 \times 10^{-4}$

C. $250 \times 10^{-6}, 240 \times 10^{-4}$

D. $250 \times 10^{-6}, 50 \times 10^{-4}$

Answer: A

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4. Two capacitors are in parallel and when connected to a source of 3000 V, store 250 J of energy. When they are connected in series to the same

source, the energy stored decreases by 190 J for the same potential. Their capacities are in the ratio

A. $3:2$

B. $2:7$

C. $4:3$

D. $3:5$

Answer: A

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5. A and B are two points in a closed circuit. The potential difference across the condenser of capacity $5\mu F$ is

A. 6V

B. 10V

C. 16V

D. 4V

Answer: A

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6. n identical condensers are joined in parallel and are charged to potential so that energy stored in cach condenser is . If they are seperated and joined in series, then the total energy and total potential difference of the combination will be

A. nE and $\frac{V}{E}$

B. n^2E and nV

C. $\frac{E}{n^2}$ and $\frac{V}{n^2}$

D. nE and nV

Answer: D

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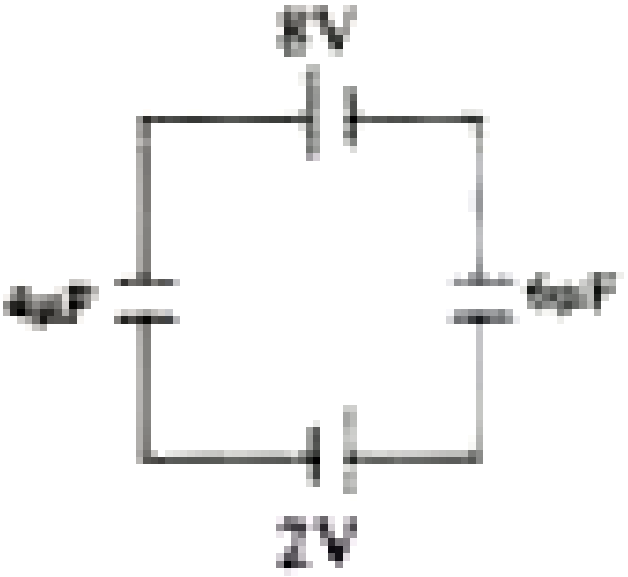
Practice Sheet Exercise Ii Level Ii Advanced Straight Objective Type Questions

1. Two condensers of capacities 4mF and 6mF are connected to two cells as shown. Then



A. P.D. of $6\mu F$ condenser is 4V

B. charge of $4\mu F$ condenser is $24\mu C$

C. both of the above are true

D. none of the above is true

Answer: C

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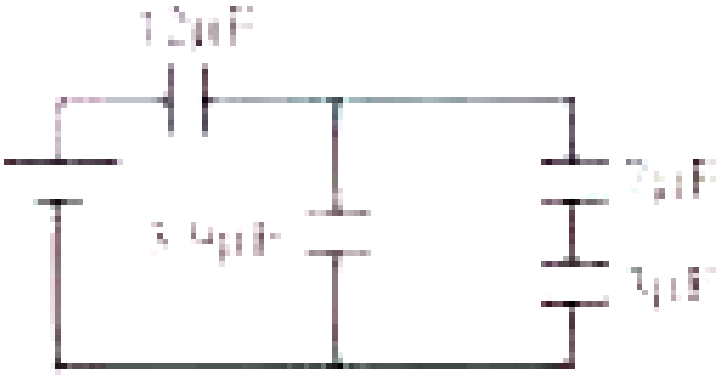
2. The potential drop across $7\mu F$ capacitor is 6V. Then



A. potential drop across $3\mu F$ capacitor is 10V

B. charge on $3\mu F$ capacitor is $21\mu F$

C. emf of the cell is 30V

D. P.D across $12\mu F$ capacitor is 5V

Answer: C

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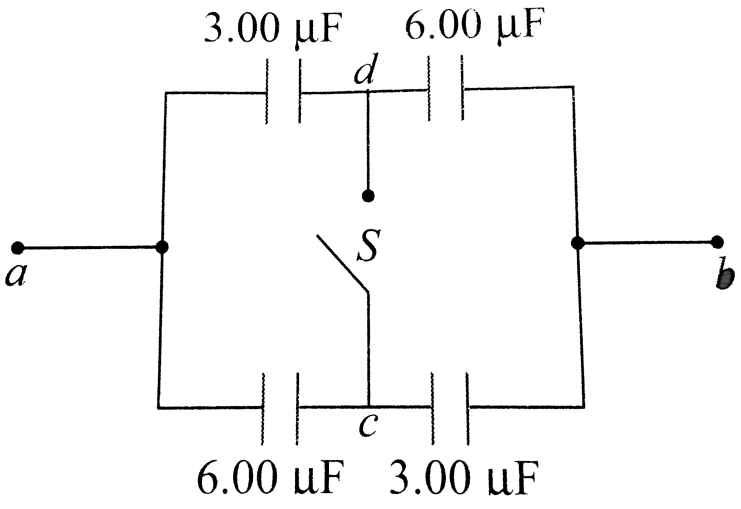
3. The capacitors in are initially uncharged and are cannected as in the diagram with switch S open. The applied potential differnce is $V_{ab} = +360V$.



a. What is the potential differnce V_{cd}

b What is the potential deffernce across each capacitor afrer switch S is

closed?

c. How much charge will flow through the awitch after it is closed?

A. 120 V

B. 100 V

C. 150 V

D. 115 V

Answer: A

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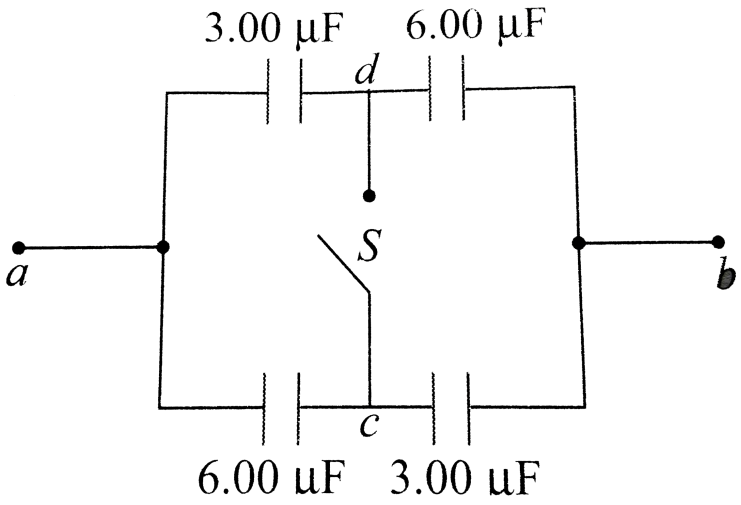
4. The capacitors in are initially uncharged and are cannected as in the diagram with switch S open. The applied potential differnce is $V_{ab} = +360V$.



a. What is the potential differnce V_{cd}

b What is the potential deffernce across each capacitor afrer switch S is closed?

c. How much charge will flow through the awitch after it is closed?

A. 100 V

B. 180 V

C. 200 V

D. 300 V

Answer: B

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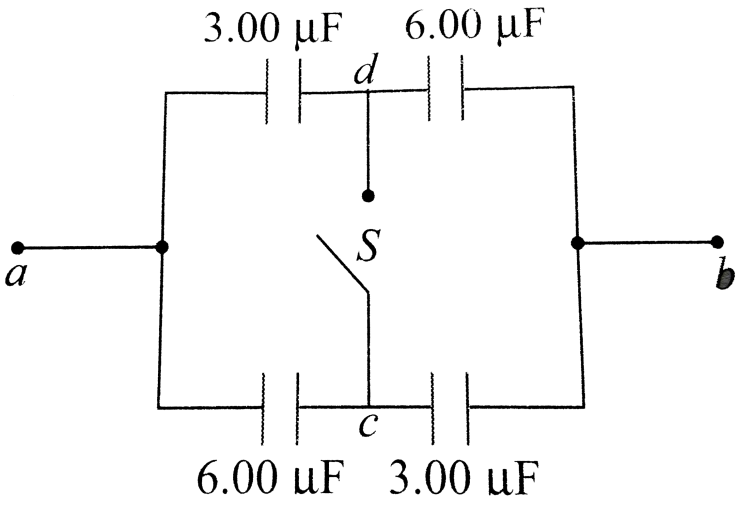
5. The capacitors in are initially uncharged and are cannected as in the diagram with switch S open. The applied potential differnce is $V_{ab} = +360V$.



a. What is the potential differnce V_{cd}

b What is the potential deffernce across each capacitor afrer switch S is closed?

c. How much charge will flow through the awitch after it is closed?

A. $140\mu C$ from C to D

B. 240μ from C to D

C. 540μ from C to D

D. $120\mu C$ from C to D

Answer: C

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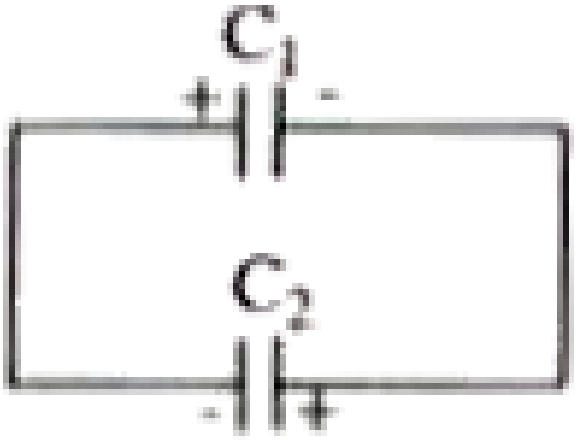
Practice Sheet Exercise Iii Level I Main Straight Objective Type Questions

1. A condenser of capacity 16 mF charged to a potential of 20 V is connected to a condenser of capacity C charged to a potential of 10 V as shown in the figure.



If the common potential is 14 V. the capacity C is equal to

A. 18 mF

B. 24 mF

C. 8 mF

D. 4 mF

Answer: D

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2. A $4\mu F$ capacitor is charged by a 200 V battery. It is then disconnected from the supply and is connected to another uncharged $2\mu F$ capacitor. During the process loss of energy (in J) s

A. Zero

B. 5.33×10^{-2}

C. 4×10^{-2}

D. 2.67×10^{-2}

Answer: D

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3. A charged sphere is connected to a similar uncharged sphere. Then the percentage loss of energy is

A. $50\ \%$

B. $25\ \%$

C. $20\ \%$

D. $10\ \%$

Answer: A

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4. The work done in increasing the P.D. across the plates of a capacitor from 4V to 6V is W then work done in increasing the P.D. from 6V to 8V is

A. $\frac{4W}{3}$

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

C. $\frac{7W}{5}$

D. $\frac{5W}{7}$

Answer: C

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5. A $10\mu F$ capacitor and a $20\mu F$ capacitor are connected in series across a 200 v supply line. The charged capacitors are then disconnected from the line and reconnected such that those same polarities are connected to each other and no external voltage is applied. The potential difference across capacitors is

A. $\frac{800}{9}$ volt

B. $\frac{800}{3}$ volt

C. 400 volt

D. 200 volt

Answer: A

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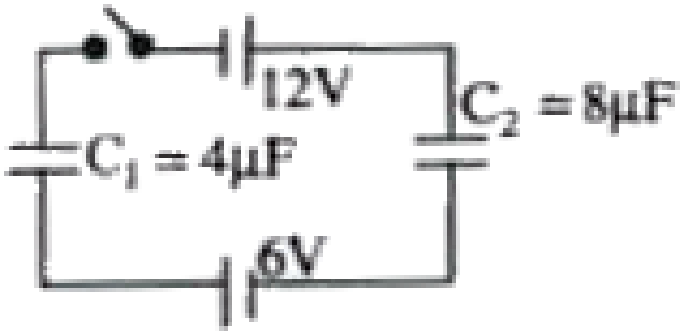
Practice Sheet Exercise Iii Level Ii Advanced More Than One Correct Answer Type Questions

1. In the circuit shown initially C_1, C_2 are uncharged. After closing the switch



A. The charge on C_2 is greater that on C_1

B. The charge on C_1 and C_2 are the same

C. The potential drops across C_2 and C_1 are the same

D. The potential drops across C_2 is greater than that across C_1

Answer: B

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2. The two plates X and Y of a parallel plate capacitor of capacitance C are given a charge of amount Q each. X is now joined to the positive terminal and Y to the negative terminal of a cell of emf E = Q/C: -

A. Charge of amount Q will flow from the negative terminal to the positive terminal of the cell inside

B. The total charge on the plate X will be 2Q.

C. The total charge on the plate Y will be zero.

D. The cell will supply CE^2 amount of energy.

Answer: A::B::C::D

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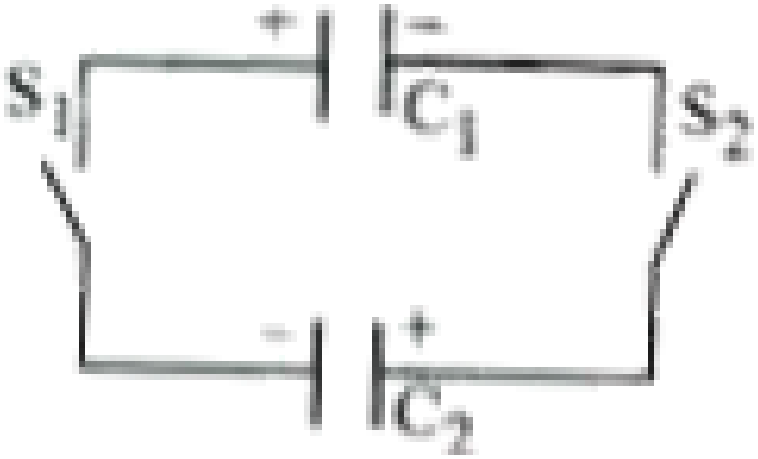
3. Two capacitors $C_1 = 4\mu F$ and $C_2 = 2\mu F$ are charged to same potential V = 500 Volt, but with opposite polarity as shown in the figure.

The switches S_1 and S_2 are closed.



A. The potential difference across the two capacitors are same and is given by $\frac{500}{3}V$

B. The potential difference across the two capacitors are same and is given by $\frac{1000}{3}V$

C. The ratio of final energy to initial energy of the system is 1/9.

D. The ratio of final energy to initial energy of the system is 4/9.

Answer: A::C::D

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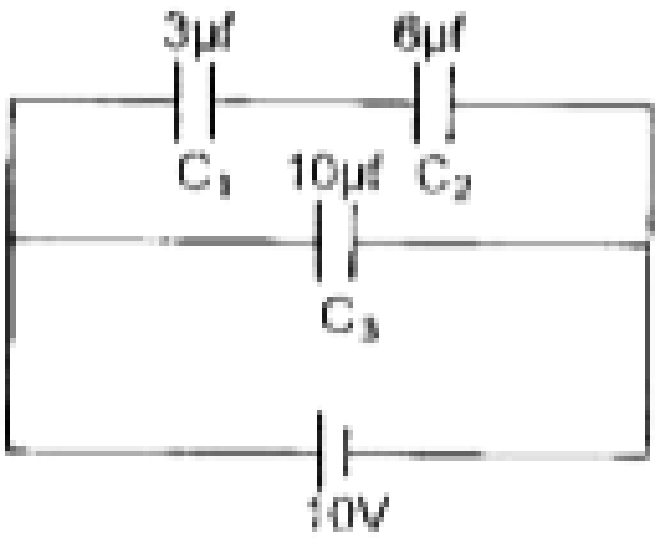
4. Three capacitors of capacitance $C_1 = 3\mu f, C_2 = 6\mu f$ and $C_3 = 10\mu f$, are connected to a 10V battery as shown in Figure 3 below



Calculate:

Equivalent capacitance

A. The amount of the charge flown through the battery is $20\mu C$

B. The heat generated in the circuit is 0.6 mJ

C. The energy supplied by the battery is 0.6 mJ

D. The amount of charge flown through the switch S is $60\mu C$

Answer: A::C::D

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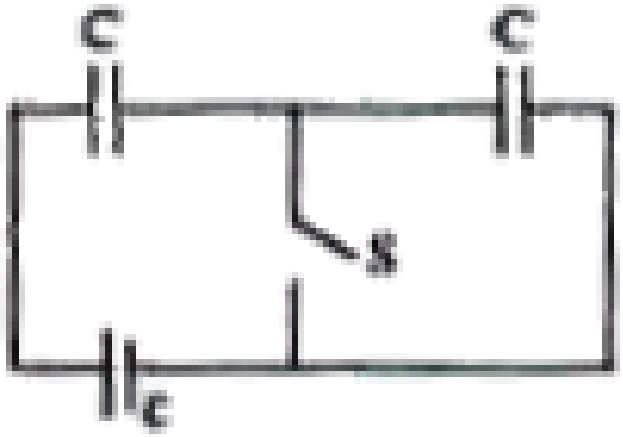
5. Consider the situation shown in figure. The switch S is open for a long time and then closed.



Find the work done by the battery .

A. $2C\varepsilon/2$

B. $C\varepsilon^2/2$

C. $C\varepsilon/2$

D. $C\varepsilon/3$

Answer: B

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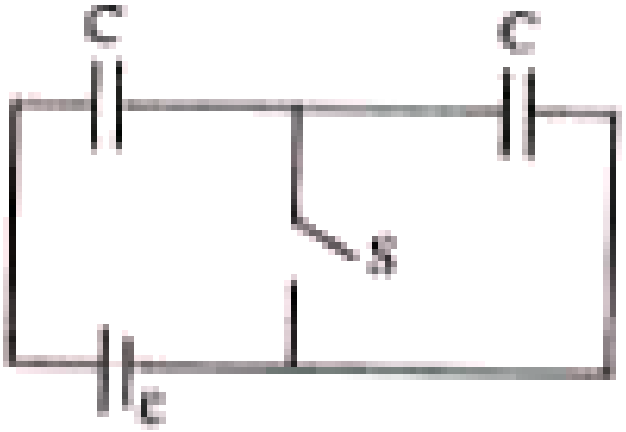
6. Consider the situation shown in figure. The switch S is open for a long time and then closed.



Find the change in energy stored in the capactiors.

A. $C\varepsilon^2/2$

B. $C\varepsilon/2$

C. $C\varepsilon^2/4$

D. C/ε

Answer: C

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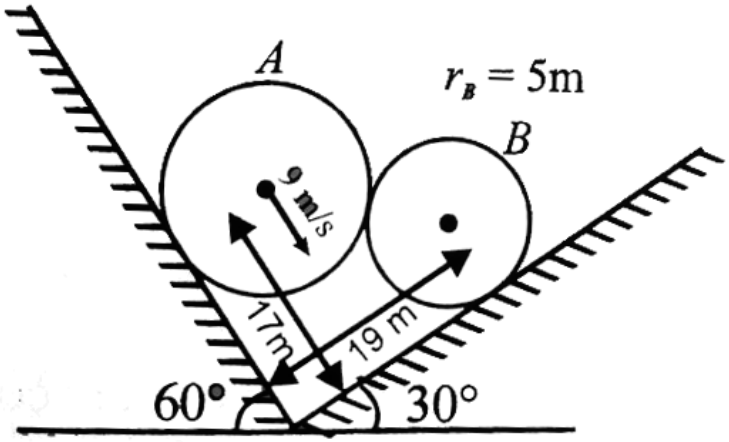
7.



System is shown in the figure. Velocity of sphere A is 9 $\frac{m}{s}$. Find the speed of sphere B.

A. $C\varepsilon^2$

B. $2C\varepsilon^2$

C. $C\varepsilon^2/2$

D. $C\varepsilon^2/4$

Answer: D

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Practice Sheet Exercise Iii Level Ii Advanced Linked Comprehension Type Questions

1. A capacitor having a capacitance of $100\mu F$ is charged to a potential difference of 24V . The charging battery is disconnected and the capacitor is connected to another battery of emf $12V$ with the positive plate of the capacitor joined with the positive terminal of the battery . (a) Find the charges on the capacitor before and after the reconnection . (b) Find the charge flown through the 12V battery . (c) Is work done by the battery or is it done on the battery ? find its magnitude . (d) Find the decrease in electrostatic field energy . (e) Find the best developed during the flow of charge after reconnection.

A. $1400\mu C, 1200\mu C$

B. $4400\mu C, 1000\mu C$

C. $5400\mu C, 3400\mu C$

D. $2400\mu C, 1200\mu C$

Answer: D

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2. A capacitor having a capacitance of $100\mu F$ is charged to a potential difference of 24V . The charging battery is disconnected and the capacitor is connected to another battery of emf $12V$ with the positive plate of the capacitor joined with the positive terminal of the battery . (a) Find the charges on the capacitor before and after the reconnection . (b) Find the charge flown through the 12V battery . (c) Is work done by the battery or is it done on the battery ? find its magnitude . (d) Find the decrease in electrostatic field energy . (e) Find the best developed during the flow of charge after reconnection.

A. $1200\mu C$

B. $1600\mu C$

C. $1800\mu C$

D. $2400\mu C$

Answer: A

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3. A capacitor having a capacitance of $100\mu F$ is charged to a potential difference of 24V . The charging battery is disconnected and the capacitor is connected to another battery of emf $12V$ with the positive plate of the capacitor joined with the positive terminal of the battery . (a) Find the charges on the capacitor before and after the reconnection . (b) Find the charge flown through the 12V battery . (c) Is work done by the battery or is it done on the battery ? find its magnitude . (d) Find the decrease in electrostatic field energy . (e) Find the best developed during the flow of charge after reconnection.

A. 12.4 mJ

B. 10.4 mJ

C. 14.4 mJ

D. 14.4 mJ

Answer: C

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4. A capacitor having a capacitance of $100\mu F$ is charged to a potential difference of 24V . The charging battery is disconnected and the capacitor is connected to another battery of emf $12V$ with the positive plate of the capacitor joined with the positive terminal of the battery . (a) Find the charges on the capacitor before and after the reconnection . (b) Find the charge flown through the 12V battery . (c) Is work done by the battery or is it done on the battery ? find its magnitude . (d) Find the decrease in electrostatic field energy . (e) Find the best developed during the flow of charge after reconnection.

A. 11.6 mJ

B. 21.6 mJ

C. 31.6 mJ

D. 41.6 mJ

Answer: B

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5. A capacitor having a capacitance of $100\mu F$ is charged to a potential difference of 24V . The charging battery is disconnected and the capacitor is connected to another battery of emf $12V$ with the positive plate of the capacitor joined with the positive terminal of the battery . (a) Find the charges on the capacitor before and after the reconnection . (b) Find the charge flown through the 12V battery . (c) Is work done by the battery or is it done on the battery ? find its magnitude . (d) Find the decrease in electrostatic field energy . (e) Find the best developed during the flow of charge after reconnection.

A. 6.2 mJ

B. 4.2 mJ

C. 2.2 mJ

D. 7.2 mJ

Answer: D

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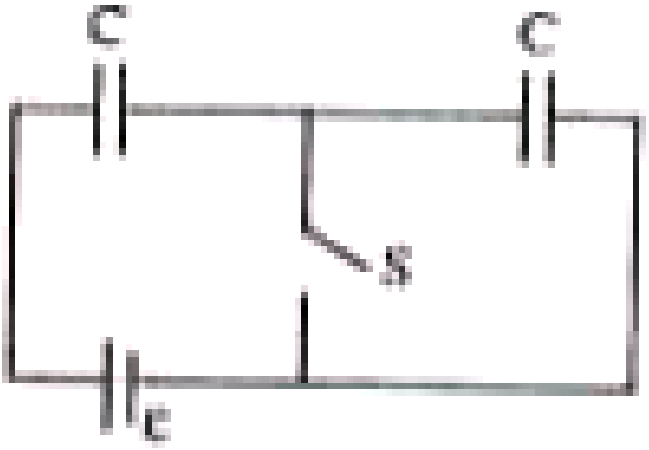
6. Consider the situation shown in figure. The switch S is open for a long time and then closed.



Find the charge flown through the battery when the switch S is closed.

A. $C\varepsilon/2$

B. $C\varepsilon/5$

C. C/ε

D. $2C/\varepsilon$

Answer: A

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Practice Sheet Exercise Iii Level Ii Advanced Matrix Matching Type Questions

1. Match the Column A with Column B

Column A	Column B
(a) Elements short by 1 electron in octet	(i) Transition elements
(b) Highly reactive metals	(ii) Noble gases
(c) Non-reactive elements	(iii) Alkali metals
(d) Elements of groups 3 to 12	(iv) Alkaline earth metals
(e) Radioactive elements	(v) Halogens
(f) Elements with 2 electrons in the ourtmost orbit.	(vi) Actinides

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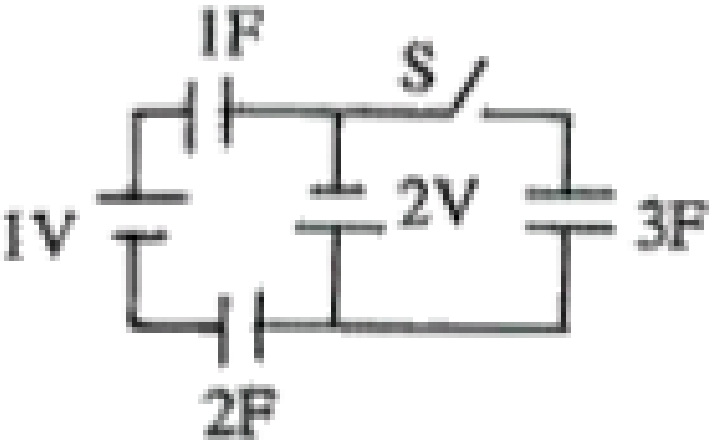
Practice Sheet Exercise Iii Level Ii Advanced Integer Type Questions

1. There is no charge on 3F capacitor when .S. is open.How Much heat (in Joule) is developed in circuit after .S. is closed ?



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Practice Sheet Exercise Iv Level I Main Straight Objective Type Questions

1. The capacity of a parallel plate capacitor formed by the plates of same area A is $0.02\mu F$ with air as dielectric. Now one plate is replaced by a

plate of area 2A and dielectric (k=2) is introduced between the plates, the capacity is

A. $0.04\mu F$

B. $0.08\mu F$

C. $0.01\mu F$

D. $2\mu F$

Answer: A

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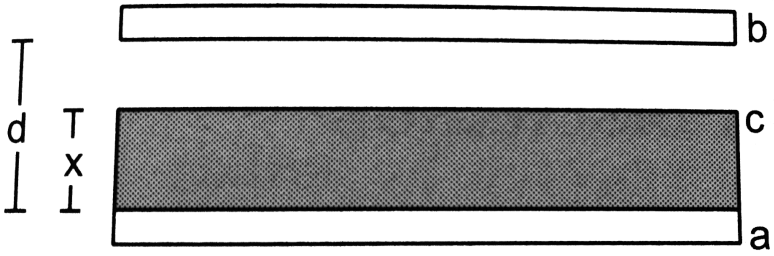
2. A parallel plate capacitor has plate area A and plate separation d. The space between the plates is filled up to a thickness x ($<$ d) with a dielectric constant K. Calculate the capacitance of the system.



A. $1.6 \times 10^{-5} J$

B. $2 \times 10^{-6} J$

C. $12.4 \times 10^{-5} J$

D. $1.6 \times 64 \times 10^{-5} J$

Answer: C

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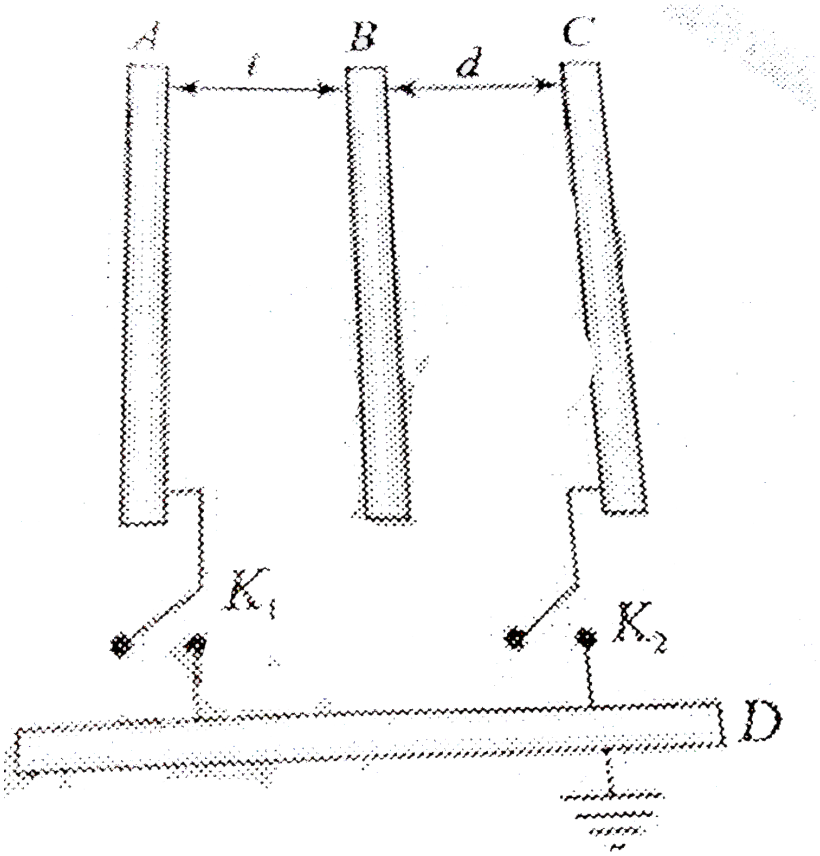
3. Three plates A, B and C are placed close to each other with $+Q$ charge given to the middle plate. The inner surfaces to A and C can be connected to earth through plate D and keys K_1 and K_2 . The plates D is a dielectric slab with dielectric constant K_1 then the charge that will flow through plate D and keys K_1 and K_2 . The plate D is a dielectric slab with dielectric constant K, then the charge that will flow though plate D when K_2 is

closed and K_2 is open is



A. 2

B. 2.5

C. 4

D. 10

Answer: B

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4. When a dielectric slab of thickness 6 cm is introduced between the plates of parallel plate condenser, it is found that the distance between the plates has to be increased by 4 cm to restore to capacity original value. The dielectric constant of the slab is

A. 1.5

B. $2/3$

C. 3

D. 4

Answer: C

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5. A parallel plate capacitor with air as medium between the plates has a capacitance of $10\mu F$. The area of capacitor is divided into equal halves

and filled with two media as shown in the figure having dielectric constant $K_1 = 2$ and $K_2 = 4$. The capacitance of the system will now be

A. 10 mF

B. 20 mF

C. 30 mF

D. 40 mF

Answer: C

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6. Two identical parallel plate capacitors are connected in series to a battery of $100N$. A dielectric slab of dielectric constant 4.0 is inserted between the plates of second capacitor. The potential difference across the capaitors will now be respectively.

A. 10 V, 40 V

B. 70V,30 V

C. 75 V,25 V

D. 80V,20 V

Answer: D

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7. The ratio between masses of two planets is 3 : 5 and the ratio between their radii is 5 : 3. The ratio between their acceleration due to gravity will be

A. 1.8pF

B. 45 pF

C. 40.5 pF

D. 20.25 pF

Answer: C

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8. A parallel plate capacitor with air as dielectric is charged to a potential .v. using a battery . Removing the battery. The charged capacitor is then connected across an identical uncharged parallel plate capacitor filled with was of dielectric constant k. The common potential of both the capacitor is

A. V volts

B. kV volts

C. (k+1) V volts

D. $\frac{V}{k+1}$ volts

Answer: D

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9. The capacity of a parallel plate condenser with air as dielectric is $2\mu F$. The space between the plates is filled with dielectric slab with K = 5. It is charged to a potential of 200V and disconnected from cell. Work done in removing the slab from the condenser completely

A. 0.8 J

B. 0.6 J

C. 1.2J

D. 1.6J

Answer: A

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10. A parallel - plate capacitor of plate area A and plate separation d is charged to a potential difference V and then the battery is disconnected . A slab of dielectric constant K is then inserted between the plate of the

capacitor so as to fill the space between the plate .Find the work done on the system in the process of inserting the slab.

A. $\frac{\varepsilon_0 A V^2}{d}\left(1-\frac{1}{K}\right)$

B. $\frac{\varepsilon_0 A V}{2d}\left(\frac{1}{K}-1\right)$

C. $\frac{\varepsilon_0 A V^2}{2d}\left(\frac{1}{K}-1\right)$

D. $\frac{\varepsilon_0 A V^2}{2d}\left(1-\frac{1}{K}\right)$

Answer: C

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11. A dielectric slab of length l, width b, thickness d and dielectric constant K fills the space inside a parallel plate capacitor. At t = 0, the slab begins to be pulled out slowly with speed y. At time t, the capacity of the capacitor is

A. $\frac{\varepsilon_0 b}{d}[Kl-(K-1)vt]$

B. $\frac{\varepsilon_0 b}{b}[Kl+(K+1)vt]$

C. $\frac{\varepsilon_0 b}{b}[(Kl+1)vt]$

D. $\frac{\varepsilon_0 b}{b}[l+(K-1)vt]$

Answer: A

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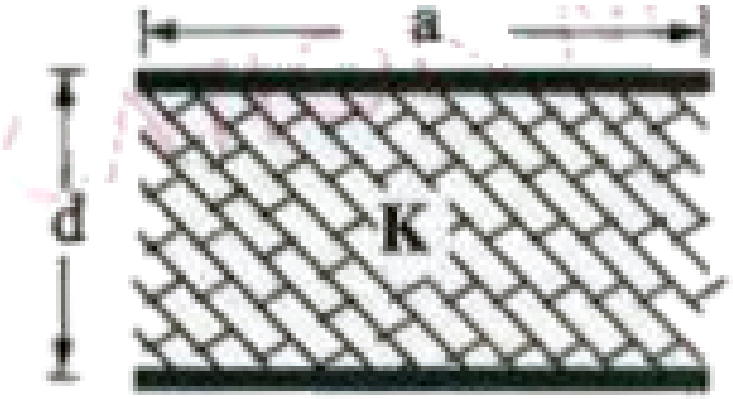
Practice Sheet Exercise Iv Level Ii Advanced Straight Objective Type Questions

1. The figure shows a parallel-plate capacitor having square plates of edge a and plate-separation di The gap between the plates is filled with a directric of dielectric constant k which varies as $K = K_0 + \alpha x$ parallel to an edge as where K and α are constants and x is the distance from the

left end. Calaculate the capacitance.



A. $\frac{\varepsilon_0 a^2}{d}\left(K_0+\frac{a\alpha}{2}\right)$

B. $\frac{\varepsilon_0 a^2}{d}\left(K_0-\frac{a\alpha}{2}\right)$

C. $\frac{\varepsilon_0 a}{d}\left(K_0-\frac{a\alpha}{2}\right)$

D. $\frac{\varepsilon_0 a}{d}\left(K_0+\frac{a\alpha}{2}\right)$

Answer: A

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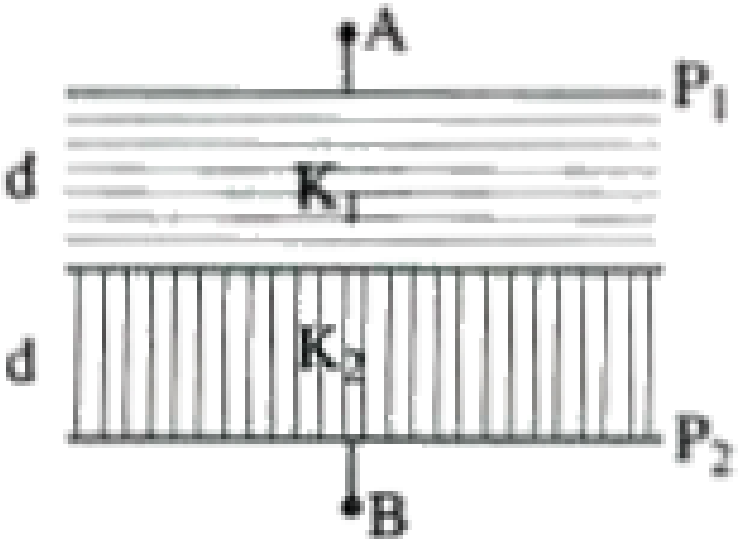
2. In the figure shown P_2 and P_2 are two conducting plates having charges of equal magnitude and opposite sign. Two dielectrics of

dielectric constant K_1 and K_2 fill the space between the plates as shown in the figure. The ratio of electrical energy in 1^{st} dielectric to that in the 2^{nd} dielectric is :



A. $1:1$

B. $K_1:K_2$

C. $K_2:K_1$

D. $K_2^2:K_1^2$

Answer: C

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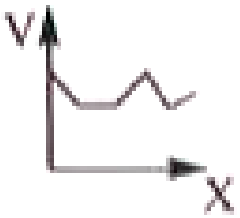
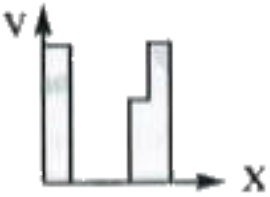
3. The distance between plates capacitor is 5d. The positively charged plate is at $x = 0$ and negatively charged plate is at $x = 5d$. Two siabs one of conductor and the outer of a dielectric of same thickness d are inserted between the plates as shownin figure. Potential (V) versus distance x graoh will be

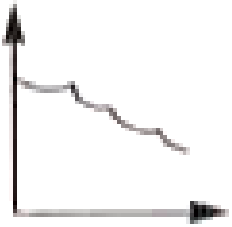
A.



B.

C.





D.

Answer: B

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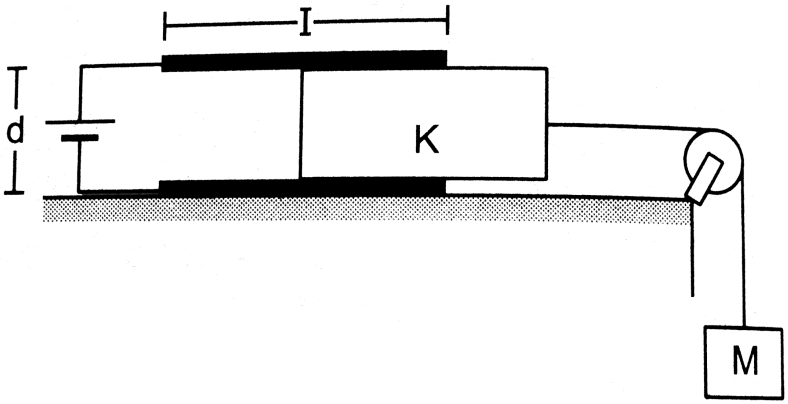
4. Consider the situation shown in figure .The width of each plate is b.The capacitor plates are rigidly clamped in the laboratory and connected to be a battery of emf ε All surfaces are friction less .Calculate the value of M for which the dielectric slab will stay in equilibrium.



A. $\frac{\varepsilon_0 bE^2(K-1)}{2dg}$

B. $\frac{\varepsilon_0 bE^2(K-1)}{dg}$

C. $\frac{2\varepsilon_0 bE^2(K-1)}{dg}$

D. $\frac{\varepsilon_0 bE^2(K+1)}{dg}$

Answer: A

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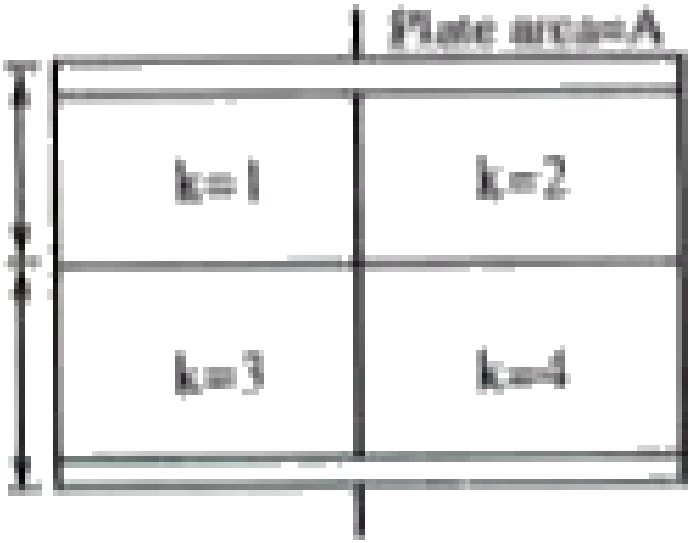
5. Find the capacitance of the system shown in figure.



A. $\frac{25}{12}\frac{\varepsilon_0 A}{d}$

B. $\frac{19}{24}\frac{\varepsilon_0 A}{d}$

C. $\frac{21}{24}\frac{\varepsilon_0 A}{d}$

D. $\frac{11}{7}\frac{\varepsilon_0 A}{d}$

Answer: A

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Practice Sheet Exercise Iv Level Ii Advanced More Than One Correct Answer Type Questions

1. Following operations can be performed on a capacitor :

X - connect the capacitor to a battery of emf. E.Y - disconnect the battery

Z - reconnect the battery with polarity reversed. W - insert a dielectric slab in the capacitor

A. In XYZ (perform X, then Y, then Z) the stored electric energy remains unchanged and no thermal energy is developed.

B. The charge appearing on the capagitor is greater after the action XWY than after the action XYW.

C. The electric energy stored in the capacitor is greater after the action WXY than after the action XYW .

D. The electric field in the capacitor after the action XW is the same as that after WX.

Answer: B::C::D

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2. 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

Answer: A::C::D

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3. The capacitance of a parallel plate capacitor is C_0 when the plates has air between them. This region is now filled with a dielectric slab of dielectric constant K and capacitor is connected with battery of EMF E and zero internal resistance. Now slab is taken out, then during the removal at slab :

A. charge CE(k - 1) flows through the cell

B. energy $E^2C(k-1)$ is absorbed by the cell.

C. the energy stored in the capacitor is reduced by $E^2C(k-1)$

D. the external agent has to do $\frac{1}{2}E^2C(k-1)$ amount of work to take the slab out.

Answer: A::B::D

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4. A parallel plate capacitor of plate area a and plate separation d is charged to potential difference V and then the battery is disconnected. A slab of dielectric costant K is then inserted between the plates of the capacitor so as to fill the space between the plates. If Q,E,and W denote, respectively, the magnitude of charge on each plate, the electric field between the plates (after the slab is inserted) and work done on the system, in question, in the process of inserting the slab, then

A. $Q = \frac{\varepsilon_0 AV}{d}$

B. $Q = \frac{\varepsilon_0 KAV}{d}$

C. $E = \frac{V/K}{d}$

D. $W = \frac{\varepsilon_0 A V^2}{2\,\mathrm{d}}\left(1 - \frac{1}{K}\right)$

Answer: A::C::D

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Additional Practice Exercise Level I Main Straight Objective Type Questions

1. A thick conducting slab is introduced between the plates of an isolated charged capacitor to fill the free space partially and without touching any plate. Which of the following is wrong statement regarding the points inside the capacitor

A. Electric field at some points will change and at some points remains unchanged

B. Electric field is zero at all the points

C. Electrostatic energy density at some points will change and that at some points remains unchanged

D. Total electrostatic energy of the capacitor will decrease

Answer: B

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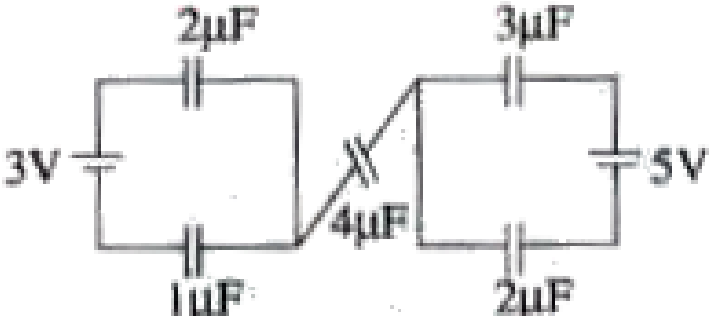
2. All the capacitors were uncharged before they are connected in circuit.

Now the charge on $4\mu F$ capacitor is



A. Zero

B. $4\mu F$

C. $8\mu F$

D. $12\mu F$

Answer: A

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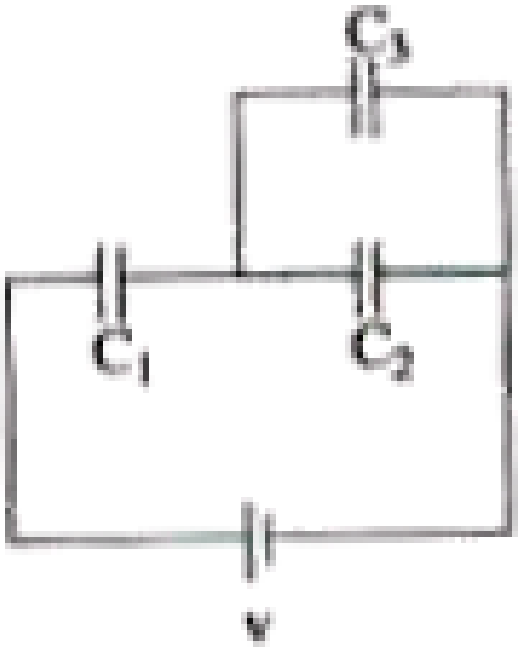
3. Three uncharged capacitors are connected across a battery as shown. It is known that the energy stored in all the capacitors is same. Which of the following is not correct?



A. $C_1 = 4C_2$

B. $C_2 = C_3$

C. $C_1 > C_2 + C_3$

D. none

Answer: D

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4. The ratio between masses of two planets is 3 : 5 and the ratio between their radii is 5 : 3. The ratio between their acceleration due to gravity will be

A. 4

B. 6

C. 8

D. 2

Answer: C

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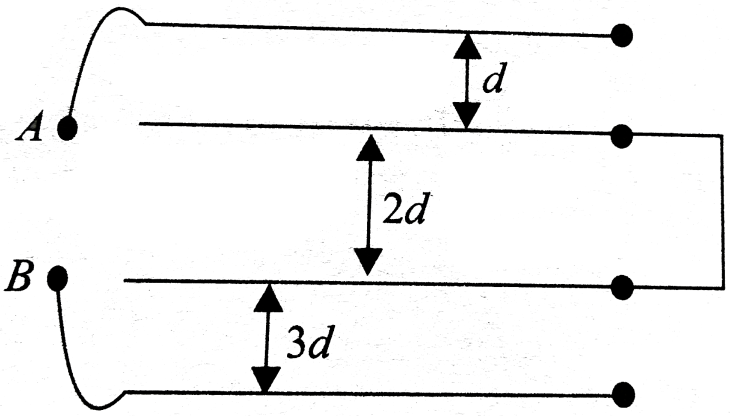
5. If the area of each plate is A and then successive separations are d, $2d$ and $3d$, then find the equivalent capacitance across A and B.



A. $\frac{\varepsilon_a A}{6d}$

B. $\frac{\varepsilon_0 A}{4d}$

C. $\frac{3\varepsilon_0 A}{4d}$

D. None

Answer: B

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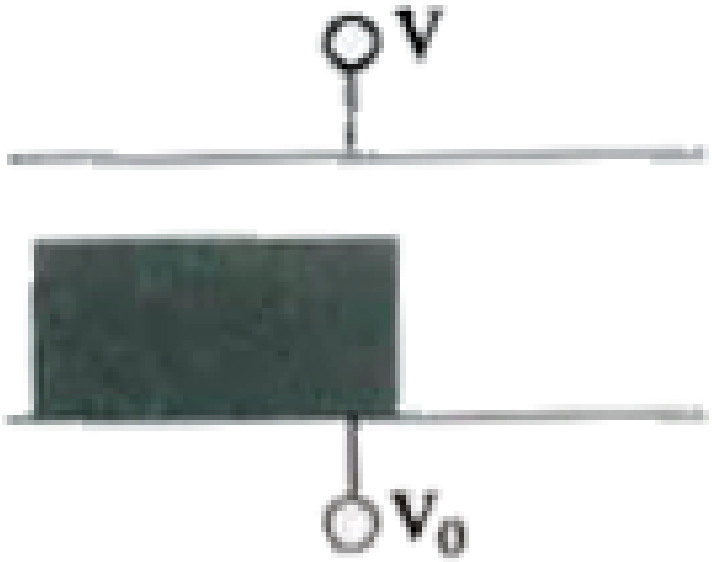
6. The capacitor shown has square plates of side L and has gap d between the photos. In the dielectric constant of the materiale of the slab is k , the capacitance of the capacitor is



A. $C_{eq} = \dfrac{\varepsilon_0 L^2(1+2K)}{d(1+K)}$

B. $C_{eq} = \dfrac{\varepsilon_0 L^2(1+3K)}{d(1+2K)}$

C. $C_{eq} = \dfrac{\varepsilon_0 L^2(1+2K)}{d(1+2K)}$

D. $C_{eq} = \dfrac{\varepsilon_0 L^2(1+3K)}{d(1+K)}$

Answer: B

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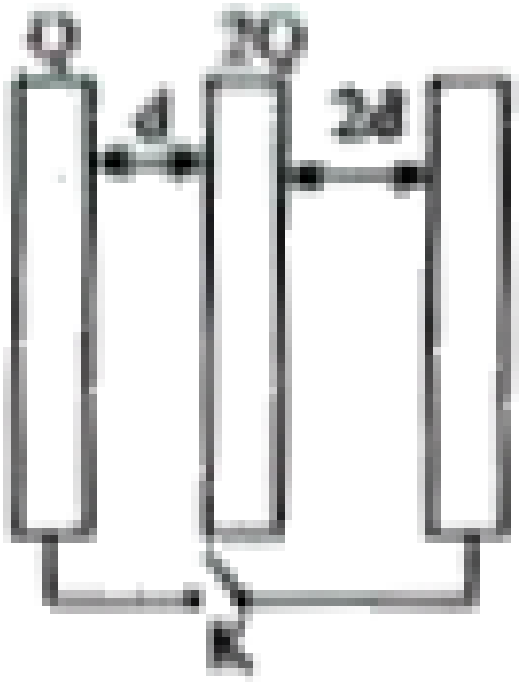
7. Three large plates are arranged as shown. How much charge will flow through the key k if it is closed?



A. $\frac{5Q}{6}$

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

C. $\frac{3Q}{2}$

D. None

Answer: A

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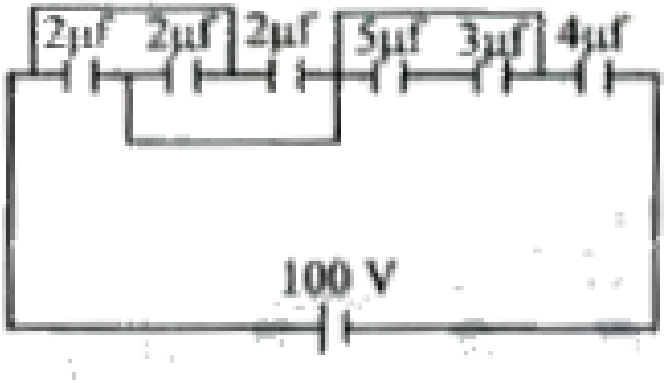
8. In the circuit shown in figure charge stored in the capacitor of capacity $5\mu f$ is



A. $16\mu C$

B. $20\mu C$

C. $30\mu C$

D. zero

Answer: D

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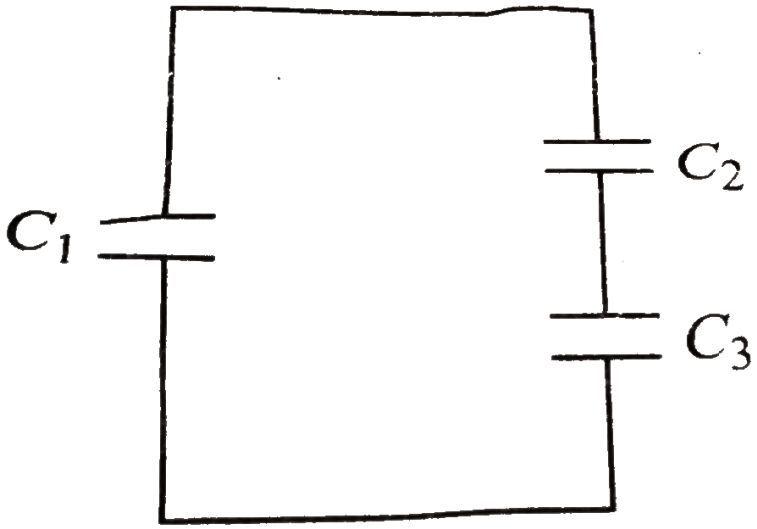
9. Capacitor C_1 is connected to a battery and charged till the magnitude of the charge on each plate is q_0. Then, the battery is disconnected and C_1 is connected to two other uncharged capacitors C_2 and C_3 as shown in figure. Final charges on the capacitors $(q_1, q_2 \text{ and } q_3)$ are related by .



A. $14\mu C$

B. $8\mu C$

C. $7\mu C$

D. $6\mu C$

Answer: B

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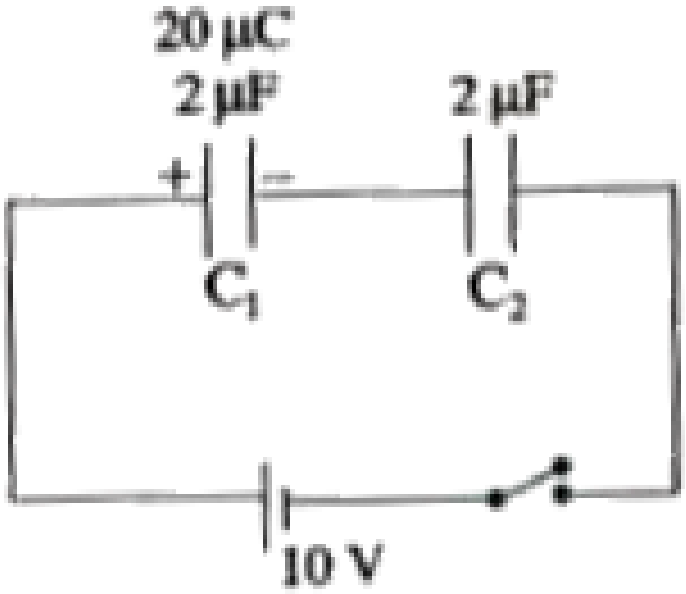
10. When switch is closed , charges on C_1 and C_2 are



A. $20\mu C, 0$

B. $10\mu C, 10\mu C$

C. $30\mu C, 10\mu C$

D. $0, 20\mu C$

Answer: A

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11. The plates of a parallel plate capacitor have surface area .A. and are initially separated by a distance .d.. They are connected to a battery of voltage v_0 Now, the plates of the capacitor are pulled apart w a separation 2d. Then, increase in the energy of the battery is

A. $\frac{\in_0 AV_0^2}{4d}$

B. $\frac{\in_0 AV_0^2}{2d}$

C. $\frac{\in_0 AV_0^2}{8d}$

D. there will be no change in the energy of the battery

Answer: B

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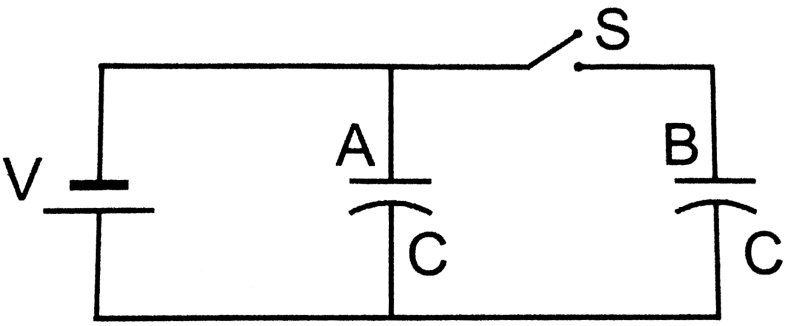
12. Figure shows two identical parallel plate capacitors connected to a switch S. Initially ,the switch is closed so that the capacitors are completely charged .The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant 3. Find the ratio of the initial total energy stored in the capacitors to the final total energy stored.



A. $3:5$

B. $1:1$

C. $5:3$

D. non of these

Answer: A

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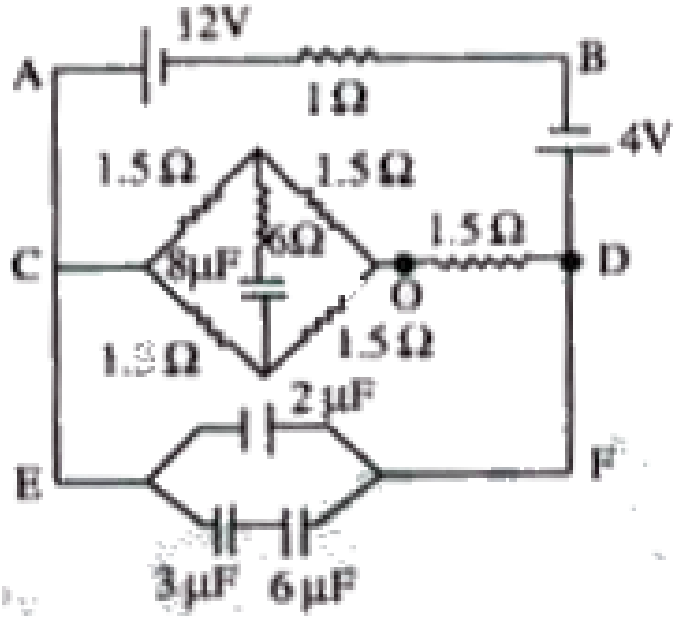
13. In the given circuit, the potential difference across the $6\mu F$ capacitor in steady state is



A. 1V

B. 4V

C. 3V

D. 2V

Answer: D

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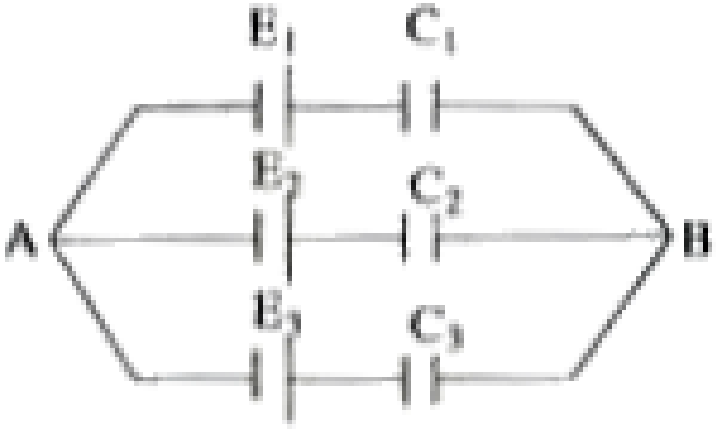
14. In the given circuit find the $|V_A - V_B|$ where V_A, V_B are electric potentials at the points A and B.



A. $\frac{E_1 + E_2 + E_3}{3}$

B. $\frac{3}{\frac{1}{E_1}+\frac{1}{E_2}+\frac{1}{E_3}}$

C. $\frac{E_1C_1+E_2C_2+E_3C_3}{C_1+C_2+C_3}$

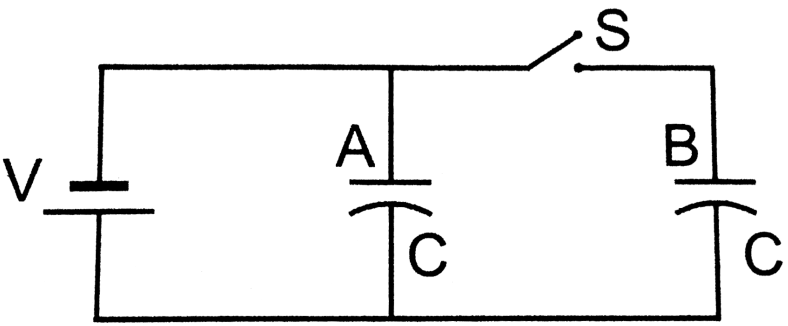
D. $\frac{\frac{E_1}{C_1}+\frac{E_2}{C_2}+\frac{E_3}{C_3}}{\frac{1}{C_1}+\frac{1}{C_2}+\frac{1}{C_3}}$

Answer: C

Watch Video Solution

15. Figure shows two identical parallel plate capacitors connected to a switch S. Initially ,the switch is closed so that the capacitors are completely charged .The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant 3. Find the ratio of the initial total energy stored in the

capacitors to the final total energy stored.



A. $2:3$

B. $3:4$

C. $3:5$

D. $5:36$

Answer: C

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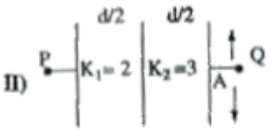
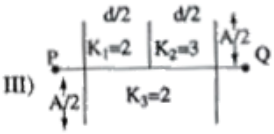
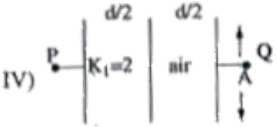
16. Arrange the folloowing in decreasing order effective capacitor between P and Q







A. IV,III,II,I

B. I,II,III,IV

C. II,IV,III,I

D. I,III,II,IV

Answer: B

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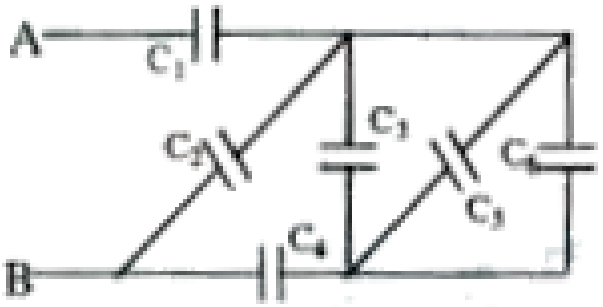
17. In the accompanying diagram , if $C_1 = 3\mu F, C_2 = 6\mu F, C_3 = 9\mu F, C_4 = 12\mu F, C_5 = 15\mu F$ and $C_6 = 18\mu$

, then the equivalent capacitor between the ends A and B is



A. $1.22\mu F$

B. $5.16\mu F$

C. $2.25\mu F$

D. $2.51\mu F$

Answer: D

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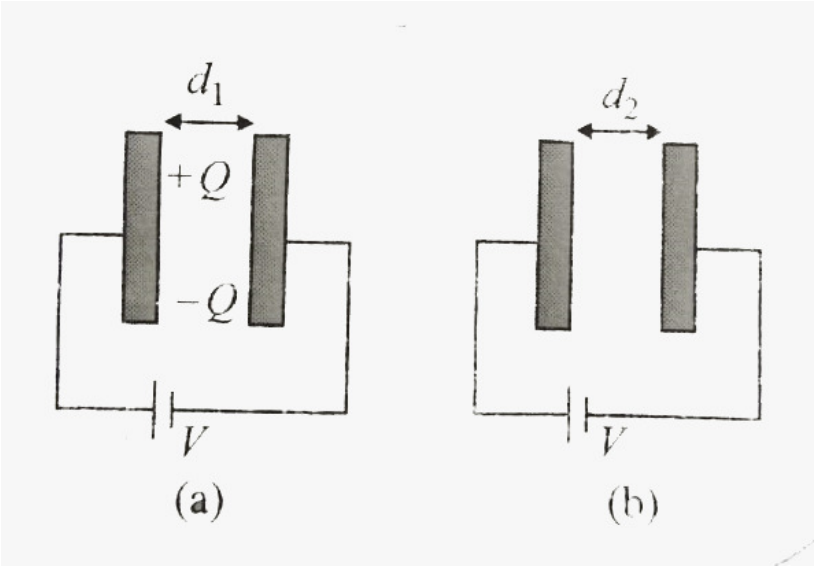
18. Consider a capacitor as shown in figure. If we pull the plates of capacitor apart to a final position as shown in figure, then we must perform some work against the electric force. For this situation, mark out

the correct statements.



A. Work done is $\frac{Q^2}{2\varepsilon_0 A}(d_2 - d_1)$ and is stored in volume $A(d_2 - d_1)$

B. Work done is $+\frac{Q^2}{2\varepsilon_0 A}(d_2 - d_1)$ and is stored in volume Ad_2.

C. Work done is $+\frac{\varepsilon_0 A V^2}{2}\left(\frac{d_2 - d_1}{d_1 d_2}\right)$ and is stored in volume $A(d_2 - d_1)$

D. Work done is $+\frac{\varepsilon_0 A V^2}{2}\left(\frac{d_2 - d_1}{d_1 d_2}\right)$ and is stored in volume Ad_2

Answer: C

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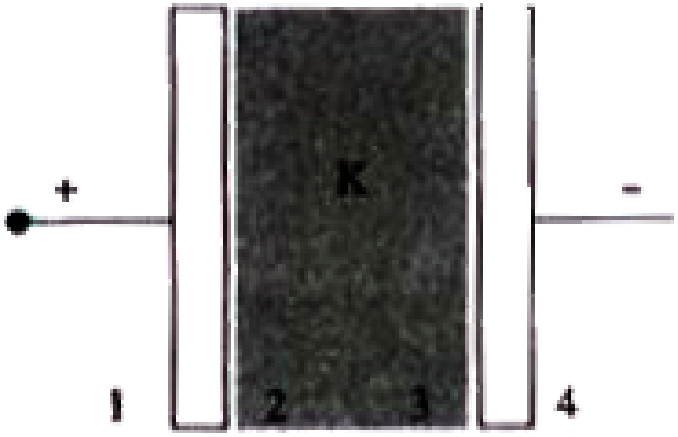
19. An isolated capacitor of capacitance C is charged to a potential V. Then a dielectric slab of dielectric constant K is inserted as shown. The net charge on four surfaces 1,2, 3 and 4 would be respectively.



A. $0, \mathrm{CV}-CV, 0$

B. $0, \frac{CV}{K}, \frac{-CV}{K}, 0$

C. $CV, 0, 0, -CV$

D. $CV, \frac{-CV}{K}, \frac{CV}{K}, -CV$

Answer: B

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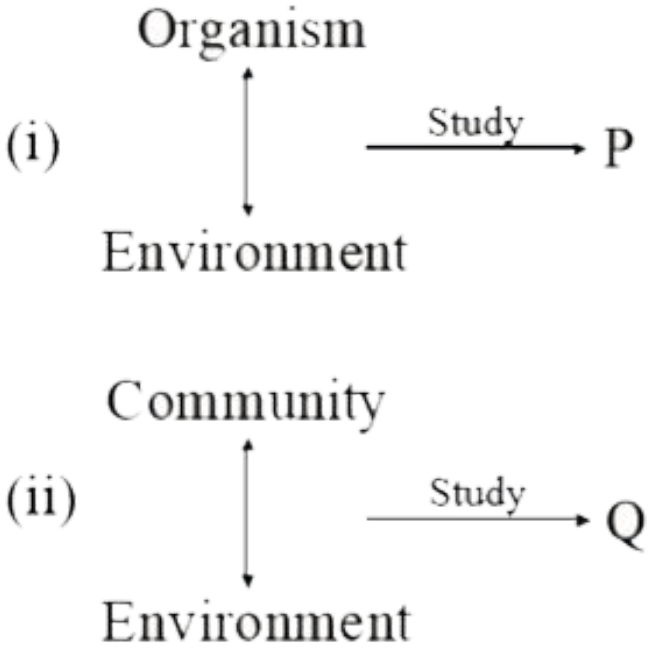

20.

then P and Q are respectively called as.

A. $Q_1 > Q_4$

B. $Q_1 = 2.5\mu C$

C. $Q_1 < Q_4$

D. $Q_4 = 5\mu C$

Answer: B

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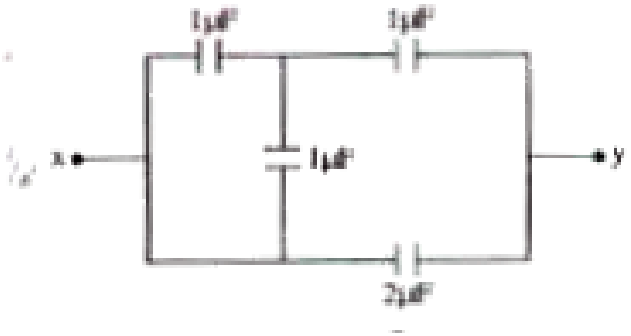
21. Four capacitors are connected as shown in figure. Their capacities are indicated in the figure. The effective capacitance between points x and y is (in μF)



A. $\frac{5}{6}$

B. $\frac{7}{6}$

C. $\frac{8}{3}$

D. 2

Answer: C

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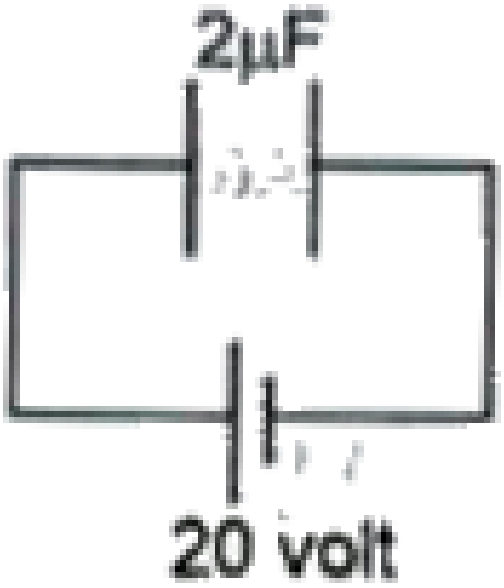
22. In the figure a capacitor of capacitance $2\mu F$ is connected to a cell of emf 20 volt. The plates of the capacitor are drawn apart slowly to double the distance between them. The work done by the external agent on the plates is:



A. $-200\mu J$

B. $200\mu J$

C. $400\mu J$

D. -400

Answer: B

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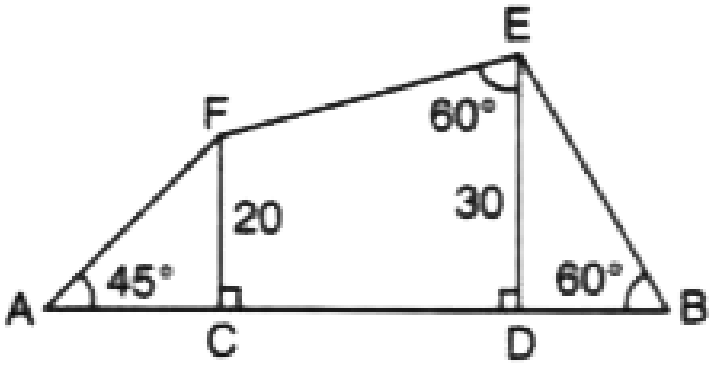
Additional Practice Exercise Level Ii Lecture Sheet Advanced Straight Objective Type Questions

1. Find AB.



A. $\frac{10}{3}$ pF

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

C. 1 pF

D. $\frac{1}{30}$ pF

Answer: A

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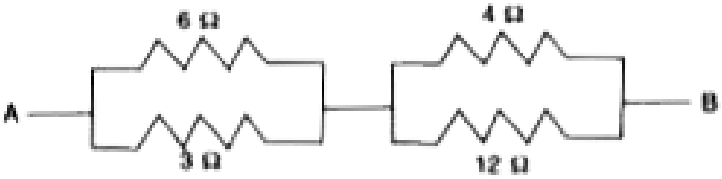
2. Find the equivalent resistance between A and B.



A. $48\pi\varepsilon_0 a$

B. $\frac{36}{11}\pi\varepsilon_0 a$

C. $\frac{72}{11}\pi\varepsilon_0 a$

D. $\frac{48}{11}\pi\varepsilon_0 a$

Answer: C

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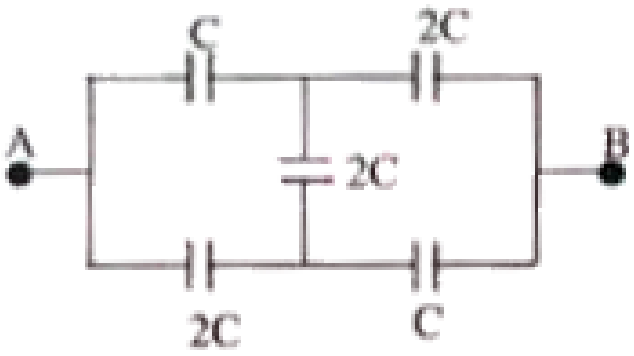
3. Find the equivalent capacitance between A and B



A. 7C

B. 10/7C

C. 10C

D. 20C

Answer: B

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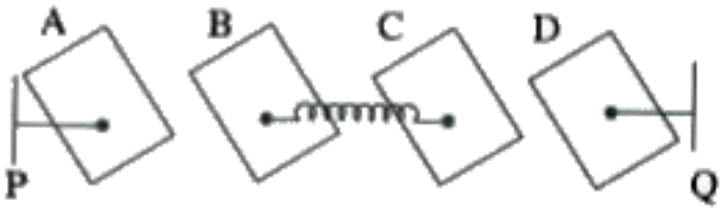
4. Four identical conducting plates are placed parallel to each other at equal separations as shown below:



Plates A and D are fixed while B and C are connected with the help of a conducting spring of spring constant k. Initially, the spring is in relaxed position and B and C are at rest, now the spring is compressed slightly by displacing B and C and then plates B and C are released to perform SHM. Now the capacitance of the system across PQ [Mass of each plate is m]

A. remain constant

B. Increase continuously

C. deceases continuously

D. is verying sinusdoidally with frequency $\frac{1}{2\pi}\sqrt{\frac{2k}{m}}$

Answer: D

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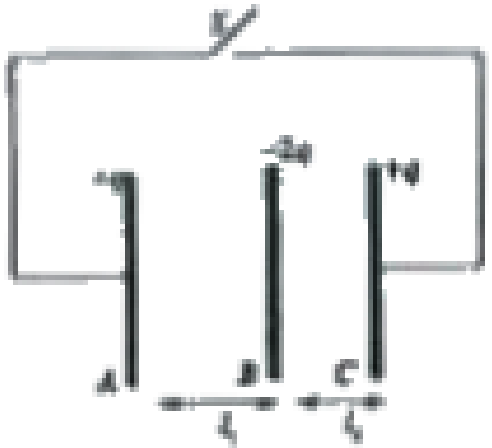
5. Three large conducting plates A, B and C having charges +q,-2q and +q as shown in fig. The gaps l_1 and l_2 are small and $> l_2$ The plates A and C are fixed and B is free to move. Neglest gravity. If switch S is closed, the plate B will start moving towards



A. Left

B. Right

C. will not move

D. First move towards left and then towards right

Answer: B

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6. First move towards left and then towards right For the circuit shown, which of the following statements is true ?

A. with S_1 closed , $V_1 = 15V, V2 = 20V$

B. with S_3 closed, $V_1 = V_2 = 25V$

C. with $S_1 \& S_2$ closed $V_1 = V_2 = 0$

D. with $S_1 \& S_2$ closed $V_1 = 30V, V_2 = 20V$

Answer: D

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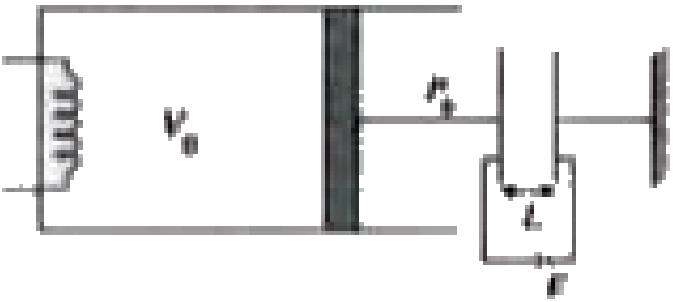
7. An ideal gas is enclosed in a cylinder fitted with a frictionless piston. The piston is connected with a light rod to one plate of capacitor whose other plate is fixed as shown. Initially volume of the gas inside the cylinder is V_0 Atmospheric pressure is P_0 separation between the plates is L, area of the piston as well as of the capacitor plates is A and emf of battery is ε . A heater supplies heat to the gas so that pressure of the gas is given as $P = P_0 - \frac{n\varepsilon_0\varepsilon^2}{L^2}$ when piston is displaced by a distance $\frac{L}{2}$. Find value of n.



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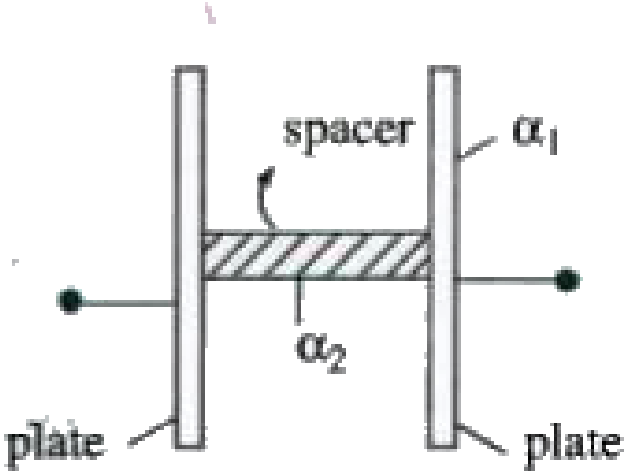
8. A capacitor is to be designed to operate, with constant capacitance, even when temperature varies.The distance between plates is adjusted by

spacer to compensate temperature effect. Let α_1 and α_2 be the coefficient of thermal expansion of plate and spacer respectively. Find the ratio of $\frac{\alpha_2}{\alpha_1}$. So that no change in capacitance of capacitor with change in temperature.



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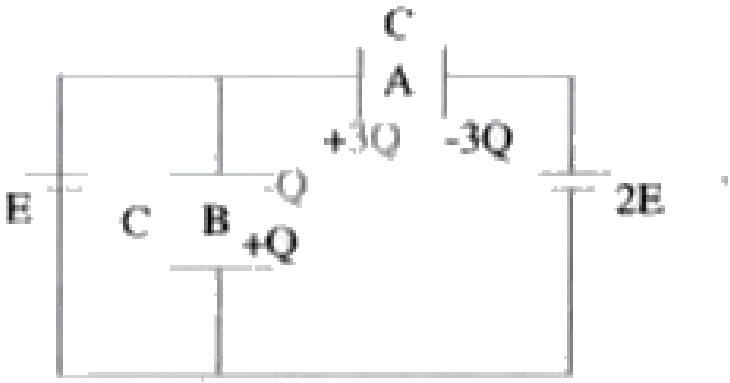
9. The initial charge across capacitors A and B are shown with Q=CE. Find the ratio of final charge in capacitor A to the final charge in capacitor B,

when cells are switched on.



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Additional Practice Exercise Level Ii Lecture Sheet Advanced Matrix Matching Type Questions

1. Match the refining methods (Column I) with (Column II).

	Column I (Refining methods)	Column II (Metals)	
I.	Liquation	(a)	Zr
II.	Zone Refining	(b)	Ni
III.	Mond Process	(c)	Sn
IV.	Van Arkel Method	(d)	Ga

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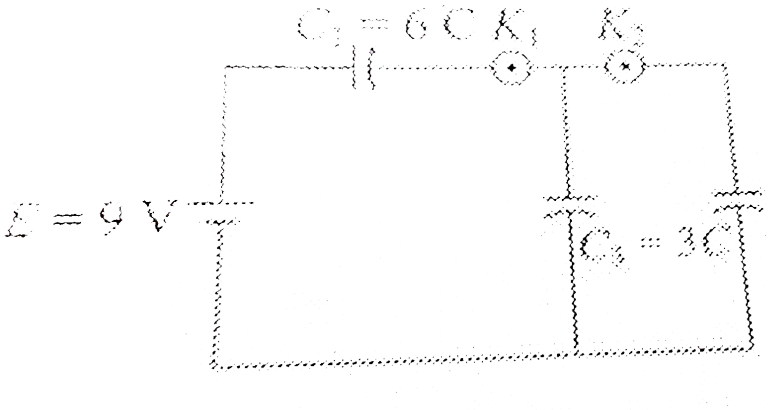
Additional Practice Exercise Level Ii Lecture Sheet Advanced Integer Type Questions

1. in the circuit shown in the figure initially K_1 is closed and K_2 is open. What are the charges on each capacitors? Now K_1 was opened and K_2 was closed (order is important) what will be the charge on each capacitor now? $[C = 1\mu F]$



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2. Two balls, each of radius R, equal mass and density, are placed in contact. Then the force of gravitation between them is proportional to:

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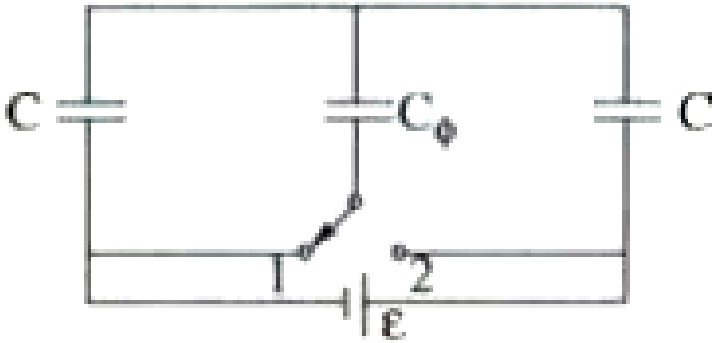
3. What amount of heat in micro joule will be generated in the circuit , after the switch is shifted from position 1 to position 2? $\left(C = C_0 = 2\mu F, E = \sqrt{6}V\right)$



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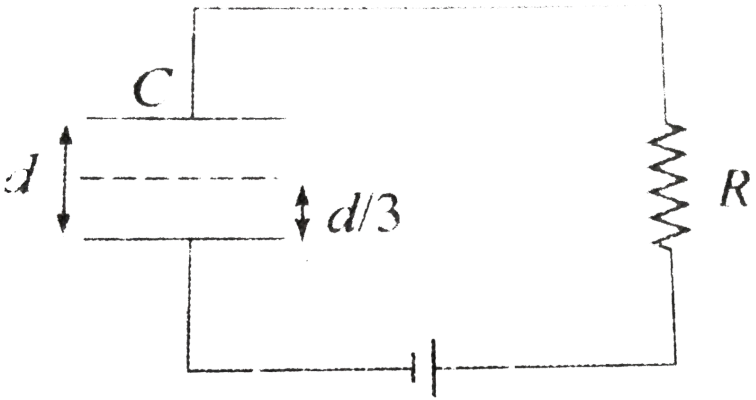
Practice Sheet Advanced Straight Objective Type Questions

1. A parallel plate capacitor C with plates of unit area and separaion d is filled with a liquid of dielectric constant K = 2. The level of liquid is $d/3$ initially. Suppose the liquid level decreases at a constant speed V. the

time constant as a function of time t is



A. $\frac{6\varepsilon_0}{5d+3vt}$

B. $\frac{(15d+9vt)\varepsilon_0}{2d^2-3dvt-9^2t^2}$

C. $\frac{6\varepsilon_0}{5d-3vt}$

D. $\frac{(15d-9vt)\varepsilon_0}{2d^2+3dvt-9v^2t^2}$

Answer: A

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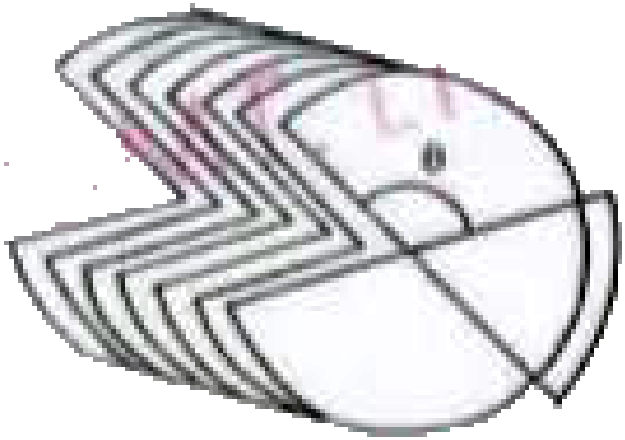
2. A variable air capacitor used in radio tuning circuit is made of N semi-cireuler plates each of radius R and positioned a distance d from its neighboring plates. A second set of similar plates is enmeshed with its plates half-way between those of first set. Second set of plates can rotate as a complete unit. capacitance of arrangement is



A. $\frac{N\varepsilon_0(\pi-\theta)R^2}{d}$

B. $\frac{(N-1)\varepsilon_0(\pi-\theta)R^2}{d}$

C. $\frac{(N-2)\varepsilon_0(\pi-\theta)R^2}{d}$

D. $\frac{(2N-1)\varepsilon_0(\pi-\theta)R^2}{d}$

Answer: D

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3. A sperical capacitor composed of two concentric metal spheres one having a radius twice as large as the other. The region in which the energy is stored has a volume of

A. $\frac{1}{4}\frac{c^3}{\pi^2\varepsilon_0^3}$

B. $\frac{1}{16}\frac{c^3}{\pi^2\varepsilon_0^2}$

C. $\frac{1}{384}\frac{c^3}{\pi^2\varepsilon_0^3}$

D. $\frac{7c^3}{384\pi^2\varepsilon_0^2}$

Answer: D

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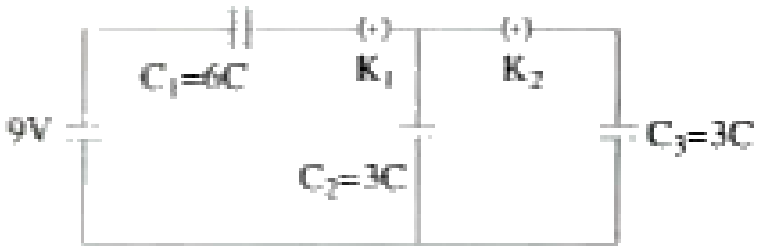
4. In the ciruit shown in figure, Initially K_1 is closed and K_2 is open, let charge on capacitor C_2 is Q_2 Then K_1 was opened while K_2 kept closed,

let charge on capacitor C_2 is Q_2 (Take, $C = 1\mu F$) Then ratio $\frac{Q_2}{Q_1}$ is



A. $1:1$

B. $2:1$

C. $3:1$

D. $1:3$

Answer: B

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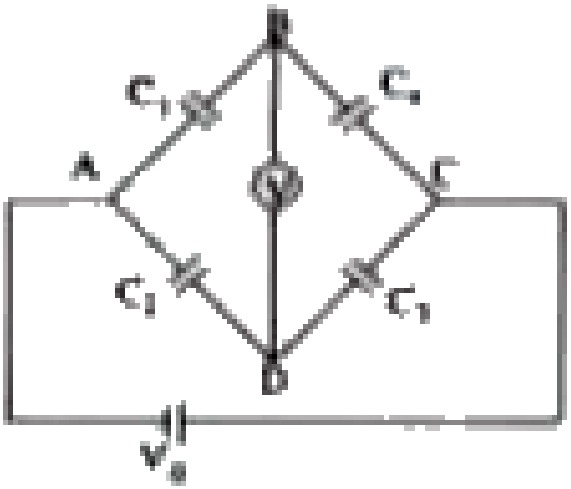
5. In capacitor bridge, a voltage V_0 is applied and the variable capacitor C_1 has been adjusted till voltmeter shown zero reading. If

$C_1 = 8.9\mu F, C_2 = 18\mu F, C_3 = 4.8\mu F$ at balance point, then C_x is



A. $5.4\mu F$

B. $7.4\mu F$

C. $2.4\mu F$

D. $3.8\mu F$

Answer: C

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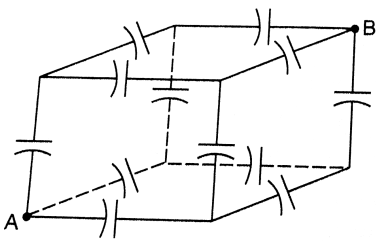
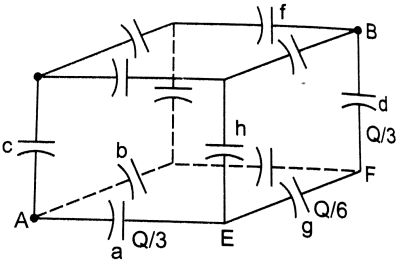
6. Twelve capacitors, each having a capacitance C, are connected to form a cube . Find the equivalent capacitance between the diagonally opposite corners such as A and B.



(a)



(b)

A. $\frac{3C}{4}$

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

C. $\frac{3C}{2}$

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

Answer: B

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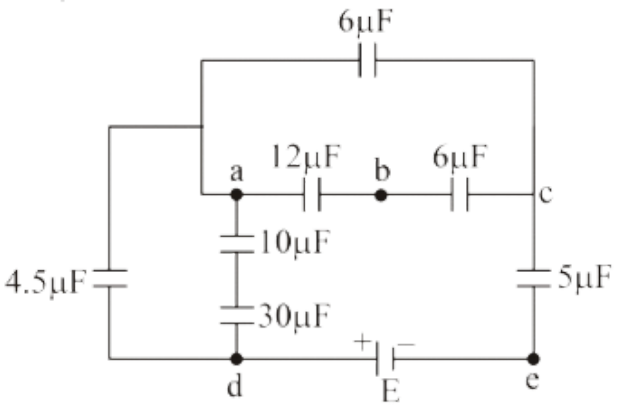
7. A combination of capacitors given is charged by a cell of emf E as shown :

If it is given that V_{ab} i.e. potential difference between points a and b is 4V, then answer the given questions.

EMF E of the charging battery is:



A. 4V

B. 12V

C. 10V

D. 8V

Answer: C

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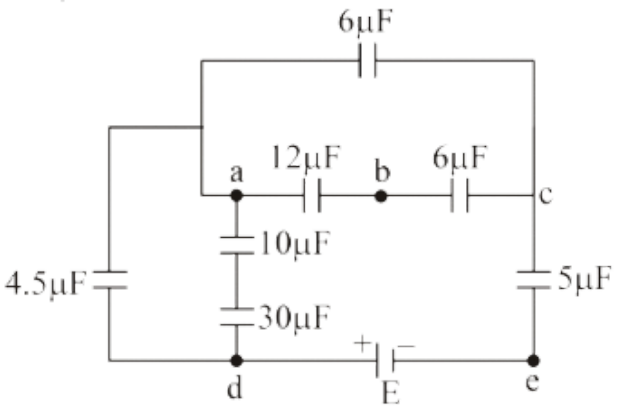
8. A combination of capacitors given is charged by a cell of emf E as shown :

If it is given that V_{ab} i.e. potential difference between points a and b is 4V, then answer the given questions.

EMF E of the charging battery is:



A. 46V

B. 12V

C. 20V

D. 18V

Answer: A

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9. Match the refining methods (Column I) with (Column II).

	Column I (Refining methods)	Column II (Metals)	
I.	Liquation	(a)	Zr
II.	Zone Refining	(b)	Ni
III.	Mond Process	(c)	Sn
IV.	Van Arkel Method	(d)	Ga

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Practice Sheet Advanced Linked Comprehension Type Questions Passage

1. The liquid used in car radiator is primarily a mixture of ethylene glycol is that

A. $\frac{2\pi\varepsilon_0 l}{\ln(R_0 l R_i)}\left\{(K_f - K_v)\frac{h}{l} + K_v\right\}$

B. $\frac{2\pi\varepsilon_0 l}{\ln(R_0 l R_i)}\left\{(K_v - K_f)\frac{h}{l} + K_i\right\}$

C. $\frac{2\pi\varepsilon_0 l}{\ln(R_i l R_0)}\left\{(K_v - K_l)\frac{h}{l} + K_v\right\}$

D. $\frac{2\pi\varepsilon_0 l}{\ln(R_i l R_0)}\left\{(K_v - K_l)\frac{h}{l} + K_v\right\}$

Answer: A

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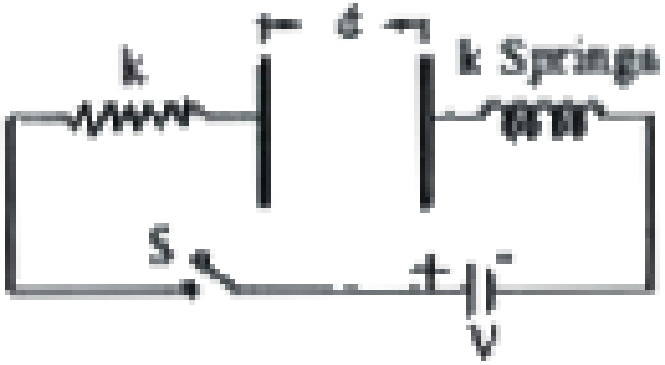
Practice Sheet Advanced Integer Type Questions

1. In the given circuit, When switch S is opencd, the plates are uncharged and are separated by distance d=8.00mm. Battery is of 100V and springs are identical with spring constant K. Capacitance of capacitor with separation d=8mm is $2\mu F$. When switch S is closed, the distance between plates is reduced to 4mm. Find the sum of spring constants of springs.



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2. A parallel plate capacitor is charged by a DC supply of 500V. Plate separation is 1mm. If capacitoris lowered into water with water filling in the gap between the plates, then change in pressure at any point between the plates is $k\varepsilon_0 \times 10^{13}(N/m)^2$. Find the value of K, given ε_r (for water)=81.

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