



PHYSICS

BOOKS - OSWAAL PUBLICATION

PHYSICS (KANNADA ENGLISH)

**ELECTROSTATIC POTENTIAL AND
CAPACITANCE**

**Topic 1 Electrostatic Potential Very Short Answer
Type Questions**

1. Why must electrostatic field at the surface of a charged conductor be normal to the surface at every point ? Give reason.



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2. Do electrostatic field lines form (electrostatic) closed loops? Give reason.



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3. (a) an electrostatic field line is a continuous curve that is field line cannot have sudden breaks why not

(b) explain why two field lines never cross each other at any point



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4. What is the shape of equipotential surface around the point charge ?



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5. Name the physical quantity whose S.I. unit is JC^{-1} . Is it a scalar or a vector quantity?



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Topic 1 Electrostatic Potential Short Answer Type Questions I

1. Depict the equipotential surfaces for a system of two identical positive point charges placed at distance 'd' apart.



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2. Write two properties of equipotential surfaces.



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3. Depict the equipotential surfaces due to an isolated point charge .



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4. Draw a plot showing the variation of (i) electric field (E) and (ii) electric potential (V) with distance r due to a point charge Q .



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Topic 1 Electrostatic Potential Short Answer Type Questions Ii

1. Derive an expression for potential energy of a system of two charges in the absence of the external electric field.



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2. Write the expression for electric potential at a contrasting feature of electric potential of dipole at a point as compared to that due to a point charge.



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3. Derive the relation between electric field and electric potential.





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Topic 1 Electrostatic Potential Numerical Problems

1. Two point charges $+1 \text{ nC}$ and 4 nC are 1 m apart in air. Find the positions along the line joining the two charges at which resultant potential is zero.



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2. Two point charges $5 \times 10^{-8} C$ and $3 \times 10^{-8} C$ are located 16 m apart. At what points on the line joining the two charges is the electric potential zero ?



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3. (a) Calculate the potential at a point P due to a charge of $4 \times 10^{-7} C$ located 9 cm away.

(b) Hence obtain the work done in bringing a charge of $2 \times 10^{-9} C$ from infinity to the

point P. Does the answer depend on the path along which the charge is brought ?



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4. Two charges $3 \times 10^{-8} C$ & $-2 \times 10^{-8} C$ are located 15 cm apart. At what point on the line joining the two charges is the electric potential zero? Take the potential infinity to be 0.



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5. Calculate the electric potential at a point P, located at the centre of the square of point charges shown in the figure.



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Topic 2 Capacitors And Capacitance Very Short Answer Type Questions

1. What is the unit of capacitance ?



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2. How much stat farad makes one farad ?



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3. What is the relation between potential difference and capacitance for same amount of charge stored ?



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4. The effective capacitance of two capacitors connected in series is

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5. Write the equation for energy stored per unit volume in the capacitor ?

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Topic 2 Capacitors And Capacitance Very Short Answer Type Questions I

1. What is an electrostatic shielding? Mention its one application.



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2. Define farad. Give the expression for energy stored in a capacitor of capacitance C charged to a potential V .



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3. The given graph shows variation of charge 'q' versus potential difference 'V' for two capacitors C_1 and C_2 . Both the capacitors have same plate separation but plate area of C_2 is greater than that of C_1 . Which line (A or B) correspond to C_1 and why?



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Topic 2 Capacitors And Capacitance Very Short Answer Type Questions li

1. Derive an expression for capacitance of a parallel plate capacitor



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2. A parallel plate capacitor is charged by a battery. After sometime the battery is disconnected and a dielectric slab with its thickness equal to the plate separation is inserted between the plates. How will (i) the capacitance of the capacitor, (ii) potential

difference between the plates and (iii) the energy stored in the capacitor be affected ? Justify your answer in each case.



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Topic 2 Capacitors And Capacitance Long Answer Type Questions

1. Write the equivalent capacitance of a number of identical capacitors connected in parallel.





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2. Obtain an expression for effective Capacitance of two Capacitors Connected in series.



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3. Deduce the expression for the electrostatic energy stored in a capacitor of capacitance 'C' and having charge 'Q'. How will the (i) energy stored and (ii) the electric field inside the

capacitor be affected when it is completely filled with a dielectric material of dielectric constant 'K' ?



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Topic 2 Capacitors And Capacitance Numerical Problems

1. Two capacitors of capacitance 600 pF and 900 pF are connected in series across a 200 V supply. Calculate (i) the effective capacitance

of the combination, (ii) the pd across each capacitor and (iii) the total charge stored in the system.



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2. A 600pF capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged 600pF capacitor. How much electrostatic energy is lost in the process?



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3. A 400 pF capacitor charged by a 100 V dc supply is disconnected from the supply and connected to another uncharged 400 pF capacitor calculate the loss of energy



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4. In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3} m^2$ and the distance between the plates is 3 m. Calculate the capacitance of the

capacitor. If this capacitor is connected to a 100V supply. What is the charge on the each plate of the capacitor?



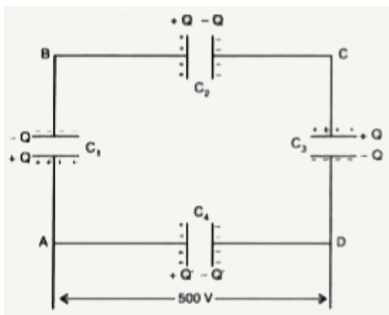
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5. The effective capacitances of two condensers are $3\mu F$ and $16\mu F$, when they are connected in series and parallel respectively. Compute the capacitance of each condenser.



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6. A network of four $10\mu F$ capacitors is connected to a 500 V supply as shown in figure. Determine (a) the equivalent capacitance of the network and (b) the charge on each capacitor.



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7. A parallel plate capacitor with only air between the plates has a capacitance of 8pF .

What will be the capacitance if the distance between the plates is reduced by half and the space between them is filled with a substance of dielectric constant 6?



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8. The plates of a parallel plate capacitor have an area of 90 cm^2 each and are separated by

2.5 mm. The capacitor is charged by connecting it to a 400 V supply.

(a) How much electrostatic energy is stored by the capacitor?

(b) View this energy as stored in the electrostatic field between the plates, and obtain the energy per unit volume u . Hence arrive at a relation between u and the magnitude of electric field E between the plates.



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