BHARATIYA VIDYA BHAVAN'S V.M. PUBLIC SCHOOL

PHYSICS TEST

### Electrostatics Test 1

CLASS XII   MARKS-20

1. Force of attraction between two point electric charges placed at a distance d in a medium is F. What distance apart should these be kept in the same medium, so that force between them becomes F/3? [1]

2. The distance of the field point on the equatorial plane of a small electric dipole is halved. By what factor will the electric filed due to the dipole change? [1]

3. Draw one equipotential surface (1) In a uniform electric field (2) For a point change $(\theta < 0)$? [2]

4. If the amount of electric flux entering and leaving a closed surface are ϕ_1 and ϕ_2 respectively. What is the electric charge inside the surface? [2]

5. Derive an expression for the total work done in rotating an electric dipole through an angle θ in a uniform electric field? [3]

6. If C_1 = 3pF and C_2 = 2pF, calculate the equivalent capacitance of the given network between points A & B? [3]
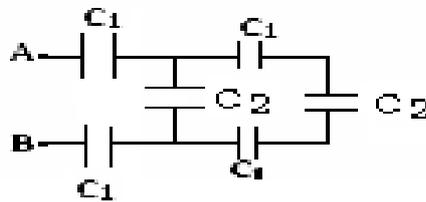
7. Prove that energy stored per unit volume in a capacitor is given by $\frac{1}{2} \in_o E^2$, where E is the electric field of the capacitor? [3]

8. (a) An air capacitor is given a charge of 2μC raising its potential to 200 V. If on inserting a dielectric medium, its potential falls to 50 V, what is the dielectric constant of the medium? [5]

   (b) A conducting stab of thickness 't' is introduced without touching between the plates of a parallel plate capacitor separated by a distance d (t<d). Derive an expression for the capacitance of a capacitor?

1. Why does the electric field inside a dielectric decrease when it is placed in an external electric field? [1]

2. What is the work done in moving a 2μ C point change from corner A to corner B of a square ABCD when a 10μC charge exist at the centre of the square? [1]

3. Show mathematically that the potential at a point on the equatorial line of an electric dipole is Zero? [2]

4. A parallel plate capacitor with air between the plates has a capacitance of 8 pF (1pF = 10^{-12} F). 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? [2]

5. Two dielectric slabs of dielectric constant K_1 and K_2 are filled in between the two plates, each of area A, of the parallel plate capacitor as shown in the figure. Find the net capacitance of the capacitor? Area of each plate = A/2 [3]

6. Prove that the energy stored in a parallel plate capacitor is given by $\frac{1}{2}CV^2$? [3]

7. State Gauss's Theorem in electrostatics? Using this theorem define an expression for the field intensity due to an infinite plane sheet of change of charge density σ c/m²? [3]

8. (a) Define dielectric constant in terms of the capacitance of a capacitor? On what factor does the capacitance of a parallel capacitor with dielectric depend? [5]

   (b) Find the ratio of the potential differences that must be applied across the

   (1) parallel

   (2) Series combination of two identical capacitors so that the energy stored in the two cases becomes the same.

1. The Plates of a charged capacitor are connected by a voltmeter. If the plates of the capacitor are moved further apart. What will be the effect on the reading of the voltmeter?   [1]

2. What is the function of dielectric in a capacitor?   [1]

3. A steam of electrons travelling with speed $v \; m/s$ at right angles to a uniform electric field E is deflected in a circular path of radius r. Prove that $\dfrac{e}{m} = \dfrac{v^2}{rE}$?   [2]

4. The distance between the plates of a parallel plate capacitor is d. A metal plate of thickness (d/2) is placed between the plates. What will be the effect on the capacitance?   [2]

5. Keeping the voltage of the charging source constant. What would be the percentage change in the energy stored in a parallel plate capacitor if the separation between its plates were to be decreased by 10%?   [3]

6. Two identical plane metallic surfaces A and B are kept parallel to each other in air separated by a distance of 1.0 cm as shown in the figure. Surface A is given a positive potential of 10V and the outer surface of B is earthed.   [3]
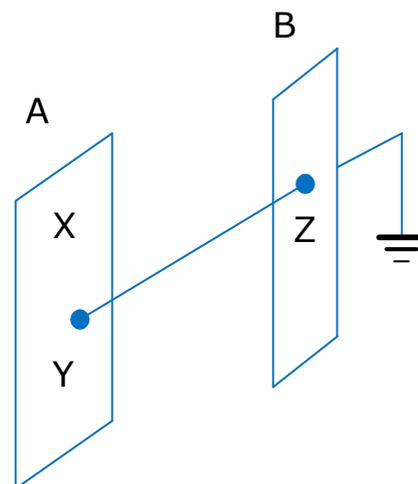
(a) What is the magnitude and direction of uniform electric field between point Y and Z? What is the work done in moving a change of 20 μc from point X to Y?

(b) Can we have non-zero electric potential in the space, where electric field strength is zero?

7. Figure (a) and (b) shows the field lines of a single positive and negative changes respectively [5]

(a)   (b)
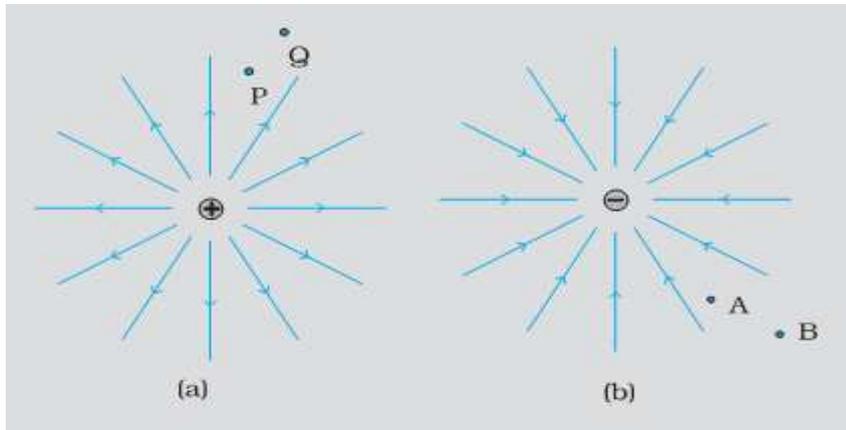
(a) Give the signs of the potential difference : $Vp - Vq$ and V_B -- V_A

(b) Give the sign of the work done by the field in moving a small positive change from Q to P.

(c) Give the sign of the work done by the field in external agency in moving a small negative change from B to A.

8. With the help of a labelled diagram, explain the principle, construction and working of a vandegraff generator. Mention its applications? [5]

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PHYSICS TEST
Electrostatics Test 4

CLASS XII   MARKS-20

1. Show does the force between two point charges change if the dielectric constant of the medium in which they are kept increase? [3]

2. A charged rod P attracts rod R where as P repels another charged rod Q. What type of force is developed between Q and R? [1]

3. A free proton and a free electron are placed in a uniform field. Which of the two experience greater force and greater acceleration? [2]

4. No two electric lines of force can intersect each other? Why? [2]

5. A particle of mass m and charge q is released form rest in a uniform electric field of intensity E. calculate the kinetic energy it attains after moving a distance s between the plates? [3]

6. Two point charges +q and +9q are separated by a distance of 10 a. Find the point on the line joining the two changes where electric field is zero? [3]

7. Define the term dipole moment $\vec{P}$ of an electric dipole indicating its direction. Write its S.I unit. An electric dipole is placed in a uniform electric field $\vec{E}$. Deduce the expression for the Torque acting on it. [3]

8. (1) The electric field $\vec{E}$ due to a point change at any point near to it is defined as: $\vec{E} = \underset{q \to c}{Lim} \dfrac{\vec{F}}{q}$ where q is the test charge and $\vec{F}$ is the force acting on it. [5]

   What is the significance of $\underset{q \to o}{\lim}$ in this expression?

   (2) Two charges each 2×10^{-7} C but opposite in sign forms a system. These charges are located at points A (0,0, -10) cm and B(0,0, +10) cm respectively. What is the total charge and electric dipole moment of the system?

9. (a) Sketch electric lines of force due to (i) isolated positive change (ie q>0) and (ii) isolated negative change (ie q<0) [5]

   (b) Two point changes q and –q are placed at a distance 2a apart. Calculate the electric field at a point P situated at a distance r along the perpendicular bisector of the line joining the charges. What is the field when r >> a?