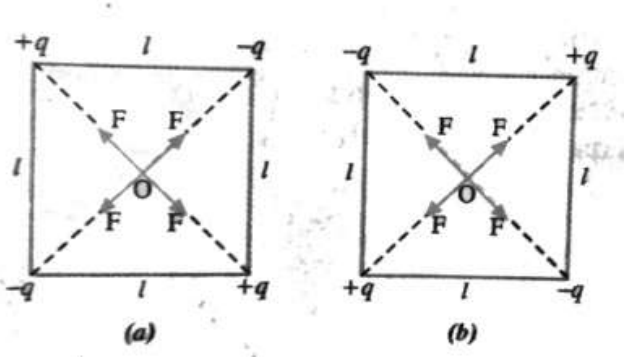
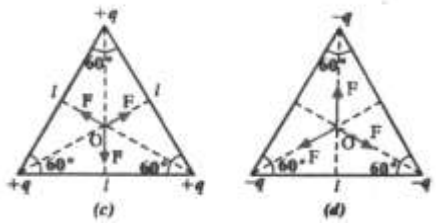
Delhi Public School Guwahati

"Under the aegis of the Delhi Public School Society, Delhi"

Class:XII

Name of Chapter: Electrostatics

Cycle 1: 1st April, 2021 to 24th April, 2021	
Learning Objectives	Students will be able to know about: • Electric charge and its properties. • Coulomb's Law • Electric Field • Electric field due to electric dipole. • Numericals relating to charge, coulomb's force and electric dipole.
Points to remember	Revise using following bullet points: 1. Electron is a charged particle i.e., electron posses charge as well as mass. 2. Charge of single electron is -1.6×10^{-19}C and mass of e- is 9.1×10^{-31}kg. 3. Charge of a proton is $+1.6\times10^{-19}$C and mass of proton is 1.66×10^{-27}kg. 4. Like charges repel each other, unlike charge attract each other. 5. Charge is a scalar quantity i.e., total charge in a system always follows algebraic expression. 6. Charge is quantised i.e., $q=\pm ne$. 7. Coulomb' force between two charged bodies is independent of the mass of the charged bodies. 8. The magnitude of Coulomb's force or electrostatic force remain same whether the interacting charge of same magnitude separated by a given distance have same signs or opposite signs. 9. Coulomb's force obeys Newton's third law of motion as force exerted by two electric charges on each other are equal and opposite. 10. Net Coulomb's force on a charge placed at the centre of a square is zero if charges of equal magnitude and with same sign are placed at the corners diagonally opposite to each other. 

	11. Net Coulomb's force on a charge placed at the centroid of an equilateral triangle is zero if the charges of equal magnitude and with same signs are placed at each corner of the equilateral triangles.  12. Electric field is a vector quantity. 13. If source charge is positive, the direction of electric field at a point is away from the charge. 14. If source charge is negative, then direction of electric field is towards the charge. 15. If we know intensity at a point, say $\vec{E}$, then at that point if we put a charge say ±q, then it will experience force, $\vec{F} = \pm qE$. 16. Unit of electric field is N/C or volt/metre. 17. Two equal and opposite charges separated by finite distance form a dipole. 18. Electric field intensity due to an electric dipole at a point inversely proportional to the cube of the distance between the point of observation and the centre of the dipole. 19. Electric field intensity due an electric dipole is directly proportional to the magnitude of the dipole moment.
Questions	**<u>Questions to be done in the physics notebook:</u>** 1. What is electronic charge? 2. Two charge Q are separated by a distance d, A third charge q is placed between the two charges in the joining the two charges such that system is in equilibrium. What is the location, nature and magnitude of third charge. 3. What is quantisation of energy? Can a body have a charge of $0.8X10^{-19}C$? 4. Calculate the charge carried by $12.5X10^{8}$ electron. 5. Does Coulomb's law obey the Newton's Third law of motion? 6. Calculate the force of electrostatic attraction between a proton and an electron separated by a distance of $8X10^{-14}m$. 7. Two small charge sphere $+q_1$ and $+q_2$ respectively. A charge dq is removed From charge carrying charge q_1 and is transferred to the other. Find charge on each sphere for maximum electric force between them. 8. Calculate the Coulomb force between two α-particle separated by $3.2X10^{-15}m$. 9. Two fixed point charge +4Q and +2Q units are separated by a distance x. Where should the third point charged be placed for it to be in equilibrium? 10. Two charges of +10μC and +40μC respectively are placed 12cm apart. Find the position of the point, where electric field is zero. 11. Infinite number of identical charges each of charge q are placed along the x-axis at a distance a, 2a, 3a, 4a, ... from the origin. Calculate the magnitude of the electric field at the origin due to this distribution of charges.

12. Two point charges +2μC and -2μC are located 10cm apart in air. (a) Calculate the electric field at the mid-point P of the line RS joining the two charges. (b) If a negative charge of $1.6X10^{-9}$C is placed at that point, find the force experienced by this charge.
13. Calculate the electric field strength required to just support a water drop of mass 10^{-7}kg and having charge $1.6X10^{-19}$C.
14. How much electric flux will come out through a surface $d\vec{S} = 10\hat{\jmath}$ kept in an electrostatic field $\vec{E} = 2\hat{\imath} + 4\hat{\jmath} + 7\hat{k}$?
15. Calculate the electric field strength required to just support a water drop of mass 10^{-7}kg and having charge $1.6X10^{-19}$C.
16. An electric dipole consisting of a pair of equal and opposite charges each of magnitude 5μC has dipole moment equal to $5.0X10^{-7}$Cm. Find the length of the dipole.
17. An electric dipole consist of two equal and opposite charges separated by 2.0 cm apart. When dipole is placed in uniform electric field of 10^5 NC^{-1}, it experiences a maximum torque of $0.2X10^{-3}$Nm. Find the magnitude of each charge.
18. Two charges are placed +0.2μμC and -0.2μμC are placed 10^{-6}cm apart. Calculate the electric field at an axial point at a distance of 10cm from their midpoint.
19. Calculate the electric field due to an electric dipole of length 20 cm consisting of charges $\pm$150μC at a point 30cm from each charges.