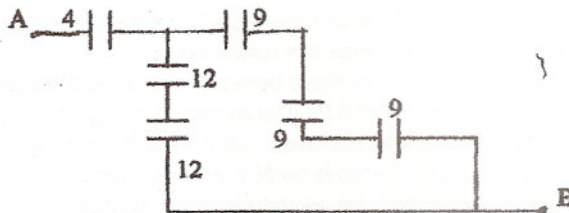


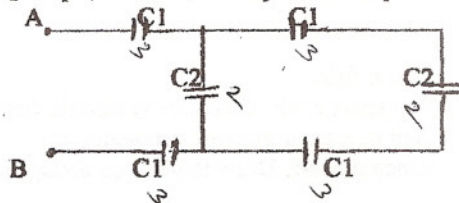
SHARJAH INDIAN SCHOOL
PHYSICS. GRADE XII - BOYS WING
ELECTROSTATICS

- (a) Two point charges $2\mu\text{C}$ and $6\mu\text{C}$ repel each other with a force of 12N . If each is given an additional charge $-4\mu\text{C}$ what will be the force between them? (b) If the distance between two equal point charges is halved and the individual charges are doubled, what would happen to the force between them?
- An electron and proton are free to move in a given electric field. Will the acceleration experienced by them be equal or different?
- If the electric field intensity is zero at a given point, will the electric potential be necessarily zero at that point? Explain.
- Define the term dielectric constant.
- How will you connect four capacitors each of $1\mu\text{F}$ to obtain a net capacitance of $0.75\mu\text{F}$? Draw a diagram to show the combination.
- Define S.I. unit of electric charge.
- Draw the lines of force to represent a uniform electric field.
- Two equal charges of -10^{-16}C each are kept 20cm apart in air. Calculate i) electric field at a point midway between them and ii) force acting on a charge of -10^{-16}C kept at a point midway between them.
- Two point charges $+q$ and $-q$ are placed at a distance d apart. Draw the line on which the resultant field is parallel to the line joining the charges.
- What is an electric line of force? Give reason why no two electric lines of force intersect.
- Calculate the equivalent capacitance between the points A and B of the circuit given below. (All the values are in micro farads)

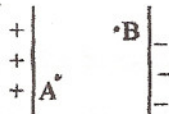


- Three capacitors of equal capacitance when connected in series have a net capacitance of C_1 and when connected in parallel have a capacitance of C_2 . What will be value of C_1/C_2 ?
- Sketch the electric line of force due to a point charges i) $q < 0$ and ii) $q > 0$.
- What is a conservative field?
- Name any two basic properties of electric charge.
- A polythene piece rubbed with wool is found have a negative charge of $3.2 \times 10^{-7}\text{C}$. Calculate the number of electrons transferred.
- Consider three charged bodies A, B and C. If A and B repel each other and A attracts C, what is the nature of the force between B and C?
- A positive charge of $2 \times 10^{-7}\text{C}$ is placed at a distance of 0.15m from another positive charge of $8 \times 10^{-7}\text{C}$. Find the point on the line joining them where the electric field is zero.
- A charge of $12\mu\text{C}$ is given to a hollow metallic sphere of radius 0.1m . Find the potential at i) the surface of the sphere and ii) the centre of the sphere.
- A $4\mu\text{F}$ capacitor is connected in parallel to another $8\mu\text{F}$ capacitor. The combination is charged at 300V . Calculate i) total charge on the combination, ii) total energy stored in the combination.
- What is the energy gained by an electron beam when accelerated by a potential difference of 2000V ?
- Two insulated charged copper spheres A and B have their centres separated by a distance of 50cm . What is the force of repulsion if charge on each sphere is $6.5 \times 10^{-7}\text{C}$. What is the force of repulsion if (i) each sphere is charged double the amount and distance between them is halved (ii) the two spheres are placed in water of dielectric constant 80.
- A charge $q_1 = 1 \times 10^{-6}\text{C}$ is kept 10cm from a charge $2 \times 10^{-6}\text{C}$. At what distance point on the line joining the two charges is the electric field strength zero?
- A parallel plate capacitor with air between its plates having plate area of $6 \times 10^{-3}\text{m}^2$ and separation between them 3mm is connected to a 100V supply. Calculate charge on each plate of the capacitor. Explain what would happen when a 3mm thick mica sheet ($k = 6$) is inserted between the plates. a) while the voltage supply remains connected. b) after the supply is disconnected.
- What is electrostatic shielding? Give at least one practical application.
- (a) Derive an expression for the energy stored in the capacitor. (b) Now if the capacitor is disconnected from the battery. What will be the energy stored in the capacitor when i) separation between the plates is doubled and (ii) an uncharged and identical capacitor is connected across it.

27. A metal plate is introduced between the plates of a charged parallel plate capacitor. Sketch the electric lines of force between the plates.
28. The electric potential at a point distant 0.9m from point charge is 50V. Find the magnitude and nature of the charge.
29. A 500 pf capacitor is charged by a 200V battery. How much electrostatic energy is stored by the capacitor? The capacitor is disconnected from the battery and connected in parallel to another 500 pf capacitor. Compute the energy stored by the system.
30. A point charge of $8.85 \times 10^{-8} \text{C}$ is situated at the centre of a cube of side 1m. Cal. the electric flux through the surface.
31. Calculate the heat generated when a capacitor of $100 \mu\text{f}$ capacity and charged to 200V is discharged through a 2Ω resistance.
32. If $C_1=3 \text{ pf}$ and $C_2= 2 \text{ pf}$, calculate the equivalent capacitance of the given network between the points A and B.



33. Ordinary rubber is an insulator. But the special rubber tyres of aircrafts are made slightly conducting. why?
34. On inserting a dielectric between the plates of a capacitor, its capacity is found to increase 5 times. What is the relative permittivity of the dielectric?
35. Two capacitors $C_1=5 \mu\text{f}$ $C_2=3 \mu\text{f}$ are connected in parallel. This combination is connected in series to another capacitor $C_3=2 \mu\text{f}$. The combination of these three capacitors is connected to a 50V supply. Draw the circuit diagram to solve and calculate the effective capacitance and total charge.
36. A particle of mass m and charge q is located midway between two fixed charged particles each having a charge q and at a distance $2l$ apart. Assuming that the middle charge moves along the line joining the fixed charge, Calculate the frequency of oscillation when it is slightly displaced. (Hint: Net force $= kq^2/(l-x)^2 - kq^2/(l+x)^2$ $\omega^2 x = 4kq^2/l^3 x$.)
37. The electric field at a point due to a point charge is 40 N/C and the electric potential at that point is 20 J/C . Calculate the distance of the point from the charge and the magnitude of the charge.
38. How does the speed of an electrically charged particle affect its i) mass ii) charge?
39. Name the physical quantity whose S.I unit is Coloumb/Volt.
40. Two protons A and B are placed between two parallel plates having a potential difference V as shown in the figure. Will these protons experience equal or unequal force?



41. Explain why capacitance becomes less in series and more in parallel combination?
42. How does the force between two point charges change, if the dielectric constant of the medium in which they are kept increases?
43. An electric flux of $-6 \times 10^3 \text{ Nm}^2/\text{C}$ passes normally through a spherical gaussian surface of radius 10 cm due to a point charge placed at the centre. i) what is the charge enclosed by the gaussian surface? ii) If the radius of the gaussian surface is doubled, how much flux would pass through the surface?
44. A tiny ball with charge q is suspended between the two very large parallel metal plates that are grounded. Sketch the electric field between the plates. what can you infer about the induced charges on the plates?
45. A charged rod attracts bits of dry cork dust which jump away from it after touching it. Why?
46. Is the electric field necessarily zero at a point where the electrostatic potential zero? Give an example to illustrate your answer.
47. Two small balls having the charges in the ratio 1: 2 exert a force F on one another when a distance x apart. The two balls are made to touch one another and separated. If they are now placed same distance apart what is the force exerted by them on one another?
48. Two point charges A and B of value $15 \mu\text{C}$ and $9 \mu\text{C}$ are kept 18 cm apart in air. Calculate the work done when charge B is moved by 3 cm towards charge A.
49. How is the electric potential at a point be affected if the medium around the point is changed?
50. Show graphically the variation of charge 'q' with time 't' when a condenser is charged.

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