

PHYSICS CLASSES

Worksheet - 1

Topic: Electrostatic Force (Num)

- Three small identical balls have charges -3×10^{-12} C, $+8 \times 10^{-12}$ C, $+4 \times 10^{-12}$ C respectively. They are brought in contact and then separated. Find
 - Charge on each ball
 - Number of electrons in excess or short on each ball
- Two charges of $+2.5 \mu\text{C}$ and $-1.6 \mu\text{C}$ are kept at a certain distance apart in vacuum. If they attract each other with a force of 0.4 N. Find the separation between them. How and by what percent will the force between them be affected when the separation between them is increased by 20% of the initial value.
- Force of attraction between two point charges placed at a distance 'd' apart in a medium is 'F'. What should be the distance in the same medium so that force of attraction between them becomes 9F?
- Two point electric charges of values q and 2q are kept at a distance d apart from each other in air. A third charge Q is to be kept along the same line in such a way that the net force acting on q and 2q is zero. Calculate the position of charge Q in terms of q and d.
- Two fixed point charges + 4e and +e units are separated by a distance 25 cm. Where the third point charge + q should be placed for it to be in equilibrium?
 - If charges are + 4e & +e and third point charge be -q
 - If charges are - 4e & +e and third point charge be +q
 - If charges are -4e & +e and third point charge be -q
- A charge q is placed at the center of the line joining two equal charges Q. Show that the system of three charges will be in equilibrium if $q = -Q/4$.
- Two free point charges +4e and +e are at a distance a apart. Where a third point charge q should be placed between them so that the entire system is in equilibrium? What will be the magnitude and sign of q?
- A charge Q is divided into two parts such that they repel each other with a maximum force when kept apart at a certain distance. Find the charges on them.
- Four point charges $2 \mu\text{C}$, $5 \mu\text{C}$, $-2 \mu\text{C}$, $-5 \mu\text{C}$ are located at the corners of a square ABCD of side 10cm. What is the force on charge of $1 \mu\text{C}$ placed at the center of the square?
- ABC is an equilateral triangle of side 10 m and D is the middle point of BC. Charges of +100C, -100C and + 75 C are placed at B, C and D respectively. What is the force experienced by 1C positive charge placed at A?
- Two opposite corners of a square carry Q charge each and the other two opposite corners of the same square carry q charge each. If the resultant force on q is zero, how are Q and q related?
- Find the force experienced by (i) 1 C charge, (ii) +x C charge, (iii) -x C charge placed respectively at the vertices of ABC. ABC is equilateral triangle of side x meter.
- At what separation should two equal charges, 1.0 C each, be placed so that the force between them equals the weight of a 50 kg person?
- Two insulation small spheres are rubbed against each other and placed 1 cm apart. If they attract each other with a force of 0.1 N, how many electrons were transferred from one sphere to the other during rubbing?
- Two charged practical having charge 2.0×10^{-8} C each are joined by an insulating string of length 1 m and the system is kept on a smooth horizontal table. Find the tension in the string.
- Two small spheres each of mass 'm' kg and charge q coulomb are suspended from a point by insulating threads each of L meter length, but of negligible mass. If θ is the angle which each string makes with the vertical when equilibrium has been reached, show that $q^2 = 4mgL^2 \sin^2 \theta \tan \theta (4\pi\epsilon_0)$

ANSWERS: 1. $+3 \times 10^{-12}$ C, 1.875×10^7 C 2. .3M,30.5% 3. d/3 4. Q is negative. Position of Q from $q = (\sqrt{2} - 1)d$
5. (a) .167m from +4e, (b) .25m from +e, (c) same in (b) 7. 2a/3 from +4e, -4e/9 8. Q/2, Q/2 9. 19.38N
10. $9\sqrt{2} \times 10^9$ N 11. $q = -2\sqrt{2}Q$ 12. (i) $\frac{1}{4\pi\epsilon_0 x}$ (ii) $\frac{1}{4\pi\epsilon_0} \sqrt{x^{-2} + 1 + x^{-1}}$ (iii) same in (ii) 13. 4.23×10^3 m 14. 2×10^{11}
15. 3.6×10^{-6} N