MATA SAVITRI DEVI SANJEEVANI PUBLIC SCHOOL

CLASS- XII ELECTROSTATICS SUBJECT: PHYSICS

BY RUPESH GUPTA SIR

ELECTRIC CHARGE AND COULOMB'S LAW

ASSIGNMENT NO: -2

NAME OF STUDENT: - **ROLL NO: -**

Q1. Two equally charged particles, held $3.2X10^{-3}$ m apart, are released from rest. The initial acceleration of the first particle is observed to be $7.0m/s^2$ and that of the second to be $9.0m/s^2$. If the mass of the first particle is 6.3×10^{-7} kg, what are (a)The mass of the second particle and (b)The magnitude of the charge of each particle?
Ans. [4.9×10^{-7} kg; 7.1×10^{-11} C]

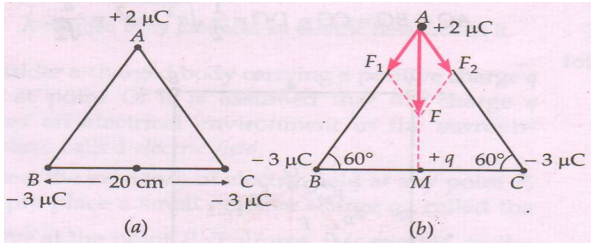
Q2. Two positive point charges which are 0.1 m apart repel each other with a force of 18 N. If the sum of the charges be 9 μ C, calculate their separate values. [Ans. 5μ C, 4 μ C]

Q3. Two identical spheres , having charges of opposite sign attract each other with a force of 0.108 N when separated by 0.5 m. the spheres are connected by a conducting wire , which then removed , thereafter they repel other with a force of 0.036 N. What were the initial charges on the spheres?

Q4. Two 'free' point charges + 4e and + e are placed a distance 'a' apart. Where should a third point charge q be placed between them such that the entire system may be in equilibrium? What should be the magnitude and sign of q? What type of a equilibrium will it be?

Q5.Charges of + 5 μC, + 10 μC and -10 μC are placed in air at the corners A, B and C of an equilateral triangle ABC, having each side equal to 5 cm . Determine the resultant force on the charge at A.

Q6. Three point charges of + 2 μC, -3 μC and -3 μC are kept at the vertices A, B and C respectively of an equilateral triangle of side 20 cm as shown in fig. 1.30(a). What should be the sign and magnitude of charge to be placed at the midpoint (M) of side BC so that the charge at A remains in equilibrium ?



Q7. Four charges +q , +q,-q and –q are placed respectively at the four corners A,B, C and D of a square of side a. Calculate the force on a charge Q placed at the centre of the square.

Q8. Two small charged spheres contain charges + q_1 and $+q_2$ respectively. A charge dq is removed from sphere carrying charge $q_1$and is transferred to the other . Find charge on each sphere for maximum electric force between them. [Ans .$(q_1+q_2)/2$]

Q9.How far apart two protons be if the electrostatic force exerted by one on the other is equal to weight of the electron?

Q10. Two charges –q each are fixed separated by distance 2d. A third charge q of mass m placed at the mid-point is displaced slightly by x (x<<d) perpendicular to the line joining the two fixed charges as shown in fig. Show that q will perform simple harmonic oscillation of time period.

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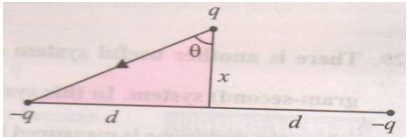

Q11. Total charge – Q is uniformly spread along length of a ring of radius R. A small test charge + q of mass m is kept at the centre of the ring and is given a gentle push along the axis of the ring.

(a) Show that the particle executes a simple harmonic oscillation.
(b) Obtain its time period.

Q12. Two charges q and -3 q are placed fixed on x-axis separated by distance 'd'. Where should a third charge 2q be placed such that it will not experience any force?

Q13. A paisa coin is made up of Al-Mg alloy and weight 0.75 g. It has a square shape and its diagonal measures 17 mm. It is electrically neutral and contains equal amounts of positive and negative charges .Treating the paisa coin made up of only Al, find the magnitude of equal number of positive and negative charges. What conclusion do you draw from this magnitude?

Q14. A negatively charged ebonite rod attracts a suspended ball of straw. Can we infer that the ball is positively charged?

Q15.Can two similarly charged balls attract each other?

Q16. Plot a graph showing the variation of Coulomb force (F) versus $(1/r^2)$, where r is the distance between two charges of each pair of charges: (1μC, 2 μ C) and (2μ C, -3μ C). Interpret the graphs obtained.

Q17. A glass rod rubbed with silk acquires a charge $+1.6\times10^{-12}$C. What is the charge on the silk?

Q18. Does motion of a body affect its charge?

Q19. What is the relevance of large value of K (=81) for water?

Q20. Can ever photons have a charge? If not why?

Q21. In coulomb's law, on what factors the value of electrostatic force constant K depends?

Q22. A copper sphere of mass 2g contains nearly 2×10^{22} atoms. The charge on the nucleus of each atom is 29 e. What fraction of the electrons must be removed from the sphere to give it a charge of +2μ C?

Q23. A small ball of mass 10^{-2} kg and charge 3 μC is tied up at one end of one meter long thread. As the other end of the thread -3μC charge is fixed, now the ball is set rotating in a vertical circle. What should be the minimum velocity at lowest point? So the ball may complete the loop?

Q24. A point charge is placed at the centre of disc insulated of mass M and radius R. the disc is resting on a rough horizontal surface. Another charge 'Q' is fixed above the disc at a height h from the centre of disc. Now the disc is slightly displaced on a horizontal plane. Prove that their motion will be simple harmonic function is sufficient at prevent slipping.