

Physics Assignment-1

Topic- Electric charge & Coulomb's Law

Q.1:- How much positive & negative charge present in 100 gm of water?

Q.2:- A polythene piece rubbed with wool is found to have a negative charge of $3 \times 10^{-7} \text{C}$.

(a) Estimate the number of electrons transferred?

(b) Is there a transfer of mass from wool to polythene?

Q.3:- Can two similarly charged bodies ever attract each other? Explain?

Q.4:- Find the unit & dimension of ϵ_0 ?

Q.5:- The dielectric constant of water is 80. What is its permittivity?

Q.6:- Find the electric force or electrostatic force acting between two α -particles separated by a distance of $3.2 \times 10^{-15} \text{m}$ in air?

Q.7:- Find the minimum electrostatic force acting between two unit charges separated by a unit distance?

Q.8:- Find the force on a charge $q_1 = 20 \mu\text{C}$ due to the charge of $q_2 = -10 \mu\text{C}$, if the positions of the charges are given as $P_1(1, -1, 2)$ and $Q(-1, 1, 1)$.

Q.9:- Consider three charged q_1, q_2, q_3 each equal to q , at the vertices of an equilateral triangle of side l , what is the force on a charge Q placed at the centroid of the triangle?

Q.10:- Two opposite corners of a square carry charge Q each and the other two opposite corners of the square carry q charge each. If the resultant

force on on Q is zero, how are Q and q related?

Q.11:- Two fixed charges $+4e$ and $+e$ units are separated by a distance a , where should a third charge be placed for it to be in equilibrium?

Q.12:- Two point charges $+9e$ and $+e$ are kept at a distance a from each other. where should we place a third charge q on the line joining two charges so that it may be in equilibrium?

Q.13:- Two particles, each having a mass of 5 gm and charge q , stay in limiting equilibrium on a horizontal table with a separation of 10 cm between them. The coefficient of friction between each particle and table is 0.18 . find q ?

Q.14:- A particle of mass m and carrying charge $-q_1$ is moving around a charge $+q_2$ along a circular path of radius r . Prove that the period of revolution of the charge $-q_1$ about $+q_2$ is given by -

$$T = \sqrt{\frac{16\pi^3 \epsilon_0 m r^3}{q_1 q_2}}$$

Q.15:- Two identical metal plate spheres having equal and similar charges repel each other with a force of 103 N when they are placed 10 cm apart in a medium of dielectric constant 5 . Determine the charge on each sphere?

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