

KENDRIYA VIDYALAYA PATTOM, TRIVANDRUM

PHYSICS HOLIDAY ASSIGNMENTS

(CLASS XII E)

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PGT PHYSICS

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Instructions:

The assignments must be done in a separate copy

1. Three small identical balls have charges $-3 \times 10^{-12}\text{C}$, $8 \times 10^{-12}\text{C}$ and $4 \times 10^{-12}\text{C}$ respectively. They are brought in contact and then separated. Calculate (i) charge on each ball (ii) number of electrons in excess or deficit on each ball after contact.
2. Two insulated charged spheres of charges $6.5 \times 10^{-7}\text{C}$ each are separated by a distance of 0.5m. Calculate the electrostatic force between them. Also calculate the force (i) when the charges are doubled and the distance of separation is halved. (ii) when the charges are placed in a dielectric medium water ($\epsilon_r = 80$)
3. Two small equal and unlike charges $2 \times 10^{-8}\text{C}$ are placed at A and B at a distance of 6 cm. Calculate the force on the charge $1 \times 10^{-8}\text{C}$ placed at P, where P is 4cm on the perpendicular bisector of AB.
4. Compare the magnitude of the electrostatic and gravitational force between an electron and a proton at a distance r apart in hydrogen atom. (Given : $m_e = 9.11 \times 10^{-31}\text{ kg}$; $m_p = 1.67 \times 10^{-27}\text{ kg}$; $G = 6.67 \times 10^{-11}\text{ Nm}^2\text{ kg}^{-2}$; $e = 1.6 \times 10^{-19}\text{ C}$)
5. Two point charges $+9e$ and $+1e$ are kept at a distance of 16 cm from each other. At what point between these charges, should a third charge q to be placed so that it remains in equilibrium?
6. Two charges $4 \times 10^{-7}\text{ C}$ and $-8 \times 10^{-7}\text{C}$ are placed at the two corners A and B of an equilateral triangle ABP of side 20 cm. Find the resultant intensity at P.
7. Calculate (i) the potential at a point due a charge of $4 \times 10^{-7}\text{C}$ located at 0.09m away (ii) work done in bringing a charge of $2 \times 10^{-9}\text{ C}$ from infinity to the point.
8. A sample of HCl gas is placed in an electric field of $2.5 \times 10^4\text{ N C}^{-1}$. The dipole moment of each HCl molecule is $3.4 \times 10^{-30}\text{ C m}$. Find the maximum torque that can act on a molecule.
9. Calculate the electric potential at a point P, located at the centre of the square of point charges shown in the figure.
10. Three charges $-2 \times 10^{-9}\text{C}$, $+3 \times 10^{-9}\text{C}$, $-4 \times 10^{-9}\text{C}$ are placed at the vertices of an equilateral triangle ABC of side 20 cm. Calculate the work done in shifting the

charges A, B and C to A1, B1 and C1 respectively which are the mid points of the sides of the triangle.

11. State Coulomb's law in electrostatics and represent it in vector form.
12. What is permittivity and relative permittivity? How are they related?
13. Explain the principle of superposition.
14. Define electric field at a point. Give its unit and obtain an expression for the electric field at a point due to a point charge.
15. Write the properties of lines of forces.
16. What is an electric dipole? Define electric dipole moment?
17. Derive an expression for the torque acting on the electric dipole when placed in a uniform field.
18. What does an electric dipole experience when kept in a uniform electric field and non-uniform electric field?
19. Derive an expression for electric field due to an electric dipole (a) at a point on its axial line (b) at a point along the equatorial line.
20. Define electric potential at a point. Is it a scalar or a vector quantity? Obtain an expression for electric potential due to a point charge.
21. Why is it safer to be inside a car than standing under a tree during lightning?
22. What is an equipotential surface?
23. The sum of two point charges is $6 \mu\text{C}$. They attract each other with a force of 0.9 N , when kept 40 cm apart in vacuum. Calculate the charges.
24. Two small charged spheres repel each other with a force of $2 \times 10^{-3} \text{ N}$. The charge on one sphere is twice that on the other. When one of the charges is moved 10 cm away from the other, the force is $5 \times 10^{-4} \text{ N}$. Calculate the charges and the initial distance between them.
25. Four charges $+q$, $+2q$, $+q$ and $-q$ are placed at the corners of a square. Calculate the electric field at the intersection of the diagonals of the square of side 10 cm if $q = \frac{5}{3} \times 10^{-9} \text{ C}$. Two charges $10 \times 10^{-9} \text{ C}$ and $20 \times 10^{-9} \text{ C}$ are placed at a distance of 0.3 m apart. Find the potential and intensity at a point mid-way between them.
26. An electric dipole of charges $2 \times 10^{-10} \text{ C}$ and $-2 \times 10^{-10} \text{ C}$ separated by a distance 5 mm , is placed at an angle of 60° to a uniform field of 10 Vm^{-1} . Find the (i) magnitude and direction of the force acting on each charge. (ii) Torque exerted by the field
27. An electric dipole of charges $2 \times 10^{-6} \text{ C}$, $-2 \times 10^{-6} \text{ C}$ are separated by a distance 1 cm . Calculate the electric field due to dipole at a point on its. (i) axial line 1 m from its centre (ii) equatorial line 1 m from its centre.
28. Two charges $+q$ and $-3q$ are separated by a distance of 1 m . At what point in between the charges on its axis is the potential zero?
29. Three charges $+1 \mu\text{C}$, $+3 \mu\text{C}$ and $-5 \mu\text{C}$ are kept at the vertices of an equilateral triangle of sides 60 cm . Find the electrostatic potential energy of the system of charges.
30. Two positive charges of $12 \mu\text{C}$ and $8 \mu\text{C}$ respectively are 10 cm apart. Find the work done in bringing them 4 cm closer, so that, they are 6 cm apart.
