Holiday Homework

Class: XII-A

Subject: Physics

1. Revise the topics taught of first two units.

2. Do the Worksheet given in Homework Notebook.

3. Do all the derivations of first three chapters.

WORK SHEET I

SUBJECT: PHYSICS

CLASS – XII   LESSON—*ELECTROSTATICS*

Q1.   Two point charges q_1 and q_2 are placed close to each other. What is the nature of the force between them
       when: (i) $q_1q_2 < 0$ and (ii) $q_1q_2 > 0$?   1

Q2.   Name the quantity with unit J/C. Is it a scalar or vector quantity?   1

Q3.   An electric dipole of dipole moment 2×10^{-6} C m is enclosed by a closed surface. What is the flux passing out
       of the surface?   1

Q4.   What is the angle between the directions of electric field at any (i) axial point and (ii) equatorial point due to
       an electric dipole?   1

Q5.   Two point charges placed at a distance r in air exert a force F on each other. At what distance will these
       charges experience the same force F in a medium of dielectric constant K?   1

Q6.   Consider a dipole of length 2a. What is the magnitude and direction of electric field at the midpoint of the
       length of the dipole   2

Q7.   Two charges +10μC and -20μC are placed 15 cm apart. At what point on the line joining the two charges is
       the electric potential zero?   2

Q8.   The following data was obtained for the dependence of the magnitude of electric field, with distance, from a
       reference point O, within the charge distribution in the shaded region.   2

Field points	A	B	A'	B'
Magnitude of field	E	E/8	E/2	E/16
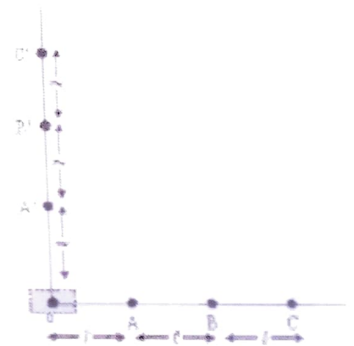
       (i)   Identify the charge distribution and justify your answer.
       (ii)   If the potential due to this charge distribution has a value V at the point A, what is its value at the
               point B and C.

Q9.   Derive expression for electric field at a point on the equatorial line of dipole.   3

Q10.   Using Gauss Theorem, show mathematically that for a point outside a shell, the field due to a uniformly
       charged thin shell is the same as if the entire charge of the shell is concentrated at the centre. Why do you

Q1. The graph shown here, shows the variation of the total energy I stored in a capacitor against the value of the capacitancel itself. Which of the two – the charge on the capacitor or the potential used to charge it is kept constant for this graph?

1
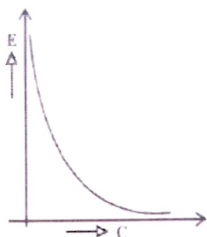
Q2. In which orientation a dipole placed in uniform electric field is in (i) stable (ii) unstable equilibrium?

1

Q3. The electric potential as a function of distance x is shown in Fig . Construct a graph of the electric field strength E.

2

2
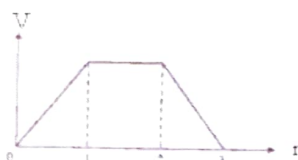
Q4. The two graphs drawn below, show the variation of electrostatic potential (V) with I being distance of point from the point charge for two point charges Q_1 and Q_2.

1

(iii)   What are the signs of the two charges?

(ii) Which of the two charges has a larger magnitude?
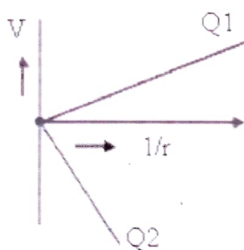
Q5. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. What is the potential at the centre of sphere.

1

Q6. Define electric potential. Derive an expression for the electric potential at a distance r from a point charge q.

2

Q7. Why two equipotential do not cross each. Draw equipotential surface for electric field which is decreasing along X-axis.

2

Q8. A uniformly charged conducting sphere of 2.4m diameter has a surface charge density

$8.0 \times 10^7 C/m^2$. Find the charge on the sphere. What is the total flux leaving the surface?

2

WORKSHEET 3

1. A proton is placed is a uniform electric field directed along the positive X-axis. In which direction will it tend to move?
   1
2. What is the electric potential due to an electric dipole at an equatorial point?
   1
3. If the radius of the Gaussian surface enclosing a charge is halved, how does the electric flux through the Gaussian surface change?
   1
4. Can two equipotential surfaces intersect each other? Justify your answer.
   1
5. A metal plate is introduced between the plates of a charged parallel plate capacitor. What is its effect on the capacitance of the capacitor?
   1
6. Calculate the amount of work done in turning an electric dipole of dipole moment 3×10^{-8} C-m from its position of unstable equilibrium to the position of stable equilibrium in a uniform electric field of intensely $10^3 NC^{-1}$.
   2
7. The sum of two point charges in 7Nc they repel each other with a force of 1N when kept 30cm apart in free space. Calculate the value of each charge.
   2
8. Two point charges $q_1 = 10 \times 10^{-8} C$ and $q_2 = -2 \times 10^{-8} C$ are separated by a distance of 10cm in air

   (iv) What is distance from charge q_1 would the electric potential be zero?
   (ii) Also, calculate the electric potential energy of the system.
   2
9. State Gauss's law in electrostatics. Use this law derive an expression for the electric field due to a long straight wire of linear charge density λ C-m.
   3
10. State the principle of the device that can build-up high voltages of the order of a few million volts. Draw its labeled diagram. A stage reaches in this device when the potential at the outer sphere cannot be increased further by piling up more charge on it. Explain why?
    3
11. A parallel plate capacitor is changed by a battery. After some-times, the battery is disconnected and a dielectric slab of dielectric constant K is inserted between the plates. How would
    (v)   the capacitances
    (ii) the electric field between plates
    (vi)   the energy stored in the capacitor, be affected?
    Justify your answer.
    3
12. (i)Define electric flux. Write its SI units.
    (vii)   Using Gauss's law, prove that electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
    (iii)How is the field directed if
        (a) the sheet is positively charged
        (b) Negatively charged?
        5

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