Holiday Homework(2024-2025)

Name: _____

Date: _____/ _05____/ _2024 **Class: XII-A1,A2**

Subject: Physics

Class-XII(Physics)

Instruction-

1.Learn chapter 1,2 and 3 for unit test -1

Answer all the questions based on based on chapter 1,2 and 3 from the last years and this year CBSE question papers (2020, 2021 , 2022 and 2023)

2.Make a flow chart of all the formula from the chapter Electrostatics and current electricity on a separate A4 size sheet for each chapter and then paste sheets in your notebook by using creativity.

3) Prepare a innovative physics project in the grouping of two students as per discussion and allotation in the class.

Investigatory Projects- Physics (2024-25)

As per C.B.S.E. guidelines, all students have to prepare one Investigatory Project carrying 3 marks. All students are therefore, advised to prepare one Investigatory Project on any one of the following topics or any other topic of their choice based on concept of physics after consulting the teacher during the summer vacation.

4)complete the assignment and M.C.Q. in the assignment notebook.

POINTERS FOR MAKING PROJECT REPORT

The material should be placed and bound in the following order:

1. **Top Sheet of transparent plastic** –The top page of your report should carry the following information in printed form or handwritten in neat block letters:

Name of project

Name of student

Roll no

Date of submission:

2. Aim of Project

3. Apparatus required

4. Principle/theory

5. construction with labeled diagram,

6. Working

7. Observations (to be filled later in lab)

8. Calculations,

9. Result/ Conclusions

10. Applications,

11. Graphs if any,

12. References/bibliography

13. Back cover of **plastic: may be opaque or transparent**

Note: Complete the practical file and the investigatory project

Assignment : Unit1,2

GENERAL INSTRUCTIONS:

A: The numerical are based on application of theory content. Attempt them in your physics notebook as practice assignment.

B: Do all questions in sequence.

COMPETENCY BASED QUESTIONS

1. An infinitely long positively charged straight wire has a linear charge density λ. An electron is revolving around the wire with a constant velocity. Deduce an expression for kinetic energy.

2. Two point charges +Q & +4Q are separated by a distance of 6a. Find the point on the line joining the two charges where the electric field is zero.

3. A hemispherical body is placed in a uniform electric field E. What is the flux associated with the curved surface, if field is (i) parallel to base? (ii) Perpendicular to base?

4. What will be the electric field intensity at the center of a uniformly charged circular wire of linear charge density?

5. Two point electric charges of unknown magnitude and sign are placed at a distance d apart. The electric field intensity is zero at a point, not between the charges but on the line joining them. Write two essential conditions for this to happen.

6. Three point charges q, – 4q and 2q are placed at the vertices of an equilateral triangle ABC of side ‘l’ as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.

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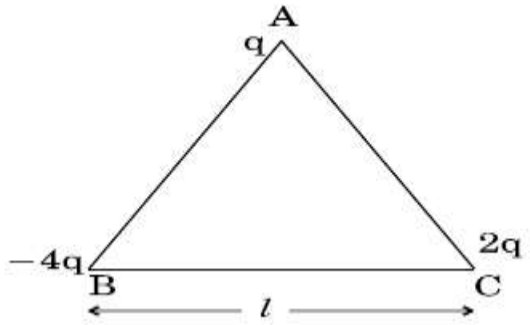


8. A long charged cylinder of linear charge density + 1 is surrounded by a hollow coaxial conducting cylinder of linear charge density 2. Use Gauss’s law to obtain expressions for the electric field at a point (i) in the space between the cylinders, and (ii) outside the larger cylinder.

9. Two parallel uniformly charged infinite plane sheets, ‘1’ and ‘2’, have charge densities + and – 2 respectively. Give the magnitude and direction of the net electric field at a point (i) in between the two sheets and (ii) outside near the sheet ‘1’.

10. A point charge +Q is placed in the vicinity of a conducting surface. Trace the field lines between the charge and the conducting surface.

11. Find out the outward flux due to a point charge + q placed at the centre of a cube of side ‘a’. Why is it found to be independent of the size and shape of the surface enclosing it? Explain.

12. Two identical circular loops ‘1’ and ‘2’ of radius R each have linear charge densities – and + C/m respectively. The loops are placed co-axially with their centres R distance apart. Find the magnitude and direction of the net electric field at the centre of loop ‘1’.

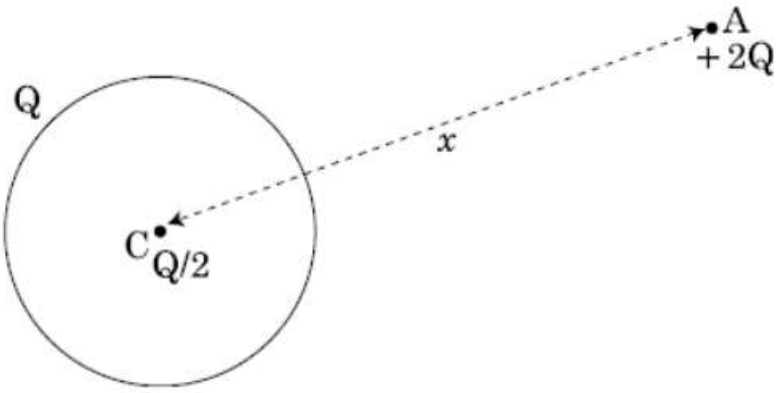
13. ‘‘Gauss’s law in electrostatics is true for any closed surface, no matter what its shape or size is.’’ Justify this statement with the help of a suitable example.

14. Draw a plot showing variation of electric field with distance from the centre of a solid conducting sphere of radius R, having a charge of +Q on its surface.

15. A point charge +Q is placed in the vicinity of a conducting surface. Draw the electric field lines between the surface and the charge.

16. A wire AB of length L has linear charge density = kx, where x is measured from the end A of the wire. This wire is enclosed by a Gaussian hollow surface. Find the expression for the electric flux through this surface.

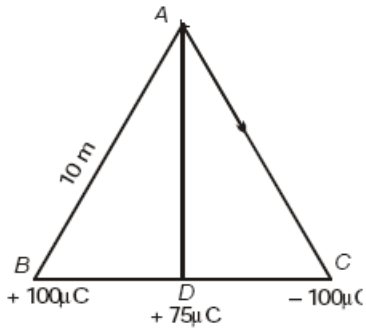
17. A thin metallic spherical shell of radius R carries a charge Q on its surface. A point charge Q/2 is placed at its center C and another charge +2Q is placed outside the shell at a distance x from the center as shown in the figure. Find (i) the force on the charge at the center of shell and at the point A, (ii) the electric flux through the shell.



18. An Oil drop of mass ‗m‘ and charge –q is to be held stationary in the gravitational field of the earth. What is the magnitude and direction of the electrostatic field required for this purpose?

19. Two charges, each of + 16 μC, are placed along a line at a distance r apart. A third charge .Q is placed between them. Determine the position and value of Q so that the system is in equilibrium.

20. ABC is an equilateral triangle of side 10 m. D is the mid-point of BC. Charge + 100 μC, -- 100 μC and + 75 μC are placed at B, C and D respectively. What is the force experienced by a1 C positive charge placed at A?



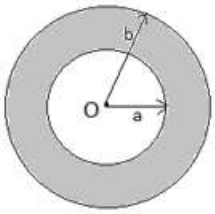
21. An ‘atom’ was earlier assumed to be a sphere of radius a having a positively charged point nucleus of charge +Ze at its centre. This nucleus was believed to be surrounded by a uniform density of negative charge that made the atom neutral as a whole. Use this theorem to find the electric field of this ‘atom’ at a distance

r (r<a) from the centre of the atom.

22. A point charge +Q is placed at the centre O of an uncharged hollow spherical conductor of inner radius ‘a’ and outer radius ‘b’. Find the following:

(a) The magnitude and sign of the charge induced on the inner and outer surface of the conducting shell.

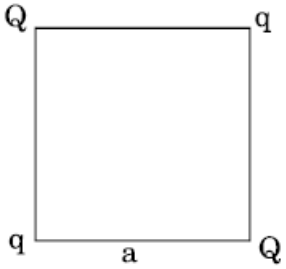
(b) The magnitude of electric field vector at a distance (i) r = a/2 , and (ii) r = 2b, from the centre of the shell.



23.Four point charges Q, q, Q and q are placed at the corners of a square of side ‘a’ as shown in the figure.

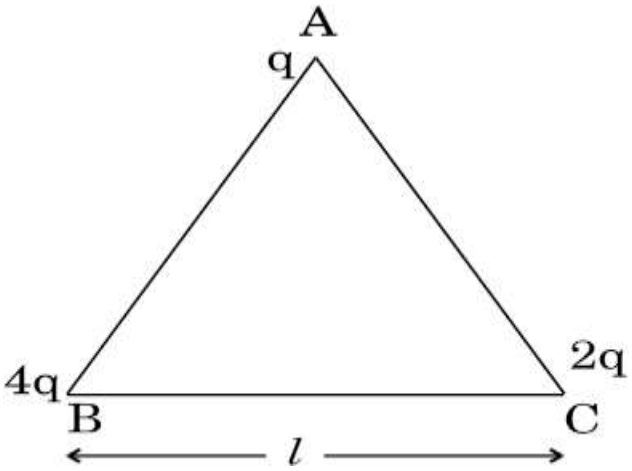
(a) Resultant electric force on a charge Q, and

(b) potential energy of this system.



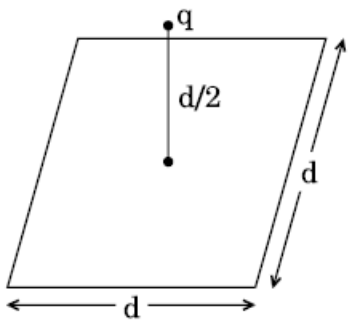
24.(A) Three point charges q, – 4q and 2q are placed at the vertices of an equilateral triangle ABC of side ‘l’ as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.

Find out the amount of the work done to separate the charges at infinite distance.



25. (a) Define electric flux. Is it a scalar or a vector quantity ? A point charge q is at a distance of d/2 directly above the centre of a square of side d, as shown in the figure. Use Gauss’ law to obtain the expression for the electric flux through the square.

(b) If the point charge is now moved to a distance ‘d’ from the centre of the square and the side of the square is doubled, explain electric flux will be affected. how the the electric flux will be affected.

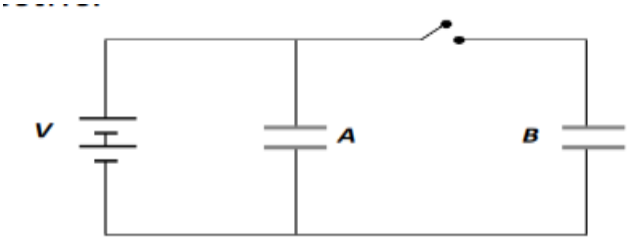


26(a) Use Gauss' law to derive the expression for the electric field due to a straight uniformly charged infinite line of charge density C/m.

(b) Draw a graph to show the variation of E with perpendicular distance r from the line of charge.

(c) Find the work done in bringing a charge q from perpendicular distance r1 to r2 (r2 > r1).

27. Two identical parallel plate capacitor A and B are connected to a battery of V volts with the switch S closed. The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant K. Find the ratio of the total electrostatic energy stored in both capacitors before and after the introduction of the dielectric.



28. If the dipole were kept in a uniform external field E0 , diagrammatically represent the position of the dipole in stable and unstable equilibrium and write the expression for the torque acting on the dipole in both case.

29(a) Use Gauss's theorem to find the electric field due to a uniformly charged infinitely large plane thin sheet with surface charge density

(b) An infinitely large plane thin sheet has a uniform surface charge density . Obtain the expression for the amount of work done in bringing a point charge q from infinite to a point, distance r , in front of the charged plane sheet.

30. Find the expression of electric field due to charge spherical shell. Plot the graph of electric field with distance from the centre of the shell.

31. What is the amount of work done in moving a point charge Q around a circular arc of radius 'r' at the centre of which another point charge 'q' is located ?

32. (a) Distinguish , with help of a suitable diagram , the difference in the behaviour of a conductor and a dielectric placed in external electric field. How does polarised dielectric modify the original external field?

(b)A capacitor of capacitance C is charged fully by connecting it to a battery of emf E. It is then disconnected from the battery. If the separation of plates of the capacitor is now doubled, how will the

following change

(i) charge stored by the capacitor.

(ii) Field strength between the plates.

(iii) energy stored by the capacitor. Justify your answer in each case.

33(a) Explain why , for any charge configuration, the equipotential surface through a point is normal to the electric field at that point.

Draw a sketch of equipotential surface due to a single –q charge, depicting the electric field lines due to the charge.

(b) Obtain the expression of work done to dissociate the system of three charges , and are placed at the vertices of an equilateral triangle of side ‘a’

34. Figure shows three circuits. Each consisting of a switch and two capacitors initially charged as indicated. After the switch has been closed, in which circuit (if any) will the charges on the left hand capacitor (i) increase (ii) decrease (iii) remain same?