	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII **All Sections**	**Department: SCIENCE 2023 – 24** **SUBJECT: PHYSICS**	**Date of submission: 20-4-2023**
Worksheet No: 1 **WITH ANSWERS**	**CHAPTER: 1** **ELECTRIC CHARGES AND FIELDS**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

This worksheet contains MCQs, Assertion-reason type questions, short answer, long answer and case study-based questions as per the CBSE pattern.

1.At a particular point, the electric field depends upon
(a) source charge Q only (b)test charge q_0 only (c) both Q and q_0 (d) neither Q nor q_0

2. In Fig.1.1, two positive charges q_2 and q_3 fixed along the y axis, exert a net electric force in the + x direction on a charge q_1 fixed along the x axis. If a positive charge Q is added at (x, 0), the force on q_1.

(a) shall increase along the positive x-axis.

(b) shall decrease along the positive x-axis.

(c) shall point along the negative x-axis.

(d) shall increase but the direction changes because of the intersection of Q with q_2 and q_3.

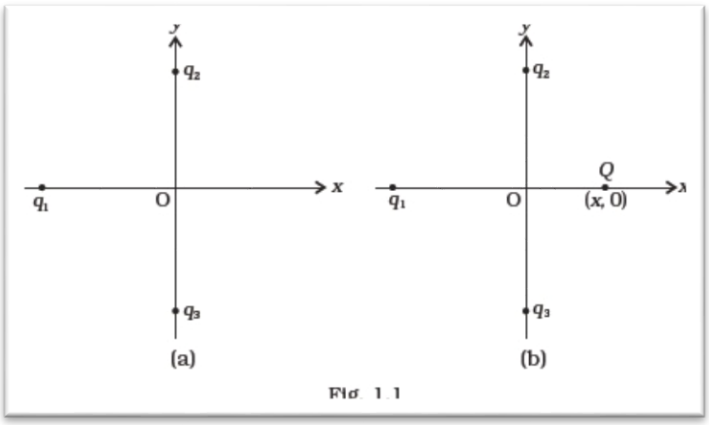


Fig. 1.1

3. A point positive charge is brought near an isolated conducting sphere (Fig. 1.2). The electric field is best given by

(a) Fig (i)

(b) Fig (ii)

(c) Fig (iii)

(d) Fig (iv)

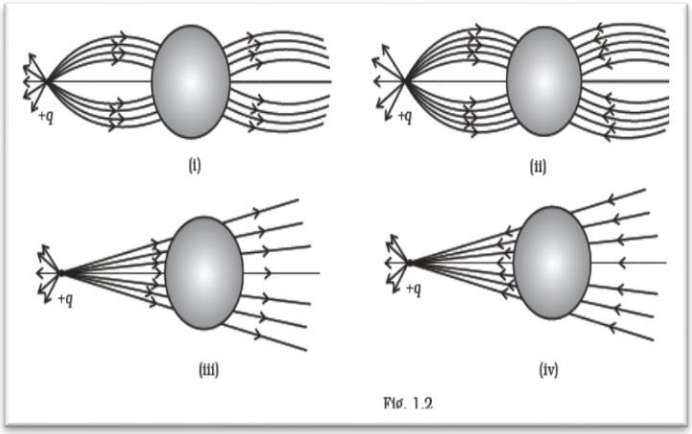


Fig. 1.2

4. The Electric flux through the surface

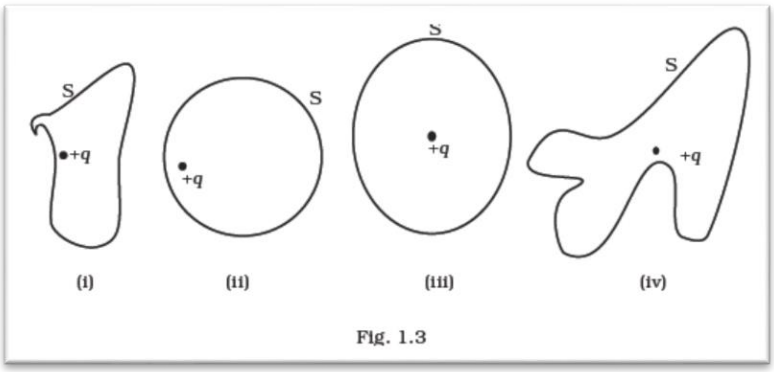


Fig. 1.3

(a) in Fig.1.3 (iv) is the largest.

(b) in Fig. 1.3 (iii) is the least.

(c) in Fig. 1.3 (ii) is same as Fig. 1.3 (iii) but is smaller than Fig. 1.3 (iv)

(d) is the same for all the figures.

5.Five charges q_1, q_2, q_3, q_4, and q_5 are fixed at their positions as shown in Fig. 1.4. S is a Gaussian surface. The Gauss's law is given by

$$\oint_S \mathbf{E}.d\mathbf{s} = \frac{q}{\varepsilon_0}$$

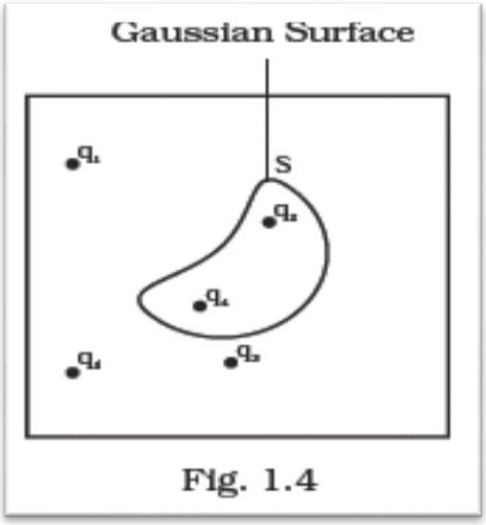


Fig. 1.4

Which of the following statements is correct?

(a) E on the LHS of the above equation will have a contribution from q_1, q_5 and q_3 while q on the RHS will have a contribution from q_2 and q_4 only.

(b) E on the LHS of the above equation will have a contribution from all charges while q on the RHS will have a contribution from q_2 and q_4 only.

(c) E on the LHS of the above equation will have a contribution from all charges while q on the RHS will have a contribution from q_1, q_3 and q_5 only.

(d) Both E on the LHS and q on the RHS will have contributions from q_2 and q_4 only.

6. Figure 1.5 shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct?

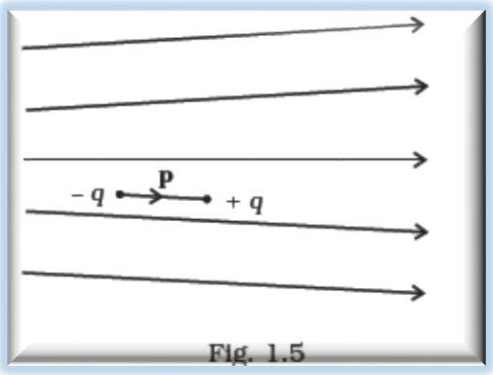


Fig. 1.5

(a) The dipole will not experience any force.

(b) The dipole will experience a force towards right.

(c) The dipole will experience a force towards left.

(d) The dipole will experience a force upwards.

7. A point charge +q, is placed at a distance d from an isolated conducting plane. The field at a point P on the other side of the plane is

(a) directed perpendicular to the plane and away from the plane.

(b) directed perpendicular to the plane but towards the plane.

(c) directed radially away from the point charge.

(d) directed radially towards the point charge.

8.A hemisphere is uniformly charged positively. The electric field at a point on a diameter away from the center is directed

(a) perpendicular to the diameter

(b) parallel to the diameter

(c) at an angle tilted towards the diameter

(d) at an angle tilted away from the diameter.

9.Electric field at a point varies as r^0 for

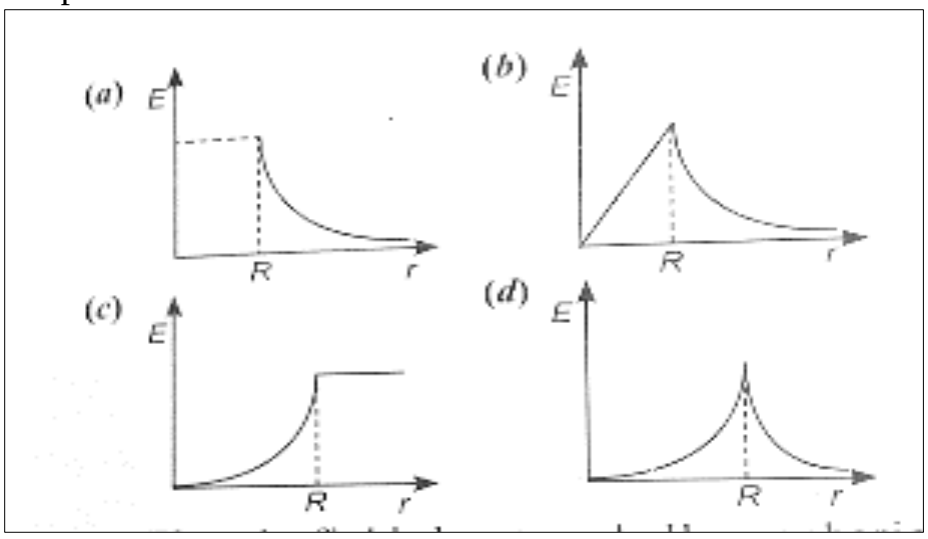
(a) an electric dipole (b) a point charge

(c)a plane infinite sheet of charge (d) a line charge of infinite length

10. An electric charge '*q'* is placed at the centre of a cube of side 'a' the electric flux on one of its faces will be

(a) $\frac{q}{6\varepsilon_0}$ (b) $\frac{q}{\varepsilon_0 a^2}$ (c) $\frac{q}{4\pi\varepsilon_0 a^2}$ (d) $\frac{q}{\varepsilon_0}$

11. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the sphere?



12. A Cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder Axis. the total flux for the surface of the cylinder is given by

(a) $2\pi R^2 E$ (b) πr^2 (c) $\frac{\pi R^2 - \pi R}{E}$ (d) Zero

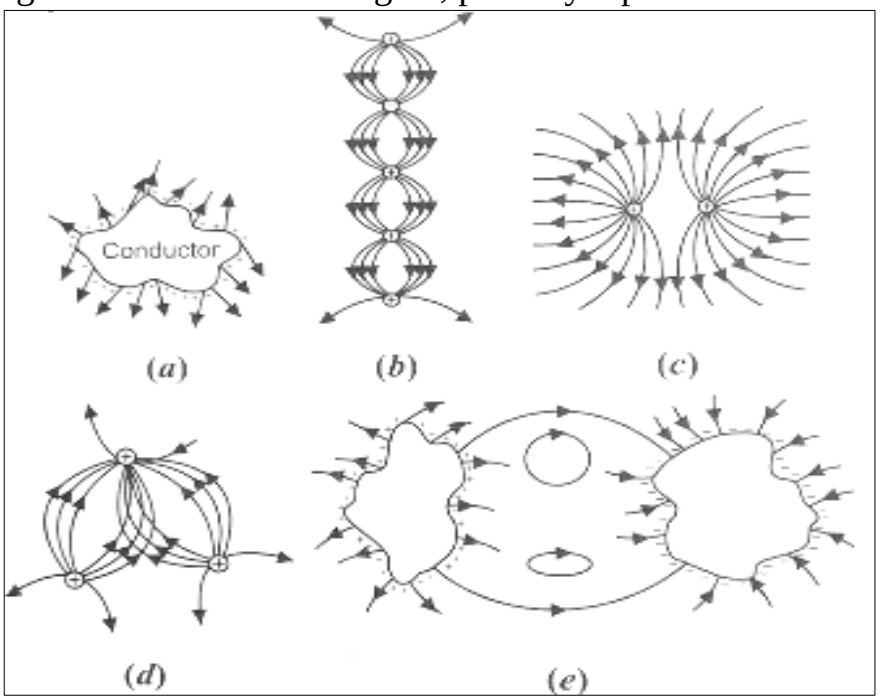
13. In general metallic ropes are suspended on the carriers taking inflammable materials the reason is

(a) to control the speed of the carrier
(b) to keep the centre of gravity of the carrier near to the earth
(c) to keep the body of the carrier in contact with the earth
(d)none of these

14. Four equal charges 'q' are placed at the four corners of a square of length 'a' the magnitude of the force on the either charge will be

(a) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (b) $\frac{4q^2}{4\pi\varepsilon_0 a^2}$ (c) $\frac{(1+2\sqrt{2})q^2}{2\times 4\pi\varepsilon_0 a^2}$ (d) $\frac{\left(\frac{2+1}{\sqrt{2}}\right)q^2}{4\pi\varepsilon_0 a^2}$

15.which among the curves shown in figure, possibly represent electrostatic field lines?



16. The magnitude of electric field intensity E is such that, an electron placed in it would experience an electric force equal to its weight is given by

(a) *mge* (b)*mg/e* (c)*e/mg* (d)e^2g/m^2

Directions: Choose any one of the following four responses.
(a) Both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) Assertion is correct, Reason is incorrect
(d) Both Assertion and Reason are correct.

17. **Assertion:** A metallic shield in form of a hollow shell may be built to block an electric field.
Reason: In a hollow spherical shield, the electric field inside it is zero at every point.

18. **Assertion:** Electric lines of force never cross each other.
Reason: Electric field at a point superimpose to give one resultant electric field.

19. **Assertion:** The Coulomb force is the dominating force in the universe.
Reason: The Coulomb force is weaker than the gravitational force.

20. **Assertion:** When bodies are charged through friction, there is a transfer of electric charge from one body to another, but no creation or destruction of charge.
Reason: This follows from conservation of electric charges.

SHORT ANSWERS TYPE QUESTIONS;

21. An arbitrary surface encloses a dipole. What is the electric flux through this surface?

22. A metallic spherical shell has an inner radius R_1 and outer radius R_2. A charge Q is placed at the center of the spherical cavity. What will be surface charge density on (i) the inner surface, and (ii) the outer surface?
23. The dimensions of an atom are of the order of an Angstrom. Thus, there must be large electric fields between the protons and electrons. Why, then is the electrostatic field inside a conductor zero?

24. If the total charge enclosed by a surface is zero, does it imply that the electric field everywhere on the surface is zero? Conversely, if the electric field everywhere on a surface is zero, does it imply that net charge inside is zero.

25. Sketch the electric field lines for a uniformly charged hollow cylinder shown in Fig 1.8.

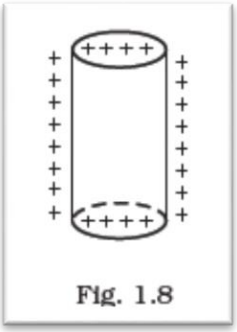
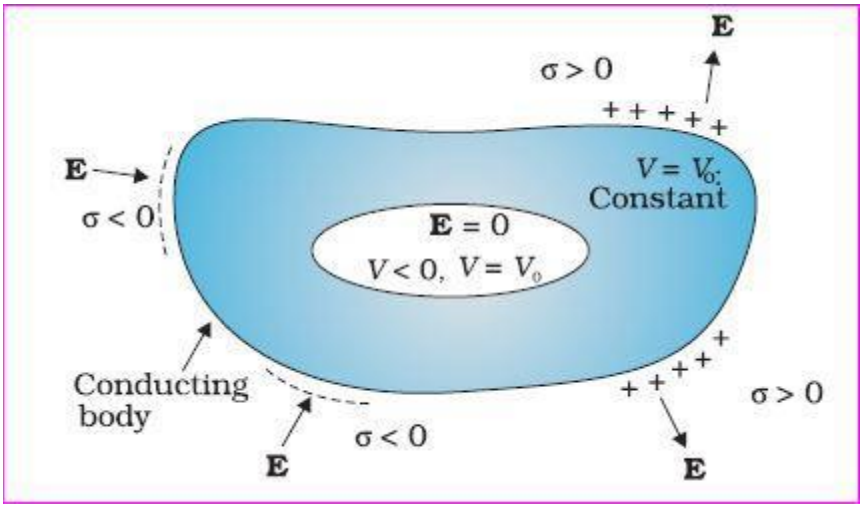


Fig. 1.8

CASE-STUDY BASED QUESTIONS;

26. The electric field inside the cavity is zero, whatever be the size and shape of the cavity and whatever be the charge on the conductor and the external fields in which it might be placed. The electric field inside a charged spherical shell is zero. But the vanishing of electric field in the (charge-free) cavity of a conductor is, as mentioned above, a very general result. A related result is that even if the conductor is charged or charges are induced on a neutral conductor by an external field, all charges reside only on the outer surface of a conductor with cavity.

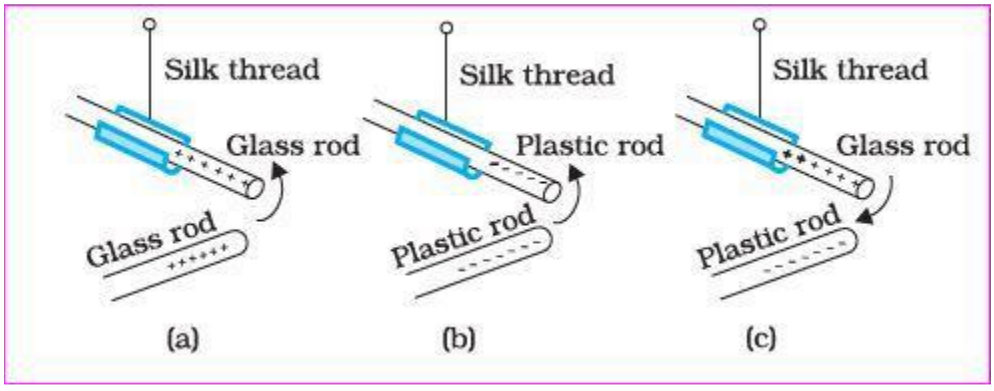


(i) What is the use of electrostatic shielding?

(ii) What is change in potential difference in a cavity when moving away from its center focus?

(ii) Define equipotential surface.

27. When a glass rod is rubbed with silk, the rod acquires one kind of charge and the silk acquires the second kind of charge. This is true for any pair of objects that are rubbed to be electrified. Now if the electrified glass rod is brought in contact with silk, with which it was rubbed, they no longer attract each other. They



also do not attract or repel other light objects as they did on being electrified. Thus, the charges acquired after rubbing are lost when the charged bodies are brought in contact. (i) What is conservation of charge. Charging by friction follow conservation of charge. Explain.

(ii) Why the transfer of nucleons is not possible during charging.

(iii) If a negatively charged rod touches a conductor, the conductor will be charged by what method?

LONG ANSWERS TYPE QUESTIONS;

28. Define Gauss's law. Find the expression of electric field due to an infinite line charge using the law.

29. find the expression for electric field intensity at axial and equatorial line position of a dipole.

ANSWER KEY	
	1. a, 2.a, 3. B, 4.d, 5.b, 6.c, 7.a, 8.a, 9.c, 10.a, 11.a, 12.d, 13.c, 14.c, 15.c, 16. B, 17. a, 18. A, 19. D, 20. A.
21	Zero, Gauss's law
22	Charge is same as Q for both, as per Gauss's law flux is same for both.
23	The electrostatic field inside a conductor is zero because the electrostatic field is due to the excess change. Atoms are electrically neutral so there is excess change on the atom. If the charge is zero, then $E = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{r^2}$ Since $q = 0$, $E = 0$ q is the charge and r is the distance at any point from the charge.
24.	if everywhere, on Gaussian surface, electric field is zero then net charge will be zero.
25.	Refer the concept of field lines
26.	(i) to protect electric sensitive devices from external field. (ii) no change, inside potential is constant, hence field is zero, (iii) definition
27.	(i) When two objects rub each other, then due to friction, one object's electrons gets transferred to the other one. The one which loses electrons becomes positively charged and the other, negative. Thus, charging by friction is only due to transfer of electrons. No charge gets created or destroyed in this process.

	(ii) they are not free to leave the nucleus (iii) conduction
28.	Refer notebook
29.	Refer notebook

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