# Objective Questions

## (For Complete Chapter)

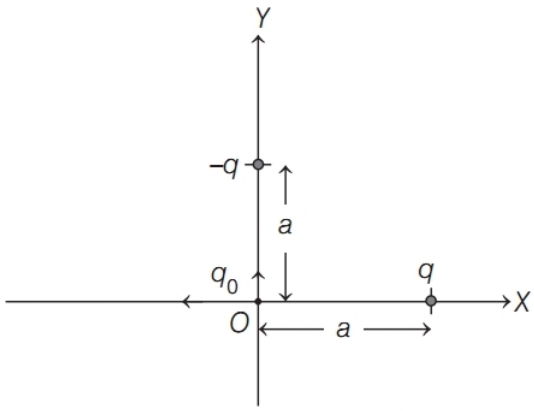
### Multiple Choice Questions (MCQs)

**1.** An object has charge of 1 C and gains $5.0 \times 10^{18}$ electrons. The net charge on the object becomes **CBSE 2021 (Term-I)**

(a) – 0.80 C (b) + 0.80 C

(c) + 1.80 C (d) + 0.20 C

**2.** Three charges $q$, $-q$ and $q_0$ are placed as shown in the figure. The magnitude of the net force on the charge $q_0$ at point $O$ is $\left(\text{Take}, K = \frac{1}{4\pi\varepsilon_0}\right)$ **CBSE 2021 (Term-I)**




(a) 0 (b) $\frac{2Kqq_0}{a^2}$

(c) $\frac{\sqrt{2}Kqq_0}{a^2}$ (d) $\frac{1}{\sqrt{2}}\frac{Kqq_0}{a^2}$

**3.** A negatively charged object $X$ is repelled by another charged object $Y$. However, an object $Z$ is attracted to object $Y$. Which of the following is the most possibility for the object $Z$? **CBSE 2021 (Term-I)**

(a) Positively charged only

(b) Negatively charged only

(c) Neutral or positively charged

(d) Neutral or negatively charged

**4.** In an experiment, three microscopic latex spheres are sprayed into a chamber and became charged with charges + 3$e$, + 5$e$ and – 3$e$, respectively. All the three spheres came in contact simultaneously for a moment and got separated. Which one of the following are possible values for the final charge on the spheres?

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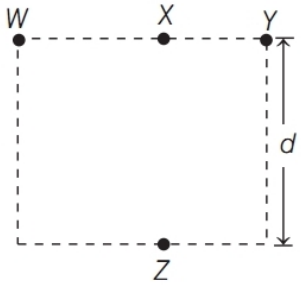
(a) + 5$e$, – 4$e$, + 5$e$ (b) + 6$e$, + 6$e$, – 7$e$

(c) + 4$e$, + 3.5$e$, + 5.5$e$ (d) + 5$e$, – 8$e$, + 7$e$

**5.** Four objects $W$, $X$, $Y$ and $Z$ each with charge + $q$ are held fixed at four points of a square of side $d$ as shown in the figure. Objects $X$ and $Z$ are on the mid-points of

the sides of the square. The electrostatic force exerted by object $W$ on object $X$ is $F$, then the magnitude of the force exerted by object $W$ on $Z$ is **CBSE 2021 (Term-I)**




(a) $\frac{F}{7}$ (b) $\frac{F}{5}$ (c) $\frac{F}{3}$ (d) $\frac{F}{2}$

**6.** A square sheet of side $a$ is lying parallel to $XY$-plane at $z = a$. The electric field in the region is $\mathbf{E} = cz^2\hat{\mathbf{k}}$. The electric flux through the sheet is **CBSE 2021 (Term-I)**

(a) $a^4c$ (b) $\frac{1}{3}a^3c$

(c) $\frac{1}{3}a^4c$ (d) 0

**7.** The magnitude of electric field due to a point charge $2q$ at distance $r$ is $E$. Then, the magnitude of electric field due to a uniformly charged thin sphere shell of radius $R$ with total charge $q$ at a distance $\frac{r}{2}(r >> R)$ will be **CBSE 2021 (Term-I)**

(a) $\frac{E}{4}$ (b) 0 (c) $2E$ (d) $4E$

**8.** The electric flux through a closed Gaussian surface depends upon **Delhi 2020**

(a) net charge enclosed and permittivity of the medium

(b) net charge enclosed, permittivity of the medium and the size of the Gaussian surface

(c) net charge enclosed only

(d) permittivity of the medium only

**9.** An electric dipole of dipole moment $\mathbf{p}$ is placed in a uniform external electric field $\mathbf{E}$. Then the

(a) torque experienced by the dipole is $\mathbf{E} \times \mathbf{p}$

(b) torque is zero, if $\mathbf{p}$ is perpendicular to $\mathbf{E}$

(c) torque is maximum, if $\mathbf{p}$ is perpendicular to $\mathbf{E}$

(d) potential energy is maximum, if $\mathbf{p}$ is parallel to $\mathbf{E}$

**10.** An electric dipole placed in a non-uniform electric field experiences

(a) both a torque and a net force

(b) only a force but no torque

(c) only a torque but no net force

(d) no torque and no net force

**11.** An electric dipole is placed in a uniform electric field with the dipole axis making an angle $\theta$ with the direction of the electric field. The orientation of the dipole for stable equilibrium is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$

(c) 0 (d) $\frac{\pi}{2}$

**12.** The electric dipole moment of an electron and a proton 4.3 nm apart is

(a) $6.88 \times 10^{-28}$ C-m (b) $2.56 \times 10^{-29}$ C$^2$/m

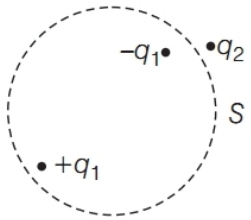
(c) $3.72 \times 10^{-14}$ C/m (d) $1.1 \times 10^{-46}$ C$^2$m

**13.** What is the nature of Gaussian surface involved in Gauss' law of electrostatics?

(a) Scalar (b) Electrical

(c) Magnetic (d) Vector

**14.** Three charges $+q_1, -q_1$ and $q_2$ are placed as shown, $S$ is a Gaussian surface. Electric field at any point on $S$ is




(a) due to $q_2$ only

(b) uniform at all points

(c) zero at all the points

(d) due to all the charges

**15.** In a region, the intensity of an electric field is given by $\mathbf{E} = (2\hat{\mathbf{i}} + 3\hat{\mathbf{j}} + \hat{\mathbf{k}})\text{NC}^{-1}$. The electric flux through a surface $\mathbf{S} = 10\,\hat{\mathbf{i}}\ \text{m}^2$ in the region is

(a) 5 N-m$^2$ C$^{-1}$ (b) 10 N-m$^2$ C$^{-1}$

(c) 15 N-m$^2$ C$^{-1}$ (d) 20 N-m$^2$ C$^{-1}$

## Assertion-Reason Questions

**Directions** (Q. Nos. 16-22) *In the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below*

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If both Assertion and Reason are incorrect.

**16.** **Assertion (A)** A negative charge in an electric field moves along the direction of the electric field.

**Reason (R)** On a negative charge the force acts in the direction of the electric field. **CBSE 2021 (Term-I)**

**17.** **Assertion** When charges are shared between any two bodies, then no charge is really lost but some loss of energy does occur.

**Reason** Some energy disappears in the form of heat, sparking, etc.

**18.** **Assertion** The coulomb force is the dominating force in the universe.

**Reason** The coulomb force is weaker than the gravitational force.

**19.** **Assertion** At the centre of the line joining two equal and opposite charges, $E = 0$.

**Reason** At the centre of the line joining two equal and similar charge, $E \neq 0$.

**20.** **Assertion** If a dipole is enclosed by a surface, then according to Gauss's law, electric flux linked with it will be zero.

**Reason** The charge enclosed by a surface is zero.

**21.** **Assertion** In a region, where uniform electric field exists, the net charge within volume of any size is zero.

**Reason** The electric flux within any closed surface in region of uniform electric field is zero.

**22.** **Assertion** With the help of Gauss's theorem, we can find electric field at any point.

**Reason** Gauss's theorem cannot be applied for any type of charge distribution.

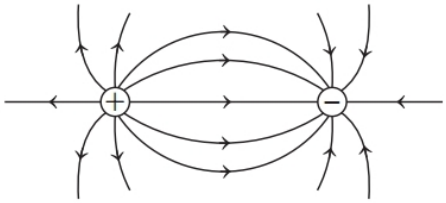
## Case Based Questions

**Directions** (Q.Nos. 23-24) *These questions are case study based questions. Attempt any 4 sub-parts from each question. Each question carries 1 mark.*

**23.** **Electric Charge**

Electric charge is an intrinsic property of elementary particles like electrons, protons, etc. Due to charge on elementary particles, attraction or repulsion force occurs between them. There are two types of charges; one is positive and other is negative.

Electric lines of forces for pair of two unlike charges are shown below



Electric field lines do not pass through a conductor.

(i) Charge on a body which carries 40 excess electrons is

(a) $6.4 \times 10^{-18}$ C

(b) $-6.4 \times 10^{-18}$ C

(c) $6.4 \times 10^{-19}$ C

(d) $-6.4 \times 10^{-19}$ C

(ii) Which of the following charge does not exist on any type of charged body?

(a) $3.2 \times 10^{-19}$ C (b) $6.4 \times 10^{-19}$ C

(c) $9.6 \times 10^{-20}$ C (d) $9.6 \times 10^{-18}$ C

(iii) A body is negatively charged, it implies that
(a) there is negative as well as positive charge in the body but the positive charge is more than negative charge
(b) there is negative as well as positive charge in the body but the negative charge is more than positive charge
(c) there is only negative charge in the body
(d) None of the above

(iv) Electric lines of forces
(a) intersect at positive charge to each other
(b) intersect at negative charge to each other
(c) do not intersect each other
(d) are not responsible for attraction for two unlike charges

(v) Two charges are repel to each other, if
(a) one charge is positive and other is negative
(b) Both charges are positive
(c) Both charges are negative
(d) Both (b) and (c)

**24. Faraday Cage**

A Faraday cage or Faraday shield is an enclosure made of a conducting material. According to electrostatics of a conductor, we know that fields within the conductor cancel out with any external fields, hence electric field within the enclosure is zero. These Faraday cages act as big hollow conductors in which we can put the things to shield them from electrical fields. Any electrical shocks, the cage receives, pass harmlessly around the outside of the cage.

(i) Which type of materials can be used to make a Faraday cage?
(a) Insulators
(b) Semiconductors
(c) Metallic conductors
(d) All of the above

(ii) Examples of a real world Faraday cage is
(a) plastic box (b) lightning rod
(c) metallic rod (d) car

(iii) An isolated point charge $-q$ is placed inside the Faraday cage. Its surface must have charge equal to
(a) $-q$ (b) $+q$ (c) $-2q$ (d) 0

(iv) A point charge of 1C is placed at the centre of Faraday cage in the shape of cube with surface of 5 cm edge.
The number of electric field lines passing through the cube normally will be
(a) $1.1 \times 10^8$ N-m$^2$/C leaving the surface
(b) $1.1 \times 10^8$ N-m$^2$/C entering the surface
(c) $9 \times 10^9$ N-m$^2$/C leaving the surface
(d) $9 \times 10^9$ N-m$^2$/C entering the surface

(v) What is the electrical force inside a Faraday cage, when it is struck by lightning?
(a) The same as the lightning
(b) Half that of the lightning
(c) A quarter of the lightning
(d) Zero