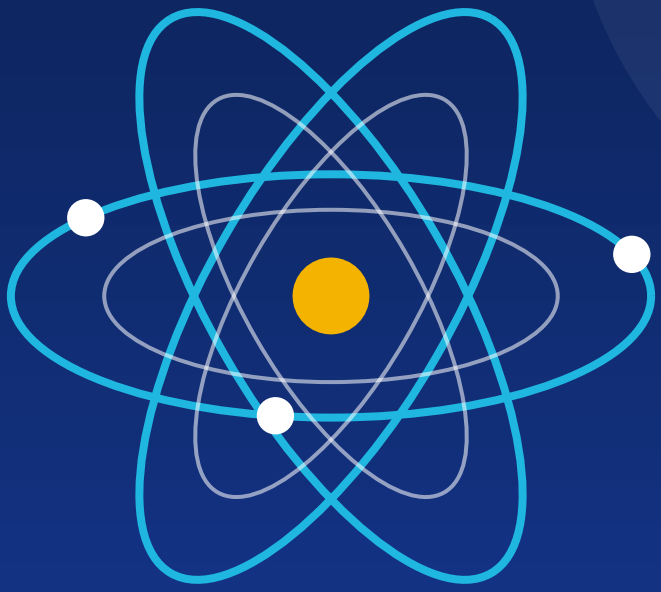
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ELECTROSTATICS

Chapter 13 • Class 10 Physics

Exercise MCQs with Answers & Explanations

66 MCQs

9 topic sections • ✓ correct answers highlighted

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Section 1: Production and Properties of Electric Charges

1 **What is the study of charges at rest called?**

A Electrodynamics

B **Electrostatics** ✓

C Magnetism

D Current Electricity

Explanation: Electrostatics specifically deals with stationary electric charges and the forces they exert on each other, unlike current electricity which deals with moving charges.

2 **When a plastic comb is rubbed through hair, it attracts small pieces of paper due to:**

A Magnetic force

B Gravitational force

C **Electric force** ✓

D Nuclear force

Explanation: Rubbing the comb transfers electrons, giving it a static electric charge which then exerts an electric force on neutral paper pieces, causing attraction.

3 **Two plastic rods rubbed with fur and suspended by silk threads will:**

A Attract each other

B **Repel each other** ✓

C Remain neutral

D Stick together

Explanation: Both rods acquire the same type of charge (negative) from the fur. According to the law of charges, like charges repel.

4 **A glass rod rubbed with silk is brought near a plastic rod rubbed with fur. They will:**

A Repel each other

B Attract each other ✓

C Have no effect on each other

D Lose their charges instantly

Explanation: The glass rod gets a positive charge, and the plastic rod gets a negative charge. Opposite charges attract each other.

5 **Which of the following is the surest test of electrification (whether a body is charged)?**

A Attraction

B **Repulsion** ✓

C Friction

D Conduction

Explanation: A neutral body can be attracted to a charged body due to induction. However, only a charged body can repel another body with the same charge. Thus, repulsion confirms the presence of charge.

6 **Charge is a basic property of a material body due to which it:**

A Gains mass

B **Attracts or repels another object** ✓

C Changes its state

D Generates heat

Explanation: The fundamental definition of electric charge is a property that causes matter to experience a force when placed in an electromagnetic field, leading to attraction or repulsion.

7 **In the process of charging by friction, what is actually transferred between the two bodies?**

A Protons

B Neutrons

C **Electrons** ✓

D Positrons

Explanation: Rubbing causes electrons (which are loosely bound in outer orbits) to be transferred from one material to another, creating an imbalance of charge.

8 **If a glass rod is rubbed with silk, the glass rod becomes positively charged because:**

A It gains protons

B **It loses electrons** ✓

C It gains neutrons

D It loses protons

Explanation: Glass has a lower electron affinity than silk. Thus, electrons are transferred from the glass to the silk, leaving the glass with a net positive charge.

Section 2: Electrostatic Induction and the Electroscope

9 **The process of charging a conductor without physical contact with a charged body is called:**

A Conduction

B Friction

C **Electrostatic induction** ✓

D Polarization

Explanation: Induction occurs when a charged object is brought near a neutral conductor, causing the charges within the conductor to redistribute without direct contact.

10 **When a positively charged rod is brought near a neutral metal sphere, the side of the sphere closest to the rod will:**

A Become positively charged

B **Become negatively charged** ✓

C Remain neutral

D Lose all its electrons

Explanation: The positive rod attracts the free electrons in the metal sphere towards it, making the near side negative and leaving the far side positive.

11 **The sensitive instrument used to detect the presence of electric charge is called:**

A Ammeter

B Voltmeter

C **Electroscope** ✓

D Galvanometer

Explanation: A gold-leaf electroscope is specifically designed to detect static electric charges. The leaves diverge when charged due to repulsion.

12 **In a gold-leaf electroscope, the thin aluminum foil at the bottom is used to:**

A Attract charges

B Store charges permanently

C **Ground the instrument and protect it from external disturbances** ✓

D Make the leaves heavier

Explanation: The aluminum foil acts as a ground connection, allowing charges to flow to or from the Earth, neutralizing the electroscope when needed and shielding it from stray external electric fields.

13 **If a negatively charged body is brought near the brass disk of an uncharged electroscope, the leaves will:**

A Collapse

B **Diverge** ✓

C Remain still

D Melt

Explanation: The negative body repels electrons down to the leaves. Both leaves become negatively charged and repel each other, causing them to diverge.

14 **To charge an electroscope positively by induction, you should bring a:**

A **Negatively charged rod near the disk and ground the disk** ✓

B Positively charged rod near the disk and ground the disk

C Negatively charged rod and touch the disk

D Positively charged rod and touch the disk

Explanation: A negative rod repels electrons to the ground when the disk is grounded. Removing the ground first, then the rod, leaves the electroscope with a net positive charge.

15 **How can you detect the type of charge on a body using a positively charged electroscope?**

A By touching the body to the disk

B **By bringing the body near the disk; if leaves diverge more, body is positive** ✓

C By bringing the body near the disk; if leaves collapse, body is positive

D By observing the color of the leaves

Explanation: If a positive body is brought near a positively charged electroscope, it repels more positive charges to the leaves, increasing divergence. If a negative body is brought near, it neutralizes some charge, decreasing divergence.

16 **If a charged electroscope's leaves collapse when a material under test is touched to its disk, the material is:**

A An insulator

B **A conductor** ✓

C A semiconductor

D A dielectric

Explanation: Touching the disk with a conductor allows the charge on the electroscope to flow through the material to the ground (or your body), causing the leaves to collapse.

Section 3: Coulomb’s Law

17 **Coulomb’s law states that the force between two point charges is:**

A Directly proportional to the distance between them

B Inversely proportional to the product of charges

C **Directly proportional to the product of charges and inversely proportional to the square of the distance** ✓

D Independent of the medium

Explanation: The mathematical relationship is $F \propto q_1 q_2 / r^2$. This means larger charges create a stronger force, while greater distance rapidly weakens the force.

18 **The value of Coulomb's constant (k) in air or vacuum is approximately:**

A **$9 \times 10^9\ \text{N m}^2\ \text{C}^{-2}$** ✓

B $9 \times 10^6\ \text{N m}^2\ \text{C}^{-2}$

C $6.67 \times 10^{-11}\ \text{N m}^2\ \text{kg}^{-2}$

D $3 \times 10^8\ \text{m/s}$

Explanation: This is a fundamental constant in electrostatics used to calculate the exact force between two charges in a vacuum.

19 **If the distance between two point charges is doubled, the electrostatic force between them becomes:**

A Double

B Half

C **One-fourth** ✓

D Four times

Explanation: Since force is inversely proportional to the square of the distance ($F \propto 1/r^2$), doubling the distance ($2r$) means the force becomes $1/(2^2) = 1/4$ of its original value.

20 **The SI unit of electric charge is:**

A Ampere

B Volt

C **Coulomb** ✓

D Farad

Explanation: The Coulomb (C) is the standard unit of electric charge, defined as the charge transferred by a steady current of one ampere in one second.

21 **Coulomb's law is strictly true only for:**

A Large charged spheres

B **Point charges** ✓

C Cylindrical conductors

D Neutral bodies

Explanation: The formula assumes the charges are concentrated at a single point. For larger bodies, the distance between centers must be much larger than the size of the bodies for the law to be highly accurate.

22 **If the magnitude of one of the charges is doubled while the distance remains constant, the force will:**

A Remain the same

B Be halved

C **Be doubled** ✓

D Be quadrupled

Explanation: Force is directly proportional to the magnitude of charges ($F \propto q_1$). Doubling q_1 will directly double the overall force.

Section 4: Electric Field and Electric Field Intensity

23 **The region around a charge where its electric force can be felt is called:**

A Magnetic field

B **Electric field** ✓

C Gravitational field

D Potential field

Explanation: An electric field is a vector field that surrounds electric charges and exerts a force on other charges placed within it.

24 **The formula for electric field intensity (*E*) is:**

A E = q/F

B **E = F/q** ✓

C E = F · q

D $E = q/r^2$

Explanation: Electric field intensity is defined as the force experienced per unit positive test charge placed at that point.

25 **The SI unit of electric field intensity is:**

A Newton (N)

B Coulomb (C)

C **Newton per Coulomb (N/C)** ✓

D Volt (V)

Explanation: Since E = Force / Charge, the unit is Newtons divided by Coulombs.

26 Electric field intensity is a:

A Scalar quantity

B Vector quantity ✓

C Tensor quantity

D Base quantity

Explanation: It has both magnitude and direction. Its direction is the same as the force on a positive test charge.

27 Electric field lines are directed:

A From negative to positive charge

B From positive to negative charge ✓

C Away from negative charge

D Towards positive charge

Explanation: By convention, field lines point in the direction of the force a positive test charge would experience, which is away from positive and towards negative charges.

28 **The spacing between electric field lines indicates:**

A The type of charge

B **The strength of the electric field** ✓

C The distance between charges

D The amount of work done

Explanation: Closer field lines mean a stronger electric field, while widely spaced lines mean a weaker field.

29 **For an isolated positive point charge, the electric field lines:**

A Point radially inward

B **Point radially outward** ✓

C Form closed loops

D Are parallel

Explanation: A positive charge repels a positive test charge placed around it, so the lines point outward in all directions.

30 **Which of the following is the mathematical formula to calculate force from electric field intensity?**

A $F = E/q$

B **$F = qE$** ✓

C $F = q/E$

D $F = E^2q$

Explanation: Since $E = F/q$, rearranging the formula gives $F = qE$. This is used to find the force on any charge q placed in a known electric field.

Section 5: Electrostatic Potential and Potential Difference

31 **Electrostatic potential at a point is defined as:**

A **Work done per unit charge** ✓

B Force per unit charge

C Charge per unit volume

D Energy stored in a capacitor

Explanation: It is the amount of work done against the electric field to bring a unit positive charge from infinity to that point.

32 **The SI unit of electric potential is:**

A Joule

B Coulomb

C **Volt** ✓

D Newton

Explanation: Volt (V) is defined as one Joule per Coulomb (J/C).

33 **Electric potential is a:**

A Vector quantity

B **Scalar quantity** ✓

C Fundamental quantity

D Magnetic quantity

Explanation: Unlike electric field, potential does not have a direction; it only has magnitude, making it a scalar quantity.

34 **The potential difference between two points is defined as:**

A **Energy supplied by a unit charge moving between them** ✓

B Total energy supplied

C The force between two charges

D The resistance between two points

Explanation: Potential difference is the work done per unit charge to move a charge from one point to another in an electric field.

35 **A positive charge naturally tends to move from:**

A Lower to higher potential

B **Higher to lower potential** ✓

C Positive to negative potential

D Left to right

Explanation: Just like a mass falls from a higher gravitational potential to a lower one, a positive charge moves towards a region of lower electric potential.

36 **If 1 Joule of work is done in bringing 1 Coulomb of charge from infinity to a point, the potential at that point is:**

A 1 Watt

B 1 Ampere

C **1 Volt** ✓

D 1 Ohm

Explanation: V = W/q = 1 J / 1 C = 1 Volt.

Section 6: Capacitors and Capacitance

37 **A device used to store electric charge is called:**

A Resistor

B Inductor

C **Capacitor** ✓

D Transformer

Explanation: A capacitor consists of two parallel plates separated by an insulator and is designed specifically to store electrical energy.

38 **The insulating medium between the plates of a capacitor is called:**

A Conductor

B **Dielectric** ✓

C Semiconductor

D Electrolyte

Explanation: Dielectric materials (like air, paper, or mica) do not conduct electricity but increase the capacitor's ability to store charge.

39 **The formula for the capacitance of a capacitor is:**

A $C = V/Q$

B **$C = Q/V$** ✓

C $C = QV$

D $C = Q \cdot r$

Explanation: Capacitance is the ratio of the charge on one plate to the potential difference between the plates.

40 **The SI unit of capacitance is:**

A Volt

B **Farad** ✓

C Henry

D Tesla

Explanation: One Farad (F) is defined as one Coulomb per Volt (C/V).

41 **One Farad is defined as the capacitance when one coulomb of charge produces a potential difference of:**

A **One volt** ✓

B One ampere

C One ohm

D One joule

Explanation: C = Q/V → 1 F = 1 C / 1 V.

42 **The capacitance of a parallel plate capacitor depends on which of the following?**

A Area of the plates

B Distance between the plates

C Type of insulator used

D **All of the above** ✓

Explanation: Larger plate area, smaller distance between plates, and a material with a higher dielectric constant all increase the capacitance.

43 **When capacitors are connected in parallel, which quantity remains the same across each capacitor?**

A Charge

B **Voltage** ✓

C Capacitance

D Energy

Explanation: In a parallel circuit, all components are connected across the same two nodes, meaning they share the same potential difference (voltage).

44 **For capacitors connected in parallel, the equivalent capacitance is given by:**

A $C_{eq} = 1/C_1 + 1/C_2$

B $C_{eq} = C_1 \cdot C_2$

C **$C_{eq} = C_1 + C_2 + \ldots$** ✓

D $C_{eq} = (C_1 + C_2)/2$

Explanation: In parallel, the total capacitance is simply the sum of the individual capacitances, making it larger than any single capacitor.

45 **When capacitors are connected in series, which quantity remains the same across each capacitor?**

A Voltage

B **Charge** ✓

C Capacitance

D Current

Explanation: In a series combination, the same charge Q is deposited on the plates of each capacitor due to electrostatic induction.

46 **The equivalent capacitance of a series combination of capacitors is always:**

A Larger than the largest individual capacitance

B **Smaller than the smallest individual capacitance** ✓

C Equal to the sum of all capacitances

D Zero

Explanation: The formula $1/C_{eq} = 1/C_1 + 1/C_2$ means the resulting equivalent capacitance will always be less than the smallest capacitor in the series.

47 **Three capacitors of 3 μF, 4 μF, and 5 μF are connected in parallel. The total capacitance is:**

A **12 μF** ✓

B 0.8 μF

C 6 μF

D 10 μF

Explanation: For parallel circuits, add the capacitances directly: 3 + 4 + 5 = 12 μF.

48 **Three capacitors of 3 μF, 4 μF, and 5 μF are connected in series. The equivalent capacitance is approximately:**

A 12 μF

B **1.3 μF** ✓

C 3.0 μF

D 2.5 μF

Explanation: Use the series formula: $1/C_{eq} = 1/3 + 1/4 + 1/5 = 47/60$. Therefore, $C_{eq} = 60/47 \approx 1.27$ μF, which rounds to 1.3 μF.

Section 7: Types and Uses of Capacitors

49 **Which type of capacitor uses a very thin oxide layer as its dielectric?**

A Paper capacitor

B Mica capacitor

C **Electrolytic capacitor** ✓

D Variable capacitor

Explanation: Electrolytic capacitors use a chemical reaction to form a microscopic layer of metal oxide, allowing for very high capacitance in a small volume.

50 **A variable capacitor is commonly used in:**

A **Tuning radio sets** ✓

B Car engines

C Flashlights

D Electric heaters

Explanation: By rotating the plates, the overlapping area changes, which adjusts the capacitance to select specific radio frequencies.

51 **In a paper capacitor, the dielectric material is:**

A Mica

B **Oil or greased paper** ✓

C Air

D Metal oxide

Explanation: Paper capacitors use thin sheets of paper impregnated with oil or wax as the insulating layer between aluminum foils.

52 **Capacitors used in electronic circuits to differentiate between high and low-frequency signals are called:**

A **Filter circuits** ✓

B Rectifiers

C Amplifiers

D Oscillators

Explanation: Capacitors react differently to different frequencies, so they are used in filter circuits to block DC or low frequencies while allowing high frequencies to pass.

53 **Why are mica capacitors enclosed in a plastic case?**

A To make them look nice

B **Because mica is very fragile** ✓

C To increase their capacitance

D To prevent them from overheating

Explanation: Mica is an excellent dielectric but is physically brittle, so it needs a protective casing to prevent cracking.

Section 8: Applications and Hazards of Electrostatics

54 **In an electrostatic air cleaner, dust particles are removed because they:**

A Fall due to gravity

B **Are charged and attracted to oppositely charged plates** ✓

C Are burned by electricity

D Get dissolved in water

Explanation: Dust particles are first given a positive charge, then they pass through negatively charged plates and stick to them, cleaning the air.

55 **In electrostatic powder painting, why is the object to be painted given an opposite charge to the paint particles?**

A To make the paint dry faster

B To create mutual repulsion

C **To attract the paint particles evenly to the surface** ✓

D To prevent the paint from sticking

Explanation: The charged paint particles are attracted to the oppositely charged car body. This ensures a uniform, smooth coating and prevents paint waste.

56 **Lightning is caused by:**

A Friction between air molecules and clouds

B **A massive buildup of electric charge in thunderclouds** ✓

C The Earth's magnetic field

D Sunlight reflecting off clouds

Explanation: Friction between water molecules and air molecules within clouds builds up immense static charge, which eventually discharges to the ground as lightning.

57 **The purpose of a lightning conductor on a tall building is to:**

A Attract lightning away from the building

B **Provide a steady conducting path for charge to flow to the Earth safely** ✓

C Store the lightning energy for later use

D Prevent clouds from forming

Explanation: It provides a low-resistance path for the massive charge to pass into the ground without damaging the structure.

58 **Static electricity can cause fires at petrol stations because:**

A Petrol is a good conductor of electricity

B **Sparks from static discharge can ignite fuel vapors** ✓

C Static electricity heats up the fuel

D It changes the chemical composition of petrol

Explanation: The friction of fuel flowing through pipes can build static charge. A sudden discharge (spark) can easily ignite flammable vapors.

59 **When an airplane lands, its static charge is transferred to the ground through:**

A The wings

B **The specially designed tires** ✓

C The pilot's suit

D The air conditioning system

Explanation: Airplanes accumulate static charge during flight. Conductive tires safely ground the plane upon landing, preventing dangerous sparks.

60 **Which of the following is NOT a use of capacitors?**

A Storing electric charge

B Tuning radio frequencies

C **Generating static electricity through friction** ✓

D Smoothing power supply in circuits

Explanation: Friction generates static electricity. Capacitors are used to store that charge and perform other electronic functions, but they do not generate the charge themselves.

Section 9: Concept Applications (From Text Features)

61 **A glass rod rubbed with silk is brought near an electroscope. If the leaves collapse, the electroscope was initially:**

A Neutral

B Positively charged

C **Negatively charged** ✓

D Grounded

Explanation: A glass rod gets a positive charge. If the leaves collapse, it means the positive charge is neutralizing the existing charge on the electroscope, which must have been negative.

62 **A negatively charged rod is brought near a neutral metal sphere, but not touched. What happens to the sphere?**

A It gains a net positive charge

B It gains a net negative charge

C **It remains neutral overall, but charges are polarized** ✓

D It loses all electrons

Explanation: This is electrostatic induction. The side near the rod becomes positive, the far side becomes negative, but the total charge remains zero.

63 **Which of the following materials is best suited for making the insulating handle of a charged rod?**

A Copper

B Aluminum

C **Rubber** ✓

D Brass

Explanation: Rubber is a good insulator (dielectric). It prevents the charge on the rod from leaking through your hand to the ground.

64 **What happens if the distance between two oppositely charged bodies is halved?**

A The force becomes half

B The force becomes double

C The force becomes four times ✓

D The force remains the same

Explanation: According to Coulomb's law ($F \propto 1/r^2$), halving the distance ($r/2$) results in the force becoming four times stronger ($1/(1/2)^2 = 4$).

65 **A capacitor stores energy in the form of:**

A Magnetic field

B Chemical energy

C Electrostatic potential energy ✓

D Kinetic energy

Explanation: The energy is stored in the electric field between the two parallel plates of the capacitor.

66 Why does a car get charged while driving?

A Due to the engine's heat

B Due to friction between the car's body and the air ✓

C Because of the battery

D Due to the tires rubbing on the road

Explanation: The friction between the moving car and the air molecules strips electrons from the car's surface, building up a static charge.



Thank You!

You have completed all 66 MCQs of Chapter 13: Electrostatics.

Revise the explanations, practise again, and keep building a strong concept base.

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