

OBJECTIVE TYPE SHORT QUESTIONS

Q. Give short Answers.

1. Why comb acquire negative charge on rubbing with dry hair?

Answer

Comb acquires negative charge when rubbed with dry hair because on rubbing a comb with dry hair. Valence electrons of the hair appear on comb making it negatively charged. Since the number of electrons on the hair has decreased, the hair will become positively charged.

2. Why glass rod becomes positively charged when rubbed with silk?

Answer

When a glass rod is rubbed with silk, glass rod becomes positively charged because valence electrons will move from glass towards silk, creating a deficiency of electrons on it. Hence glass rod becomes positively charged.

3. Differentiate between insulators and conductors.

Answer

Insulators:

- Insulators are the substances through which electric charge do not flow easily.

- Such substances do not have free electrons to transport charge from one point to another.

Examples:

Glass, rubber, plastic etc..

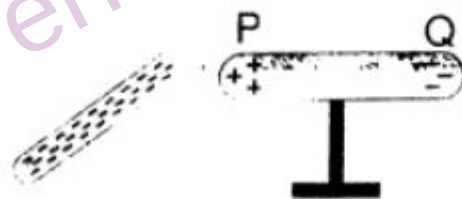
Conductors

- Substances through which electric charge can flow easily are called conductors.
- Conductors have free electrons, which are responsible to transport charge from one end to another end through them.
- Examples:
Copper, silver, iron, mercury etc..

4. What is meant by electrostatic induction?

Answer

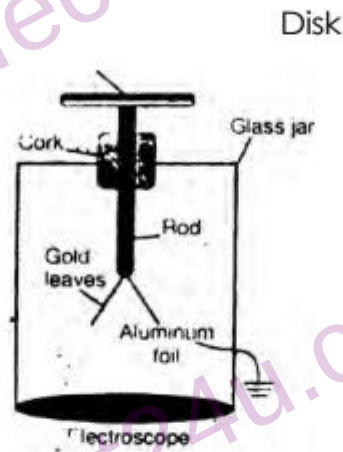
The phenomenon in which a charged body produces an, opposite charge at one end and a like charge at the other end of an insulated conductor is known as electrostatic induction.



5. Define gold leaf electroscope. Draw its diagram.

Answer

It is an instrument used for detecting and testing the nature of charge on body.



6. By using an electroscope, how we can find the presence of charge on a body?

Answer

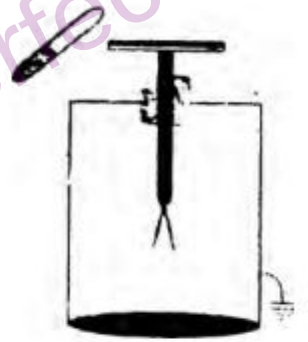
In order to detect the presence of charge on a body, bring the charged body near the disk of an uncharged electroscope. If the body is charged, the leaves of the electroscope will diverge otherwise they would remain in their normal position.



7. By using an electroscope. How we can find the nature of the charge present on a body?

Answer

- In order to detect the nature of the charge on a charge body, the electroscope will have to be first charged either with positive charge or with negative charge.
- If the divergence of the leafs increases, then body has the same kind of charge as oil the electroscope.
- If the divergence of the leafs decreases, then charge on the body is opposite to the kind present on the electroscope.



8. By using an electroscope, how we can find whether a body is insulator or a conductor?

Answer

- Touch the disc of a charged electroscope with body under test.
- If the leafs collapse from their diverged position then the body will be a conductor.
- If there is no change in the divergence of the leafs. It means that the body is an insulator.
- A gradual collapse will indicate that the body is not a good conductor.

9. Write some applications of electroscope.

Answer

Gold leaf electroscope is used to:

- Detect the presence of charge.
- Test the nature of charge.
- Distinguish between insulator and conductor.

10. State Coulomb's law.

Answer

The force between two-point charges is directly proportional to the product of charges and inversely proportional to the square of the distance between them.

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

11. What is the unit of charge?

Answer

In S.I system, the unit of charge is Coulomb.

It is equal to the charge of 6.25×10^{18} electrons.

12. What is the effect of medium on the Coulomb's force?

Answer

The Coulomb's force in the presence of dielectric is given by

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

The dielectric reduces the electrostatic force by a factor ϵ_r . The value of relative permittivity ϵ_r is different for different dielectrics.

13. What is meant by electric field?

Answer

The electric field of a charge is a region or space surrounding it, in which a charge can feel its electrostatic effect in the form of a force.

OR

The region or space around a charge in which another charge can feel its electrostatic effect, in the form of a force, is called electric field of that charge.

14. Define electric intensity.

Answer

The strength of the electric field at any point is known as electric intensity.

OR

The electric intensity at any point is defined as the force acting on a unit positive charge placed at that point.

Mathematically, $E = \frac{F}{q}$

15. What is the unit of electric intensity?

Answer

The unit of electric intensity is NC^{-1} (Newton per coulomb).

16. What a charge produces in the space surrounding it?

Answer

A charge produces an electric field in the space surrounding it.

17. Give the direction of electric intensity?

Answer

Direction of electric intensity

Electric intensity is vector quantity and its direction are found as:

- In case of positive charge, the direction of electric intensity is same as that of force acting on it.
- In case of free charge, it will move in the direction of electric intensity.
- In case of negative charge, the force on it will be opposite to the direction of electric intensity.

18. Prove that $1 \text{ e V} = 1.6 \times 10^{-19} \text{ J}$

Answer

Charge on an electron = $e = 1.6 \times 10^{-19}$ coulomb

Potential difference between two points $V = 1$ volt.

$$1\text{eV} = 1.6 \times 10^{-19} \text{coulomb} \times \frac{1\text{Joule}}{1\text{coulomb}}$$

$$1\text{eV} = 1.6 \times 10^{-19} \text{ J}$$

$$1\text{eV} = 1.6 \times 10^{-19} \text{ J}$$

19. Write the differences between gravitational force and electrostatic force.

Answer

Following are the differences between them.

- The gravitational force is very weak as compared to electrostatic force.
- The electrostatic force could be attractive or repulsive, while the gravitational force is only attractive.
- The electrostatic force is medium dependent and can be shielded while gravitational force lacks this property.

20. Define electric field lines of force.

Answer

The direction of electric intensity in an electric field can be indicated by drawing lines, are known as electric lines of force.

21. Write the properties of electric field lines of force.

Answer

- 1) Electric field lines start from positive charge and end on negative charge.
- 2) The tangent to a field line at any point gives the direction of the electric field at that point.
- 3) The lines are closer where the field is strong.
- 4) The lines are farther apart where the field is weak.
- 5) No two lines cross each other.

22. How can you show that the Coulomb's force on a charged object is independent of its mass?

Answer

The relation for Coulomb's force is

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

This equation shows that the electrostatic force between two charged objects is independent of their masses.

23. If the distance between two charged bodies is doubled, what is the effect on the force between them?

Answer

The relation for Coulomb's force is

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

This relation shows that force between two charged bodies is inversely proportional to the square of the distance between them. So, if the distance is doubled then the force will reduce to one-fourth.

24. Define electric potential.

Answer

Electric potential at a point is defined as the potential energy of a unit positive charge placed at that point which is equal to the work done in bringing a unit positive charge from infinity to that point.

Mathematically.

25. What is the S.I unit of electric potential? Define it.

Answer

Potential is a scalar quantity. Its S.I unit is known as Volt.

"If the potential energy of one coulomb positive charge at a point is one joule, the potential of that point would be one volt."

26. What is meant by the potential difference between two points?

Answer

The potential difference between two points can be defined as the energy supplied by a unit positive charge as it moves from one point to another.

27. Which phenomenon is used for separating of smoke from chimneys?

Answer

Electrostatic phenomenon is used for separation of smoke and other particles from the gases coming out of the chimneys of various factories.

28. What are advantages of painting by electrostatic?

Answer

Some advantages of painting by electrostatic are:

- This method is very effective, efficient and cheap.
- This method needs less paint as compared to other methods.
- This method is widely used to paint refrigerators, metallic furniture and other articles.

29. What is an electron volt?

Answer

An electron volt is a unit of energy. It is defined as:

"The amount of energy gained or lost by an electron as it passes through a potential difference of one volt."

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

30. Write the similarities between electrostatic force and gravitational force.

Answer

- Both the forces are conservative forces.
- Both forces vary inversely with the square of the distances between two-point charges or two masses.
- The gravitational force between two masses is similar to the electric force between two charges.

31. How many methods are used for connecting capacitors?

Answer

Generally, two methods are used for connecting capacitors.

- Parallel combination of capacitors.
- Series combination of capacitors.

32. Is Coulomb's electrostatic interaction consistent with Newton's third law of motion?

Answer

Yes, the Forces exerted by two charges are equal and opposite. It means that this law obeys Newton's third law of motion.

33. Define capacitor.

Answer

A capacitor is a device that can store charge.,

The simplest kind of capacitor is a parallel plate capacitor. It consists of two thin metal plates, parallel to each other with a small separation between them. The medium between the two plates is either air or some insulator. This medium is called dielectric.



Parallel plate capacitance

34. Define unit of capacitance.

Answer

The S.I unit of capacitance is called farad.

The capacitance of a capacitor is one farad if a charge of one coulomb given to one of the plates of a parallel plate capacitor, produces a potential difference of one volt between them.

$$1F = 1C / 1V$$

35. On what factors the capacitance of a capacitor depends?

Answer

The capacitance of a capacitor depends upon the following factors:

- Area of plates
- Distance between the plates
- Nature of the medium

36. Write some characteristics of parallel combination of capacitors.

Answer

- The potential difference across each capacitor is the same.
- The charge storage on each capacitor is different.
- Capacitors are connected in parallel to increase the value capacitance.

37. Find the equivalent capacitance in case of parallel combination?

Answer

If n-capacitors are combined in parallel the equivalent capacitance of the combination is given by

$$C_e = C_1 + C_2 + C_3 \dots\dots\dots + C_n$$

Generally, capacitors are connected in parallel to increase the value of capacitance.

38. Write some characteristics of series combination of capacitors.

Answer

- The potential difference across each capacitor is different.
- The charge on each capacitor would be same.
- Capacitors are connected in parallel to decrease the value capacitance.

39. Find the equivalent capacitance in case of parallel combination?

Answer

If n-capacitors are combined in parallel, the equivalent capacitance of the combination is given by:

$$1 / C_e = 1 / C_1 + 1 / C_2 + 1 / C_3 \dots\dots\dots + 1 / C_n$$

This shows that when capacitors are connected in series, their equivalent capacitance decreases.

40. Define capacitance.

Answer

The ability of a capacitor to store charge is called the capacitance of a capacitor.

41. What happens to the capacitance in case of the presence of any medium between the plates of the capacitor?

Answer

When any medium is placed between the plates of the capacitor, its capacitance increases.

42. A paper capacitor is a fixed capacitor. Explain?

Answer

A fixed capacitor is that whose capacitance is fixed and cannot be changed. It is generally made of Aluminum foil with greased paper or plastic sheet as insulator between them.

43. What are types of the capacitors?

Answer

There two types of capacitors:

- Those capacitors whose capacitance is fixed are called fixed capacitors.

- Those capacitors whose capacitance can be changed are called variable capacitors.

44. How the capacitance of a capacitor can be changed?

Answer

The capacitance of capacitors can be changed:

- By changing the separation between the plates of a capacitor.
- By changing the area of plates of a capacitor.
- By changing the dielectric material.

45. Can there be a potential difference between two conductors that carrying like charges of the same magnitude?

Answer

Yes, there can be potential difference between two charged conductors that carry like charges of the same magnitude, if they are some distance apart on a line.

46. Electric lines of force never cross. Why?

Answer

Electric lines of force never cross each other because electric intensity being a vector quantity has only one direction at any given point.

47. How many kinds of electric charge?

Answer

There are two kinds of electric charge:

- Positive charge.
- Negative charge.

48. Give some properties of charges.

Answer

- Like charges repel each other.
- Unlike charges attract each other.
- Electric lines of force start from +ive charge.
- Electric lines of force end on —ive charge.

49. Give some applications of capacitors.

Answer

Capacitors of all shapes and sizes are important element in various electrical appliances.

- Some capacitors are used to tune radio circuits.
- Some are used to store energy.

50. How an aero plane acquires a charge as it flies through air and how danger of spark is eliminated?

Answer

During flight, body of an aeroplane gets charged. Their tyres are of some conducting materials. As the aeroplane lands, this charge is easily transferred to ground and the danger of sparking is eliminated while the petrol is filled in it.

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