13. The number of electrons that must be removed from an electrically neutral silver dollar to give it a charge of + 2.4 C is
(a) 2.5×10^{19} (b) 1.5×10^{19}
(c) 1.5×10^{-19} (d) 2.5×10^{-19}

14. A coin is made up of Al and weighs 0.75 g. It has a square shape and its diagonal measures 17 mm. It is electrically neutral and contains equal amounts of positive and negative charges. The magnitude of these charges is (Atomic mass of Al = 26.98 g)
(a) 3.47×10^{4} C (b) 3.47×10^{2} C
(c) 1.67×10^{20} C (d) 1.67×10^{22} C

15. If an object of mass 1 kg contains 4×10^{20} atoms. If one electron is removed from every atom of the solid, the charge gained by the solid in 1 g is
(a) 2.8 C (b) 6.4×10^{-2} C
(c) 3.6×10^{-3} C (d) 9.2×10^{-4} C

COULOMB'S LAW

16. Coulomb's law relates two charges and distance between them describing the electric force as being
(a) proportional to the sum of the charges
(b) inversely proportional to the distance between charges
(c) proportional to the product of the charges and inversely proportional to the distance
(d) proportional to the product of the charges and inversely proportional to the square of distance.

17. Which of the following statements is true about electrical forces?
(a) Electrical forces are produced by electrical charges.
(b) Like charges attract, unlike charges repel.
(c) Electric forces are weaker than gravitational forces.
(d) Positive and negative charges can combine to produce a third type of charge.

18. The constant k in Coulomb's law depends on
(a) nature of medium
(b) system of units
(c) intensity of charge
(d) both (a) and (b)

19. Which of the following statement is not a similarity between electrostatic and gravitational forces?
(a) Both forces obey inverse square law.
(b) Both forces operate over very large distances.
(c) Both forces are conservative in nature.
(d) Both forces are attractive in nature always.

20. SI unit of permittivity of free space is
(a) Farad (b) Weber
(c) $C^2N^{-1}m^{-2}$ (d) $C^2N^{-1}m^{-1}$

21. The force between two small charged spheres having charges of 1×10^{-7} C and 2×10^{-7} C placed 20 cm apart in air is
(a) 4.5×10^{-2} N (b) 4.5×10^{-3} N
(c) 5.4×10^{-2} N (d) 5.4×10^{-3} N

22. The nucleus of helium atom contains two protons that are separated by distance 3.0×10^{-15} m. The magnitude of the electrostatic force that each proton exerts on the other is
(a) 20.6 N (b) 25.6 N (c) 15.6 N (d) 12.6 N

23. Two insulated charged metallic spheres P and Q have their centres separated by a distance of 60 cm. The radii of P and Q are negligible compared to the distance of separation. The mutual force of electrostatic repulsion if the charge on each is 3.2×10^{-7} C is
(a) 5.2×10^{-4} N (b) 2.5×10^{-3} N
(c) 1.5×10^{-3} N (d) 3.5×10^{-4} N

24. Two point charges of + 3 μC and + 4 μC repel each other with a force of 10 N. If each is given an additional charge of −6 μC, the new force is
(a) 2 N (b) 4 N (c) 5 N (d) 7.5 N

25. The ratio of magnitude of electrostatic force and gravitational force for an electron and a proton is
(a) 6.6×10^{39} (b) 2.4×10^{39}
(c) 6.6×10^{29} (d) 2.4×10^{29}

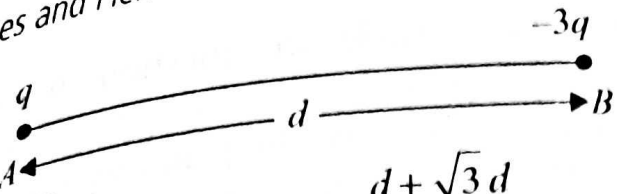
26. The electrostatic attracting force on a small sphere of charge 0.2 μC due to another small sphere of charge −0.4 μC in air is 0.4 N. The distance between the two spheres is
(a) 43.2×10^{-6} m (b) 42.4×10^{-3} m
(c) 18.1×10^{-3} m (d) 19.2×10^{-6} m

27. Under the action of a given coulombic force the acceleration of an electron is 2.5×10^{22} m s^{-2}. Then the magnitude of the acceleration of a proton under the action of same force is nearly
(a) 1.6×10^{-19} m s^{-2} (b) 9.1×10^{31} m s^{-2}
(c) 1.5×10^{19} m s^{-2} (d) 1.6×10^{27} m s^{-2}

28. The acceleration for electron and proton due to electrical force of their mutual attraction when they are 1 Å apart is
(a) 3.1×10^{22} m s^{-2}, 1.3×10^{19} m s^{-2}
(b) 3.3×10^{18} m s^{-2}, 3.2×10^{16} m s^{-2}
(c) 2.5×10^{22} m s^{-2}, 1.4×10^{19} m s^{-2}
(d) 2.5×10^{18} m s^{-2}, 1.3×10^{16} m s^{-2}

FORCES BETWEEN MULTIPLE CHARGES

29. Two charges q and $-3q$ are fixed on x-axis separated by distance d. Where should a third charge $2q$ be placed from A such that it will not experience any force?



(a) $\frac{d-\sqrt{3}d}{2}$ (b) $\frac{d+\sqrt{3}d}{2}$

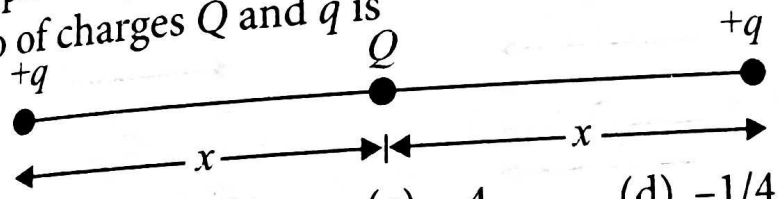
(c) $\frac{d+3d}{2}$ (d) $\frac{d-3d}{2}$

30. Consider the charges q, q and $-q$ placed at the vertices of an equilateral triangle of each side l. The sum of forces acting on each charge is

(a) $\frac{q^2}{4\sqrt{2}\pi\varepsilon_0 l^2}$ (b) $\frac{-q^2}{4\pi\varepsilon_0 l^2}$

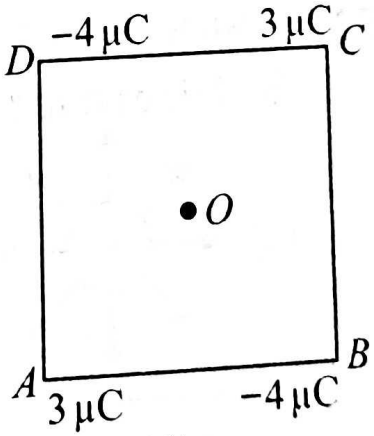
(c) $\frac{q^2}{4\pi\varepsilon_0 l^2}$ (d) zero

31. A charge Q is placed at the centre of the line joining two point charges $+q$ and $+q$ as shown in figure. The ratio of charges Q and q is



(a) 4 (b) 1/4 (c) −4 (d) −1/4

32. Four point charges are placed at the corners of a square $ABCD$ of side 10 cm, as shown in figure. The force on a charge of 1 μC placed at the centre of square is



(a) 7 N (b) 8 N (c) 2 N (d) zero

33. Three charges of equal magnitude q is placed at the vertices of an equilateral triangle of side l. The force on a charge Q placed at the centroid of the triangle is

(a) $\frac{3Qq}{4\pi\varepsilon_0 l^2}$ (b) $\frac{2Qq}{4\pi\varepsilon_0 l^2}$ (c) $\frac{Qq}{2\pi\varepsilon_0 l^2}$ (d) zero

ELECTRIC CHARGES

1. There are two types of electric charges positive charges and negative charges. The property which differentiates the two types of charges is
   (a) field of charge (b) amount of charge
   (c) strength of charge (d) polarity of charge

2. What will happen when we rub a glass rod with silk cloth?
   (a) Some of the electrons from the glass rod are transferred to the silk cloth.
   (b) The glass rod gets positive charge and silk cloth gets negative charge.
   (c) New charge is created in the process of rubbing.
   (d) both (a) and (b) are correct.

3. When a person combs his hair, static electricity is sometimes generated by what process?
   (a) Contact between the comb and hair results in a charge.
   (b) Friction between the comb and hair results in the transfer of electrons.
   (c) Deduction between the comb and hair.
   (d) Induction between the comb and hair.

4. Object may acquire an excess or deficiency of charge by
   (a) electric force (b) heating
   (c) shaking (d) by rubbing

5. The charge on an electron was calculated by
   (a) Faraday (b) J.J. Thomson
   (c) Millikan (d) Einstein

CHARGING BY INDUCTION

6. A method for charging a conductor without bringing a charged body in contact with it is called
   (a) Magnetization
   (b) Electrification
   (c) Electrostatic induction
   (d) Electromagnetic induction

7. An object is charged when it has a charge imbalance, which means the
   (a) object contains no protons
   (b) object contains no electrons
   (c) object contains equal number of electrons and protons
   (d) object contains unequal number of electrons and protons

8. A conducting sphere is negatively charged. Which of the following statements is true?
   (a) The charge is uniformly distributed throughout the entire volume.
   (b) The charge is located at the center of the sphere.
   (c) The charge is located at the bottom of the sphere because of gravity.
   (d) The charge is uniformly distributed on the surface of the sphere.

BASIC PROPERTIES OF ELECTRIC CHARGE

9. The number of electrons present in –1 C of charge is
   (a) 6×10^{18} (b) 1.6×10^{19}
   (c) 6×10^{19} (d) 1.6×10^{18}

10. A cup contains 250 g of water. Find the total positive charges present in the cup of water.
   (a) 1.34×10^{19} C (b) 1.34×10^{7} C
   (c) 2.43×10^{19} C (d) 2.43×10^{7} C

11. A polythene piece rubbed with wool is found to have a negative charge of 6×10^{-7} C. The number of electrons transferred to polythene from wool is
   (a) 3.75×10^{10} (b) 9.6×10^{10}
   (c) 9.6×10^{12} (d) 3.75×10^{12}

12. If 10^9 electrons move out of a body to another body every second, then the time required to get a total charge of 1 C on the other body is
   (a) 250 years (b) 100 years
   (c) 198 years (d) 150 years