

MPVMGG
Physics HHW 2025-26

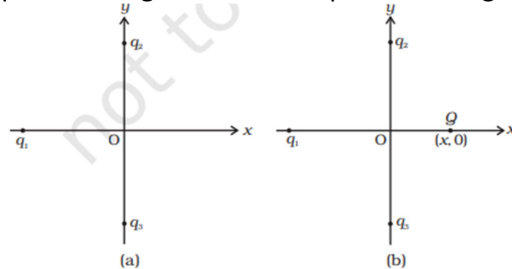
1. In an experiment three microscopic latex sphere are sprayed into a chamber and became charged with charges $+3e, +5e$ and $-3e$ respectively. All the three spheres came in contact simultaneously for a moment and got separated. Which one of following are possible values for the final charge on the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

- (a) $+5e, -4e, +5e$ (b) $+6e, +6e, -7e$ (c) $-4e, +3e, +5e$ (d) $+5e, -8e, +7e$

2. Identify the wrong statement in the following, Coulomb's law correctly describes the electric force that

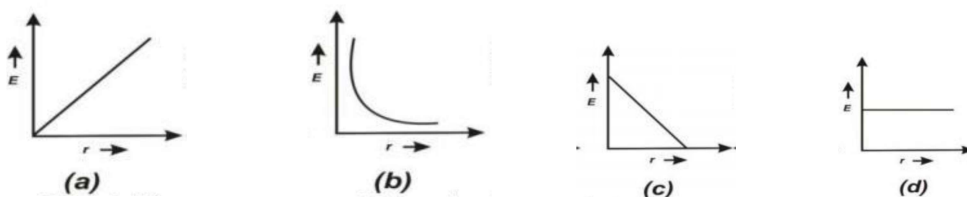
- a) binds the electrons of an atom to its nucleus
b) binds the protons & neutrons in the nucleus of an atom
c) binds atoms together to form molecules
d) binds atoms & molecules to form solids

3. In Fig., 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 .

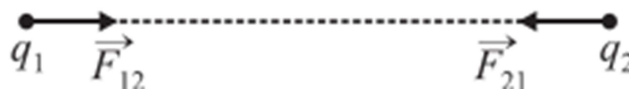
4. For a point charge, the graph between electric field versus distance is given by:



5. Two point charges placed in a medium of dielectric constant 5 are at a distance r between them, experience an electrostatic force 'F'. The electrostatic force between them in vacuum at the same distance r will be-

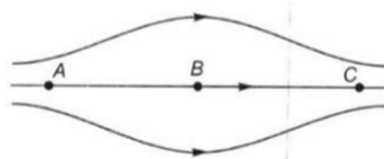
- (a) $5F$ (b) F (c) $F/2$ (d) $F/5$

6. According to Coulomb's law, which is the correct relation for the following figure?

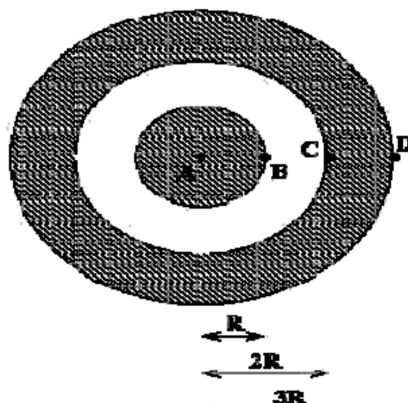


- (a) $q_1 q_2 > 0$ (b) $q_1 q_2 < 0$ (c) $q_1 q_2 = 0$ (d) $1 > q_1 / q_2 > 0$

7. The figure below shows the electric field lines due to two positive charges. The magnitudes E_A , E_B and E_C of the electric fields at point A, B and C respectively are related a

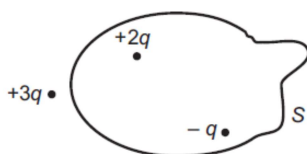


- (a) $E_A > E_B > E_C$ (b) $E_B > E_A > E_C$ (c) $E_A = E_C > E_B$ (d) $E_A > E_B = E_C$
8. An electric dipole consisting of charges $+q$ and $-q$ separated by a distance L is in stable equilibrium in a uniform electric field E . The electrostatic potential energy of the dipole is :
- (a) qLE (b) zero (c) $-qLE$ (d) $-2Qel$
9. A solid spherical conductor has charge $+Q$ and radius R . It is surrounded by a solid spherical shell with charge $-Q$, inner radius $2R$, and outer radius $3R$. Which of the following statements is true?



- (a) The electric potential has a maximum magnitude at C and the electric field has a maximum magnitude at A
- (b) The electric potential has a maximum magnitude at D and the electric field has a maximum magnitude at B.
- (c) The electric potential at A is zero and the electric field has a maximum magnitude at D.
- (d). Both the electric potential and electric field achieve a maximum magnitude at B.
10. When 10^{19} electrons are removed from a neutral metal plate, the electric charge on it is
- a) -1.6 C b) $+1.6 \text{ C}$ c) 10^{+19} C d) 10^{-19} C

11. Figure shows three point charges, $+2q$, $-q$ and $+3q$. Two charges $+2q$ and $-q$ are enclosed within a surface 'S'. What is the electric flux due to this configuration through the surface 'S'?



- 12.** There are two identical metallic spheres *A* and *B*. *A* is given a charge $+Q$. Both spheres are then brought in contact and then separated.
- Will there be any charge on *B*?
 - What will the magnitude of charge on *B*, if it gets charged when in contact with *A*.
- 13.** How many electrons exist in a -1C charge? What is the total mass of these electrons?
- Explain the meaning of the statements 'electric charge of a body is quantized'.
 - Why can one ignore quantization of electric charge when dealing with macroscopic i.e., large scale charges?
- 14.** When a glass rod is rubbed with a silk cloth, charges appear on both. A similar phenomenon is observed with many other pairs of bodies. Explain how this observation is consistent with the law of conservation of charge.
- 15.** (a) Explain the meaning of the statement 'electric charge of a body is quantised'.
- Why can one ignore quantisation of electric charge when dealing with macroscopic i.e., large scale charges?
- 16.** A charged object has $q = 4.8 \times 10^{-16}\text{C}$. How many units of fundamental charge are there on the object? (Take $e = 1.6 \times 10^{-19}\text{C}$).
- 17.** Two insulated charged copper spheres *A* and *B* of identical size have charges q_A and q_B respectively. A third sphere *C* of the same size but uncharged is brought in contact with the first and then in contact with the second and finally removed from both. What are the new charges on *A* and *B*?
- 18.** If distance between two equal point charges is double and their individual charges are also doubled, what would happen to the force between them?
- 19.** The electrostatic force between two charges is a central force. Why?
- 20.** How is the coulomb force between two charge affected by the presence of third charge?
- 21.** Force between two point charge kept at a distant d apart in air is F . If these charges are kept at the same distance in water, how does the the electric force between then change?
- 22.** The dielectric constant of water is 80. What is its permittivity?
- 23.** Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude $17.0 \times 10^{-22}\text{C/m}^2$. What is E : (a) in the outer region of the first plate, (b) in the outer region of the second plate, and (c) between the plates?
- 24.** An oil drop of 12 excess electrons is held stationary under a constant electric field of $2.55 \times 10^4\text{NC}^{-1}$ in Millikan's oil drop experiment. The density of the oil is 1.26g cm^{-3} . Estimate the radius of the drop. ($g=9.81\text{m s}^{-2}$; $e=1.60 \times 10^{-19}\text{C}$).

25. In a certain region of space, electric field is along the z-direction throughout. The magnitude of electric field is, however, not constant but increases uniformly along the positive z-direction, at the rate of 10^5 NC^{-1} per metre. What are the force and torque experienced by a system having a total dipole moment equal to 10^{-7} Cm in the negative z-direction
26. A hollow charged conductor has a tiny hole cut into its surface. Show that the electric field in the hole is $(\sigma/2\epsilon_0) \hat{n}$, where \hat{n} is the unit vector in the outward normal direction, and σ is the surface charge density near the hole.
27. Obtain the formula for the electric field due to a long thin wire of uniform linear charge density λ without using Gauss's law.
28. Consider an arbitrary electrostatic field configuration. A small test charge is placed at a null point (i.e., where $\mathbf{E} = 0$) of the configuration. Show that the equilibrium of the test charge is necessarily unstable.
29. A particle of mass m and charge $(-q)$ enters the region between the two charged plates initially moving along x-axis with speed v_x . The length of plate is L and an uniform electric field E is maintained between the plates. Show that the vertical deflection of the particle at the far edge of the plate is $qEL^2/(2m v_x^2)$.

30. Art integration project in Physics

TOPIC:-

To study of A.C. Generator in context of produce electrical energy from mechanical energy