COULOUMB FORCES IN ELECTROSTATICS

(1) ABC is an equilateral triangle. Three identical charges each $+q$ are kept at the three vertices. The force acting on the charge at A has a magnitude 'F'. If this charge at A is moved to the centroid of the triangle then the force acting on it now will have a magnitude of

(1) $\sqrt{3}F$ (2) $3F$ (3) $F/\sqrt{3}$ (4) F

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(2) Two α particles at a distance d apart mutually repel with a force of F. Two deutrons at double that distance mutually repel with a force of ?

(1) $F/4$ (2) $F/2$ (3) $F/16$ (4) $F/8$

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(3) Two particles each of mass m and carrying charge 'q' are separated by some distance, if they are in equilibrium under mutual gravitational and electrostatic forces, then the specific charge (q/m) is given by?

(1) $\sqrt{4\pi G\varepsilon_0}$ (2) $\frac{1}{\sqrt{4\pi G\varepsilon_0}}$ (3) $\sqrt{\frac{G}{4\pi\varepsilon_0}}$ (4) $\sqrt{\frac{4\pi\varepsilon_0}{G}}$

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(4) Electrical force between two point charges is 200N. If charge on one is increased by 10%. other is decreased by 10% and separation is increased is $\sqrt{2}$ times of initial separation between them, electrical force between them becomes

(1) 198N (2) 100N (3) 200N (4) 99N

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(5) Two point charges placed 3m apart, have a combined charge 24μc. If they repel each other with a force of 0.08N in free space, then the ratio of their charges can be

(1) 5:1 (2) 4:1 (3) 1:9 (4) 3:2

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(6) There are two charges +1μc and +2μc kept at certain separation. The ratio of electrostatic forces acting on them will be in the ratio of

(1) 1:2 (2) 2:1 (3) 1:1 (4) 1:4

(7) Three charges $-q$, $+q$ and $-q$ are placed at the corners of an equilateral triangle of side 'a'. The resultant electric force on a charge $+q$ placed at the centroid 'o' of the triangle is?

(1) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (2) $\frac{q^2}{4\pi\varepsilon_0 a^2}$ (3) $\frac{q^2}{2\pi\varepsilon_0 a^2}$ (4) $\frac{3q^2}{2\pi\varepsilon_0 a^2}$

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(8) The force between two electrons when placed in air is equal to 0.5 times the weight of an electron. Find the distance between two electrons (Mass of an electron = 9.1×10^{-31} kg)

(1) 2.285m (2) 72cm (3) 72m (4) 720m

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(9) Two identical copper spheres are separated by 1m in vacuum. How many electrons would have to be removed from one sphere and added to the other so that they now attract each other with a force of 0.9N?

(1) 6.25×10^{15} (2) 62.5×10^{15} (3) 6.25×10^{13} (4) 0.65×10^{13}

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(10) Two charges of equal magnitude and at a distance 'r' exert a force 'F' on each other. If the charges are halved and distance between them is doubled, then the new force acting on each charge is?

(1) F/8 (2) F/4 (3) 4F (4) F/16

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(11) Two positive charges separated by a distance 2m repel each other with a force of 0.36N. If the combined charge is 26μC, the charges are

(1) 20μC, 6μC (2) 16μC, 10μC (3) 18μC, 8μC (4) 13μC, 13μC

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(12) Two charges 2C and 6C are separated by a finite distance. If a charge of -4C is added to each of them, the initial force of 12×10^3 N will change to?

(1) 4×10^3 N repulsion (2) 4×10^2 N repulsion (3) 6×10^3 N attraction

(4) 4×10^3 N attraction

(13) Two charges $2\mu C$ and $1\mu C$ are placed at a distance of 10 cm. The position of third charge form $2\mu C$ between them, so that it does not experience any force?

(1) 7cm (2) 2cm (3) 5.858cm (4) 8cm

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(14) The force between two similar charges of magnitude 2C each separated by a distance of 2km?

(1) 9N (2) 9×10^3N (3) 300N (4) 50N

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(15) Two small balls having equal positive charge of Q C on each are suspended by two insulating strings of equal length 'L' metre, from a hook fixed to a stand. The whole setup is taken into space where there is no gravity (state of weightlessness). Then the angle 'θ' between the two strings is?

(1) 0° (2) 90° (3) 180° (4) $0°<\theta<180°$

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(16) A pith ball of mass 9×10^{-5} kg carries a charge of $5\mu C$. What must be charge in another pith ball placed directly 2cm above the given pith ball such that they are held in Equilibrium?

(1) 3.2×10^{-11}C (2) 7.84×10^{-11}C (3) 1.2×10^{-13}C (4) 1.6×10^{-19}C

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(17) The force between two charges separated by a distance of 1m is 1.8N. The charges are in the ratio 1:2. Then the charges are?

(1) $5\mu C, 5\mu C$ (2) $5\mu C, 10\mu C$ (3) $1\mu C, 10\mu C$ (4) $10\mu C, 20\mu C$

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(18) Two equal and opposite charges are placed at a certain distance apart and force of attraction between them is 'F'. If 75% charge of one is transferred to another, then the force between the charges becomes,

(1) $\frac{7F}{16}$ (attraction) (2) $\frac{F}{16}$ (attraction) (3) $\frac{7F}{16}$ repulsion (4) $\frac{F}{16}$ (repulsion)

(19) Four point charges $q_A = 2\mu C$, $q_B = -5\mu C$, $q_C = 2\mu C$ and $q_D = -5\mu C$ are located at the corners of a square ABCD of side 10cm. what is the force on the charge of $1\mu C$ placed at the centre of the square?

(1) Zero (2) $2.545 \times 10^9 N$ (3) $15.91 \times 10^9 N$ (4) $12.72 \times 10^9 N$

(20) The force between two charges 0.06 m apart is 5N. If each charge is moved towards the other by 0.01 m, then the force between them will become

(1) 170N (2) 11.25N (3) 45N (4) 22.50N

(21) The force between two α particles separated by a distance 'r' is 'F'. In order to have same force 'F' the distance between singly ionised chlorine atoms separated by a distance of?

(1) 2r (2) 4r (3) r/2 (4) r/4

(22) Calculate force between two charges of $1\mu C$ each separated by 1m in vacuum.

(1) $9 \times 10^9 N$ (2) $0.9 \times 10^{-9} N$ (3) $9 \times 10^{-9} N$ (4) 9×10^9 Dynes

(23) Two charges $9\mu C$ and $1\mu C$ are placed at a distance of 30cm. The position of third charge form $9\mu C$ between them so that it does not experience any force.

(1) 7.5cm (2) 22.5cm (3) 5.858cm (4) 10cm

(24) Two positively charged particles each of mass is 9×10^{-30} kg and carrying a charge of $1.6 \times 10^{-19} C$ are placed at a distance 'r' apart. If each experiences a force equals to its weight, the value of 'r' is? ($g = 10 m/s^2$)

(1) 1.6m (2) 0.16m (3) 0.116m (4) 0.8m

(25) The ratio of the forces between two charges placed at a certain distance apart in air and at half of the distance apart in medium of dielectric constant K is?

(1) 1 : 4K (2) K : 4 (3) 4K : 1 (4) 4 : K

(26) Two point charges +2C and +6C repel each other with a force of 12N. If a charge 'q' is given to each of these charges then they attract with 4N. The value of 'q' is?

(1) +4C (2) -2C (3) -4C (4) +2C

(27) The force between two charges 4C and -2C which are separated by a distance of 3cm is?

(1) 9×10^3 N (2) 24×10^3 N (3) 8×10^3 N (4) 4×10^3 N

(28) Two small balls having equal positive charge 'q' C on each are suspended by two insulating strings of equal length 'L' metres, from a hook fixed to a stand. The whole setup is taken into space where there is no gravity (State of weightlessness) Then the tension in the string is?

(1) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{4L^2}$ (2) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{L^2}$ (3) $\frac{1}{4\pi\varepsilon_0}\frac{\sqrt{2}q^2}{L^2}$ (4) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{2L^2}$

(29) Two positively charged particles each of mass 1.7×10^{-27} kg and carrying a charge of 1.6×10^{-19} C are placed 'r' distance apart. If each one experience a repulsive force of 'F' equals to its weight, Find the distance between them.

(1) 117m (2) 117cm (3) 11.7cm (4) 1.17mm

(30) Three charges 'q' each are at the vertices of an equilateral triangle of side 'x'. How much charge should be placed at the centroid so that the system remains in equilibrium?

(1) $-q$ (2) $-\frac{q}{3}$ (3) $-\frac{q}{\sqrt{3}}$ (4) $+\frac{q}{3}$

(31) Five point charges each +q are placed on five vertices of a regular hexagon of side 'L'. The magnitude of the force on a point charge of value -q placed at the centre of the hexagon is?

(1) Zero (2) $\frac{\sqrt{3}q^2}{4\pi\varepsilon_0 L^2}$ N (3) $\frac{q^2}{4\pi\varepsilon_0 L^2}$ N (4) $\frac{q^2}{4\sqrt{3}\pi\varepsilon_0 L^2}$ N

(32) A charge of $+2\mu C$ is placed at $x=0$ and a charge of $-32\mu C$ at $x=60cm$. A third charge $-Q$ be placed on the x-axis such that it experiences no force. The distance of the point form $+2\mu C$ is (in cm)

(1) -20 (2) 20 (3) 15 (4) 10

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(33) Three charges $+q$, $-q$ and $+q$ are placed at the corners of an equilateral triangle of side 'a'. The resultant electric force on a charge $+q$ placed at the centroid 'O' of the triangle is?

(1) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (2) $\frac{q^2}{4\pi\varepsilon_0 a^2}$ (3) $\frac{q^2}{2\pi\varepsilon_0 a^2}$ (4) $\frac{3q^2}{2\pi\varepsilon_0 a^2}$

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(34) Two charged particles are placed at a distance of 1 cm apart. What is the minimum possible magnitude of electro-static force acting on each charge?

(1) $25\times10^{-24}N$ (2) $23\times10^{-24}N$ (3) 2.3×10^{-24} dyne (4) $2.3\times10^{-24}N$

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(35) Three identical charges of magnitude $2\mu C$ are placed at the corners of right angled triangle ABC whose base is BC and height is BA respectively 4 cm and 3 cm. Forces on charge at right angled corner B due to charges at 'A' and 'C' are respectively F_1 and F_2. The angle between their resultant force and F_2 is?

(1) $\sin^{-1}\left(\frac{3}{4}\right)$ (2) $\tan^{-1}\left(\frac{16}{9}\right)$ (3) $\cos^{-1}\left(\frac{1}{3}\right)$ (4) 45°

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(36) Electric charges of $1\mu C$, $-1\mu C$, and $2\mu C$ are placed in air at the corners A, B and C respectively of an equilateral triangle ABC having lengths of each side 10 cm. The resultant force on the charge at C is?

(1) 0.9N (2) 1.8N (3) 2.7N (4) 3.6N

(37) Two point sized identical spheres carrying charges q_1 and q_2 on them are separated by a certain distance. The mutual force between them is F. These are brought in contact and kept at the same separation. Now, the force between them is F'. Then $\left(\frac{F'}{F}\right) = ?$

(1) $\frac{q_1+q_2}{2q_1q_2}$ (2) $\frac{(q_1+q_2)^2}{4q_1q_2}$ (3) $\frac{q_1q_2}{2(q_1+q_2)}$ (4) $\frac{(q_1q_2)^2}{2(q_1+q_2)}$

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(38) Equal charges 'q' are placed at the four corners A, B, C and D of a square of length 'a'. The magnitude of the force on the charge at B will be?

(1) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (2) $\frac{4q^2}{4\pi\varepsilon_0 a^2}$ (3) $\left[\frac{1+2\sqrt{2}}{2}\right]\frac{q^2}{4\pi\varepsilon_0 a^2}$ (4) $\left[2+\frac{1}{\sqrt{2}}\right]\frac{q^2}{4\pi\varepsilon_0 a^2}$

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(39) The ratio of electric and gravitational forces between two protons. charge of each proton is 1.6×10^{-19} C. mass is 1.67×10^{-27} kg and $G = 6.67\times10^{-11}\ \frac{Nm^2}{kg^2}$

(1) 1.23×10^{36} (2) 10^{26} (3) 10^{15} (4) 5

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(40) Four charges Q, q, Q and q are placed at the corners A, B, C and D of a square ABCD. If the resultant electric force on the charge at the corner C is to be zero, then the value of (Q/q) is?

(1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) -2 (4) $-2\sqrt{2}$

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(41) An infinite number of charges each of magnitude q are placed along x-axis at $x = 1m, 2m, 4m, 8m$ and so on but the consecutive charges are of opposite sign starting with $+q$ at $x = 1$ m. A point charge 'q_0' kept at the origin, experiences a force of magnitude

(1) $\frac{qq_0}{4\pi\varepsilon_0}$ (2) $\frac{qq_0}{5\pi\varepsilon_0}$ (3) $\frac{qq_0}{3\pi\varepsilon_0}$ (4) $\frac{qq_0}{2\pi\varepsilon_0}$.

(42) A regular polygon has 20 sides. Equal charges, each Q are placed at 19 vertices of the polygon and a charge q is placed at the centre of polygon. If the distance of each vertex from the centre is 'a', net force experienced by 'q' is ?

(1) $\frac{1}{4\pi\varepsilon_0}\frac{20Qq}{a^2}$ (2) $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{a^2}$ (3) $\frac{1}{4\pi\varepsilon_0}\frac{19Qq}{a^2}$ (4) Zero

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(43) Two particles having charges q_1 and q_2 when kept at a certain distance, exert a force 'F' on each other. If the distance between the two particles is reduced to half and the charge on each particle is doubled, the force between the particles would be

(1) 2F (2) 4F (3) 8F (4) 16F

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(44) Three charges 10μC, 5μC, -5μC are placed in air at the three corners A, B and C of an equilateral triangle of side 0.1m. Find the resultant force experienced by the charge placed at corner A?

(1) 45N (2) 90N (3) 135N (4) 180N

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(45) A charge having magnitude Q is divided into two parts q and (Q-q). If the two charges exert a maximum force of repulsion on each other for a given distance, then find the value of (Q/q)

(1) 2 (2) 3 (3) 5 (4) 7

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(46) If the force between the electron in the first Bohr orbit and the nucleus (proton) in Hydrogen atom is 'F'. Then the force between them when the electron is in the second orbit is?

(1) 4F (2) F/4 (3) F/9 (4) F/16

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(47) Two small identical spheres having charges +10μC and -90μC attract each other with a force of 'F' newtons. If they are kept in contact and then separated by the same distance, the new force between them is?

(1) F/6 (2) 16F (3) 16F/9 (4) 9F

(48) Two point charges $+4\mu C$ and $-10\mu C$ are placed 10 cm apart in air. A dielectric slab of large length and breadth but of thickness 5 cm is placed between them. Calculate the force of attraction between the charges, if the relative permittivity of dielectric is 9.

(1) 6N (2) 7N (3) 8N (4) 9N

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(49) ABC is a right angled triangle in which AB = 3 cm and BC = 4 cm and right angle is at B. The three charges $+15\mu C$, $+12\mu C$, and $-20\mu C$ are placed respectively at A, B and C. The force acting on B is?

(1) 1250N (2) 3500N (3) 1200N (4) 2250N

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(50) Two similar metal spheres are suspended by silk threads from the same point. When the spheres are given equal charges of $2\mu C$, the distance between them becomes 6 cm. If length of each thread is 5 cm, the mass of each sphere is? ($g = 10 m/s^2$)

(1) 4 kg (2) 3 kg (3) $\frac{4}{3}$ kg (4) $\frac{1}{3}$ kg

Coulomb's law in Electrostatics

1) 1	11) 2	20) 2	29) 3	38) 3	47) 3
2) 3	12) 4	21) 3	30) 3	39) 1	48) 4
3) 1	13) 3	22) 1	31) 3	40) 4	49) 4
4) 4	14) 2	23) 2	32) 1	41) 2	50) 3
5) 1	15) 3	24) 1	33) 1	42) 2	
6) 3	16) 2	25) 2	34) 4	43) 4	
7) 4	17) 4	26) 3	35) 2	44) 1	
8) 1	18) 2	27) 3	36) 2	45) 1	
9) 3	19) 1	28) 1	37) 2	46) 4	
10) 4					