Coulomb's law and Electrostatic force

Theoretical Questions

1. Coulomb's Law describes the force between two point charges. Which of the following statements is true about this force?

a) It is always attractive.

b) It is directly proportional to the distance between the charges.

c) It is inversely proportional to the square of the distance between the charges.

d) It depends on the mass of the charges.

2. Which of the following factors does NOT affect the electrostatic force between two charges?

a) Magnitude of the charges

b) Distance between the charges

c) Permittivity of the medium

d) Mass of the charges

3. The electrostatic force between two charges is F. If the distance between them is doubled, what will be the new force?

a) $F/2$

b) $F/4$

c) $2F$

d) $4F$

4. Two charges q_1 and q_2 are placed in a medium with permittivity ϵ. If the medium is replaced with one having permittivity 2ϵ, how does the electrostatic force change?

a) It doubles.

b) It halves.

c) It remains the same.

d) It quadruples.

Numerical Questions

5. Two point charges $q_1 = +2\mu C$ and $q_2 = -3\mu C$ are placed 5 cm apart in a vacuum. What is the magnitude of the electrostatic force between them?

a) $21.6\,N$

b) $10.8\,N$

c) $5.4\,N$

d) $2.7\,N$

6. Three charges $q_1 = +1\mu C$, $q_2 = -2\mu C$, and $q_3 = +3\mu C$ are placed at the corners of an equilateral triangle with side length $10\,cm$. What is the net electrostatic force on q_1?

a) $0.9\,N$

b) $1.8\,N$

c) $2.7\,N$

d) $3.6\,N$

7. A charge $q = +5\mu C$ is placed in a uniform electric field of strength $E = 1000\,N/C$. What is the electrostatic force acting on the charge?

a) $0.005\,N$

b) $0.05\,N$

c) $0.5\,N$

d) $5\,N$

8. Two identical charges $q = +4\mu C$ are placed $12\,cm$ apart. What is the electrostatic force between them?

a) $10\,N$

b) $20\,N$

c) $30\,N$

d) $40\,N$

9. A proton and an electron are separated by a distance of $1 \times 10^{-10}\,m$. What is the ratio of the electrostatic force to the gravitational force between them?

a) 10^{20}

b) 10^{30}

c) 10^{40}

d) 10^{50}

10. Two small spheres, each with a mass of $0.2\,g$ and carrying a charge of $+10\,nC$, are suspended by strings of length $30\,cm$ from the same point. What is the angle each string makes with the vertical when the system is in equilibrium?

a) $5°$

b) $10°$

c) $15°$

d) $20°$

Answer Key

1) c)

2) d)

3) b)

4) b)

5) a)

6) b)

7) d)

8) a)

9) c)

10) b)