SECTION NAME

Physics Sample

DURATION: 0 Hours 30 Minutes **DATE: 2025-03-28**

SYLLABUS

Physics: | Electric Charges And Fields.

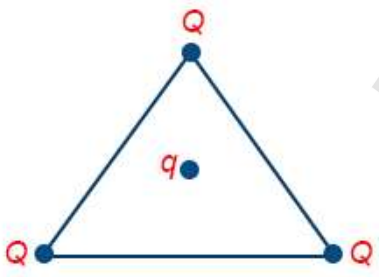
(Physics)

1. Two point charges of 20 μC and 80 μC are 10 cm apart. Where will the electric field strength be zero on the line joining the charges from 20 μC charge

A) 0.1 m **B)** 0.04 m

C) 0.033 m **D)** 0.33 m

2. Three charges (each *Q*) are placed at the three corners of an equilateral triangle. A fourth charge *q* is placed at the center of the triangle. The ratio |*q*/*Q*| so as to make the system in equilibrium is



A) 1:3 **B)** $1:\sqrt{3}$

C) $\sqrt{3}:1$ **D)** $2:\sqrt{3}$

3. Two spherical conductors *B* and *C* having equal radii and carrying equal charges in them repel each other with a force *F* when kept apart at some distance. A third spherical conductor having same radius as that of *B* but uncharged, is brought in contact with *B*, then brought in contact with C and finally removed away from both. The new force of repulsion between B and *C* is

A) $\frac{F}{4}$ **B)** $\frac{3F}{4}$

C) $\frac{F}{8}$ **D)** $\frac{3F}{8}$

4. A charged oil drop of mass 2.5 × 10^{-7} kg is in space between the two plates, each of area 2 × 10^{-2} m^2 of a parallel plate capacitor. When the upper plate has a charge of 5 × 10^{-7} C and the lower plate has an equal negative charge, the oil remains stationary. The charge of the oil drop is (Take g = 10 m/s^2)

A) 9 × 10^{-1} C **B)** 9 × 10^{-6} C

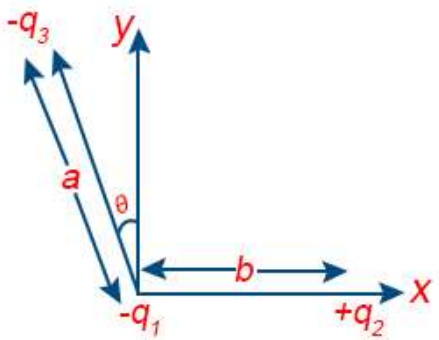
C) 8.35 × 10^{-13} C **D)** 1.8 × 10^{-14} C

5. Electric charges of 1 μC, 1 μC and 2 μC are placed in air at the corners of A, B and C respectively of an equilateral triangle ABC having the length of the side 10 cm. The resultant forces at C is $\left(\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \mathrm{Nm^2C^{-2}}\right)$

A) 0.9 N **B)** $1.8\sqrt{3}\ N$

C) 2.7 N **D)** 3.6 N

6. Three charges $-q_1$, $+q_2$ and $-q_3$ are placed as shown in the figure.The *x*-component of the force on $-q_1$ is proportional to



A) $\frac{q_2}{b^2} - \frac{q_3}{a^2}cos\theta$ **B)** $\frac{q_2}{b^2} + \frac{q_3}{a^2}sin\theta$

C) $\frac{q_2}{b^2}+\frac{q_3}{a^2}cos\theta$ D) $\frac{q_2}{b^2}-\frac{q_3}{a^2}sin\theta$

7. A 1C charge is placed at the origin. Other infinite numbers of unit charges are placed at $\sqrt{2}, \sqrt{4}, \sqrt{8}, \sqrt{16}, \ldots$.(up to infinite) distances from the origin in a straight line. What will be the total force acting on the 1st charge?

A) 9*109 N **B)** 18*109 N

C) Infinite **D)** 1 N

8. Three−point charges, +Q, +2Q, and −3Q, are placed along a straight line. If the net electrostatic force on +Q is zero, what is the relationship between the distances of +2Q and −3Q from +Q?

A) The distance of +2Q from +Q is twice the distance of −3Q from +Q. **B)** The distance of +2Q from +Q is half the distance of −3Q from +Q.

C) The distances of +2Q and −3Q from +Q are equal. **D)** The distance of +2Q from +Q is three times the distance of −3Q from +Q.

9. Three charges, +Q, −Q, and +2Q, are placed at the vertices of an equilateral triangle. How does doubling the magnitude of each charge affect the net electrostatic force on each charge?

A) The net force on each charge doubles. **B)** The net force on each charge quadruples.

C) The net force on each charge remains unchanged. **D)** The net force on each charge is halved.

10. Three equal positive charges are kept at the corners of an equilateral triangle. What will be the vector sum of the forces acting on the particles?

A) Zero **B)** Directed radially outside

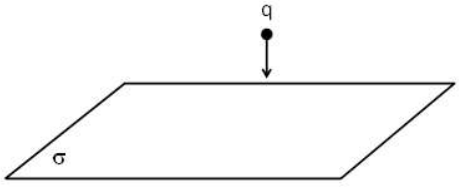
C) Acts along one of the sides of the triangle **D)** Directed towards the center

11. A charge Q is placed at each of the opposite corners of a square. A charge *q* is placed at each of the other two corner. If the net electrical force on Q is zero, then $\frac{Q}{q}$ equals

A) $-2\sqrt{2}$ **B)** −1

C) 1 **D)** $-\frac{1}{\sqrt{2}}$

12. An infinite conducting plate carries a uniform charge density σ. A particle of charge q and mass m is held in front of the plate. The particle falls on the plate with acceleration equal to the acceleration due to gravity.



What is the value of the charge q ?

A) $\frac{\sigma}{2\varepsilon_0}$ **B)** $-\left(\frac{\sigma}{2\varepsilon_0}\right)mg$

C) $-\left(\frac{2\varepsilon_0}{\sigma}\right)mg$ **D)** $\left(\frac{\varepsilon_0 m}{\sigma}\right)$

13. Two parallel metal plates having charges +Q and −Q face each other at a certain distance between them. If the plates are now dipped in kerosene oil tank, the electric field between the plates will

A) Become zero **B)** Increase

C) Decrease **D)** Remain same

14. A particle of mass m and charge q is placed at rest in a uniform electric field E and then released. The kinetic energy attained by the particle after moving a distance y is

A) qEy^2 **B)** qE^2y

C) qEy **D)** q^2Ey

15. A table tennis ball which has been covered with a conducting paint is suspended by a silk thread so that it hangs between two metal plates. One plate is earthed and the other plate is connected to a high voltage generator then the ball

A) is attracted to the high voltage plate and stays there **B)** hangs without moving

C) swings backward and forward hitting each plate in turn **D)** is repelled to the earthed plate and stays there

16. Two parallel infinite line charges +λ and -λ are placed with a separation distance *R* in free space. The net electric field exactly mid way between the two line charges is

A) Zero **B)** $\frac{2\lambda}{\pi\epsilon_0 R}$

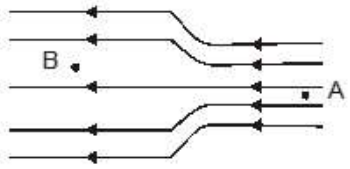
C) $\frac{\lambda}{\pi\epsilon_0 R}$ **D)** $\frac{1}{2\pi\epsilon_0 R}$

17. An electron is held freely by the application of a uniform electric field directed vertically upwards. What is the magnitude of the electric field that is balancing the electron?

A) 2.34×10^{-11} N C^{-1} **B)** 3.62×10^{-11} N C^{-1}

C) 4.21×10^{-11} N C^{-1} **D)** 5.58×10^{-11} N C^{-1}

18. The figure given below field lines of an electric field, the line spacing perpendicular to the page is the same everywhere. If the magnitude of the field at A is 40 N/C, then what is the magnitude of the field at B?



A) 80 N/C **B)** 60 N/C

C) 40 N/C **D)** 20 N/C

19. A B C is a right angled triangle in which A B =3 cm and B C = 4 cm. And ∠ A B C = π / 2. The three charges +15, +12 and −20 e.s.u are placed respectively on A,B and C. The force acting on B is

A) 125 dynes **B)** 35 dynes

C) 25 dynes **D)** Zero

20. Four charges equal to −Q are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium the value of q is

A) $-\frac{Q}{4}(1+2\sqrt{2})$ **B)** $\frac{Q}{4}(1+2\sqrt{2})$

C) $-\frac{Q}{2}(1+2\sqrt{2})$ **D)** $\frac{Q}{2}(1+2\sqrt{2})$