D.A.E Classes

Destination of Academic Excellence

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1. Mark out the correct statement.
   (a) Attraction is a true test of electrification.
   (b) Mass can exist without charge and charge can also exist without mass.
   (c) Charge is discrete in general and can be constant also.
   (d) Mass and charge, both are invariant physical quantities.

2. Two point charges $2Q$ and $-18Q$ are placed at a separation r. Find the location and charge of a test charge, so that the entire system is in equilibrium.
   (a) Outside the for joining the charges to on side of $2Q$ at $x=\frac{r}{2}, \frac{-9Q}{2}$
   (b) Outside the line joining the charges on side of $2Q$ at $x=r$, $-9Q$
   (c) For any value of test charge at $x=\frac{r}{2}$ from $2Q$, outside the charges
   (d) Not possible for all the three charges to remain in equilibrium

3. A charge particle q_1 experiences an electric force $\vec{F}$ due to another charge q_2. If we bring a charge q_3 near to q_2, then the force experienced by q_1 due to q_2
   (a) may be greater than $\vec{F}$
   (b) may be smaller than $\vec{F}$
   (c) remains the same as $\vec{F}$
   (d) either (a) or (b)

4. A positively charged insulating rod is brought close to an object that is suspended by a string. If the object is attracted towards the rod, we can conclude that
   (a) the object is positively charged
   (b) the object is an insulator
   (c) the object is a conductor
   (d) None of the above

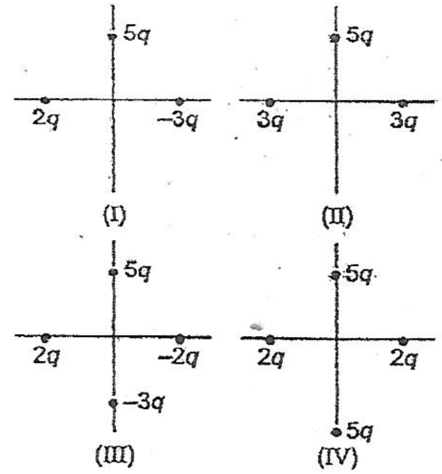
5. Two identical conducting spheres A and B carry equal charges. They are separated by a distance much larger than their diameters. A third identical uncharged conducting sphere C is first touched to A, then to B and finally removed. As a result, the electrostatic force between A and B which was originally F, becomes
   (a) $\frac{F}{2}$ (b) $\frac{F}{4}$
   (c) $\frac{3F}{8}$ (d) F

6. Two particles have charges Q and $-Q$. For a zero net force to be exerted on a third charged particle, it must be placed
   (a) on the perpendicular bisector of line joining Q and $-Q$, but not on that line itself
   (b) on the line joining Q and $-Q$, to the side of Q opposite $-Q$
   (c) on the line joining Q and $-Q$, to the side of $-Q$, opposite Q
   (d) No such location is possible

7. Charge Q is located at $(0, a)$ and charge q is at $(d, 0)$. The value of d for which X component of force on q due to Q is maximum, is
   (a) 0 (b) a
   (c) $\frac{a}{\sqrt{2}}$ (d) $\frac{a}{2}$

8. Experimenter A uses a test charge q_0 while another experimenter B uses a test charge $\frac{q_0}{2}$ to measure the $\vec{E}$ at a point due to a stationary charge. A finds a field that is
   (a) the same as the field found by B
   (b) less than the field found by B
   (c) greater than the field found by B
   (d) either greater or less than the field found by B

9. The diagrams below depict 4 charge distributions. All the point charges are at same distance from the origin. Rank the situations according to magnitude of $\vec{E}$ at origin-from least to greatest.



   (a) IV, III, II, I (b) IV, II, III, I
   (c) IV, II, I, III (d) IV, I, II, III

10. A positive charge Q is placed on a conducting spherical shell with inner radius R_1 and outer radius R_2. A point charge q is placed inside the shell (not at centre). The $\vec{E}$ at any point outside the shell at a distance r from its centre would be
   (a) $\frac{Q}{4\pi\varepsilon_0 r^2}$
   (b) $\frac{Q+q}{4\pi\varepsilon_0 R_2^2}$
   (c) $\frac{Q+q}{4\pi\varepsilon_0 r^2}$
   (d) Can't be determined

11. Charge is distributed uniformly on the surface of a large (infinite) sheet. The magnitude of $\vec{E}$ at a point 2 cm from the sheet is 60 N/C. What would be magnitude of $\vec{E}$ at a point at a distance 4 cm from the sheet?
   (a) 15 N/C (b) 30 N/C
   (c) 120 N/C (d) 60 N/C

12. A solid metal sphere of radius 50 cm carries a charge of 25×10^{-10} C. The electrostatic potential at a distance of 20 cm from the centre will be
   (a) 25 V (b) 15 V
   (c) 35 V (d) 45 V