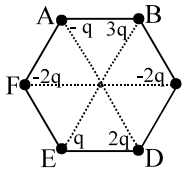
Date: 1-5-2016 **Physics Test - 2**
Time: 60 Mins **Cass XII**
Max Marks: 120 **Electro**

In all Questions, 4 marks will be awarded for correct answer and –1 for every wrong attempt.

Q.1 Six charges are placed at the corner of a regular hexagon as shown. If an electron is placed at its centre O, force on it will be:

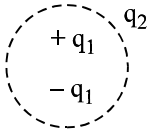


(A) Zero (B) Along OF
(C) Along OC (D) None of these

Q.2 The dimension of $\left(\frac{1}{2}\right)\varepsilon_0 E^2$ (ε_0 : permittivity of free space ; E : electric field) is :

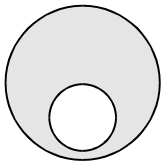
(A) $M L T^{-1}$ (B) $M L^{-1} T^{-2}$ (C) $M L T^{-2}$ (D) $M L^2 T^{-1}$

Q.3 Consider the charge configuration and a spherical Gaussian surface as shown in figure. When calculating the flux of the electric field over the spherical surface, the electric field will be due to



(A) q_2 (B) only the positive charges
(C) all the charges (D) $+q_1$ and $-q_1$

Q.4 A spherical portion has been removed from a solid sphere having a charge distributed uniformly in its volume as shown in the figure. The
electric field inside the emptied space is



(A) zero everywhere (B) non-zero and uniform
(C) non-uniform (D) zero only at its center

Q.5 A point charge 50μC is located in the XY plane at the point of position vector $\vec{r}_0 = 2\hat{i} + 3\hat{j}$. What is the electric field at the point of position vector $\vec{r} = 8\hat{i} - 5\hat{j}$

(A) 1200V/m (B) 0.04V/m (C) 900V/m (D) 4500 V/m

Q.6 An infinite nonconducting sheet of charge has a surface charge density of 10^{-7} C/m^2. The separation between two equipotential surfaces near the sheet whose potential differ by 5V is

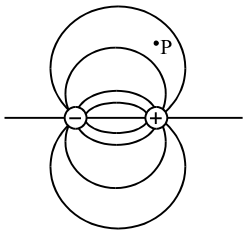
(A) 0.88 cm (B) 0.88 mm (C) 0.88 m (D) 5×10^{-7} m

ROUGH SPACE

Q.7 In a regular polygon of n sides, each corner is at a distance r from the centre. Identical charges are placed at (n – 1) corners. At the centre, the intensity is E and the potential is V. The ratio V/E has magnitude.

(A) r n (B) r (n – 1) (C) (n – 1)/r (D) r(n – 1)/n

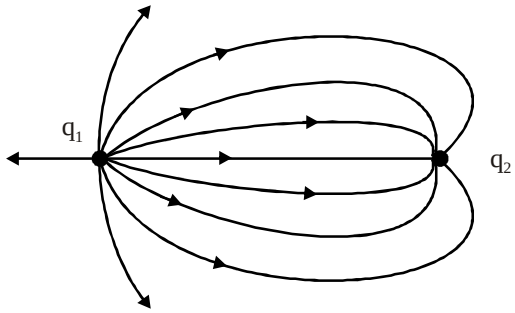
Q.8 Figure shows the electric field lines around an electric dipole. Which of the arrows best represents the electric field at point P ?



(A) ↑ (B) ↖

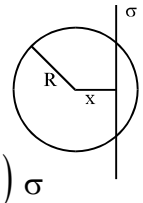
(C) ↗ (D) ↙

Q.9 The figure shows the electric field lines in the vicinity of two point charges. Which one of the following statements concerning this situation is true?



(A) q_1 is negative and q_2 is positive
(B) The magnitude of the ratio (q_2/q_1) is less than one
(C) Both q_1 and q_2 have the same sign of charge
(D) The electric field is strongest midway between the charges.

Q.10 An infinite, uniformly charged sheet with surface charge density σ cuts through a spherical Gaussian surface of radius R at a distance x from its center, as shown in the figure. The electric flux Φ through the Gaussian surface is



(A) $\frac{\pi R^2 \sigma}{\varepsilon_0}$ (B) $\frac{2\pi\left(R^2 - x^2\right)\sigma}{\varepsilon_0}$ (C) $\frac{\pi(R-x)^2\sigma}{\varepsilon_0}$ (D) $\frac{\pi\left(R^2 - x^2\right)\sigma}{\varepsilon_0}$

ROUGH SPACE

Q.11 A non-conducting ring of radius 0.5 m carries a total charge of 1.11×10^{-10} C distributed non-uniformly on its circumference producing an electric field $\vec{E}$ every where in space. The value of the line integral $\int_{\ell=\infty}^{\ell=0} -\vec{E}.d\vec{\ell}$ ($l = 0$ being centre of the ring) in volts is :

(A) + 2 (B) – 1 (C) – 2 (D) zero

Q.12 **Statement-1 :** A positive point charge initially at rest in a uniform electric field starts moving along electric lines of forces. (Neglect all other forces except electric forces)

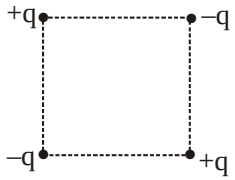
Statement-2 : Electric lines of force represents path of charged particle which is released from rest in it.

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false. (D) Statement-1 is false, statement-2 is true.

Q.13 **Statement-1 :** The electric potential and the electric field intensity at the centre of a square having four fixed point charges at their vertices as shown in figure are zero.



Statement-2 : If electric potential at a point is zero then the magnitude of electric field at that point must be zero.

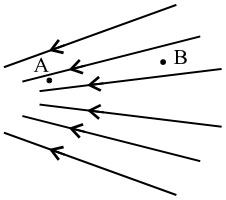
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true.

Q.14 Which of the following is true for the figure showing electric lines of force?
(E is electrical field, V is potential)



(A) $E_A > E_B$ (B) $E_B > E_A$

(C) $V_A > V_B$ (D) $V_B = V_A$

ROUGH SPACE

Q.15 Units of electric flux are

(A) $\frac{N - m^2}{Coul^2}$ (B) $\frac{N}{Coul^2 - m^2}$ (C) volt-m (D) Volt-m^3

Q.16 Which of the following statements are correct?

(A) Electric field calculated by Gauss law is the field due to only those charges which are enclosed inside the Gaussian surface.

(B) Gauss law is applicable only when there is a symmetrical distribution of charge.

(C) Electric flux through a closed surface will depends only on charges enclosed within that surface only.

(D) None of these

Q.17 Charges Q_1 and Q_2 lies inside and outside respectively of a closed surface S. Let E be the field at any point on S and ϕ be the flux of E over S.Which statement is incorrect

(A) If Q_1 changes, both E and ϕ will change.

(B) If Q_2 changes, E will change but ϕ will not change.

(C) If $Q_1 = 0$ and $Q_2 \neq 0$ then $E \neq 0$ but $\phi = 0$.

(D) If $Q_1 \neq 0$ and $Q_2 = 0$ then $E = 0$ but $\phi \neq 0$.

Q.18 It is observed that when a soap bubble is given some positive charge its radius increases. What will happen to the same soap bubble if it is given equal negative charge instead of positive charge?

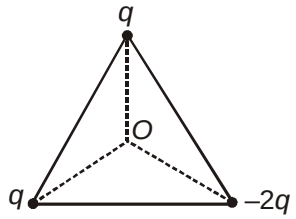
(A)Its radius increases (B)Its radius decreases

(C)Its radius remains same (D)It gets burst

Q.19 A sphere of radius *R* is placed in uniform electric field *E*. The net electric flux linked with the sphere is

(A)$4\pi R^2E$ (B) $2\pi R^2E$ (C) πR^2E (D)Zero

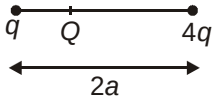
Q.20 Three point charges are placed at the three corners of an equilateral triangle as shown in figure. The statement which is true for net electric potential *V* and the net electric field intensity *E* at the centre of the triangle is



(A)$E = 0, V = 0$ (B) $V = 0, E \neq 0$ (C)$V \neq 0, E = 0$ (D)$V \neq 0, E \neq 0$

ROUGH SPACE

Q.21 Two point charges q and $4q$ are located at a distance $2a$ apart. A charge Q is placed along the line joining them as shown in figure so that force on this becomes zero. The distance between charges q and Q is



(A) $\frac{a}{3}$ (B) $\frac{a}{4}$ (C) $\frac{2a}{3}$ (D) $\frac{a}{2}$

Q.22 Charges q, $2q$, $4q$, $8q$, ... are placed along x-axis at r, $2r$, $4r$, $8r$, ... from origin respectively. The net electric field at origin is

(A)Infinite (B) $\frac{q}{4\pi\varepsilon_0 r^2}$ (C) $\frac{2q}{4\pi\varepsilon_0 r^2}$ (D) $\frac{q}{8\pi\varepsilon_0 r^2}$

Q.23 Select the incorrect statement regarding the electrostatics of conductors

(A)Inside a conductor, electrostatic field is zero

(B)At the surface of a charged conductor, electrostatic field must be normal to the surface at every point

(C)The interior of a conductor can have no excess charge in the static situation

(D)Electrostatic potential is variable throughout the volume of a conductor

Q.24 An electron of mass m_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p, also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio $\frac{t_2}{t_1}$ is nearly equal to

(A) 1 (B) $\sqrt{\frac{m_P}{m_e}}$ (C) $\sqrt{\frac{m_e}{m_P}}$ (D) 1836

Q.25 A charge Q is uniformly distributed over a large plastic plate. The electric field at a point P close to the centre of the plate is 10 V/m. If the plastic plate is replaced by a copper plate of the same geometrical dimensions and carrying the same charge Q, the electric field at the point P will become

(A) zero (B) 5 V/m (C) 10 V/m (D) 20 V/m

Q.26 Two point charges +q and –q are held fixed at (-d, 0) and (d, 0) respectively of a (X, Y) coordinate system. Then

(A) $\vec{E}$ at all points on the Y-axis is along $-\hat{j}$. (B) $\vec{E}$ at all points on the Y-axis is along $\hat{i}$.

(C) $\vec{E}$ at all points on the Y-axis is along $-\hat{i}$. (D) $\vec{E}$ at all points on the Y-axis is along $\hat{j}$.

ROUGH SPACE

Q.27 When air is replaced by a dielectric medium of constant *k*, the maximum force of attraction between two charges separated by a distance

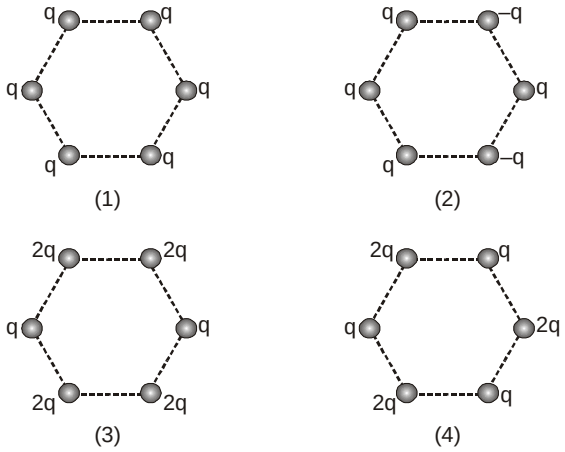
(A)Decreases, *k* times (B) Remains unchanged

(C)Increases, *k* times (D) Decreases, 1/ *k* times

Q.28 In a region with uniform electric field, the number of lines of force per unit area is E. If a spherical metallic conductor is placed in this region, the number of lines of force per unit area inside the conductor will be

(A)E (B)more than E (C)less than E (D)zero

Q.29 Figures below show regular hexagons, with charges at the vertices. In which of the following cases the electric field at the centre is not zero



(A) 1 (B) 2 (C) 3 (D) 4

Q.30 The electric intensity due to an infinite cylinder of radius *R* and having charge *q* per unit length at a distance *r(r > R)* from its axis is

(A) Directly proportional to r^2 (B) Directly proportional to r^3

(C) Inversely proportional to r (D) Inversely proportional to r^2

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