## Model Question Paper

## Electrostatistics - Part V

12th Standard

## Physics

Reg.No. $\square$
I.Answer all the Questions.
II.Use blue pen only.

1) the force between 2 charges when they are separated by a certain distance is ' $F$ " $N$. when they are placed in medium, the distunce of separation is halved to get the same force. what is the relative permittivity of the medium?
(a) 2 (b) 4
(c) 6
(d) 5
2) the charge acquired by $5 \times 10^{10}$ electrons
(a) $3.204 \times 10^{-19} \mathrm{C}$
(b) $4.806 \times 10^{-10} \mathrm{C}$
(c) $8.01 \times 10^{-9} \mathrm{C}$
(d) $1.602 \times 10^{-10} \mathrm{C}$
3) the electric field intensity due to a point charge 3 muC at a distunce 20 cm in a medium of relative permittiity 5
(a) $3000 \mathrm{~V} / \mathrm{m}$
(b) $1.35 \times 10^{5} \mathrm{~V} / \mathrm{m}$
(c) $12.4 \times 10^{4} \mathrm{~V} / \mathrm{m}$
(d) $7500 \mathrm{~V} / \mathrm{m}$
4) the electric potential at a point at a distance 7.5 cm from an electric field $25 \mathrm{Vm}^{-1}$
(a) 1.75 V
(b) 1.875 V
(c) 0.1875 V
(d) 17.5 V
5) The electric field at any point on the axial line of an electric dispole is
(a) $E=\frac{2 q}{4 \pi \epsilon_{0} r^{3}}$
(b) $\quad E=\frac{2 q}{4 \pi \epsilon_{0}} \frac{2 p}{r^{3}}$
(c) $\quad E=\frac{4 q d}{4 \pi \epsilon_{0} r^{3}}$
(d) $\quad E=\frac{2 q d}{4 \pi \epsilon_{0} r^{3}}$

## Section-B

$4 \times 3=12$
6) Calculate (i) the potential at a point due a charge of $4 \times 10^{-7} \mathrm{C}$ located at 0.09 m away. (ii)work done in bringing a charge of $2 \times 10^{-9} \mathrm{C}$ from infinity to the point
7) A sample of HCl gas is placed in an electric field of $2.5 \times 10^{4} \mathrm{NC}^{-1}$. The dipole moment of each HCl molecule is $3.4 \times 10^{-30} \mathrm{C} \mathrm{m}$. Find the maximum torque that can act on a molecule.
8) A point charge causes an electric flux of $-6 \times N M^{2} C^{-1}$ to pass through a spherical Gaussian surface of 10 cm radius centred on the charge. (i) If the radius of the Gaussian surface is doubled, how much flux will pass through the surface? (ii) What is the value of charge?

## 9)

Calculate the effective capacitance of the combination shown in figure.

## Section-C

10) State and explain the principle of superposition in electrostatics.
11) Define electric potential at a point and obtain an expression for electric potential due to a point charge.
12) Write the steps involved in charging a metal sphere by induction.
13) Explain the effect of introducing a dielectric also between the plates of parallel plate capacitor.
14) a) A parallel plate capacitor is connected to a battery.If the dielectric slab of thickness equal to half the plate separation is inserted between the plates, what happens to (i) capacitance of the capacitor (ii) electric field between the plates and (iii) potential difference between the plates.
(OR)
b) Discuss polarisation of dielectric material with a diagram.

## Section-D

15) State Gauss law. Using Gauss law, obtain an expression for electric field due to an infinitely long straight uniformly charged wire.
16) Deduce an expression for the effective capacitance of capacitors of capacitances $\mathrm{C}_{1}, \mathrm{C}_{2}$ and $\mathrm{C}_{3}$ connected in series.
17) State Gauss's law.Using this, calculate electric field due to (i) an infinitely long straight charge with uniform charge density and (ii) an infinite plane sheet of charge of $q$.
