+2 PHYSICS – UNIT TEST 1

Time :1 hr 30 min **Mark : 75**

Answer all questions **Part I** **14 x 1 = 14**

Choose and write the correct answer

1. An electric dipole is placed in a uniform electric field with its axis perpendicular to the field. It experiences
   (a) only a net force
   (b) only a torque
   (c) both a net force and torque
   (d) neither a net force nor a torque
2. The angle between the electric field lines and an equipotential surface is
   (a) 0° (b) 45° (c) 90° (d) 180°
3. Which is not based on electrostatic induction?
   (a) Van de Graff generator
   (b) Capacitor
   (c) Lightning conductor
   (d) Microwave oven
4. The equivalent capacitance of two capacitors in series is 1.5 μF. The capacitance of one of them is 4 μF. The capacitance of other is
   (a) 0.417μF (b) 2.4μF (c) 0.24μF (d) 4.17μF
5. The number of electric lines of force originating from a charge of 1nC is
   (a) 1.129×10^{11} (b) 1.129×10^{2} (c) 1.129×10^{5} (d) 1.129×10^{3}
6. Electric field in between the plates of two oppositely charged plane sheets of charge density σ is
   (a) $\frac{\sigma}{2\varepsilon_0}$ (b) $\frac{\sigma}{\varepsilon_0}$ (c) $\frac{\sigma}{\varepsilon}$ (d) zero
7. Of the following which one is correct
   (a) The unit of electric field is NC (b) The unit of electric flux is $NC^{-1}m^{-2}$
   (c) The unit of charge density is Cm^2 (d) The unit of dipole moment is Cm
8. The electric potential at a point on the equatorial line of the dipole is
   (a) V (b) -V (c) 2V (d) zero
9. At a sharp point of a charged conductor
   (a) curvature is minimum ; radius is maximum; charge density is maximum
   (b) curvature is maximum; radius is minimum; charge density is maximum
   (c) curvature is minimum; radius is minimum; charge density is maximum
   (d) curvature is maximum; radius is maximum; charge density is maximum
10. when ε_r is the relative permittivity of a medium which of the following is correct
    (a) $\varepsilon_r = \varepsilon / \varepsilon_0$ (b) $\varepsilon_r = F / F_m$ (c) $\varepsilon_r > 1$ (d) all the above
11. A body has a negative charge of 1C. It means that
    (a) it has lost one electron (b) it has acquired one electron
    (c) it has lost 6.25×10^{18} electrons (d) it has acquired 6.25×10^{18} electrons
12. The magnitude of the force acting on a charge of 2×10^{-10}C placed in a uniform electric field of 10 Vm^{-1} is
    (a) 2×10^{-9} N (b) 4×10^{-9} N (c) 2×10^{-10} N (d) 4×10^{-10} N

13. Molecular polarisability is measured by the unit
    (a) Cm (b) NC^{-1} (c) $C^2N^{-1}m$ (d) $NC^{-2}m^{-1}$
14. A hollow metal ball carrying an electric charge produces no electric field at points
    (a) outside the sphere (b) on its surface
    (c) inside the sphere (d) at a distance more than twice

Part II

Answer any seven questions **7 x 3 = 21**

15. Define : Coulomb
16. What is electrostatic shielding?
17. Why is it safer to be inside a car than standing under a tree during lightning?
18. Distinguish polar and non – polar molecules with two examples
19. What is meant by electric polarization?
20. Write the applications of capacitor
21. What is an equipotential surface?
22. An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2m. Calculate the linear charge density.
23. Find the electric flux through each face of a hollow cube of side 10 cm, if a charge of 8.85 micro coulomb is placed at the centre

PART –III

Answer Question No.27 is compulsory

Answer any three of the remaining 4 questions **4 x 5 = 20**

24. Write the properties of electric lines of force.
25. Define electric potential at a point. Derive an expression for it due to a point charge.
26. Define an expression for the equivalent capacitance of capacitors connected in series.
27. The sum of two point charges is $6\mu C$. They attract each other with a force of 0.9 N. When kept 40cm apart in vacuum. Calculate the charges.

    (Or)

    The plates of a parallel plate capacitor have an area of $90cm^2$ each and are separated by 2.5mm. The capacitor is charged by connecting it to a 400 V supply. How much electrostatic energy is stored by the capacitor?
28. Derive the expression for the torque on a dipole placed in a electric field.

PART – IV

Answer any two questions in detail **2 x 10 = 20**

29. Define electric field intensity at a point. Derive an expression for electric field at a point due to an electric dipole on its equatorial line.
30. What is Van de Graff generator? State its principle. Explain its construction, working and use with a diagram.
31. State Gauss Law. Applying Gauss's law, calculate the electric field due to
    (i) an infinitely long straight charge with uniform charge density
    (ii) an infinite plane sheet of charge q