

H.S 2nd year

Question Bank (Chapter wise)

From 2013 – 2019

<u>Section 1</u>	Electrostatics	Marks(8)
Chapter	1)Electric charges and fields	
	2)Electrostatic potential and capacitance	
2013		
	1. State Gauss's law of electrostatics ?	1
	2. Define one Electron volt?	1
	3. Find an expression for potential at a point due to a point charge?	2
	4. What is an electric dipole ? Find an expression for the torque acting on an electric dipole Placed in an external uniform electric field.	2
	5. If electric field $E=0$ in a region do you think potential at the region should also be zero? Justify your answer.	2
	6. What is electrostatic-shielding? How can it be achieved?	2
	7. A 400PF capacitor is charged by a 100v battery. How much electrostatic energy is stored by the capacitor?	2
2014		
	1.State Coulomb's law of electrostatics. Express it in vector form?	2
	2.What is electric polarisation vector? Define the Electric susceptibility.	2
	3.Deduce an expression for the capacity of a parallel plate condenser.	3
	4.If $\vec{E}=(3\hat{i}+6\hat{j}+4\hat{k})\text{N/C}$, calculate the electric flux through a surface of area 20cm^2 in Y-Z plane?	3
	5.Apply Gauss theorem to calculate the electrostatic field due to an infinite plane sheet of charge?	3
2015		
	1.What is quantisation of charge?	1

2. Calculate the magnitude of electrostatic force between a proton and an electron separated by a distance 0.5\AA , Given that magnitude of charge of proton and electron to be $1.6 \times 10^{-19}\text{C}$ each and

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{Nm}^2/\text{C}^2. \quad 3$$

3. A 100 PF capacitor is charged by a potential difference of 100 V. What is the amount of charged stored? What is the electrostatic energy stored in the capacitor? 2

4. Define electric dipole and dipole moment. Derive an expression for electric field intensity at a point On the axial line of an electric dipole. 5

5. Explain the concept of electric field. Express electric flux through a surface in terms of electric field intensity. Show that the electric flux through a cylindrical surface with its axial parallel to a uniform electric field is zero. 5

2016

1. What is the SI unit of permittivity? 1

2. State two basic properties of electric charges. 2

3. What is electrostatic shielding? How can it be achieved? 2

4. Define dielectric constant of a medium. 2

5. The work done in moving a charge $2 \times 10^{-9}\text{C}$ from a point of potential -3kV to another point P is $5 \times 10^{-5}\text{J}$. Find the potential at point P. 2

6. A parallel plate capacitor has plate separation 'd' and the area of each plate is 'A'. The space Between the plates is completely filled with a dielectric of constant K. Derive the expression for the Capacity of the parallel capacitor. 3

7. Two spheres of radii 3cm and 8cm are charged with $4 \times 10^{-9}\text{C}$ and $16 \times 10^{-9}\text{C}$ of electricity Respectively. If they are joined by a wire, how much charge will flow from one to the other sphere? 3

2017

1. In an electric field a unit positive charge is displaced from one point to another point along a Straight line of length 2cm and the work done is 2mJ. If it is displaced along a parabolic path between the same points of length 5cm, what will be the work done? 1

2. The product of permeability of free space and permittivity is-

i) ϵ , ii) ϵ^{-1} iii) ϵ^2 iv) ϵ^{-2} (Choose the right option) 1

3. Three electric point charges q_0 , q_1 and q_2 are at distances \vec{r}_0 , \vec{r}_1 and \vec{r}_2 respectively with respect to same origin. What is the force on charge q_0 in the field of charges q_1 and q_2 ? 2

4. The volume charge density within a volume V is $\rho(r)$. What is the force on a small test charge q_0 placed outside the volume having position vector \vec{r}_0 with respect to the same origin considered to specify the position vector of the charge distribution within the volume. 2

5. What is the net electric flux through a closed surface surrounding an electric dipole? Derive the expressions for electric field intensity both inside and outside a uniformly charged spherical cell. What is the total charge enclosed by a closed surface if the electric flux entering and leaving the surface are 2000N/Cm^2 and 3000N/Cm^2 respectively. 5

6. Why is an insulator sometimes called a dielectric? What is the main difference between free and bound charge? Generally one of the two plates of a capacitor system is earthed, why? Derive the expression for the energy stored in a charged capacitor. 5

2018

1. Which experiment established the fact that electric charge is quantized? 1

2. Give the statement of Coulomb's law for the force between two point charges. Write this law in vector notation for two point charges of same magnitude and opposite sign separated by a distance r in vacuum? 2

3. Two point charges $0.01\mu\text{C}$ and $-0.01\mu\text{C}$ are placed 10cm apart in vacuum. Calculate the magnitude of electric field intensity at the middle point of the line joining the charges and mention its direction? 2

4. A $600\mu\text{F}$ capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged $600\mu\text{F}$ capacitor. How much electrostatic energy is lost in the process? 3

5. Apply Gauss's law to derive the expression for electric field intensity due to an infinitely long straight uniformly charged wire. What is the direction of the field intensity if it is positively charged? 3

6. Derive the expression for field intensity due to an electric dipole in vacuum for points on its axis. Compare the variation of field intensity with distance for an electric dipole and a point charge when both kept in vacuum. 3

2019

1. Mention one similarity between Coulomb force and gravitational force acting between two stationary charges . 1

2. Define one coulomb charge. Two point charges at a distance 'r' in air exert a force F on each other. At what distance will these charges experience the same force F in a medium of dielectric constant k? 2

3. There is an electric dipole on the x-y plane. Its dipole moment is 4×10^{-9} Cm. On the same plane there is also a uniform electric field of magnitude 5×10^4 N/C. If the axis of the dipole makes an angle 30° with the electric field, calculate the magnitude of the torque acting on the dipole and also mention The direction of torque. 3

5. The capacity of a parallel plate capacitor with air is 18pF. When a dielectric material is inserted In the space between the plates, its capacity becomes 108 pF. Calculate the permittivity of the material. What is the material? 3