

XII L-1 (2 marks + 3 marks)[www.Radasalai.Net](http://www.Radasalai.Net)[www.TrbTnpsc.com](http://www.TrbTnpsc.com)

1) what is meant by triboelectric charging? charging the objects through rubbing is called triboelectric charging

2) what is meant by conservation of charges?

The total electric charge in the universe is constant and charge can neither be created nor be destroyed and in any physical process, the net change in charge will always be zero.

3) what is meant by quantisation of charge:

The charge  $q$  on any object is equal to to an integral multiple of this fundamental unit of charge  $e$   $q = ne$   $n = 0, \pm 1, \pm 2$  etc.

4) write down coulomb's law in vector form and mention what each term represents

The force on a charge  $q_1$  exerted by a point charge  $q_2$  is given by

$$\vec{F}_{12} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r_{12}^2} \hat{r}_{12}$$

Here  $\hat{r}_{12}$  is the unit vector from charge  $q_2$  to  $q_1$ . But  $\hat{r}_{12} = -\hat{r}_{21}$

$$\therefore \vec{F}_{12} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r_{12}^2} (-\hat{r}_{12}) = -\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r_{12}^2} (\hat{r}_{12})$$

$$(OR) \vec{F}_{12} = -\vec{F}_{21}$$

5) what are the differences between coulomb's force and gravitational force.

1) The gravitational force between two masses is always attractive but coulomb force between two charges can be attractive or

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ii) The value of gravitational constant  $G = 6.626 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$ . The value of  $k$  in coulomb law is  $k = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$

iii) The Gravitational force is independent but the electrostatic force dependent on the medium

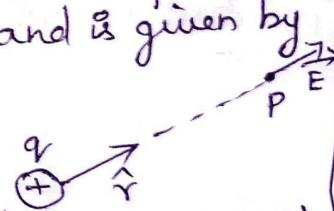
6) ~~State superposition principle~~

According to this principle the total force acting on a given charge is equal to the vector sum of forces exerted on it by all the other charges

7) Define electric field?

The electric field at the point P at a distance  $r$  from the point charge  $q$  is the force experienced by a unit charge and is given by

$$\vec{E} = \frac{\vec{F}}{q_0}$$



It is a vector quantity. Unit =  $\text{Nc}^{-1}$

8) what is mean by Electric field lines?

The set of continuous lines which are the visual representation of the electric field in some region of space is called electric field lines.

9.) what is uniform and non-uniform electric field .

The field which have the same direction and constant magnitude at all points in space is called uniform electric field.

The field which have different directions and different magnitude at different points in space is called non uniform electric field.

10) The electric field lines never intersect. Justify.

No two electric field lines intersect each other. If two lines cross at a point, then there will be two different electric field vectors at the same point.

11) Define electric dipole?

Two equal and opposite charges separated by a small distance constitute an electric dipole.  
Example:  $\text{CO}_2$ , water, ammonia etc,

12) What is meant by electric dipole moment?

It is defined as the product of magnitude of one of the charges and the distance between them  $\vec{p} = q \vec{a}$ .

13) Define electrostatic potential

It is defined as the work done by an external force to bring a unit positive charge with constant velocity from infinity to the point P in the region of external electric field  $\vec{E}$ .

14) What is an equipotential surface? An equipotential surface is a surface on which all the points are at the same potential.

15) The potential due to a point charge is spherically symmetric but the potential due to dipole is not spherically symmetric why?

Because the potential due to point charge depends only the distance r but the potential due to

dipole depends on the angle between  $\vec{p}$  and position vector  $\vec{r}$  of the point.

16) What are the properties of equipotential surface?

(i) The work done to move a charge q between any two points A and B,  $W = q(V_B - V_A)$   
If all the points A and B lie on the same equipotential surface workdone is zero because  $V_A = V_B$

(ii) The electric field is normal to an equipotential surface. If it not normal there is a component of the field parallel to surface.

17) Give the relation between electric field and electric potential.

To move a unit positive charge by a small distance dx in the electric field E, the Workdone  $dw = -Edx$ .

The work done is equal to the electric potential difference  $dw = dv$  ( $dw = -Edx$ )

$$\therefore -Edx = dv$$

$$E = -\frac{dv}{dx}$$

The Electric field E is equal to the negative gradient of the electric potential.

18) Define electrostatic potential energy?

It is defined as the amount of work done in assembling the charges at their locations by bringing them in from infinity

Q1) when the potential energy is maximum and minimum in dipole?

when the dipole is aligned in anti-parallel ( $\theta = \pi$ ) to the external field the potential energy is maximum and if the dipole is aligned parallel ( $\theta = 0$ ) to the external field the potential energy is minimum.

Q2) Define electric flux?

The number of electric field lines crossing a given area kept normal to the electric field lines : It is a scalar quantity  
Unit =  $N m^2 c^{-1}$

Q3) what is meant by electrostatic energy density?

It is defined as the energy stored per unit volume

$$U_E = \frac{U}{\text{Volume}}$$

$$\therefore U_E = \frac{1}{2} \epsilon_0 A d E^2$$

$$U_E = \frac{1}{2} \epsilon_0 E^2$$

$$U_E = \frac{1}{2} \frac{\epsilon_0 A}{d} (Ed)^2$$

$$= \frac{1}{2} \frac{\epsilon_0 A E^2 d}{d}$$

$$= \frac{1}{2} \epsilon_0 A d E^2$$

$$V = A \times d$$

Q4) State Gauss's law?

If a charge  $Q$  is enclosed by an arbitrary closed surface, then the total electric flux  $\Phi_E$  through the closed surface is  $\Phi_E = \oint \vec{E} \cdot d\vec{A} = \frac{Q_{\text{enc}}}{\epsilon_0}$

Q5) why Gauss law is treated much more general law than Coulomb law?

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Because It is also applicable to the charges in motion and also another form of coulomb's law.

Q6.) what is meant by electrostatic shielding?

A sensitive electrical instrument which is to be protected from external electrical disturbance is kept inside the cavity in which the electric field inside is zero.

Q7) why it is safer to sit inside a car or bus than a tree

Because the metal body of the bus provides electrostatic shielding since the electric field inside is zero and during lightning the charges flow through the body to the ground with no effect.

Q8) what is electrostatic Induction

The type of charging without actual contact is called electrostatic Induction

Q9) what is meant by dielectric

It is a non-conducting material and has no free electrons as it is bound within the atoms .Ex: Ebonite, mica

Q10) what are polar molecules?

Give examples?

The center of the positive and negative charges coincide. It has no permanent dipole

moment [www.Padasalai.Net](http://www.Padasalai.Net) &  $\text{CO}_2$

29.) what are non-polar molecules? Give an example.

The centers of positive and negative charges are separated and it have a permanent dipole moment  
example:  $\text{H}_2\text{O}$ ,  $\text{N}_2\text{O}$  &  $\text{HCl}$ .

30.) what is polarisation?

It is defined as the total dipole moment per unit volume of the dielectric

31.) what is dielectric strength?

The maximum electric field the dielectric can withstand before it breakdown is called dielectric strength

32.) what is a capacitor?

It is a device used to store electric charge and electrical energy.

33.) Define Capacitance ? Give its unit?

It is defined as the ratio of the magnitude of charge to the potential difference existing between the conductors

$$C = \frac{q}{V}$$

Unit = coulomb per volt

$C/V$  (or) Farad (F)

34.) what is corona discharge

The leakage of charges  
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from the sharp points on the charged conductor is called corona discharge (or) action of points

Uses: It is used in lightning arrestors and in Vande Graaff generators

35.) what is meant by dielectric breakdown? When the external electric field applied to a dielectric is very large, it tears the atoms apart so that the bound charges become free charges then the dielectric starts to conduct electricity. This is called dielectric breakdown.