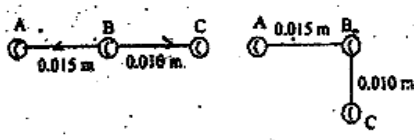
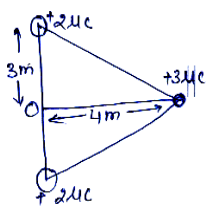
# IMPORTANT QUESTIONS – 2019-20
## CLASS - XII – PHYSICS
### Chapter – Coulomb's Law

1. Two similarly and equally charged identical metal spheres A and B repel each other with a force of 2 x $10^{-6}$ N. A third identical charged sphere C is touched with A and then placed at the mid-point between A and B. Calculate the net electric force of C.
2. Two electric charges q and 2q are at a distance 'a' apart from each other in air. A third charge Q is to be placed along the same line in such a way that the net force acting at q and also at 2q is zero. Calculate the position of charge Q in terms of q and 'a'.
3. Two fixed point-charged + 4e and +e units are separated by a distance 'a'. Where could a third points charge q be place on the joining the two charges so that it be in equilibrium? In which condition the equilibrium will be stable and in which unstable?
4. Two identical point-charges Q, Q are kept at the distance 'r' apart. A third point charge q is place on the line joining the above two charges such that all the three charges are in equilibrium. What is the magnitude, sign and position of third charge?
5. Three charges (each +q) are placed at the corners of an equilateral triangle. A fourth charge Q is placed at the centre of the triangle. (a) if Q = -q, will the charges at the corners move towards the centre or fly away from it? (b) For what value of Q will all the four charges remain stationary? How much work will be done in removing the charges to infinity in this situation.
6. a) The force between two electrons when placed in air is equal to 0.5 times the weight of an electron . Find the distance between two electrons, mass of electron is 9.1 x $10^{-31}$ kg.
   b) A charge of magnitude Q is divided into two parts q and (Q-q) such that the two parts exert maximum force on each other. Calculate the ratio Q/q.
7. Write the vector form of Coulomb's Law for two point charges $q_1$ and $q_2$ for (i) $q_1 q_2 < 0$ (ii) $q_1 q_2 > 0$ If their position vector are $\vec{r}_1$ & $\vec{r}_2$ and show that $\rightarrow \vec{F}_{12} = -\vec{F}_{21}$ .
8. $q_A = 5\ \mu C$ , $q_B = -15\ \mu C$ , $q_C = -5\ \mu C$ and $q_D = 15\ \mu C$ , are placed at the corners of square of size 25 cm. Find the net force acting on charge of 1 $\mu C$ placed at the centre of it.
9. Short answer type:
   i) What do you mean by quantisation of charge?
   ii) Define relative permittivity and give the relation of it with force.
   iii) 1 Coulomb = ---------- start coulomb = _____ ab coulomb's.
   iv) What is conservative force?
   v) Sketch the electric line of force due to give charges.
   a) q> 0 ii) q < 0
10. A charge q is placed of the centre of the line joining two equal charges Q. Show that the system of three charges will be in equilibrium if $q = \frac{-Q}{4}$ .
11. In the adjoining figures are shown three particles A, B and C which are equally charged. The forced acting on B due to A is 2.0 x $10^{-6}$ N. Find out in each figure (i) force exerted on B by C (ii) net force on B.

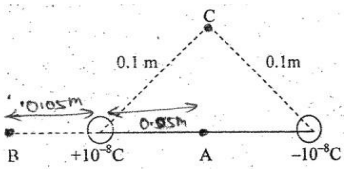



12. Two opposite corners of a square carry Q charge each and the other two opposite corners of the same square carry q charge each. if the resultant force on q is zero. How are Q and q related?
13. Three equal charges, 2.0 x $10^{-8}$ C each, are held fixed at the three corners of an equilateral triangle of side 5 cm. Find the Coulomb force experiment by one of the charges due to the rest two.
14. Two charges 2 $\mu$ c, interact with a third charge +3 $\mu$ c, as given. Calculate the magnitude and direction of force on the charge of +3 $\mu$ c.

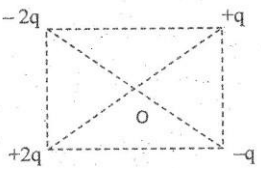


## Chapter – Intensity of Electric Field

1. Two point charges 5 x $10^{-19}$ C and 20 x $10^{-19}$ C are separated by distance of 2m. At which point on the line joining them, the electric field is zero.
2. An oil drop have 12 exess electrons is held stationary under a uniform electric field of 2.55 x $10^4$ N/C. The density of oil is 1.26g/$cm^3$. Estimate the radius, of the drop.
3. Three charges +q, -2q and +q are located at the vertices of an equilateral triangle of side 2l. What is the equivalent dipole moment of the arrangement.
4. If an oil drop of weight 3.2 x $10^{-13}$ N is balanced in an electric field of 5 x $10^5$ N/C. Find the charge on the drop.
5. Calculate the $\dot{E}$ , due to a helium nucleus at a distance of $1A^0$ from the nucleus.
6. Two points charges 3 $\mu C$ and -3 $\mu C$ are placed at a point A and B respectively, 20cm apart in vaccum. Find the electric field at mid-point O of the line AB. What force will be experienced by a negative test charge of 1.5 x $10^{-9}$ C placed at O?
7. Two points charges of $+10^{-8}$C and $-10^{-8}$C are placed 0.1 apart, as shown. Calculate the electric field at points – (i) A (ii) B and (iii) C.




8. Four point-charges are placed at the corners of a square of side 2cm, as shown. Square of side 2 cm, as shown. find the magnitude and direction of $\vec{E}$ at the centre 0, if q = 0.02 $\mu C$.



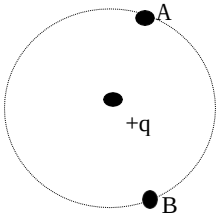

9. If five charges each of magnitude +0.7 $\mu C$ is placed at the vertices of a regular hexagon of side 2 cm. Find the magnitude and direction of E at 0.
10. $q_1$ = 1.2 x $10^{-8}$C, $q_2$ = -1.6x$10^{-8}$C are placed at two point A and B respectively 5cm apart in a right angle triangle. Find $\vec{E}$ at 3cm and 4cm from both the points.
11. An electric dipole of length 4 cm, when placed with its axis making an angle of $60^0$ with a uniform electric field experiences $4\sqrt{3}$ a torque of Nm. calculate the (i) magnitude of the electric field (ii) potential energy of the dipole, if the dipole has charges of $\pm$ 8 nC.

## Chapter – Electric Potential

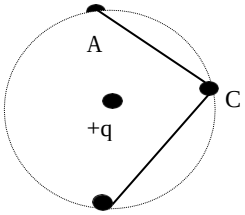
1. Two charges $q_1$ and $q_2$ separated by a small distance and satisfy the equation $q_1 + q_2 = 0$ what does it tell us about the charge.
2. i) Write the formula and unit of electric flux.

   ii) Draw equipotential surface due to point charge?

   iii) Can two similar charged ball attract each other?
3. An electric field $\vec{E} = (20\hat{i} + 30\hat{j})$ N/C is exists in the space. It the potential at the origin is zero, find the potential at point (2, 2) metre.
4. A point charge of $10^{-8}$ coulomb is situated at the origin of coordinates. Find the potential difference between two points A(4,4,2) m and B (1,2,2) m .
5. Draw the graph between $\vec{E}$ and $\vec{r}$ for a given sphere of radius R. Also draw the graph for V and r for it and write the difference between these graphs.
6. A proton moves with a speed of 7.45 x $10^5$ m/s directly towards a free proton at rest. Find the distance of closest approach of these two protons.
7. Derive the formula for potential energy of an electric dipole, placed in an electric field, making angle $\theta$ with the direction of dipole moment. Also write the formula for potential energy of dipole in stable equilibrium condition.
8. Prove that K.E. of a charge 'q' in potential difference 'v' is qv.
9. If E = 300 N/C is directed along to (-x) axis. Calculate the potential difference between AB, BC and CA if the point are given A (4, 1) B (4, 4) and C (-3, 4).
10. What would be the work done if a point charge (-1, q) is taken from point A to B on the circumference of a circle drawn with another point charge (+q) at the centre.

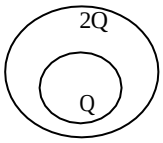


**11.** If a point charge (+q) is taken first from A to C then from C to B of a circle drawn, from another charge (+q) as the centre. Then along which path more work will be done.




## Chapter – Gauss Theorem

**12.** $S_1$ and $S_2$ are two hollow concentric sphere enclosing charges Q and 2Q respectively as shown in the figure.



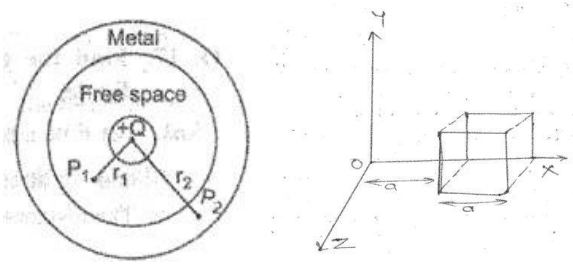

a) What is the ratio of the electric flux through $S_1$ and $S_2$.

b) How will the electric flux through the sphere $S_1$change , if a medium of dielectric constant 5 is introduced in the space inside $S_1$ in place of air?

**13.** The electric field components in figure are $E_x = \alpha\, a^{\frac{1}{2}}$, $E_y = E_z = 0$ in which $\alpha = 800$ N/C- $m^{\frac{1}{2}}$. Calculate for given cube: (If a = 100cm.)

i) The flux $\phi$ through the cube

ii) The charge within the cube

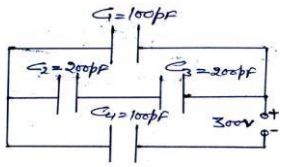


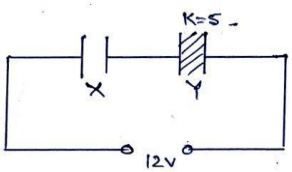

**14.** A small metal sphere carrying charge +Q is located at the centre of a spherical cavity in a large uncharged metal sphere as shown in figure. Use Gauss's theorem to find electric field at points $P_1$ and $P_2$.

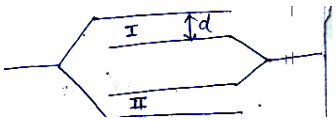
**15.** State the Gauss theorem and find the electric field due to a uniformly charged thin spherical shell of radius R for the condition of (i) r >> R (ii) r = R(iii) r << R

## Chapter – Capacitance

1. Obtain the equivalent capacitance of network, for a 300V supply. Determine the charge and voltage across each capacitor.




2. X and Y two paralled plate capacitor having same area and separation between the plates. X has air and Y dielectric of K = 5.

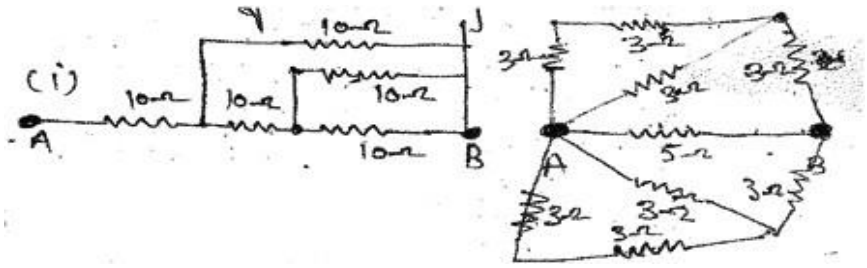
a) Calculate the capacitance of each capacitor if net capacitance is 4 $\mu$ F.

b) Find the ratio of electrostatic energy stored in X & Y.

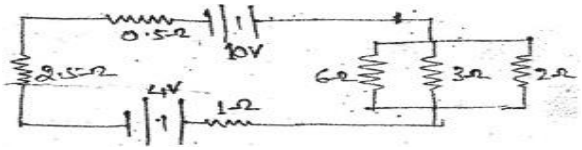
3. What is the capacitance of arrangement of 4 plates each of area A at a distance d in air as given in fig?

# CURRENT ELECTRICITY

1. Define the relation between $\vec{E}, \sigma$ and $\vec{J}$.
2. a) Carbon resistor are marked as follows. Find the resistance:
   i) Yellow, Red , Orange , Silver ii) Red , Yellow, Orange
   b) The external diameter of a 5m long hollow tube is 10 cm and the thickness of its wall is 5 mm. If the specific resistance of copper be 1.7 x 10-8 $\Omega$ -m. Find the resistance. ($R = 5.7 \times 10^{-5} R$)
3. a) A cylinder wire is stretched to increase its length by 10%. Calculate the percentage increase in resistance.
   b) Draw the graph showing variation of resistivity with temp for (i) Nichrome and (ii) Silicon.
4. Calculatethe equivalent resistance in each case between point A and B.

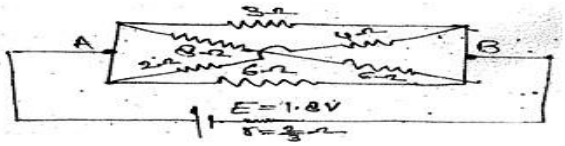



5. For the given circuit calculate:
   i) Current in the circuit
   ii) Current in the resistor of 6 $\Omega$
   iii) P.D across each battery



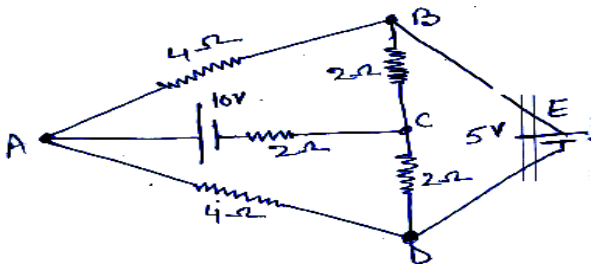

6. A battery of 10V and negligible internal resistance is connected across the diagonally opposite corner of a cubical resistor of R $\Omega$ each of resistance 1 $\Omega$ . Calculate the equivalent resistance of the network and current along the various edges of the cube.

7. Calculate the current in the 3 $\Omega$ resistor and the power dissipated in the entire given circuit.




8. There are two electric bulb rated 60W-110V and 100W – 150V. They are connected in series with a 220V DC. Supply will any bulb fuse? What if they are connected in parallel with the same supply?

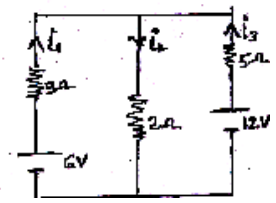
9. Determine the current in each branch of the given network as shown.



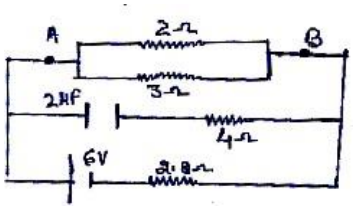

10. i) A carbon resister of resistance 47k $\Omega \pm$ 10% is given. What should be the sequence of colour bands?
    ii) The resistance of a platinum wire at the ice point is 5 $\Omega$ and at steam point is 5.23 $\Omega$ . When it is inserted in a hot bath resistance become 5.795 $\Omega$ . Calculate the temp of bath.

11. If n cells are connected in series and such m series are connected in parallel of same emf. Then find the total current released by combination if r is internal resistance of each cell if this combination of cell is connected with circuit Resistance 'R'. Find the condition when maximum current is drawn from the combination of cells.

**12** Calculate the value of current $i_1$, $i_2$ and $i_3$ in given network.

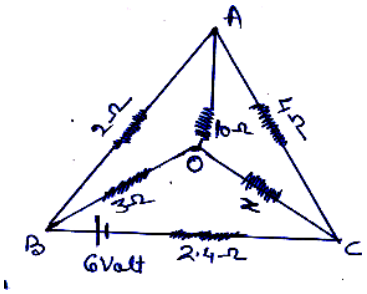



**13.** Calculate steady current through the 2 Ω resister in the circuit shown ?




**14.** Four identical cells, each of emf 2 V are joined in parallel and connect to an external circuit containing two resisters of 15 Ω each in parallel. The terminal potential of each cell is 1.6 volt. Calculate the internal resistance of each cell.

**15.** i) Explain with necessary theory the determination of internal resistance of cell by potentiometer.
ii) Find the value of x in given circuit, if no current is flowing through the wire AO ?




## PHOTO ELECTRIC EFFECT

1. Which of the following moving with the same velocity has the longest de-Broglie wavelength , $\bar{e}$, $p^+$, deutron $\alpha$ particle?
2. Describe Davisson and Germer's experiment to demonstrate the wave nature of electrons, with labelled diagram.
3. An $\alpha$ - particle and proton are accelerated from the state of rest through the same potential difference V. Find the ratio of de-Broglie wavelengths associated with them.
4. i) What is the effect of frequency in stopping potential. Explain with graph.

   ii) The work function of cesium is 2.14 ev. Find :
   a) Threshold frequency b) The wavelength of incident light if stopping potential is 0.06 valt.
5. X-rays of wavelength fall on a photosensitive surface of negligible work function. Show that the de-Broglie wave length of emitted electron will be $\sqrt{\frac{h\lambda}{2mc}}$. Where m is mass of electron.
6. What is the effect of frequency on photo current. Explain with graph for different frequencies.
   In an experiment on photo electric emission wave length of incident light is $1.98 \times 10^{-7}$ m. Stopping potential is 2.5 volt. Find –
   a) Threshold frequency b) Work function c) Max K.E. of photo electrons.
7. Two metals A and B have work function 2 ev and 4 ev respectively which one have lower threshold wavelength ? Write the formula also.
8. In an experiment on photoelectric effect, the slope of stoping potential $V_0$ versus frequency of incident light is $4.2 \times 10^{-15}$ V.s. Estimate the planck's constant.