CBSE Sample Paper - 02
Class – XII Physics (Theory)

Time allowed: 3 hours **M. M: 70**

General Instructions:

a) All the questions are compulsory.
b) There are **26** questions in total.
c) Questions **1** to **5** are very short answer type questions and carry **one** mark each.
d) Questions **6**to **10** carry **two** marks each.
e) Questions **11** to **22** carry **three** marks each.
f) Question No. **23** carry **four** marks each.
g) Questions **24** to **26** carry **five** marks each.
h) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.
i) Use of calculators is **not** permitted. However, you may use log tables if necessary.
j) You may use the following values of physical constants wherever necessary:

$c = 3x10^{8} m/s$

$h = 6.63x10^{-34} Js$

$e = 1.6x10^{-19} C$

$\mu_o = 4\pi x10^{-7} TmA^{-1}$

$\frac{1}{4\pi\varepsilon_0} = 9x10^{9} Nm^2C^{-2}$

$m_e = 9.1x10^{-31} kg$

---

1. What is the basic use of capacitor?
2. The current i flows in a wire of circular cross section with the free electrons travelling with a drift velocity v. What is the drift velocity of electrons when a current of 2i flows in another wire of twice the radius and of the same material?
3. A radioactive material has a half life of 1 minute. If one of the nuclie decays now, when will the next one decay?
4. What is the value of conductivity of a semiconductor at absolute zero?
5. The surfaces of sunglasses are curved, yet their power may be zero. Why?
6. A spherical conductor of radius 12 cm has a charge of 1.6×10^{-7}C distributed uniformly on its surface. What is the electric field inside the sphere?
7. A silver wire has a resistance of 2.1 Ω at 27.5 °C, and a resistance of 2.7 Ω at 100 °C. Determine the temperature coefficient of resistivity of silver.
8. A point charge of 2.0 μC is at the centre of a cubic Gaussian surface 9.0 cm on edge. What is the net electric flux through the surface?
9. A nucleus with mass number A = 240 and BE/A = 7.6 MeV breaks into two fragments, each of A = 120 with BE/A = 8.5 MeV. Calculate the released energy.
10. A spherical conductor of radius 12 cm has a charge of 1.6×10^{-7}C distributed uniformly on its surface. What is the electric field inside the sphere?
11. (a) What is meant by energy density of a parallel plate capacitor? Derive its expression also.

(b) What is the area of the plates of a 2 Farad parallel plate air capacitor, given that the separation between the plates is 0.5 cm?

12. (a) For the given carbon resistor, let the first strip be yellow, second strip be red, third strip be orange and forth be gold. What is its resistance? (b) What are thermistors?
13. State Ampere's circuital law. Also find the expression for the magnetic field due to the infinite long straight wire carrying current by using this law.
14. (a) What do you mean by hypermetropia? What are its possible cause and how it is corrected?
    (b) A hypermetropic person whose near point is at 100 cm wants to read a book at 25 cm. Find the nature and power of the lens needed.
15. Light falls from glass (n = 1.5) to air. Find the angle of incidence from which the angle of deviation is 90^0?
16. (a) Represent the AM process graphically.
    (b) Write its two advantages
17. Derive an expression for the electric field intensity due to two thin infinite parallel sheets of charge.
18. (a) Define current density and conductance.
    (b) Derive the relation between current density, conductance and electric field.
19. (a) The connecting wires are of copper. Why?
    (b) Calculate the resistivity of the material of wire 1 m long, 0.4 mm in diameter and having resistance of 2 ohm.
20. (a) A transistor does not work in railway carriage. Why?
    (b) A common emitter amplifier is designed with npn transistor (α = 0.99). The input impedance is 1 kΩ and load is 10 kΩ. Find the voltage gain and power gain.
21. (a) What do you mean by modulation and demodulation? Explain.
    (b) An audio signal of amplitude 0.1 V is used in amplitude modulation of a carrier wave of amplitude 0.2 V. Calculate the modulation index.
22. (a) Define decay constant.
    (b) The sequence of decay of radioactive nucleus is $D \xrightarrow{\alpha} D_1 \xrightarrow{\beta} D_2 \xrightarrow{\alpha} D_3 \xrightarrow{\alpha} D_4$

    If nucleon number and atomic number of D_2 are 176 and 71 respectively, what are their values for D and D_4?
23. Ram and Shyam went to the trade fair. They were busy in a crowded corner where the balloons were sold. A child was seen troubling his parent and crying for something. On seeing this, Ram went to the child and said that he would perform a trick with balloons. Ram took two balloons and Shyam helped him to inflate and tie. When the balloons were rubbed with the sweater he was wearing, they were attracted. When taken nearer to wall, the balloons got stuck. The child enjoyed and stopped crying.
    (a) Give two values of Ram and Shyam.
    (b) How did the balloons get attracted? Will they repel also?
24. (a) Using Gauss law, derive an expression for the electric field intensity at any point outside a uniformly charged thin spherical shell of radius R and charge density $\sigma C/m^2$. Draw the field lines when the charge density of the sphere is positive and negative.
    (b) A uniformly charged conducting sphere of 2.5 m in diameter has a surface charge density of $100\mu C/m^2$. Calculate the
    (i) Charge on the sphere
    (ii) Total electric flux passing through the sphere.

Or

A spherical capacitor has an inner sphere of radius 12 cm and an outer sphere of radius 13 cm. the outer sphere is earthed and the inner sphere is given a charge of 2.5μC. the space between the concentric spheres is filled with liquid of dielectric constant 32.

(a) Determine the capacitance of the capacitor

(b) What is the potential of the inner sphere

(c) Compare the capacitance of this capacitor with that of an isolated sphere of radius 12 cm. explains why the latter is much smaller.

25. Two charges 5×10^{-8} C and -3×10^{-8} C are located 16 cm apart. At what point(s) on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero.

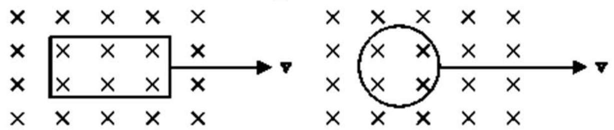
Or

A parallel plate capacitor with air between the plates has a capacitance of 8 pF (1pF = 10^{-12}F). What will be the capacitance if the distance between the plates is reduced by half, and the space between them is filled with a substance of dielectric constant 6?

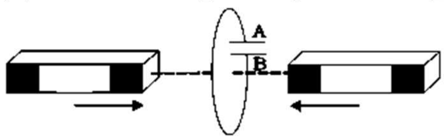
26. (a) A closed loop is held stationary in the magnetic field between the north and south poles of two permanent magnets held fixed. Can we hope to generate current in the loop by using very strong magnets?

(b) A closed loop moves normal to the constant electric field between the plates of a large capacitor. Is a current induced in the loop, (i) when it is wholly inside the region between the capacitor plates, (ii) when it is partially outside the plates of the capacitor? The electric field is normal to the plane of the loop.

(c) A rectangular loop and a circular loop are moving out of a uniform magnetic field region in the figure given below to a field-free region with a constant velocity v. In which loop do you expect the induced emf to be constant during the passage out of the field region? The field is normal to the loops.

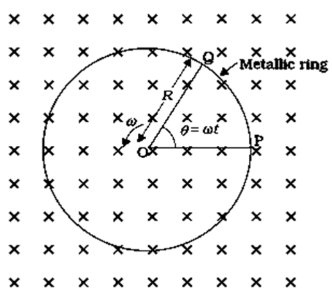


(d) Predict the polarity of the capacitor in the situation described in the figure below:



Or

A metallic rod of 1 m length is rotated with a frequency of 50 rev/s, with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius 1 m, about an axis passing through the centre and perpendicular to the plane of the ring in the figure given below. A constant and uniform magnetic field of 1 T parallel to the axis is present everywhere. What is the emf between the centre and the metallic ring?



CBSE Sample Paper - 02
Class – XII Physics (Theory)

Time allowed: 3 hours **Maximum Marks: 70**

Solutions

1. To store the charge and electricity.
2. $v_d = \frac{i}{nAe} = v$

   $v_d^{`} = \frac{2i}{n(4A)e} = \frac{1}{2}\frac{i}{nAe} = \frac{v}{2}$

3. The next nucleus can decay any time.
4. Zero
5. The both the surfaces of sun glasses are curved. Also, $R_1 = R_2$

   As $P = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

   P = 0.

6. Radius of the spherical conductor, r = 12 cm = 0.12 m
   Charge is uniformly distributed over the conductor, $q = 1.6 \times 10^{-7}$ C
   Electric field inside a spherical conductor is zero. This is because if there is field inside the conductor, then charges will move to neutralize it.
7. Temperature, $T_1 = 27.5°C$
   Resistance of the silver wire at T_1, $R_1 = 2.1\Omega$
   Temperature, $T_2 = 100°C$
   Resistance of the silver wire at T_2, $R_2 = 2.7\Omega$
   Temperature coefficient of silver = α
   It is related with temperature and resistance as
   $\alpha = \frac{R_2 - R_1}{R_1(T_2 - T_1)}$
   $= \frac{2.7 - 2.1}{2.1(100 - 27.5)} = 0.0039°C^{-1}$
   Therefore, the temperature coefficient of silver is $0.0039°C^{-1}$.
8. Net electric flux (ϕ_{net}) through the cubic surface is given by,

   $\phi_{net} = \frac{q}{\in_0}$
   Where,
   $\in_0$ = Permittivity of free space
   $= 8.854 \times 10^{-22} N^{-1}C^2m^{-2}$
   q = Net charge contained inside the cube = 2.0 μC = 2×10^{-6} C
   $\therefore \phi_{Net} = \frac{2 \times 10^{-6}}{8.854 \times 10^{-12}}$

$= 2.26 \times 10^5\ Nm^2c^{-1}$

The net electric flux through the surface is 2.26 ×10^5 N m^2C^{-1}.

9. The binding energy of the nucleus of mass number $240, B_1 = 7.6 \times 240 = 1824\,MeV$ The binding energy of each product nucleus, $B_2 = 8.5 \times 120 = 1020\,MeV$. Then, the energy released as the nuclues breaks is given by $E = 2B_2 - B_1 = 2 \times 1020 - 1824 = 216\,MeV$
10. Radius of the spherical conductor, r = 12 cm = 0.12 m
Charge is uniformly distributed over the conductor, $q = 1.6 \times 10^{-7}$ C
Electric field inside a spherical conductor is zero. This is because if there is field inside the conductor, then charges will move to neutralize it.
11. (a) It is defined as the total energy stored per unit volume of the capacitor.
Expression:

$$u = \frac{\text{total energy(U)}}{\text{volume(V)}} = \frac{\frac{1}{2}\text{CV}^2}{\text{Ad}} = \frac{1}{2}\left(\frac{\epsilon_0 A}{d}\right)\left(\frac{E^2d^2}{Ad}\right)$$

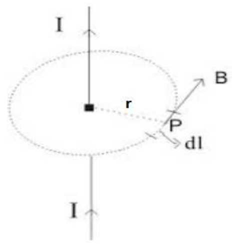
$$u = \frac{1}{2}\epsilon_0 E^2$$

(b) C = 2 Farad, d = 0.5 cm = 5 × 10^{-3} m, ϵ_0 = 8.85 × 10^{-12} $C^2N^{-1}m^{-2}$, A = ?

$$C = \frac{\epsilon_0 A}{d}$$

$$A = \frac{Cd}{\epsilon_0} = \frac{2 \times 5 \times 10^{-3}}{8.85 \times 10^{-12}} = 1.13 \times 10^9\ m^2.$$

12. (a) As we know that the numbers for yellow, red and orange are 4, 2 and 3. Gold represents tolerance of ± 5%.
Thus, the value of resistance is 42 × 10^3 Ω ± 5%.
(b) A thermistor is a heat sensitive device whose resistivity changes very rapidly with change of temperature.
13. It states that the line integral of magnetic field $\vec{B}$ induction around a closed path in vacuum is equal to μ_0 times the total current I threading the closed path.
Expression for the magnetic field:
Consider an infinite long straight wire lying in the plane of paper. Let I be the current flowing through it from X to Y. A magnetic field is produced which is has the same magnitude at all the points that are at the same distance from the wire, i.e., the magnetic field has cylindrical symmetry around the wire.



Let P be a point at a perpendicular distance r from the straight wire and $\vec{B}$ be the magnetic field at point P. Now consider an ampereian loop as a circle of radius r, perpendicular to the plane of paper with centre on the wire such that point P lies on the loop. The magnitude of the magnetic field is same at all points on this loop. The magnetic field is tangential to the circumference of the circular loop. The line integral $\vec{B}$ round the closed loop is:

$$\oint \vec{B}.d\vec{l} = \oint B\,dl\,Cos0° = B\oint dl = B\,2\pi r$$

Now by using the Ampere's circuital law

$$\oint \vec{B}.d\vec{l} = \mu_0 I$$

$$B\,2\pi r = \mu_0 I$$

Or

$$B = \frac{\mu_0 I}{2\pi r} = \frac{\mu_0}{4\pi}\frac{2I}{r},$$

14. (a) It is the defect of human eye by virtue of which the eye can see clearly the far off objects but the nearby objects cannot be seen clearly. In case of hypermetropia, the near point shifts away from the eye.
The main causes of this defect is:
(i) contraction in the size of the eye ball (ii) increase in the focal length of eye lens.
To correct this defect, the person has to use the spectacles with convex lens of suitable focal length.
(b) u = - 25 cm, v = - 100 cm, f = ?
By using lens equation,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{25} - \frac{1}{100} = \frac{3}{100}$$

f = 100/3 = 33.3 cm
P = 100/f = 100/(100/3) = 3 D.

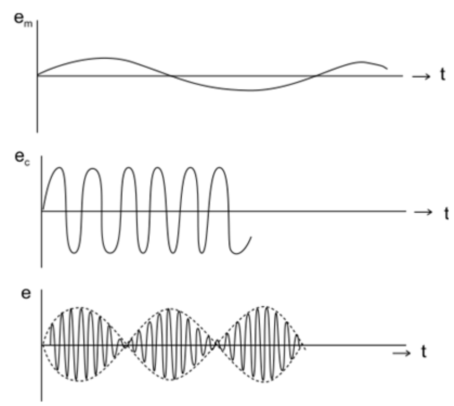
15. Since

$$\sin i_e = \frac{1}{n} = \frac{1}{1.5} = 0.6667$$

$$i_e = 41.8^0$$

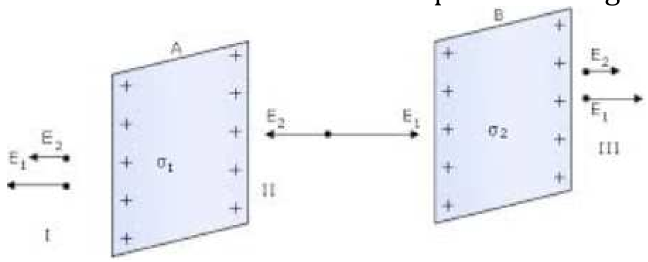
Deviation = $90^0 - i_c = 90^0 - 41.8^0 = 48.2^0$
This is the maximum attainable deviation in refraction.
In reflection deviation = $180^0 - 2i$
Therefore i = 45^0

16.



Advantages:
(i) For speech transmission
(ii) Short range distance communication.

17. Let A and B be two thin infinite parallel charged sheets held parallel to each other.



Let, σ_1 = uniform surface density of charge on A, σ_2 = uniform surface density of charge on B. Now by using the superposition principle, we can calculate the electric field. By the convention, a field pointing from left to right is taken as positive and the one pointing from right to left is taken as negative. Here we assume that $\sigma_1 > \sigma_2 > 0$.

In region I: $E_I = -E_1 - E_2 = \frac{-\sigma_1}{2\epsilon_0} - \frac{\sigma_2}{2\epsilon_0} = \frac{-1}{2\epsilon_0}(\sigma_1 + \sigma_2)$

In region II: $E_{II} = E_1 - E_2 = \frac{\sigma_1}{2\epsilon_0} - \frac{\sigma_2}{2\epsilon_0} = \frac{1}{2\epsilon_0}(\sigma_1 - \sigma_2)$

In region III: $E_{III} = E_1 + E_2 = \frac{\sigma_1}{2\epsilon_0} + \frac{\sigma_2}{2\epsilon_0} = \frac{1}{2\epsilon_0}(\sigma_1 + \sigma_2)$

In some special cases, let $\sigma_1 = \sigma$ and $\sigma_2 = -\sigma$

So, $E_I = 0$

$E_{II} = \frac{2\sigma}{2\epsilon_0} = \frac{\sigma}{\epsilon_0}$ = a constant

$E_{III} = 0$

18. (a) The current density at a point in a conductor is defined as the amount of current flowing per unit area of the conductor around that point provided the area is held in a direction normal to the current. It is denoted by J.

density = Electric current / Area

It is a vector quantity and its unit is Ampere/metre^2.

The reciprocal of resistance is called conductance. It is denoted by G.

Conductance = 1 / resistance

Its unit is mho or siemen.

(b) As we know that, $I = neAv_d$

$I = nAe\left(\frac{eE}{m}\tau\right) = \frac{nAe^2\tau E}{m}$

$\frac{I}{A} = \frac{ne^2\tau E}{m}$

$J = \frac{I}{A} = \frac{1}{\rho}E \qquad \left(\because \rho = \frac{m}{ne^2\tau}\right)$

$J = \sigma E \qquad \left(\because \sigma = \frac{1}{\rho}\right)$

It is also called as the microscopic form of Ohm's law.

19. (a) The electrical conductivity of copper is high. Therefore, it conducts the current without offering much resistance. The copper being diamagnetic material does not get magnetized due to current through it and hence does not disturb the current I the circuit.

(b) Here, l = 1 m, D = 0.4 × 10^{-3} m = 4 × 10^{-4} m, R = 2 ohm

Area of crossection, A = $\frac{\pi D^2}{4} = \frac{\pi(4\times10^{-4})^2}{4} = 4\pi\times10^{-8}\,m^2$

Now, $\rho = \frac{RA}{l} = \frac{2\times4\pi\times10^{-8}}{1} = 2.514\times10^{-7}\,\Omega m$

20. (a) The railway carriage works as an electric screen. The electric field inside the carriage is zero and any change from outside in electric field cannot enter the carriage. Hence the electromagnetic signals do not find their entry in the railway carriage. Due to this, the transistor does not work in railway carriage.

(b) $\beta = \frac{\alpha}{1-\alpha} = \frac{0.99}{1-0.99} = 99$

Volatge gain, A_v = $\beta\frac{R_0}{R_i} = 99\times\frac{10\times10^3}{1\times10^3} = 990$

Power gain = $\beta^2\frac{R_0}{R_i} = (99)^2\times\frac{10\times10^3}{1\times10^3} = 98010$

21. (a) Modulation is the process of superimposing the low frequency message signal on a high frequency wave. The resulting wave is the modulated wave which is to be transmitted.
Demodulation is the reverse process of modulation. It is the phenomenon of retrieval of information from modulated wave at the receiver.

(b) Here, A_m = 0.1 V, A_c = 0.2 V

$\mu = \frac{A_m}{A_c} = \frac{0.1}{0.2} = 0.5$

22. (a) The decay constant of a radioactive element is the reciprocal of the time during which the number of atoms left in the sample reduces to 1/e times the original number of atoms in the sample.

(b) As the mass number of each α particle is 4 units and its charge number is 2 units, therefore, for D_4

A = 176 – 8 = 168, Z = 71 – 4 = 67

Now, charge number of β is -1 and its mass number is zero, therefore, for D

A = 176 + 0 + 4 = 180, Z = 71 – 1 + 2 = 72

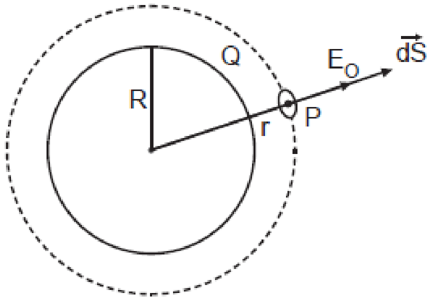
23. (a) Presence of mind and knowledge of static electricity.

(b) When balloons were rubbed with woolen sweater, it becomes negatively charged. When taken nearer the wall, positive charges are induced by electrostatic induction on that part of the wall, so gets attracted. Yes, when the bodies are similar charged they repel.

24. (a) Electric field intensity at a point outside a uniformly charged thin spherical shell- consider a uniformly charged thin spherical shell of radius R carrying charge Q. to find the electric field outside the shell, we consider a spherical Gaussian surface of radius (>R), Concentric with given shell. If $\vec{E}$ is electric field outside the shell, then by symmetry electric field strength has same magnitude E_0 on the Gaussian surface and is directed radially outward. Also the directions of normal at each point is radially outward, so angle between $\vec{E_i}$ *and* d$\vec{S}$ is zero at each point. Hence, electric flux through Gaussian surface will be,

$\oint S\vec{E}.d\vec{S}$

$\oint E_0 dS\cos 0 = E_o.4\pi r^2$



Now Gaussian surface is outside the given charged shell, so charge enclosed by bGaussian surface Q. hence Gaus theoerm

$$\oint \vec{E_o}.d\vec{E} = \frac{1}{\varepsilon_o} \text{ x charged enclosed}$$

$$E_0 4\pi r^2 = \frac{1}{\varepsilon_0} \text{ x Q}$$

$$\text{E}_0 = \frac{1}{4\pi\varepsilon_o}\frac{Q}{r^2}$$

Thus electric field outside a charged thin spherical shell is the same as if the whole charge Q is concentrated at the centre.

If σ is the surface charge density of the spherical shell then,

$$\phi = 4\pi R^2 \sigma C$$

$$E_0 = \frac{1}{4\pi\varepsilon_0}\frac{4\pi R^2\sigma}{r^2} = \frac{R^2\sigma}{\varepsilon_0 r^2}$$

(b) Given

$$\sigma = 100\mu C/m^2 = 100 \text{ x } 10^{-6} C/m^2$$

Diameter D = 2 R = 2.5 m

(i) Charge on sphere Q = $\sigma.4\pi R^2 = \sigma.\pi(2R)^2$

$$= (100 \text{ x } 10^{-6} C/m^2) \text{ x } 3.14 \text{ x } (2.5 \text{ m})^2$$

$$= 19.625 \text{ x } 10^{-4} C$$

$$= 1.96 mC$$

(ii) Electric flux passing through the sphere

$$\phi = \frac{1}{\varepsilon_0}(Q) = \frac{1}{8.86 \text{ x } 10^{-12}} \text{ x } (1.96 \text{ x } 10^{-3})$$

$$= 2.21 \text{ x } 10^8 Nm^2C^{-1}$$

Or

Radius of the inner sphere r_2 = 12cm = 0.12m

Radius of the outer sphere r_1 – 13 cm = 0.13 m

Charge on the inner sphere q = 2.5μC = 2.5 x 10^{-6}C

Dielectric constant of a liquid ε_r = 32

(a) Capacitance of the capacitor is given by the relation

$$C = \frac{4\pi\varepsilon_0\varepsilon_1 r_1 r_2}{r_1 - r_2}$$

Where ε0 = permittivity of the free space = 8.85 x 10^{-12} C^2 N^{-1} m^{-2}

$$\frac{1}{4\pi\varepsilon_0} = 9x10^9\,Nm^2C^{-2}$$

$$C = \frac{32 \text{ x } 0.12 \text{ x } 0.13}{9 \text{ x } 10^9 \text{x } (0.13 - 0.12)}$$

$$C = 5.5x10^9\,F$$

Hence the capacitance of the capacitor is approximately 5.5 x 10^{-9} F

(b) Potential of the inner sphere is given by

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

$$r = \frac{2.5 \text{ x } 10^{-6}}{5.5 \text{ x } 10^9} = 4.5 \text{ x } 10^2\text{V}$$

Hence, the potential of the inner sphere is 4.5 x 10^2V.

(c) Radius of an isolated sphere r = 12 x 10^{-2}m

Capacitance of the sphere is given by the reaction,

$C' = 4\pi\varepsilon_0 r$

= 4π x 8.85 x 10^{-12} x 12 x10^{-12}

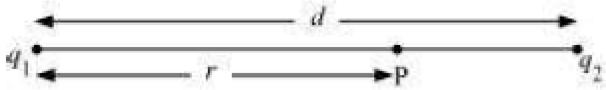
= 1.33 x 10^{-11}F

The capacitance of the isolated sphere is less in comparison to the concentric spheres. This is because the outer sphere of the concentric spheres is earthed. Hence the potential difference is less and the capacitance is more than the isolated sphere.

25. There are two charges, q_1 = 5 x 10^{-8}C andq_2 = -3 x 10^{-8} C

Since between the two charges, d = 16 cm = 0.16 m.

Consider a point P on the line joining the two charges, as shown in the given figure.



Distance of point P from charge q_1 = r

Let the electric potential (V) at point P be zero.

Potential at point P is the sum of potentials caused by charges q_1 and q_2 respectively.

$$V = \frac{q_1}{4\pi\varepsilon_0 r} + \frac{q_2}{4\pi\varepsilon_0 (d\text{-}r)} ---------- (1)$$

Where ε_0 = permittivity of free space. For V =0 , equation (1) reduces to

$$\frac{q_1}{4\pi\varepsilon_0 r} = -\frac{q_2}{4\pi\varepsilon_0 (d\text{-}r)}$$

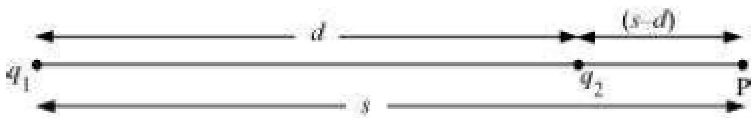
$$\frac{q_1}{r} = -\frac{q_2}{d - r}$$

Substituting the values, we get

R = 0.1 m = 10 cm

Therefore the potential is zero at distance of 10 cm from the positive charge between the charges.

Suppose point P is outside the system of two charges at a distance s from the negative charge, where potential is zero as shown in the figure.



For this arrangement, potential is given by

$$V = \frac{q_1}{4\pi\varepsilon_0 s} + \frac{q_2}{4\pi\varepsilon_0 (s - d)} ----------(2)$$

For V =0, equation (ii) reduce to,

$$\frac{q_1}{s} = -\frac{q_2}{(s - d)}$$

Substituting the values, we get
s = 0.4 m = 40 cm
Therefore, potential is zero at a distance of 40cm from the positive charge outside the system of charges.

Or

Capacitance between the parallel plates of the capacitor C = 8 pF
Initially distance between the parallel plates was d and it was filled with air. Dielectric constant of air k=1,
Capacitance C is given by formula

$$C = \frac{k\varepsilon_0 A}{d} = \frac{\varepsilon_0 A}{d} \text{-------------- (1)}$$

Where A = area of each plate and ε_0 = permittivity of free space.
If the distance between the plates is reduced to half, then new distance $d' = d/2$
Dielectric constant of the substance filled in between the plates $k' = 6$

$$C = \frac{k'\varepsilon_0 A}{d'} = \frac{6\varepsilon_0 A}{\frac{d}{2}} \text{-------------- (2)}$$

Taking ratios of equation (i) and (ii) we obtain
$C' = 2 \times 6C$
$= 12\ C$
$= 12 \times 8 = 96$ pF
Therefore, the capacitance between the plates is 96pF.

26. (a) No. However strong the magnet may be, current can be induced only by changing the magnetic flux through the loop.
(b) No current is induced in eithercase. Current cannot be induced by changing the electric flux.
(c) The induced emfis expected to be constant only in the case of the rectangular loop. In the case of circular loop, the rate of change of area of the loop during its passage out of the field region is not constant; hence induced emfwill vary accordingly.
(d) The polarity of plate 'A' will be positive with respect to plate 'B' in the capacitor.

Or

As the rod is rotated, free electrons in the rod move towards the outer end due to Lorentz force and get distributed over the ring. Thus, the resulting separation of charges produces an emf across the ends of the rod. At a certain value of emf, there is no more flow of electrons and a steady state is reached. We know that, the magnitude of the emf generated across a length d*r* of the rod as it moves at right angles to the magnetic field is given by,
$D\varepsilon = Bvdr$, hence

$$\varepsilon = \int d\varepsilon = \int_0^R Bvdr = \int_0^R B\omega r dr = \frac{B\omega R^2}{2}$$

Substituting the value, we get 157 V.