# SAMPLE QUESTION PAPER
## Physics (Theory) - Class XII (Code A)

**Time : 3 Hours** **Max. Marks : 70**

## General Instructions :

(i) All questions are compulsory.

(ii) There are 30 questions in total. Questions 1 to 8 are very short answer type questions and carry one mark each.

(iii) Questions 9 to 18 carry two marks each, questions 19 to 27 carry three marks each and questions 28 to 30 carry five marks each.

(iv) There is no over all choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choice in such questions.

(v) Use of calculator is not permitted. However, you may use log tables if necessary.

(vi) You may use the following physical constants wherever necessary :

$c = 3 \times 10^8$ m/s

$h = 6.63 \times 10^{-34}$ Js

$e = 1.6 \times 10^{-19}$ C

$\mu_0 = 4\pi \times 10^{-7}$ Tm A$^{-1}$

$$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \ \frac{\text{Nm}^2}{\text{C}^2}$$

1. Is free neutron a stable particle? **[1]**

2. Write expression for displacement current. **[1]**

3. Name the electromagnetic radiations used for viewing objects through fog. **[1]**

4. You are sitting in a room, an electron comes from your back in a horizontal plane and gets deflected to your right. What is the direction of magnetic field existing in your room? **[1]**

5. A photon and an electron both have same energy *E*. What is the ratio of their wavelength? **[1]**

6. An electric dipole of moment *p* is in stable equilibrium position in a uniform electric field *E*. What is the work done by the field in rotating it to unstable equilibrium position? **[1]**

7. A rectangular glass slab is kept over two coloured dots viz. blue and red. When viewed from top, which dot will appear closer to the eye? **[1]**

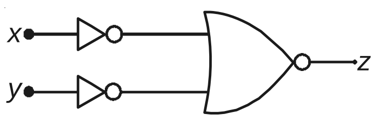
8. The potential difference across a conductor of uniform cross-section is doubled. What happens to the drift velocity of electrons inside the conductor? **[1]**

9. Draw the ray diagram of an astronomical telescope for normal adjustment. **[2]**

10. The image formed by a convex mirror of focal length 30 cm is of one fourth height compared to that of the object. What is the distance of the object from the mirror? **[2]**

11. Why GaAs is better than Si for making solar cells? **[2]**

12. Write the truth table of the following logic gate. **[2]**




13. Write down the expression for electrical potential energy of system of three point charges $Q_1$, $Q_2$ and $Q_3$ kept at the three vertices of an equilateral triangle of side $L$. **[2]**

14. What do you understand by "dynamo effect"? **[2]**

15. About 20% of the power of a 100 W light bulb is converted to visible radiation. What is the average intensity of visible radiation at a distance 1 m from the bulb? **[2]**

16. Prove that the angular bandwidth of a series $LCR$ resonance circuit is $\frac{R}{L}$. **[2]**

**OR**

Obtain an expression for the self inductance of a solenoid having length $l$, number of turns $N$ and area of each turn $A$.

17. There are $10^7$ radioactive nuclei in a given radioactive element. Its half life is 20 s. How many nuclei will remain after 10 seconds? **[2]**

18. A message signal of frequency 20 kHz and peak voltage of 20 volt is used to modulate a carrier of frequency 1 MHz and peak voltage of 30 volts. Determine

(a) Modulation index **[1]**

(b) The side bands produced **[1]**

19. Draw a graph to show the variation of stopping potential with frequency of radiations incident on a metal plate. How can we calculate the value of Planck's constant from this graph? **[3]**

20. A tube of hydrogen atoms in ground state is pumped with electrical energy of 12.09 eV. How many spectral lines will be detected in emission spectra? **[3]**

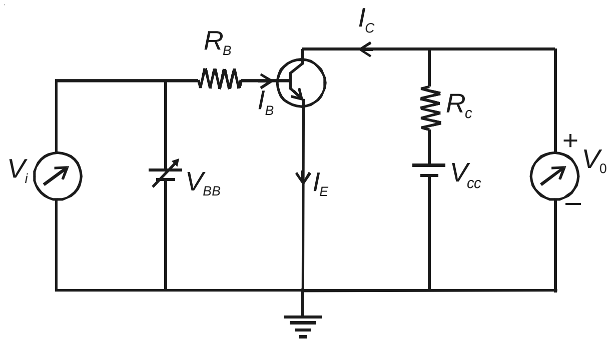
21. Draw the typical input characteristics and output characteristics for a NPN transistor in CE configuration. **[3]**

22. A 10 m long wire of uniform cross-section and 20 Ω resistance is used in a potentiometer. The wire is connected in series with a battery of 5 V along with an external resistance of 480 Ω. If an unknown emf $E$ is balanced at 6 m length of the wire. Calculate **[3]**

(a) Potential gradient of potentiometer wire

(b) The value of unknown emf $E$

23. Refer to the base biased transistor in CE configuration below.




It is given that supply $V_{BB}$ has a range of 0 V to 5 V. The Si transistor has $\beta_{dc}$ = 200 and $R_B$ = 150 kΩ, $R_c$ = 1.5 kΩ. and $V_{cc}$ = 4.5 V. Assume that when the transistor is saturated, $V_{CE}$ = 0 and $V_{BE}$ = 1 volt. **[3]**

(a) Calculate the minimum base current, for which the transistor will reach saturation.

(b) Find $V_i$ when transistor is switched on.

24. A 30 volt, 10 watt lamp is connected in series with an emf of 220 volt and frequency 50 Hz. Find the capacity of a condenser required to be connected in series with the source. **[3]**

25. Prove that resistivity of a conductor is inversely proportional to relaxation time. **[3]**

**OR**

Write down the limitations of Ohm's law.

26. A straight rod of length *L* moves on a rectangular conducting frame kept inside a uniform magnetic field *B* perpendicular to its length with uniform velocity *v*. Derive an expression for the **[3]**

(a) EMF induced in the rod.

(b) Power required to move the rod.

27. A 0.02 cm wide slit is illuminated at normal incidence by light having wavelength 6000 Å. What would be the width of central maximum, if the apparatus is immersed in water of refractive index 4/3 and the screen is 1 m away from the slit? **[3]**

28 (a) Define total internal reflection and critical angle. Find the relation between critical angle and refractive index. Under what conditions does total internal reflection take place? **[2½]**

(b) A compound microscope has lenses of focal length 10 mm and 30 mm. An object placed at 1.2 cm from the first lens is seen through the second lens at 0.25 m from the eye lens. Calculate distance between the two lenses. **[2½]**

**OR**

(a) What is meant by interference of light? Describe briefly Young's double slit experiment to demonstrate interference of light.

(b) What do you understand by wavefront? Prove Snell's law of refraction on the basis of wave theory.

29. (a) Using Gauss's theorem derive an expression for electric field intensity at a point inside and outside a uniform spherical distribution of charge in air. Volume charge density $\rho$ and radius $R$. **[2½]**

(b) A plastic rod of length 4.4 m and radius 7.2 mm carries a negative charge of $7.6 \times 10^{-7}$ C spread uniformly over its surface. What is the electric field near the mid-point of the rod, at a point on its surface? **[2½]**

**OR**

(a) Derive an expression for the capacitance of a parallel plate capacitor with a dielectric slab placed in between the two plates partially.

(b) Two identical charges each of mass $10^{-2}$ kg and charge 200 $\mu$C each are kept 1 cm apart and released. Find the speed of each particle when they reach infinity.

30. (a) Using Biot-Savart's law derive an expression for the magnetic field due to a finite straight wire at a perpendicular distance $d$. The angle subtended by the two ends of the wire at the point are $\phi_1$ and $\phi_2$. **[2½]**

(b) A long straight solid metal wire of radius $R$ carries a current $I$, uniformly distributed over its circular cross-section. Find the magnetic field at a distance $r$ from axis of wire (i) inside and (ii) outside the wire. **[2½]**

**OR**

(a) Write down the principle and construction of a moving coil galvanometer.

(b) Derive an expression for the current and voltage sensitivity of the galvanometer. Will increase in current sensitivity necessarily increase the voltage sensitivity?

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# Physics (Theory) - Class XII

## SOLUTIONS

1. No. It decays into a proton, an electron and antineutrino.

2. $I_D = E_0 \dfrac{d\phi_E}{dt}$

3. Infrared radiations.

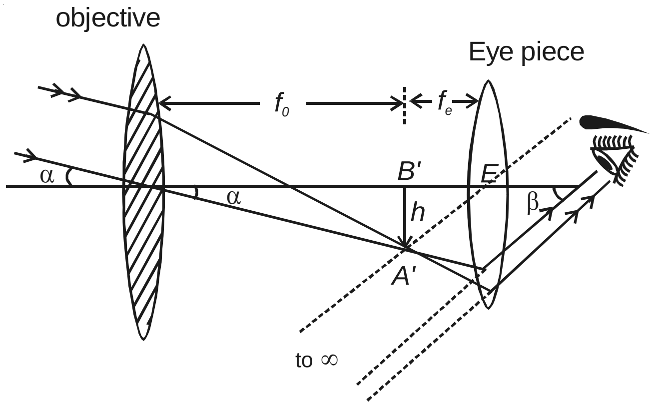
4. Vertically downwards.

5. $\dfrac{\lambda_p}{\lambda_e} = \dfrac{hc/E}{h/\sqrt{2mE}} = c\sqrt{\dfrac{2m}{E}}$

6. $-2pE$

7. Blue dot.

8. Drift velocity gets doubled.

9. 


10. $\dfrac{-v}{u} = \dfrac{1}{4}$.

$\dfrac{1}{v} + \dfrac{1}{u} = \dfrac{1}{f}$ or, $\dfrac{-4}{u} + \dfrac{1}{u} = \dfrac{1}{f}$ or, $\dfrac{-3}{u} = \dfrac{1}{30}$

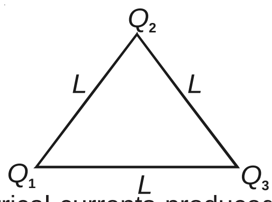
$\therefore$ $u$ = – 90 cm.

11. GaAs is better (inspite of its higher band gap) than Si because of its relatively higher absorption coefficient.

12.

| $x$ | $y$ | $z$ |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

13. Potential energy $U = U_{12} + U_{23} + U_{13}$




$$= \frac{1}{4\pi\varepsilon_0 L}\ [Q_1Q_2 + Q_2Q_3 + Q_1Q_3]$$

14. The earth's magnetic field is assumed to arise due to electrical currents produced by **convective** motion of metallic fluids (consisting mostly of molten iron and nickel) in the outer core of the earth. This is known as the "dynamo effect".

15. Intensity = $\dfrac{\text{Power}}{\text{area}} = \dfrac{0.2\times 100}{4\pi 1^2} = \dfrac{5}{\pi}$ watt/m$^2$

16. Quality factor = $\dfrac{\omega_0 L}{R}$

This is also given as $\dfrac{\omega_0}{\Delta\omega}$ (Here $\Delta\omega$ is band width)

$\therefore\ \dfrac{\omega_0 L}{R} = \dfrac{\omega_0}{\Delta\omega}$

$\therefore\ \Delta\omega = \dfrac{R}{L}$

**OR**

Let the length of the solenoid be $\ell$, number of turns be $N$ and area of each turn be $A$.

If current $I$ passes through the coil, then the magnetic field $B$ through it will be $B = \mu_0 \dfrac{N}{\ell} I$

Total flux $\phi$ through the coil is $BNA = \dfrac{\mu_0 N^2 A I}{\ell}$

$\therefore$ Coefficient of self inductance $L = \dfrac{\phi}{I} = \dfrac{\mu_0 N^2 A}{\ell}$

17. Here $N_0 = 10^7$. Number of half lives = $\dfrac{10}{20} = \dfrac{1}{2}$

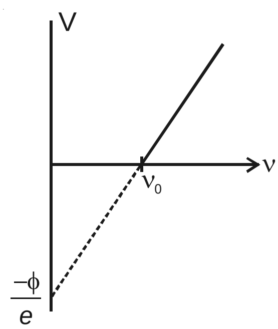
$$N = N_0\left(\frac{1}{2}\right)^n = 10^7\left(\frac{1}{2}\right)^{1/2} \approx 7\times 10^6 \text{ nuclei.}$$

18. (a) Modulation index = $\dfrac{A_m}{A_c} = \dfrac{20}{30} = \dfrac{2}{3}$

(b) The side bands are at (1000 + 20) = 1020 kHz and (1000 – 20) = 980 kHz

19. Einstein's photoelectric equation is

$eV = h\nu - \phi$ $\quad\therefore\ V = \dfrac{h}{e}\nu - \dfrac{\phi}{e}$




($\nu_0$ : threshold frequency)

From the equation it can be seen that the slope of the graph = $\dfrac{h}{e}$

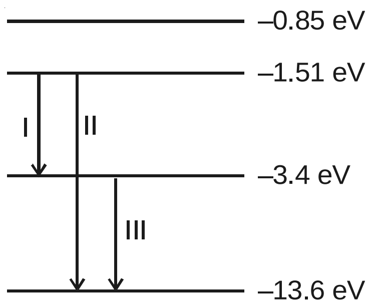
So, Planck's constant $h = e \times$ slope of the graph

(where $e$ = electronic charge)

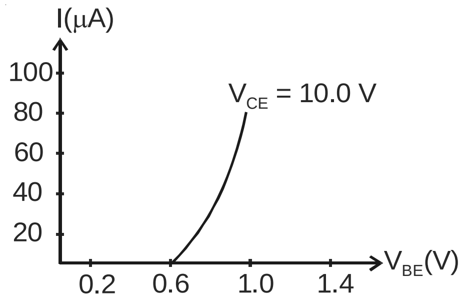
20. The highest energy value upto which the electrons can equal to

$$-13.6 \text{ eV} + 12.09 \text{ eV} = -1.51 \text{ eV}$$

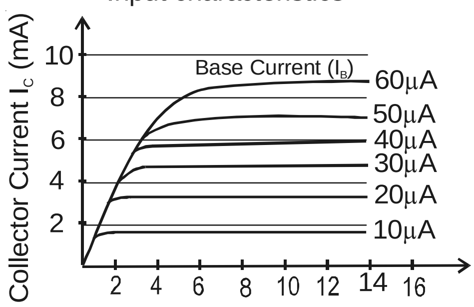
So the maximum transition will be upto $n = 3$ because here the energy value is –1.51 eV. So the emission spectra transitions will be total three in number as shown.




21.




Input characteristics




Collector to emitter voltage ($V_{CE}$) in volts

22. (a) Potential gradient = $\dfrac{5 \text{ V} \times 20\ \Omega}{(480+20)\Omega} \times \dfrac{1}{10} = 0.02$ V/m

(b) Unknown emf = 0.02 × 6 = 0.12 volt.

23. (a) At saturation $V_{CE} = 0$

also, $V_{CE} = V_{CC} - I_C R_C = 0$

or, $4.5 - I_C\, 1.5 \text{ k}\Omega = 0$ $\therefore\ I_C = 3$ mA

So base current $I_B = \dfrac{I_C}{\beta_{dc}} = \dfrac{3 \text{ mA}}{200} = 15\ \mu\text{A}$.

(b) $V_i = I_B R_B + V_{BE}$

$= 15\ \mu\text{A}\ (150 \text{ k}\Omega) + 1 \text{ volt} = 3.25$ V

24. Resistance $R$ of the lamp = $\dfrac{V^2}{P} = \dfrac{(30)^2}{10} = 90\ \Omega$

Current through the bulb $I = \dfrac{P}{V} = \dfrac{10}{30} = \dfrac{1}{3}$ A

$$I = \frac{V^2}{\sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}} \quad \text{or,} \quad \frac{1}{3} = \frac{(220)^2}{\sqrt{(90)^2 + \left(\frac{1}{2\pi 50 C}\right)^2}}$$

$\therefore\ C = 4.86\ \mu$F

25. Let the electric field inside a conductor be $E$ and length of conductor be $\ell$.

Average acceleration of electron = $\dfrac{eE}{m}$

$\therefore$ Drift speed $v_d = a\tau = \dfrac{eE\tau}{m}$ ($\tau$ = relaxation time)

Now using $I = nev_dA$

We get $I = ne\left(\dfrac{eE\tau}{m}\right)A$

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

$\therefore$ Resistance $R = \dfrac{V}{I} = \dfrac{m\ell}{ne^2\tau A}$

Also $R = \dfrac{\rho\ell}{A} = \dfrac{m\ell}{ne^2\tau A}$

$\therefore \quad \rho = \dfrac{m}{ne^2\tau}$

So $\rho \propto \dfrac{1}{\tau}$

**OR**

There are a number of materials and devices used in electric circuits where the proportionality of $V$ and $I$ does not hold. The deviations are of following types

(i) $V$ does not remain proportional to $I$ at higher values

(ii) For a diode the relation between $V$ and $I$ depends on the sign of $V$.

(iii) For GaAs the relation between $V$ and $I$ is not unique, *i.e.* there is more than one value of $V$ for the same current $I$.

26. (a) When the straight rod moves in the magnetic field, the free electron in it experience force along its length. Due to movement of electrons an electric field is established which presents further movement of other free electrons. Force due to $B$ = force due to $E$.

or $evB = eE$

$\Rightarrow \quad vB = \dfrac{V}{\ell}$ (emf $V = E\ell$)

$\therefore \quad V = B\ell v$

(b) Let the circuit resistance be $R$

$\therefore$ Current in rod $I = \dfrac{E}{R} = \dfrac{B\ell v}{R}$

$\therefore$ Force on rod = $I\ell B = \dfrac{B^2\ell^2 v}{R}$

$\therefore$ Power = Force × velocity = $\dfrac{B^2\ell^2 v^2}{R}$

27. $W = \dfrac{2\lambda D}{\mu . a} = \dfrac{2\times 6000\times 10^{-10}\times 1}{\frac{4}{3}\times 0.02\times 10^{-2}} = 0.45\text{ cm}$

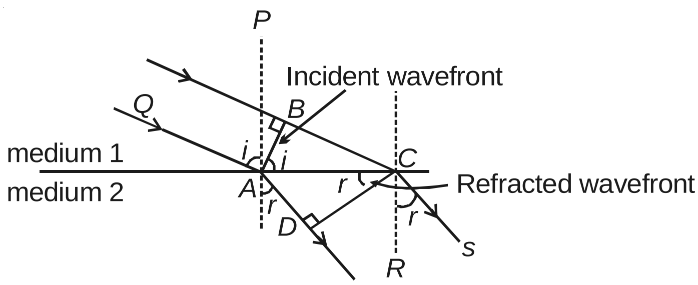
**(b) Wavefront :**

A wavefront is the locus of adjacent points having the same phase of oscillation. Depending on source of light we have most common wave fronts as spherical, cylindrical or planar.

**Law of refraction on the basis of wave theory**

Refraction is the change of direction that a ray undergoes when it enters another transparent medium. This change of direction results from a change in the speed of propagation and the subsequent change in wavelength, when the ray enters the second medium.

**Proof of law of refraction**




In $\Delta ABC$, $\sin\angle PAQ = \sin\angle BAC = \sin i = \dfrac{BC}{AC}$

In $\Delta ACD$, $\sin\angle RCS = \sin\angle ACD = \sin r = \dfrac{AD}{AC}$

$$\therefore \quad \frac{\sin i}{\sin r} = \frac{BC}{AD} = \frac{v_1 t}{v_2 t} = \frac{v_1}{v_2} = \mu$$

where $v_1$ and $v_2$ are velocities of light in medium 1 and medium 2 and $\mu$ is refractive index of medium 2 w.r.t. medium 1.

29. (a) Let the spherical distribution in air has radius $R$ and volume charge density $\rho$.

**For inside point $r < R$**

Consider a Gaussian spherical surface of radius $r$ ($r < R$). Assumptions on Gaussian surface is that the nature of electric field on it is radially outward and the magnitude of electric field over it is constant.

Consider an element area vector over the Gaussian surface.

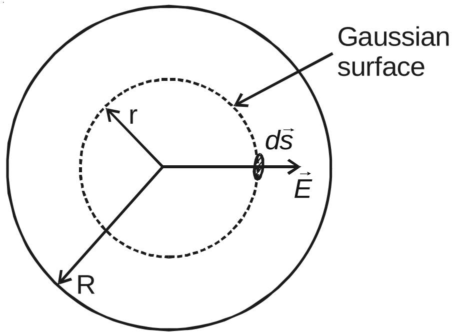
Applying Gauss law :

$$\oint \vec{E}.d\vec{s} = \frac{Q_{\text{net enclosed}}}{\varepsilon_0}$$

$$\Rightarrow E\oint ds = = \frac{\left(\rho\dfrac{4\pi r^3}{3}\right)}{\varepsilon_0} \quad (\because E \text{ is constant and } \theta = 0)$$

$$= E(4\pi r^2) = \frac{\left(\rho\dfrac{4\pi r^3}{3}\right)}{\varepsilon_0}$$

$$\Rightarrow \therefore\ E = \frac{\rho r}{3\varepsilon_0}$$



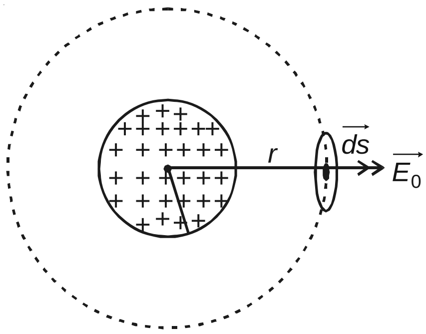
**For outside point $r > R$**

$$\oint \overrightarrow{E_0}.\overrightarrow{ds} = \frac{Q_{\text{net enclosed}}}{\varepsilon_0}$$

$$\Rightarrow \oint E_0\, ds \cos\theta = \frac{\rho \frac{4}{3}\pi R^3}{\varepsilon_0}$$

$$\Rightarrow E_0 \oint ds = \frac{4\pi R^3 \rho}{3\varepsilon_0}$$

$$\Rightarrow E_0 = \frac{\rho R^3}{3\varepsilon_0 r^2} \Rightarrow E_0 \propto \frac{1}{r^2}$$




(b) $E = \dfrac{\lambda}{2\pi\varepsilon_0 R} = \dfrac{Q}{2\pi\varepsilon_0 LR}$

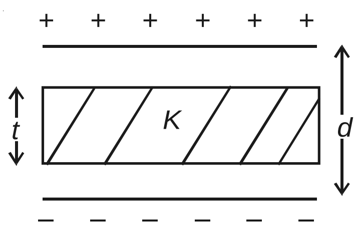
$$= \frac{2\times 7.6\times 10^{-7}\times 9\times 10^{9}}{4.4\times 7.2\times 10^{-3}} = 4.3\times 10^{5} \text{ N/C}$$

**OR**

(a) **Capacitance of a capacitor**

Let the capacitor has plate area $A$ and plate separation $d$. Let parallel dielectric slab of thickness $t$ ($t < d$) and dielectric constant $K$ be inserted into it. The electric field in air gap = $\dfrac{Q}{A\varepsilon_0}$

The electric field inside the dielectric is $\dfrac{Q}{KA\varepsilon_0}$




The potential difference $V$ between the plates = $\dfrac{Q}{A\varepsilon_0}(d-t) + \dfrac{Q.t}{KA\varepsilon_0}$

The capacitance = (charge on one of the plates)/V

$$= \frac{Q}{\dfrac{Q}{A\varepsilon_0}(d-t) + \dfrac{Qt}{KA\varepsilon_0}}$$

$$\therefore \quad C = \frac{\varepsilon_0 A}{\left[(d-t) + \dfrac{t}{K}\right]}$$

(b) $\dfrac{Q_1 Q_2}{4\pi\varepsilon_0 R} = 2\left(\dfrac{1}{2}mv^2\right)$

or $v = \sqrt{\dfrac{9\times 10^{9}\times\left(200\times 10^{-6}\right)^2}{\left(10^{-2}\right)\times 10^{-2}}} = 60$ m/s

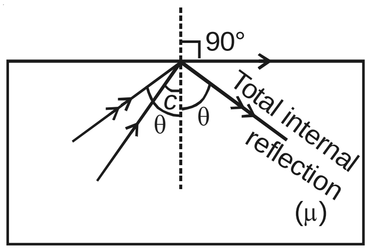
28. (a) When a beam of light enters a rarer medium from a denser medium, then the beam bends away from the normal. At angle of incidence more than critical angle $C$, the entire beam gets reflected in the denser medium itself. This phenomenon is called total internal reflection. Critical angle is the angle of incidence at the denser medium for which refracted ray in rarer medium grazes with the surface. At this, the angle of refraction in the rarer medium becomes 90°.

$\therefore \quad \mu = \dfrac{\sin 90^\circ}{\sin C} \qquad \therefore \quad \mu = \dfrac{1}{\sin C} \qquad (\mu > 1)$

**Condition for total internal reflection :**

(i) Ray must go from denser to rarer medium.

(ii) Angle of incidence must be greater than the critical angle.




(b) $\dfrac{1}{v_0} - \dfrac{1}{u_0} = \dfrac{1}{f_0}$ or, $\dfrac{1}{v_0} + \dfrac{1}{12} = \dfrac{1}{10}$ $\therefore \quad v_0 = 60$ mm

Now for eyepiece

$\dfrac{1}{v_e} - \dfrac{1}{u_e} = \dfrac{1}{f_e}$ or, $\dfrac{-1}{250} - \dfrac{1}{u_e} = \dfrac{1}{30}$ $\therefore \quad u_e = 27$ mm

$\therefore$ Separation = $v_0 + u_e = 60 + 27 = 87$ mm

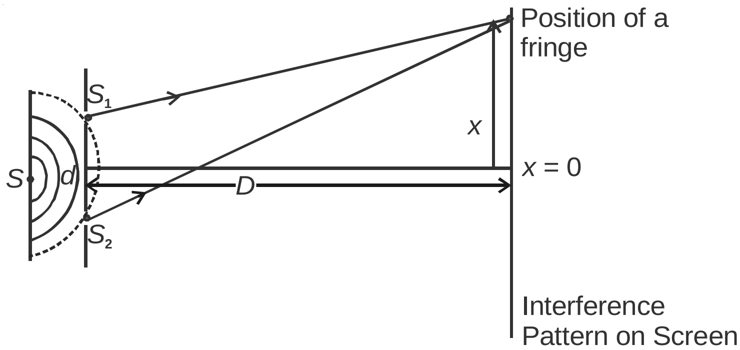
**OR**

(a) **Interference :**

The modification in distribution of intensity due to superposition of two or more coherent waves is known as interference.

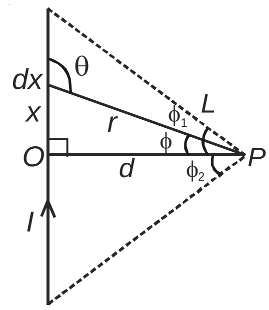
**Young's Double Slit Experiment (YDSE)**

In this experiment a monochromatic source of light is used. A slit ($S$) is placed in front of this original source. This slit now acts as the original source for the two slits $S_1$ and $S_2$ which are placed in front of this single slit as shown in figure. The light waves coming from $S_1$ and $S_2$ become coherent and they interfere on a screen which is kept a distance $D$ away from the slits $S_1$ and $S_2$. An interference pattern of alternate bright and dark lines is obtained on the screen. The slit separation '$d$' is kept of the order of 1 mm and the distance $D$ is kept of the order of 1 m.



30. (a) Consider a line element of length $dx$ at a distance $x$ from $O$. Let the current element be $Idx$. The position vector from $Idx$ to point $P$ is $r$.

So, as per Biot-Savart's law small magnetic field $dB$ at point $P$ is




$$dB = \frac{\mu_0}{4\pi}\frac{(Idx)r\sin\theta}{r^3} = \frac{\mu_0}{4\pi}\frac{Idx\sin\theta}{r^2}$$

Now $\tan\phi = \frac{x}{d}$ or $x = d\tan\phi$

$\therefore\ dx = d\sec^2\phi.\ d\phi$

Also $\theta = 90° + \phi$ $\therefore\ \sin\theta = \sin(90° + \phi) = \cos\phi$

and $r\cos\phi = d$ $\therefore\ r = d\sec\phi$

$$\therefore\ dB = \frac{\mu_0}{4\pi}\frac{Id\sec^2\phi\, d\phi\cos\phi}{d^2\sec^2\phi} = \frac{\mu_0 I}{4\pi d}\cos\phi\, d\phi$$

$$\therefore\ \text{Total } B = \int dB = \frac{\mu_0 I}{4\pi d}\int_{\phi=-\phi_2}^{\phi=+\phi_1}\cos\phi.\, d\phi = \frac{\mu_0 I}{4\pi d}[\sin\phi_1 + \sin\phi_2]$$

(b) (i) $\oint \vec{B}.\vec{dl} = \mu_0 I_{\text{enclosed}}$

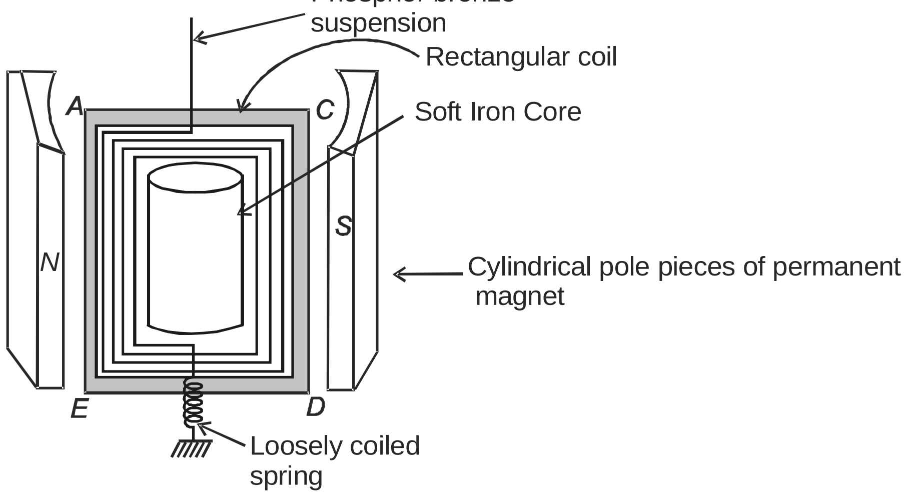
or, $B.2\pi r = \mu_r\mu_0\frac{I\pi r^2}{\pi R^2}$ $\therefore\ B = \mu_r\mu_0\frac{Ir}{2\pi R^2}$

(ii) $\oint \vec{B}.\vec{dl} = \mu_0 I_{\text{enclosed}}$

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

**OR**

(a) **Moving Coil Galvanometer**



**Principle :**

When a current is passed through a coil placed in a magnetic field, it experiences a torque. Because of this torque, the coil rotates causing a twist in the suspension strip which provides opposite balancing torque. Hence an equilibrium is achieved and the coil stabilizes itself in a definite angular position. By knowing the angular position of the coil, the current in the galvanometer can be calculated.

**Construction :**

A coil *ACDE* is suspended between the north and south cylindrical poles of a permanent magnet. The coil is wounded on a soft iron core. The coil is attached to the torsion head with a phosphor bronze wire. The other side of the coil is attached with a loosely coiled spring. This complete arrangement is enclosed by a non-magnetic cover to avoid disturbance due to outer environment.

Torque due to field = torque due to spring

$(INA\ B \sin\phi) = C\theta$

Here $I$ = current in the coil

$N$ : No. of turns in the coil

$A$ : area of each turn

$B$ : magnetic field

$\theta$ : angle of twist of the coil

$C$ : torsional constant of the spring

(b) The cylindrical poles produces radial magnetic field hence $\phi = 90°$ between the dipole moment of the coil and the magnetic field.

Current sensitivity $= \frac{\theta}{I} = \frac{NAB}{C}$

Voltage sensitivity $\frac{\theta}{V} = \frac{\theta}{IR}$ (where $R$ is resistance of the coil)

$= \frac{NAB}{CR}$

Increasing current sensitivity need not increase the voltage sensitivity because suppose we double the number of turns, then it will double the current sensitivity. But doubling the turns will also double the resistance hence voltage sensitivity will not be affected because $\frac{N}{R}$ = constant.

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