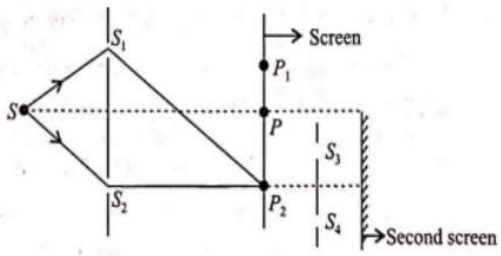
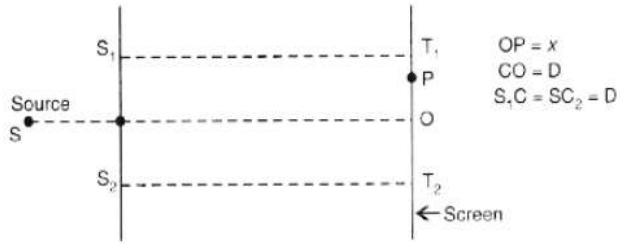
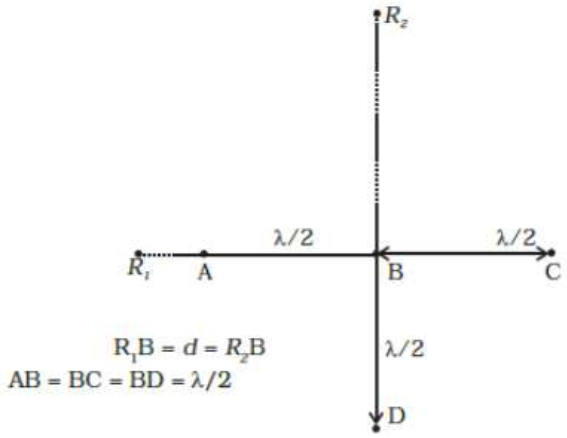
1.	Spherical wave fronts, emanating from a point source, strike a plane reflecting surface. What there be any change in the shape of wave fronts, immediately after reflection? (a) They will remain spherical with the same curvature, and same direction of propagation. (b) They will become plane wave fronts. (c) They will remain spherical, with the same curvature, but direction of propagation is reversed. (d) They will remain spherical, but with different curvature, and different direction of propagation. **[CBSE Sample Paper]**
2.	Two coherent sources of different intensities send waves which interfere. The ratio of maximum intensity to the minimum intensity is 25. The intensities of the sources are in the ratio (a) 25:1 (b) 5:1 (c) 9:4 (d) 25:16
3.	Consider sunlight incident on a slit of width 10^4 Å. The image seen through the slit shall be (a) a fine sharp slit white in colour at the centre (b) a bright slit white at the centre diffusing to zero intensities at the edges (c) a bright slit white at the centre diffusing to regions of different colours (d) a diffused slit white in colour **[CBSE Sample Paper]**
4.	Consider a ray of light incident from air onto a slab of glass (refractive index n) of width d, at an angle θ . The phase difference between the ray reflected by the top surface of the glass and the bottom surface is (a) $\frac{4\pi nd}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{-1/2}+\pi$ (b) $\frac{4\pi nd}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{-1/2}$ (c) $\frac{4\pi nd}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{-1/2}+\frac{\pi}{2}$ (d) $\frac{4\pi nd}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{-1/2}+2\pi$ **[Hard]**
5.	Figure shows a standard two slit arrangement with slits S_1 ,S_2 .P_1 ,P_2 are the two minima points on either side of P. At P_2 on the screen, there is a hole and behind P_2 is a second

	2-slit arrangement with slits S_3, S_4 and a second screen behind them.  (a) There would be no interference pattern on the second screen but it would be lighted (b) The second screen would be totally dark (c) There would be a single bright point on the second screen (d) There would be a regular two slit pattern on the second screen
6.	In a Young's double slit experiment, the source is white light. One of the holes is covered by red filter and another by a green filter. In this case (a) There shall be alternate interference fringes of red and blue. (b) There shall be an interference pattern for red distinct from that for blue. (c) There shall be no interference fringes. (d) There shall be an interference pattern, for red mixing with one for blue.
	Short Answer Type Qs (2 & 3 Marks)
7.	(a) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency. Explain why? (b) When light travels from a rarer to a denser medium, it loses speed. Does the reduction in speed imply a reduction in energy carried by the light wave? (c) In the wave picture of light, intensity of light is determined by the square of the amplitude of wave. What determines the intensity of light in the photon picture of light? **[CBSE Sample Paper]**
8.	Why is the diffraction of sound wave more evident in daily experience than that of light wave?
9.	What is effect on the interference pattern in a Young's double slit experiment when (a) The screen is moved closer to the slit (b) The separation between the two slits is increased?
10.	(a) What happens to the interference pattern if phase difference between the two sources varies continuously?

	(b) A double slit is illuminated by light of wave length 600 nm. The slits are 0.1 cm apart and the screen is placed one metre away. Calculate. (i) The angular position of the 10th maximum in radian and (ii) Separation of the two adjacent minimal.
11.	Consider a two slit interference arrangements (figure) such that the distance of the screen from the slits is half the distance between the slits. Obtain the value of D in terms of λ such that the first minima on the screen falls at a distance D from the centre O. 
	Long Answer Type Qs (5 Marks)
12.	(a) Write the distinguishing features between a diffraction pattern due to a single slit and the interference fringes produced in Young s double slit experiment. (b) If a monochromatic light source is replaced by white light what changes would you observe in the diffraction pattern? (c) In a single-slit diffraction experiment, the width of the slit is reduced to half its original width. How would this affect the size and intensity of the central maximum? **[CBSE Sample Paper]**
13.	Four identical monochromatic sources A, B, C, and D as shown in the (figure) produce waves of the same wavelength λ and are coherent. Two receiver R_1 and R_2 are at great but equal distances from B. (a) Which of the two receivers picks up the larger signal? (b) Which of the two receivers picks up the larger signal when B is turned off? (c) Which of the two receivers picks up the larger signal when D is turned off? (d) Which of the two receivers can distinguish which of the sources B or D has been turned off?



14. The optical properties of a medium are governed by the relative permittivity (μ_r) and relative permeability (μ_r). The refractive index is defined as $\sqrt{\boldsymbol{\mu_r \varepsilon_r}}$ = n. For ordinary material, $\varepsilon_r > \varepsilon_0$ and $\mu_r > 0$ and the positive sign is taken for the square root. In 1964, a Russian scientist V. Veselago postulated the existence of material with $\varepsilon_r < 0$ and $\mu_r < 0$. Since, then such metamaterials have been produced in the laboratories and their optical properties studied. For such materials n = $-\sqrt{(\boldsymbol{\mu_r \varepsilon_r})}$. As light enters a medium of such refractive index the phases travel away from the direction of propagation.

(a) According to the description above show that if rays of light enter such a medium from air (refractive index =1) at an angle θ in 2nd quadrant, then the refracted beam is in the 3rd quadrant.

(b) Prove that Snell's law holds for such a medium.

	HINTS AND ANSWER
1.	(c)
2.	(c)
3.	(a)
4.	(a)
5.	(b)
6.	(c)
7.	**Conceptual Type Problems** (a) Because frequency must remain same for continuity of wave fronts across boundary. (b) No, energy depends only on frequency, not speed. (c) Intensity is proportional to the photon flux (number of photons per unit area per unit time).
8.	**Conceptual Type Problems** Diffraction of sound is more evident because the wavelength of sound is comparable to the dimensions of ordinary objects and openings, while the wavelength of light is extremely small, making its diffraction effects negligible in everyday experience.
9.	**Conceptual Type Problems** (a) Moving the screen closer → **fringes become narrower** (fringe width decreases). (b) Increasing slit separation → **fringes also become narrower** (fringe width decreases).
10.	**Conceptual Type Problems** (a) Pattern washes out → no steady interference fringes. **Numerical Type Problems** (b)(i) Angular position of 10th maximum = 6.0×10^{-3} rad (ii) Adjacent minima separation = 0.60 mm
11.	**Expression Type Problems** $D = \lambda / 2.472$
12.	**Knowledge Based** (a) Diffraction → broad, unequal maxima; Interference → sharp, equally spaced fringes. (b) Central maximum white, coloured fringes on either side, pattern fades away. (c) Central maximum becomes twice as wide, but much less intense (≈ one-fourth).

13.	**Expression Type Questions** (a) R_2 picks up the larger signal. (b) R_1 and R_2 pick up the same signal. (c) R_2 picks up larger signal compared to R_1. (d) Signal at R_1 indicated B has been switched off and an enhanced signal at R_2 indicated D has been switched off.
14.	**Conceptual Type Problems** (a)The Postulates is correct If light enters such a medium, the refracted beam appears in the 3rd quadrant (on the same side of the normal as the incident ray, but below the axis). (b) Snell's law still holds: $n_1 \sin\theta_1 = n_2 \sin\theta_2$ but with $n_2<0$ on the refracted ray bends "negatively."

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