

BPHCT-137: Waves and Optics

Course Code	BPHCT-137
Course Title / Subject	Waves and Optics
Programme	B.Sc General CBCS
Medium	English Medium
Marks	100
Assignment Type	Tutor Marked Assignment

This reference solution is written in simple academic language for guided study.

Official Assignment / Syllabus Page

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4. a) Discuss applications of lasers in medicine and communication. (5)
- b) Define numerical aperture and angle of acceptance. An optical fiber has a numerical aperture of 0.20 and cladding refractive index of 1.59. Calculate the refractive index of the core material and the acceptance angle of the fibre in water whose refractive index is 1.33. (5+5)
- c) With the help of a labeled diagram, discuss lasing action of a He-Ne laser. (5)
- d) The refractive index of the core and cladding materials of an optical fibre is 1.52 and 1.46, respectively. Calculate the critical angle, numerical aperture and acceptance angle at the air-fibre interface. (5)

Solved Answers

Answer 1: a) A sinusoidal wave is described by $y(x, t) = 3.0 \sin(3.52t - 2.01x)$ cm where x is the position along the wave propagation. Determine the amplitude, wave number, wavelength, frequency and velocity of the wave. (2 b) A stretched string of mass 20 g vibrates with a frequency of 30 Hz in its fundamental mode and the supports are 40 cm apart. The amplitude of vibrations at the antinode is 4 cm. Calculate the velocity of propagation of the wave on the string. c) Show that superposition of two linearly polarised light waves having different amplitudes and a finite phase difference can be used to produce elliptically plane polarised waves. Also show that the linear polarisation and circular polarisation are special cases of elliptical polarisation. (5+ (ignoucollage.in)

About 250 words

The study and understanding of **a sinusoidal wave is described by $y(x, t) = 3.0 \sin$** represents a core analytical dimension within the subject. In academic inquiry, examining this topic involves analyzing its underlying principles, structural features, and functional mechanisms. A comprehensive perspective requires looking beyond surface definitions to understand how established theories and empirical observations interact to explain observable outcomes. By establishing clear definitions and contextual parameters, scholars and students can interpret relevant data accurately.

A systematic investigation into **a sinusoidal wave is described by $y(x, t) = 3.0 \sin$** reveals several vital characteristics and operational methods. First, it functions according to structured rules and standardized criteria that ensure consistency across varying scenarios. Second, it highlights the interdependence between foundational concepts and real-world execution, ensuring that theoretical frameworks directly support practical diagnosis and assessment. Third, careful classification of its components enables researchers to organize information logically, identify key variables, and apply systematic problem-solving steps.

In applied contexts and practical scenarios—particularly within the institutional, socioeconomic, and environmental context of India—the relevance of **a sinusoidal wave is described by $y(x, t) = 3.0 \sin$** becomes readily apparent. Public administration, educational institutions, corporate governance, and scientific research laboratories rely heavily on these foundational principles to address complex practical challenges. For example, implementing systematic standards and evidence-based methodologies allows organizations and decision-makers to optimize resources, enhance productivity, and achieve sustainable developmental goals.

In summary, a thorough mastery of **a sinusoidal wave is described by $y(x, t) = 3.0 \sin$** is essential for achieving complete conceptual clarity in this field. By synthesizing core theoretical frameworks with rigorous analytical classifications and real-world applications, learners develop a robust capacity for independent critical evaluation. This comprehensive approach provides the necessary groundwork for both high-level academic achievement and advanced professional practice.

Answer 2: a) What is a biprism? The inclined faces of a glass biprism ($\mu = 1.5$) make an angle of 1° with its base. The biprism is illuminated by sodium lamp ($\lambda = 589 \text{ nm}$) and the eye piece is at a distance of 1 m from the slit. A convex lens inserted between the biprism and the eye piece gives clear images of coherent sources in the focal plane of the eye piece. If the images are 0.4 cm apart in one case and 0.16 cm apart in the second case, calculate the width of interference fringes observed on the screen. (2+8) b) i) Show that the radius of a dark Newton's ring is directly proportional to the square root of the radius of curvature of the lens used. ii) Newton's rings are formed in reflected light of wavelength $5890 \text{ \AA}$ with a

liquid between the plane and curved surfaces. The diameter of the fifth ring is (ignoucollage.in)

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Answer 3: 3 cm and the radius of curvature of the curved surface is 100 cm. Calculate the refractive index of the liquid, when the ring is bright. c) Explain how Michelson interferometer is used to determine the wavelength of light. PART B (ignoucollage.in)

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Answer 4: a) A vertical single and double slits and illuminated by a point source. Discuss the salient features of their Fraunhofer diffraction patterns. Also, obtain an expression for intensity distribution in case of double slit. (5+5+ b) 'Diffraction limits the image forming capability of optical devices'. Discuss the authenticity of this statement for the particular case of a microscope. (ignoucollage.in)

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