# PHYSICS

# BOOKS - HC VERMA PHYSICS (ENGLISH)

# SPEED OF LIGHT

## Objective 1

**1.** Light passes through a closed cylindrical tube containing a gas. If the gas is gradually

pumped out, the speed of light inside the tube will

A. 1.increase

B. 2.decrease

C. 3.remain constant

D. 4.first increases then decreases

**Answer: A**

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**2.** The speeds of red light and yelow light are exactly same

A. 1.in vacuum but not in air

B. 2.in air but not in vacuum

C. 3.in vacuum as well as in air

D. 4.neither in vacuum nor in air

Answer: A

**3.** An illuminated object is placed on the principal axis of a converging lens so that real image is formed on the other side of the lens. If the object is shifted a little,

A. 1.the image will be shifted simultaneously with the object

B. 2.the image will be shifted a little later than the object

C. 3.the image will be shifted as little earlier than the object

D. 4.to image will not shift

**Answer: B**

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**Objective 2**

1. The speeds of light is $299, 792, 458\ ms^{-1}$

A. 1.with respect to the earth

B. 2.with respect to the sun

C. 3.with respect to as moving on the earth

D. 4.with respect to a spaceship going in

outer space

**Answer: A::B::C**

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**2.** Which of the following methods can be used

to measure the speed of light in laboratory?

A. Roemer method

B. Fizeau method

C. Foucault Method

D. Michelson method

**Answer: C**

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**3.** Which of the following methods can be used to measure the speed of light in water?

A. Roemer method

B. Fizeau method

C. Faucault method

D. Michelson method

**Answer: C**

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**Exercises**

**1.** In an experiment to measure the speed of light by Fizeau's apparatus, following data are

used :

Distance between the mirrors = 12.0 km,

Number of teeth in the wheel = 180.

Find the minimum angular speed of the wheel for which the image is not seen.

**2.** In an experiment with Foucault's apparatus, the various distances used are as follows :

Distance between the rotating and the fixed mirror = 16 m

Distance between the lens and the rotating mirror = 6 m,

Distance between the source and the lens = 2 m. When the mirror is rotated at a speed of 356 revolutions per second, the image shifts by 0.7 mm. Calculate the speed of light from these data.

**3.** In a Michelson experiment for measuring speed of light, the distance travelled by light

between two reflections from the rotating mirror is 4.8 km. The rotating mirror has a shape of a regular octagon. At what minimum angular speed of the mirror (other than zero) the image is formed at the position where a non rotating mirror forms it ?

**Question For Short Answer**

**1.** The speed of sound in air is `332 in ms^-1. Is it advisable to define the length 1 m as the distance travelled by sound in 1/332 s ?

**2.** Consider Galileo's method of measuring the speed of light using two lanterns. To get an accuracy of about 10%, the time taken by the experimenter in closing or opening the shutter should be about one tenth of the time

taken by the light in going from one experimenter to the other. Assume that it takes 1/100 second for an experimenter to close or open the shutter. How far should the two experimenters be to get a 10% accuracy ? What are the difficulties in having this separation ?

**3.** In Fizeau method of measuring the speed of light, the toothed wheel is placed in the focal

plane of a converging lens. How would the experiment be affected if the wheel is slightly away from the focal plane ?

**4.** In the original Fizeau method, the light travelled 8.6 km and then returned. What could be the difficulty if this distance is taken as 8.6 m ?

**5.** What is the advantage of using a polygonal mirror with larger number of faces in Michelson method of measuring the speed of light ?

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