

Wave and Motion : Light Waves -Typical Problems

Vision is the next to sense of touch and sound that one experiences after birth. Vision is all about wave optics while actual object is different in colour, shape and size. Analysis of visual effects is completely a wave phenomenon. Light waves are characteristically different from sound waves and vibrations in strings. Basic differences are both quantitative in terms of velocity, wavelength and frequency and nature. Sound waves and those in string or air are mechanical while light is electromagnetic wave. Since light is a wave its qualitative treatment in reflection, refraction, and interference is similar to that of sound waves. In diffraction quantitative difference becomes significant. But, in case of polarization is characteristic to light waves which does not exist in light sound waves.

These concepts howsoever well they may have been understood remain a burden on memory unless they are practiced in solving problem. In the process concepts become intuitive so much so that one would find it easy to visualize how they apply real life physical experiences. This also helps to sharpen observation followed by enhancement in analytical capability, a pre-requisite for creativity and innovation of a person.

Science is a subject not to learn but a matter of realization through experiments and its visualization in surrounding. But, our target students are not equipped either to conduct experiment or an environment which facilitates visualization of science in play around him. This is where simulation is a technique to validate concepts and study effect of variation in parameters related to the concept. Educations creates an opportunity of learning concepts without drainage of time and efforts in reinventing the wheel.

Solving typical problems with gradual increase in complexity helps to build power of visualization of concepts, without losing confidence in one's ability to solve problems. It requires reasonable proficiency in language to understand problem, in first go. Next comes evolving solution or answer based on concepts learnt. At this stage simpler calculations are being skipped in elaboration, with a hope that reader would be able to decipher intermediate steps.

Competitive examinations and problems encountered in real life are never straight application of formula. They demand integration interdisciplinary knowledge. Yet ability to solve such typical problems, that one is groomed, enhances competence to handle unknown problems speedily, correctly and with a greater degree of clarity and confidence, an essential attribute of thought process needed for success in life.

Mentors' Manual is one of the dimensions of the Gyan Vigyan Sarita through which efforts are being made to reach out to remote teachers through our experience of mentoring unprivileged children who are more close to ground. Moreover, they are disconnected from us by virtue of multiple barriers. Despite, direct interaction has been possible through Interactive Online Mentoring Sessions (IOMS) a working model of connecting unprivileged children in a selfless manner. This experience is being disseminated to the teachers spread out by writing of chapters of an open source Mentors' Manual. Wave Optics, in the manual has been placed after Simple Harmonic Motion and Sound considering interrelation of concepts..

India, growing digital, provides optimism to every student to be able to have an access to virtual laboratory, where without any physical laboratory, involving consumption of equipment and material. It provides an opportunity to carry out virtual experiments in an e-environment. In this environment excellent simulation videos available on the web either free or on price. Problem mostly encountered by students is in sequencing and scaling of concepts and selection of an appropriate video out of a big list of search results. This severely distracting. But, mentors are best person to use these videos to modulate and upgrade their illustrations. Yet it does not rule out importance of problem solving.

In light of this Question Banks including problems from various sources and they are being supported with illustrations is being created. These illustrations are not just solutions but an attempt to bring home use of basics involved in solving problems. In an effort to compile problem there some good text books including those authored by Prof. H.C. Verma and a team of authors Robert Resnick, David Halliday and Kenneth S. Krane and many more. Some objective questions from different examinations have also been included. These questions are graded and authors have attempted to incorporate all concepts covered in the book. Thus it necessitates a student to read each chapter carefully before taking up questions.

Some students may find illustrations to be a bit lengthy and dwelling into basics more than their need. However, if they want to use this resource they are requested have patience.

This initiative of a small group of passionate persons is aimed at to mentor unprivileged children and is driven with a sense of **Personal Social Responsibility (PSR)** in a *non-organizational, non-remunerative, non-commercial and non-political manner*. You are welcome to add value to this initiative by way of suggestion, advising correction or new type of questions, or any other form that suits to your competence and convenience.