

## Wave and Motion : Geometrical Optics -Typical Problems

*These question banks have been developed for students who are - (a) in initial stages of solving problems from text book or reference book so as to gain proficiency in application of concepts learnt, and (b) deprived of adequate exposure at learning. Such unprivileged and deprived students need guidance for stepwise application of concepts and associated mathematics, while evolving solutions. Main purpose of is to inculcate in students an ability to appreciate physics and related mathematics involved in problems and apply them. Accordingly, illustrations have been made explanatory to the extent possible. Once, students get equipped with that capability, gradually they themselves would be able to evolve optimized solutions. Greater is the practice more intuitive becomes the optimization of steps. Those students who are at a stage of refining their problem solving skills or more apt at concepts may choose to use these illustrations. However, they may please bear in mind our target students and, therefore, they skip detailing in illustrations to the best of their advantage.*

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. Education creates an opportunity of systematic learning concepts without 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. 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 extremely simpler calculations are being skipped, with a hope that reader would be able to decipher intermediate steps.

Questions and problems appearing in competitive examinations are seldom encountered in real life, and are never straight application of formula. They demand integration interdisciplinary knowledge. Yet ability to solve such typical problems, 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 severely lack in exposure. Moreover, they are disconnected from us by virtue of multiple barriers. Despite, efforts to establish direct interaction through Interactive Online Mentoring Sessions (IOMS) its reach to target students is extremely feeble. Nevertheless, IOMS has established as a working model of selfless mentoring unprivileged children. This experience is being disseminated to the teachers spread

out by writing of chapters of an open source Mentors' Manual.

India, growing digital, provides optimism to every student to be able to have an access to virtual laboratory; it is an alternative to physical laboratory. 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. But, problem mostly encountered by students is in sequencing and scaling of concepts and selection of an appropriate video out of a big list available in web-search. This is severely distracting. Mentors are, however, the best persons to use these videos to modulate and upgrade their illustrations. Yet it does not rule out importance of hands-on by students in problem solving and is called dry-run of concepts, in the parlance of computer programming.

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 this effort repository of problems from good books viz. Prof. H.C. Verma and a team of authors Robert Resnick, David Halliday and Kenneth S. Krane and many more have been used. 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.

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 passion and convenience.