

## Heat & Temperature - Foundation of Thermodynamics

*Understand of heat and mechanics is has grown organically with human civilization, It is only in 1840 that James Prescott Joules formalized through an experiment mechanical equivalent of heat and set the understanding of thermodynamics. While Heat is one of the form of energy, temperature is a perceivable effect of heat. Heat is an inseparable to existence of nature.*

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 disconnected from us by virtue of multiple barriers. Direct interaction through Interactive Online Mentoring Sessions (IOMS) is our real life model of connecting unprivileged children in a selfless manner. This experience is being disseminated to the teachers spread out writing of chapters for Mentors' Manual. Accordingly one chapter has been dedicated on Heat and Thermodynamics.

Science is a subject not to learn but a matter of realization through experiments and its visualization in surrounding. Every student is not equipped either to conduct experiment or an environment for visualization of science in his surroundings. This is where simulation is a technique to verify the concepts and study effect of variation in parameters related to the concept. There are various simulation tools leading to virtual laboratories.

India growing digital provides optimism to every student to be able to have an access to virtual laboratory, where without any physical laboratory, consumption or destruction of material, it is possible to carry out experiments in an e-environment. There are some excellent videos available on the web or on price which provide an experience of kinds in simulation of the concepts, The only problem with this is of sequencing and scaling of concepts and selection appropriate video out of the search results. In absence of this it is neither possible nor affordable for a student to first make a survey, then select most suitable video view for gaining proficiency in the concepts.

It creates a question, can one wait for the virtual labs to become available to gain proficiency in concepts? Definitely not, then the only way to get going on acquiring proficiency in concepts and their applications, soon after learning them, is solving problems of variety. This is a key to patience and perseverance to acquire proficiency, and an essential ingredient of development of skill.

Question Banks comprises of from various sources and they are being supported with illustrations. These are not just solutions but an attempt to bring home use of basics involved in solving a problem. 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. Questions in these books 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.

In addition questions from different examinations provide an opportunity to handle questions of sorts, a necessary practice to be followed once graded questions are solved.

In the illustrations, to the problem in the question banks, some student may find them to be a bit lengthy and dwelling into basics more than required. Their patience is requested for the benefit of those students who did not have proper opportunity to understand basics and apply them. Such students are in plenty spread all across, yet disconnected from main stream and interactive learning through IOMS.

Three question and their illustrations are drawn from the set-1, on Heat and Thermodynamics, covering question on temperature and thermal expansion and appended here. The complete set of 41 questions is being uploaded as a free web-resource.

This initiative is aimed at to mentor unprivileged children is of a small group of passionate persons is driven with a sense of Personal Social responsibility 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.

