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# Laboratory Manual

# PHYSICS

Class XI

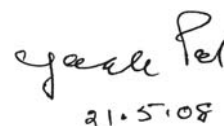


राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्  
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

## FOREWORD

The National Council of Educational Research and Training (NCERT) is the apex body concerning all aspects of refinement of School Education. It has recently developed textual material in Physics for Higher Secondary stage which is based on the National Curriculum Framework (NCF)–2005. NCF recommends that children’s experience in school education must be linked to the life outside school so that learning experience is joyful and fills the gap between the experience at home and in community. It recommends to diffuse the sharp boundaries between different subjects and discourages rote learning. The recent development of syllabi and textual material is an attempt to implement this basic idea. The present Laboratory Manual will be complementary to the textbook of Physics for Class XI. It is in continuation to the NCERT’s efforts to improve upon comprehension of concepts and practical skills among students. The purpose of this manual is not only to convey the approach and philosophy of the practical course to students and teachers but to provide them appropriate guidance for carrying out experiments in the laboratory. The manual is supposed to encourage children to reflect on their own learning and to pursue further activities and questions. Of course, the success of this effort also depends on the initiatives to be taken by the principals and teachers to encourage children to carry out experiments in the laboratory and develop their thinking and nurture creativity.

The methods adopted for performing the practicals and their evaluation will determine how effective this practical book will prove to make the children’s life at school a happy experience, rather than a source of stress and boredom. The practical book attempts to provide space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience. It is hoped that the material provided in this manual will help students in carrying out laboratory work effectively and will encourage teachers to introduce some open-ended experiments at the school level.



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21.5.08

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## PREFACE

The development of the present laboratory manual is in continuation to the NCERT's efforts to support comprehension of concepts of science and also facilitate inculcation of process skills of science. This manual is complementary to the *Physics Textbook for Class XI* published by NCERT in 2006 following the guidelines enumerated in National Curriculum Framework (NCF)-2005. One of the basic criteria for validating a science curriculum recommended in NCF-2005, is that 'it should engage the learner in acquiring the methods and processes that lead to the generation and validation of scientific knowledge and nurture the natural curiosity and creativity of the child in science'. The broad objective of this laboratory manual is to help the students in performing laboratory based exercises in an appropriate manner so as to develop a spirit of enquiry in them. It is envisaged that students would be given all possible opportunities to raise questions and seek their answers from various sources.

The physics practical work in this manual has been presented under four sections (i) experiments (ii) activities (iii) projects and (iv) demonstrations. A write-up on major skills to be developed through practical work in physics has been given in the beginning which includes discussion on objectives of practical work, experimental errors, logarithm, plotting of graphs and general instructions for recording experiments.

Experiments and activities prescribed in the NCERT syllabus (covering CBSE syllabus also) of Class XI are discussed in detail. Guidelines for conducting each experiment has been presented under the headings (i) apparatus and material required (ii) principle (iii) procedure (iv) observations (v) calculations (vi) result (vii) precautions (viii) sources of error. Some important experimental aspects that may lead to better understanding of result are also highlighted in the discussion. Some questions related to the concepts involved have been raised so as to help the learners in self assessment. Additional experiments/activities related to a given experiment are put forth under suggested additional experiments/activities at the end.

A number of project ideas, including guidelines are suggested so as to cover all types of topics that may interest young learners at higher secondary level.

A large number of demonstration experiments have also been suggested for the teachers to help them in classroom transaction. Teachers should encourage participation of the students in setting up and improvising apparatus, in discussions and give them opportunity to analyse the experimental data to arrive at conclusions.

Appendices have been included with a view to try some innovative experiments using improvised apparatus. Data section at the end of the book enlists a number of useful Tables of physical constants.

Each experiment, activity, project and demonstration suggested in this manual have been tried out by the experts and teachers before incorporating them. We sincerely hope that students and teachers will get motivated to perform these experiments supporting various concepts of physics thereby enriching teaching learning process and experiences.

It may be recalled that NCERT brought out laboratory manual in physics for senior secondary classes earlier in 1989. The write-ups on activities, projects, demonstrations and appendices included in physics manual published by NCERT in 1989 have been extensively used in the development of the present manual.

We are grateful to the teachers and subject experts who participated in the workshops organised for the review and refinement of the manuscript of this laboratory manual.

I acknowledge the valuable contributions of Prof. B.K. Sharma and other team members who contributed and helped in finalising this manuscript. I also acknowledge with thanks the dedicated efforts of Sri R. Joshi who looked after the coordinatorship after superannuation of Professor B.K. Sharma in June, 2008.

We warmly welcome comments and suggestions from our valued readers for further improvement of this manual.

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