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 Biology for Higher Secondary stage which is based on the National Curriculum Framework (NCF)–2005. The 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 Biology for Class XII. 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 May 2008
The development of the present laboratory manual is in continuation to the NCERT's efforts to improve upon comprehension of concepts and practical skills among the students. The present laboratory manual will be complementary to the textbook of Biology for Class XII.

The expansion of scientific knowledge and consequently the change in the system of education has led to the development of new methods of instructions. Today the stress is laid on the enquiry approach and discussion method instead of lecture method of teaching. Biology is now something more than observation of living organisms. Study of Biology includes microscopic observations to reveal minute internal details of the organism, biochemical testing to understand complex reactions taking place inside the organisms, experiments with live organism to understand various physiological processes and even much more. In other words experiments in Biology truly represents an interdisciplinary approach of learning.

The new syllabus of Biology has been designed to cater to the needs of pupil who are desirous of pursuing science further. The fundamental objective of this course is to develop scientific attitude and desired laboratory skills required for pursuing Biology as a discipline at this level. A similar approach has been taken while formulating the practical syllabus of Biology for higher secondary stage. The practical syllabus includes content based experiments, which help in comprehension of the concepts. There are altogether twenty-five exercises in the present manual which are based on Biology curriculum for Class XII. For each practical work, principle, requirements, procedure, precautions, observations, discussion and the questions are given in the book. The methodology of preparation of any reagent, if required, has been given along with the requirements, for the convenience of students and teachers. The questions are aimed to develop learner's understanding of the related problems. However, teacher may provide help in case the problem is found to be beyond the capability of the learner. Precautions must be well understood by the learners before proceeding with the experiments and projects. In addition to the core experiments enlisted in the syllabus for Class XII emphasis has also been given for pursuing Investigation Project Work. It is expected that these informations will motivate the students to take up independent project work on topics of their interest.

Appropriate appendices related to the observation and study of organisms are given along with the experiment. International symbols for units, hazards and hazard warnings are given at appropriate places in the book. It is expected that this will make the learners more careful about the environment and make them careful while dealing with the equipments and chemicals in the laboratory.
It gives me a pleasure to express my thanks to all those who have been associated at various stages of development of this laboratory manual. It is hoped that this practical book will improve teaching-learning process in Biology to a great extent. The learners will be able to understand the subject well and will be able to apply the acquired knowledge in new situations. I acknowledge with thanks the dedicated efforts and valuable contribution of Dr Dinesh Kumar, coordinator of this programme and other team members who contributed and finalised the manuscript. I especially thank Professor G. Ravindra, Director (Incharge), NCERT for his administrative support and keen interest in the development of this laboratory manual. I am also grateful to the participating teachers and subject experts who participated in the review workshop and provided their comments and suggestions which helped in the refinement of this manual. We warmly welcome comments and suggestions from our readers for further improvement of this manual.

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ACKNOWLEDGEMENT

The National Council of Educational Research and Training (NCERT) acknowledges the valuable contribution of the individuals and organisations involved in the development of this laboratory manual. The council also acknowledges the valuable contribution of the following academics for reviewing and refining the manuscript of the laboratory manual: A.K. Sharma, Reader in Zoology, University of Lucknow, Lucknow; Iswant Kaur, D.M. School, RIE, Bhopal; K. Muralidhar, Professor, Department of Zoology, University of Delhi, Delhi; K.K. Sharma, Professor Department of Zoology, M.D.S. University, Ajmer; M.M. Chaturvedi, Professor Department of Zoology, University of Delhi, Delhi; Nazir Ahmad Kakpori, Department of Education, Govt of Jammu & Kashmir, Srinagar; Reena Mohapatra, St. Stephen’s Senior Secondary School, Ajmer; Savita Sharma, Mount Carmel School, Dwarka, New Delhi; Savithri Singh, Professor and Principal, Acharya Narendra Dev College, New Delhi; Shalu Dhawan, Amity International School, Saket, New Delhi; Shivani Goswami, Mother’s International School, New Delhi; V.K. Srivastava, Reader in Zoology, J.N. College, Pasighat; Vijay Kumar, Delhi State Science Teacher Forum, New Delhi.

We also acknowledge the contributions of Anil Kumar and Binita Kumari, Junior Project Fellows, DESM, NCERT, New Delhi.

Special thanks are also due to Hukum Singh, Professor and Head, DESM, NCERT for his interest in the work and administrative support.

The Council also acknowledges the efforts of Surender Kumar, Narender Kumar Verma, Monika Rajput and Girish Goyal, DTP Operators, for helping in shaping this laboratory manual. The contributions of Publication Department of NCERT in printing out this laboratory manual are also duly acknowledged.
Exercise 13: Staining of nucleic acid by acetocarmine

Exercise 14: To identify common disease-causing organisms and the symptoms of the diseases

Exercise 15: To study the texture of soil samples

Exercise 16: To determine the water-holding capacity of soils

Exercise 17: To study the ecological adaptations in plants living in xeric and hydric conditions

Exercise 18: To study the adaptations in animals living in xeric and hydric conditions

Exercise 19: To determine the pH of different water and soil samples

Exercise 20: To study turbidity of water samples

Exercise 21: To analyse living organisms in water samples

Exercise 22: To determine the amount of Suspended Particulate Matter (SPM) in air at different sites in a city

Exercise 23: To study plant population density by quadrat method

Exercise 24: To study plant population frequency by quadrat method

Exercise 25: Study of homologous and analogous organs in plants and animals

Investigatory Project Work

Project 1: To study the effect of pH on seed germination

Project 2: Quantitative analysis of phytoplankton in a water body