

BIOLOGY

TEXTBOOK FOR CLASS XII

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राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
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FOREWORD

The National Curriculum Framework (NCF) 2005, recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge.

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and evaluation will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavour by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

The National Council of Educational Research and Training (NCERT) appreciates the hard work done by the textbook development committee responsible for this book. We wish to thank the Chairperson of the advisory group in science and mathematics, Professor J.V. Narlikar and the Chief Advisor for this book, Professor K. Muralidhar, Department of Zoology, University of Delhi, Delhi for guiding the work of this committee. Several teachers contributed to the development of this textbook. We are grateful to their principals for making this possible. We are indebted to the institutions and organisations which have generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed

by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairmanship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution.

As an organisation committed to systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

New Delhi
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Director
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PREFACE

Biology is the study of life in its entirety. The growth of biology as a natural science during the last 1000 years is interesting from many points of view. One feature of this growth is changing emphasis. Initially it was description of life forms. Identification, nomenclature, classification of all recorded living forms enjoyed the attention of scientists for a long time. Description of their habitats and (in the case of animals) their behaviour was included in this study. In later years, the focus was physiology and internal morphology or anatomy. Darwinian ideas of evolution by natural selection changed the perception completely. Classical descriptive and clueless biology found a theoretical framework in the evolutionary theory of Darwin.

In the nineteenth and twentieth centuries, Physics and Chemistry were applied to Biology and the new science of Biochemistry soon became the dominant face of biology. On one hand Biochemistry was integrating with Physiology, becoming almost synonymous with it. On the other hand it gave rise to Structural Biology (structure of biomacromolecules), originally called Molecular Biology. The work of Bernal, Pauling, Watson and Crick, Hodgkins, Perutz and Kendrew, Delbruck, Luria, Monod, Beadle and Tatum, Lederberg, Brenner, Benzer, Nirenberg, Khorana, McIntock, Sanger, Cohen, Boyer, Kornbergs (father and son), Leder, Chambon and scores of others brought in and established a modern version of Molecular Biology dealing with life processes at molecular level.

Physics and Chemistry dominated public perception of science for a long time. Daytoday life of man was influenced by developments in Physics, Chemistry and their respective manufacturing industries. Slowly and steadily, Biology, not to be left behind, demonstrated its utility for human welfare. Medical practice, especially diagnostics, green revolution and the newly emerging biotechnology and its success stories made the presence of biology felt by the common man. Patent laws brought biology into political domain and commercial value of biology became obvious.

For more than a century, classical and so-called reductionist biology fought artificial battles. The fact is both are important. Ecology brought in synthesis of both approaches and emphasised integrated understanding of biology. Form and process are both equally important. Systems biology, using mathematical tools, is bringing about a modern synthesis of both the aspects of Biology.

The Class XI and XII textbooks in biology essentially were to reflect these threads of biological thought. While the Class XI book dealt with morphology, taxonomy, molecular and cellular aspects of physiology, the Class XII book deals with the physiological process of reproduction in flowering plants and humans, the principles of inheritance, the nature of genetic material and its function, the contributions of biology to human welfare, basic principles of biotechnological processes and their applications and achievements. The Class XII book also relates genes to evolution on one hand and presents ecological interactions, behaviour of populations and ecosystems on the other. Most important, the guidelines under NCF-2005 have been followed in letter and spirit. The total learning load has been reduced

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