

EXEMPLAR PROBLEMS

CHEMISTRY

Class XII



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

FOREWORD

The National Curriculum Framework (NCF) 2005 initiated a new phase of development of syllabi and textbooks for all stages of school education. In this phase, a conscious effort has been made to discourage rote learning and to enhance comprehension. This is well in tune with the NPE-1986 and Learning Without Burden-1993 that recommend child centred system of education. The textbooks for Class XI were released in 2006 and for Class XII in 2007. Overall the books have been well received by students and teachers.

NCF-2005 notes that treating the prescribed textbooks as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. It further reiterates that the methods used for teaching and evaluation will also determine how effective these textbooks prove for making children's life at school a happy experience, rather than source of stress or boredom. It calls for reforms in examination system currently prevailing in the country.

The position papers of the National Focus Groups on Teaching of Science, Teaching of Mathematics and Examination Reforms envisage that the question papers, set in annual examinations conducted by the various Boards do not really assess genuine understanding of the subjects. The quality of question papers is often not up to the mark. They usually seek mere information based on rote memorisation, and fail to test higher-order skills like reasoning and analysis, let alone lateral thinking, creativity, and judgment. Good unconventional questions, challenging problems and experiment-based problems rarely find a place in question papers. In order to address the issue, and also provide additional learning material, the Department of Education in Science and Mathematics (DESM) has made an attempt to develop resource book of exemplar problems in different subjects at secondary and higher secondary stages. Each resource book contains different types of questions of varying difficulty level. Some questions would require the students to apply simultaneously understanding of more than one concept. These problems are not meant to serve merely as question bank for examinations but are primarily meant to improve the quality of teaching/learning process in schools. It is expected that these problems would encourage teachers to design quality questions on their own. Students and teachers should always keep in mind that examination and assessment should test comprehension, information recall, analytical thinking and problem-solving ability, creativity and speculative ability.

A team of experts and teachers with an understanding of the subject and a proper role of examinations worked hard to accomplish this task. The material was discussed, edited, and finally included in this resource book.

NCERT would welcome suggestions from students, teachers and parents which would help us to further improve the quality of material in subsequent editions.

Professor Yash Pal

Chairperson

National Steering Committee
National Council of Educational
Research and Training

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PREFACE

The Department of Education in Science and Mathematics (DESM), National Council of Educational Research and Training (NCERT), initiated the programme for the development of 'Exemplar Problems' in science and mathematics for secondary and higher secondary stages based on the subject textbooks developed on the basis of the NCF-2005. The present book is based on the content of the Chemistry Textbook for Class XII published by the Council in 2007.

The main objective of the book on 'Exemplar Problems in Chemistry' is to provide the teachers and students a large number of quality problems in various forms and format with varying levels of difficulty to facilitate teaching-learning of concepts in Chemistry that are presented through the Textbook for Class XII. It is envisaged that the problems included in this book would help the teachers to design tasks to assess effectiveness of their preparation of balanced question papers for unit and terminal tests. The feedback based on the analysis of students' responses may help the teachers in further improving the quality of classroom instructions. In addition, the problems given in this book are also expected to help the teachers to perceive the basic characteristics of good quality questions and motivate them to frame similar problems on their own. Students can benefit themselves by attempting the problems given in the book for self assessment and also in mastering the basic techniques of problem solving. Some of the problems given in the book are expected to challenge the students' understanding of Chemistry concepts and to apply them in new situations. At a number of places elaboration of answers may be required.

The problems included in this book were developed in workshop mode organised by the DESM involving practising teachers, subject experts from universities and institutes of higher learning, and the members of the Chemistry group of the DESM whose names appear separately. I gratefully acknowledge their efforts and thank them for their valuable contribution in our endeavour to provide good quality instructional material for the school system. I, especially, thank Professor Brahm Parkash, Dr. Alka Mehrotra, and Dr. Anjni Koul of DESM for editing and refining the problems and for making the manuscript pressworthy. Thanks are also due to Professor Brahm Parkash and Dr. Alka Mehrotra of DESM for coordinating this programme.

I also thank Shri Ishwar Singh, Sr. DTP Operator for typing the manuscript and preparing a press-ready copy.

We look forward to feedback from students, teachers and parents for further improvement of the content of the book.

Hukum Singh
Professor and Head

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

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INTRODUCTION

Assessment of students is an important part of the teaching-learning process. It helps a teacher to evaluate (i) his/her own teaching and (ii) the achievement of students in a particular subject. In other words, assessment provides the present achievement and subsequent guidance to teaching-learning. It is also an instrument to assess the educational progress of learners.

According to Bloom's taxonomy, there are three domains of educational objectives (i) cognitive (ii) affective and (iii) psychomotor. Cognitive domain deals with the educational products and processes.

In the present book, the problems pertaining to cognitive domain have been included. These are categorised into different classes on the basis of the type of their construction.

- (i) Multiple choice
- (ii) Matching type
- (iii) Short answer type
- (iv) Long answer type
- (v) Assertion and reason type

(i) Multiple choice type : Multiple choice questions are widely used in objective tests for different examinations. A multiple choice question consists of a stem followed by 4-5 responses.

(a) Stem : The stem is that part in which the task which the students have to undertake is set out. It may be a direct question or an incomplete statement.

(b) Response : Below the stem of the question, there are a number of options comprising of the correct answer(s) and distractors. These should appear to closely resemble with one another. The distractors distract students. The style of presentation i.e., length, precision etc. of any response should not provide any clue of its being a correct answer or a distractor. Correct responses should be arranged randomly. A good multiple choice question can induce higher order thinking among students. A number of multiple choice questions relating to various aspects of the same theme presented as material, picture or diagram, or a combination of more than one of these enables the learners to develop multiple abilities.

(ii) Matching Type : In this type, a premise is to be matched with single correct response out of a number of responses. It is known as simple matching. In compound matching, a premise has to be matched with more than one correct response.

(iii) Short answer type : These type of questions have a short answer either in the form of a word or a few sentences or diagram or numerical value or a combination of these. Good short answer questions involve the use of

action oriented and precise verbs such as, deduce, conclude, classify, interpret, explain, extrapolate, translate etc. for precision. The words like, briefly, short notes on etc. are avoided.

(iv) Long answer type : These questions require long answers to be written with or without diagram(s). Long answer questions involve the following tasks to test higher order abilities.

- (a) contrast, distinguish, discriminate and differentiate.
- (b) compare, list similarities/dissimilarities.
- (c) explain, show how and why and give explanatory reasons.
- (d) discuss, defend, refute, prove, disprove, justify.
- (e) judge, evaluate.

(v) Assertion- Reason type : These questions enhance the reasoning ability of the learner. In these questions there is a statement of assertion followed by a statement of reason. Learner selects the correct response through logical reasoning.

Some Problem Solving questions have also been included in the book. Such questions require the application of knowledge and procedures to a problem situation. It is a form of discovery learning, bridging the gap between the learner's existing knowledge and the solution to the problem. In problem solving the learner is required to construct some knowledge to find out the solution to the problem or investigate a fact or a result.

For closed-ended problems, there will only be one answer. For open-ended problems, there will be more than one answer.

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