

# PHYSICS

Basic Education  
Grade Nine

## Teacher's Guide





**Republic of Lebanon**

Ministry of Education and Higher Education

THE SYSTEM

■  
**PHYSICS**

Teacher's Guide ■

**Basic Education**

Grade Nine

Center for Educational Research and Development



National  
Textbook

**New Curricula**

General Coordinator  
**Moustapha Yaghi**

Proof Reader  
**Sami Achkar** ■

# ■ **PHYSICS**

**Teacher's Guide ■**

**Basic Education**

Grade Nine

**Ali Abbas** (Coordinator)

**Ahmad Fawaz**

**Antoine Skaf**

**Ibrahim Rachidi**

Center for Educational Research and Development



**Educational Company**

for Printing, Publishing and Distribution S.A.R.L.

■ **Documentary Research :** Iconographic Team, CERD

■ **Publishing and Distribution :**  **Educational Company**  
for Printing, Publishing and Distribution S.A.R.L

**Layout :** Technical Team, LEPC s.a.l.

**Cover :** Elie Tabet

**Printing :** By Green Glory

© CERD 2000, Sin-EI-Fil, Lebanon, P.O.Box: 55264

All Rights Reserved for CERD

3<sup>rd</sup> impression 2008

4<sup>th</sup> Impression 2010

# Together We Build Through Education!

The Center for Educational Research and Development (CERD) has embarked on an extensive workshop for assessing and developing the educational framework and curricula which have been placed into effect more than three years ago. With full realization of the fact that the educational cycle must continue normally through its components, and until the development process attains its aspired objectives, we are placing in the hands of students, teachers and directors of public schools, this corrected version of textbooks issued by CERD as part of the National Textbook Series.

This version is an interim stage incorporating the corrected typographical and linguistic errors discovered by CERD specialists as well as teachers and students through their daily dealings with the books. The process of assessment and development of the framework and curricula will take into consideration all the comments that have been made, or will be made, in this regard.

It is expected that once the curricula are developed and aligned with the general and specific objectives set for them, the textbooks will be realigned with the new curricular and framework requirements, including tying the content of a course to the number of teaching hours set for it during the school year, taking into consideration vertical alignment within the same course as well as the horizontal alignment with the rest of the courses.

I take this opportunity to invite all school administrators, teachers and students and all officials concerned in public and private schools alike, to promptly send their comments on these curricula and books as their contribution to enrichment of this momentous national process.

This workshop, which was launched under the kind sponsorship of His Excellency the Minister of Education and Higher Education in implementation of Decree No. 10227 embodying the educational curricula and their objectives, fits in with CERD's proclaimed new motto "Together We Build Through Education".

It is our earnest desire to see this national, all-inclusive workshop attracting the greatest amount of interest and participation to define the safest and soundest educational options that directly affect our children, as we vow to continually modernize education and develop its ways and means to keep abreast of modern developments and progress in science and technology.

**Dr. Leila MALEEHA**  
President CERD





# PREFACE

This Physics guidebook for Grade 9 of Basic Education is written in conformity with the student textbook.

In each chapter, the teacher finds the basic parts of the official syllabus (learning objectives, activities and remarks), the procedure to be followed in giving more complementary scientific explanations related to the treated subjects, the answers of the exercises of the student textbook, and finally, supplementary exercises and their solution.

The main parts of each chapter are:

- 1- The plan of the chapter
- 2- The role of the experiment
- 3- The materials
- 4- The experimental procedure:
  - a) Some experiments must be performed by the teacher himself as they are either difficult or dangerous.
  - b) Some other experiments are "collective experiments" where each student may participate actively and help in providing the necessary materials that are not easily available.
  - c) The remaining experiments are simple and easy to perform and do not require special materials . They can be done by each group of students.
- 5- The supplementary exercises and their solutions : they help the teacher as an additional evaluation.

We hope that this guide would meet the needs of teachers and make their job easier.

*The authors*

# Table of contents

<i>chapters</i>	<i>page</i>
1 Refraction of Light	9
2 Lenses	18
3 Formation of images	27
4 The Eye	40
5 DC Voltage	46
6 Alternating Voltage	57
7 The Voltage of the Mains	67
8 Resistors	76
9 Electric Power and Energy	91
10 Transfer of Heat and Quantity of Heat	103
11 Change of Phase and Thermal Equilibrium	110
12 Mechanical Actions	121
13 Equilibrium of a Body	133
14 Pressure in Liquids	144
15 Archimedes Upthrust	153
<b>Typical Lessons</b>	<b>164</b>