

David Sang
Cambridge IGCSE
Physics
Workbook

Cambridge University Press
978-0-521-17358-2 - Cambridge IGCSE Physics Workbook
David Sang
Frontmatter
[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore,
São Paulo, Delhi, Dubai, Tokyo, Mexico City

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

www.cambridge.org
Information on this title: www.cambridge.org/9780521173582

© Cambridge University Press 2010

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 2010

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-17358-2 Paperback

Cover image: Fingers weave through optical fibers.
© Adam Hart-Davis/Science Photo Library

Cambridge University Press has no responsibility for the persistence or
accuracy of URLs for external or third-party internet websites referred to in
this publication, and does not guarantee that any content on such websites is,
or will remain, accurate or appropriate. Information regarding prices, travel
timetables and other factual information given in this work is correct at
the time of first printing but Cambridge University Press does not guarantee
the accuracy of such information thereafter.

NOTICE TO TEACHERS

References to practical activities contained in these resources are provided 'as is' and
information provided is on the understanding that teachers and technicians
shall undertake a thorough and appropriate risk assessment before
undertaking any of the practical activities listed. Cambridge University Press makes
no warranties, representations or claims of any kind concerning the practical activities.
To the extent permitted by law, Cambridge University Press will not be liable
for any loss, injury, claim, liability or damage of any kind resulting from the
use of the practical activities.

Contents

Introduction

V

Block 1 General physics

1

1	Making measurements	1
E	1.1 Accurate measurements	1
	1.2 Density data	2
	1.3 Testing your body clock	4
2	Describing motion	6
	2.1 Speed calculations	7
	2.2 Distance against time graphs	8
E	2.3 Speed against time graphs	11
3	Forces and motion	13
	3.1 Identifying forces	13
	3.2 The effects of forces	14
	3.3 Falling	15
4	Turning effects of forces	16
	4.1 Turning effect of a force	16
E	4.2 Calculating moments	17
5	Forces and matter	19
	5.1 Stretching a spring	19
E	5.2 Pressure	21
6	Energy transformations and energy transfers	23
E	6.1 Energy efficiency	24
	6.2 Energy calculations	26
7	Energy resources	27
	7.1 Renewables and non-renewables	28
8	Work and power	29
	8.1 Forces doing work, transferring energy	30
E	8.2 Calculating work done	31
	8.3 Power	32
Block 2 Thermal physics		34
9	The kinetic model of matter	34
	9.1 Changes of state	34
	9.2 Brownian motion	36
E	9.3 Boyle's law	37
10	Thermal properties of matter	39
	10.1 Calibrating a thermometer	39
E	10.2 Heat calculations	41
11	Thermal (heat) energy transfers	44
	11.1 Convection currents	44
	11.2 Radiation	46

Block 3 Physics of waves

48

12	Sound	48
	12.1 Sound on the move	48
	12.2 Sound as a wave	51
13	Light	52
	13.1 On reflection	53
	13.2 Refraction of light	54
14	Properties of waves	54
	14.1 Describing waves	55
E	14.2 The speed of waves	56
15	Spectra	58
	15.1 Electromagnetic waves	58

Block 4 Electricity and magnetism

60

16	Magnetism	60
	16.1 Attraction and repulsion	60
	16.2 Make a magnet	61
	16.3 Magnetic fields	62
17	Static electricity	63
	17.1 Attraction and repulsion	63
	17.2 Moving charges	64
18	Electrical quantities	65
	18.1 Current and charge	66
	18.2 Electrical resistance	67
E	18.3 Electrical energy and power	70
19	Electric circuits	71
	19.1 Circuit components and their symbols	72
E	19.2 Diodes	73
	19.3 Resistor combinations	73
20	Electromagnetic forces	74
	20.1 Using electromagnetism	75
	20.2 Cathode rays	77
21	Electromagnetic induction	78
	21.1 Electricity generation	79
E	21.2 Transformers	80

Block 5 Atomic physics

82

22	The nuclear atom	82
	22.1 The structure of the atom	82
E	22.2 Discovering the structure of the atom	83
	22.3 Isotopes	85
23	Radioactivity	86
	23.1 The nature of radiation	87
	23.2 Radioactive decay	88
E	23.3 Using radioactive substances	91

Introduction

This book has been written to help you increase your understanding of the topics covered in your IGCSE Physics course. The exercises will give you opportunities for the following:

- practice in writing about the ideas that you are studying
- practice in solving numerical and other problems
- practice in thinking critically about experimental techniques and data
- practice in drawing and interpreting diagrams, including graphs.

Most of the exercises are somewhat different from examination questions. This is because they are designed to help you *develop* your knowledge, skills and understanding. (Examination questions are designed differently, to *test* what you know, understand and can do.)

Spaces have been left for you to write your answers. Some of the diagrams are incomplete, and your task will be to complete them.

Safety

A few practical exercises have been included. These could be carried out at home using simple materials that you are likely to have available to you. (There are many more practical activities on the CD-ROM that accompanies your textbook.)

While carrying out such experiments, it is your responsibility to think about your own safety, and the safety of others. If you work sensibly and assess any risks before starting, you should come to no harm. If you are in doubt, discuss what you are going to do with your teacher before you start.